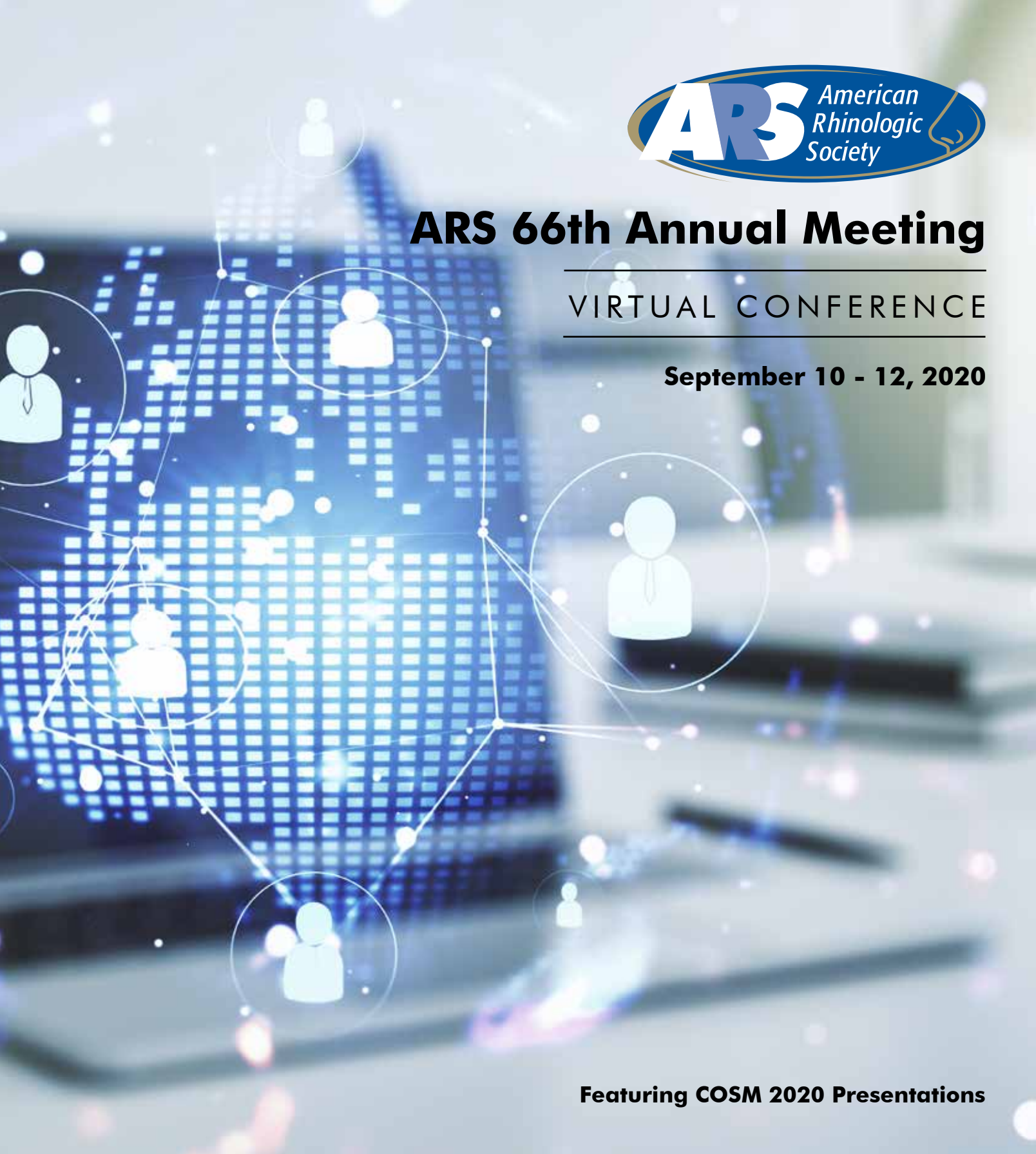

American Rhinologic Society

ARS 66th Annual Meeting

VIRTUAL CONFERENCE

September 10 - 12, 2020

Featuring COSM 2020 Presentations

PROGRAM GUIDE

The ARS welcomes our
66th Annual Meeting
Guest Countries:

Brazil, Japan, Korea, Philippines

The ARS also welcomes
the AAO-HNS
Guest Countries:

Caribbean, Egypt, Germany, Taiwan

ROBERT KERN, MD, FARS

Presidential Welcome

On behalf of the American Rhinologic Society, I am pleased to invite all those interested in Rhinologic disease to our 66th annual meeting, virtual this year in the face of the COVID pandemic. These are trying times for everyone and the move to a virtual meeting was the only practical answer. Very special notes of gratitude are due to many people. First, is Joe Han and the entire program committee, who have worked very closely to organize the many facets of this meeting, plowing new ground and stretching the limits of virtual technology to bring you the best experience possible. Wendi, Tammy and Susan have also worked tirelessly behind the scenes, dealing with all sorts of new challenges. The American Rhinologic Society is committed to providing first class educational material to our members, and despite the current pandemic, I think you will be very pleased. I would also like to thank our sponsors who have continued to generously support the society. It has been my great pleasure to serve as your President over the past year, and despite the pandemic, it has been a wonderful and exciting experience, full of friendship and camaraderie as well as problem solving on the fly. The current tough times will pass, and I am certain our organization will continue to do even more great things in the future. I thank you for the chance to serve as a steward of such a wonderful organization.

Robert Kern, FARS
President, American Rhinologic Society

JOSEPH HAN, MD, FARS

Welcome from the Program Chair

Welcome to the 66th Annual American Rhinologic Society Meeting. This will be the first virtual ARS Annual meeting. As your President-Elect, I appreciate the opportunity to serve as program chair for 2020. In the year 2020, it has been a turbulent and unexpected year that has been full of twist and turns.

The Program Committee has reviewed 217 abstracts for COSM ARS meeting and 221 abstracts for the annual meeting. We owe the program committee a huge debt of gratitude for their tireless work in ensuring the finest possible meeting content. Their names are listed below.

After careful consideration and discussions, ARS have developed the first ever virtual ARS annual meeting. The covid 19 virus has impacted rhinologists significantly because of the high viral load in the nose, sinuses, and skull base. It has created an environment in which we have to consider how to take extra precautions to protect patients, medical staffs and ourselves from the virus. It has also even impacted the timely ability to care for patient who require treatment. Therefore, creating a virtual program made sense this year and we have created a program that would minimize the impact for you and your care for your patients. The Annual meeting will be a 2 day program, starting Thursday evening and continuing on Saturday. It will be a combination of live panels to allow for immediate interactions and recorded scientific presentations with live time for questions and discussions. The virtual format will allow for possibilities that have not been available in the past like instantaneous online chatting, networking, and discussion.

The program will begin Thursday evening with the David Kennedy Lectureship featuring Peter Hwang as the speaker and the title is "Moving Forward: Rhinology in the post-COVID era". The lecture is very timely. We will also be highlighting the top 10 scientific abstracts from both the ARS COSM abstracts and ARS Annual Meeting abstracts which were selected in a blinded fashion by the Program Committee. We will also showcase a multidisciplinary panel on the management for chronic rhinosinusitis with nasal polyps.

Saturday afternoon or morning based on your residence, we will break up into three rooms with multiple sessions in each room. The panels will cover diverse concepts ranging from understanding the use of biologics, impact of COVID-19 on the rhinology practice, international perspective on the management of chronic rhinosinusitis, and evidence based approach to the management of allergic rhinitis. One of the panels is sponsored by Women in Rhinology and will talk about “Work-life balance during COVID-19 era”. There is no doubt that there is a large amount of material and definitely something for everyone in this year’s Fall meeting.

One of the benefits to this year virtual meeting is that you do not have to run from one room to another to hear the interesting talks. You can simply click from one room to another room. The top ten oral presentations will have 10 minutes to present their information, oral presentations will have 7 minutes, and new to this year is the format of the poster sessions. Each poster will be allowed 3 minutes to present their scientific presentations. If there are conflicting talks you want to hear, don’t worry because we will record the presentations and panels so that they will be available for viewing at a later time. However these recordings will be available only for a limited time so make sure you view all the wonderful abstracts.

The rhinology scientific content does not end on Saturday. If you are a paid ARS registrant, you will be able to have access to the AAOHNS rhinology week, September 24 to 27. During this week, there will be several interesting rhinology panels. A couple of interesting panels during the rhinology week is a joint ARS-AAOHNS panel discussing the tips and trick to endoscopic pituitary surgery and a joint ARS-AAOA panel discussing the work up and management of nasal polyps.

It has been an honor and a pleasure to serve as President-Elect and Program Chair and I look forward to seeing you in person in Los Angeles!

Joseph Han, MD, FARS
ARS President Elect and Program Chair

MICHAEL G. STEWART, MD, MPH, FARS

Report from the ARS Executive Vice President

These times are testing everyone and everything, and medical societies are no exception. However the ARS will make it through this, because we have adequate reserves to withstand the loss of revenue, and because we have outstanding members and an important mission.

All ARS members should be very proud of the remarkable efforts of so many of our members and leaders to persevere during these difficult times. I hesitate to name names, because I might exclude someone accidentally, so I apologize in advance for any omissions.

I first want to recognize ARS President Robert Kern, MD who has showed great flexibility and wisdom in dealing with many unexpected challenges, and he has kept the Society on track. President-Elect Joseph Han, MD is responsible for our meetings, which has been the most disrupted part of our work, but working with the Program Committee, he has done an amazing job of steering a new course and creating an exciting Virtual Meeting format. The leaders of our Summer Sinus Symposium – Drs. Greg Davis, Marc Dubin and Doug Reh – have had to move the meeting (twice!) and change the format, but they have persevered and we look forward to a successful Virtual SSS in November.

Todd Kingdom, MD, and David Poetker, MD, worked seamlessly with the Fellowship Directors and the SF Match to move the interviews and match dates for next year's Fellows. Erin O'Brien, MD, and the membership committee have been addressing important membership issues, and Troy Woodard, MD, and the newly created Diversity and Inclusion Committee have been working to address diversity and inclusion issues in the society, which has proven to be very timely. Jivianne Lee, MD, leads the Women in Rhinology Section, and they have been continuing their important work as well.

Kevin Welch, MD, is our Treasurer and he has been keeping a close eye on our finances. Brent Senior, MD, has stayed in contact with all of our industry partners who are anxious to continue to work with us, and he has also helped to organize some well-received Webinars on Covid and Rhinology. And last but certainly not least, Spencer Payne, MD, and the IT committee have been working extremely hard on our meeting program logistics, maintaining our website, and facilitating communications with our members.

And finally, of course our administrative staff are critical to the success of the ARS and that is certainly true now; Wendi Perez, Susan Arias and Tammy Lorimer have been loyal and supportive, and are putting in extra effort to ensure that our programs continue for the benefit of our membership.

Please join me in thanking our volunteer leaders and our staff for all their efforts for the American Rhinologic Society.

Michael G. Stewart, MD, MPH, FARS
ARS President Elect and Program Chair

TROY WOODARD, MD

ARS Diversity and Inclusion

In January 2020, the ARS Board and Committee Chairs convened for our first strategic planning retreat in several years. At that meeting, there was unanimous agreement that the ARS needed to update its Diversity and Inclusion Mission Statement and appoint a leader and a committee to address Diversity and Inclusion for the ARS. Troy Woodard, MD, agreed to become our inaugural Diversity Officer as well as Chair of our new Diversity and Inclusion Committee. Current committee membership includes Jean Eloy, MD, Jivianne Lee, MD, Jose Mattos, MD, Erin O'Brien, MD, Kenneth Rodriguez, MD, Zach Soler, MD, and Danielle Warner, MD. The committee will study and implement plans to increase the diversity and inclusion of the ARS and its activities. They also welcome input from ARS Members.

Since its inception, the Diversity and Inclusion Committee has created a new Diversity and Inclusion Mission Statement for the Society:

The American Rhinologic Society (ARS) is committed to diversity and inclusion within the membership of our society.

In order to fulfill our mission of promoting excellence in patient care, research, and education in rhinology and skull base disorders, we are committed to respecting, promoting, and valuing the contributions of members regardless of their age, ethnicity, gender, race, disability status, economic circumstances, religion or sexual orientation.

We will actively work to improve the inclusion and participation of diverse members at all levels including in committees and leadership and in educational offerings and research support.

The ARS will advance culturally competent patient care and research and the role of diversity in the ARS membership to further these efforts.

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ARS Mission Statement

The American Rhinologic Society's mission is to serve, represent and advance the science and ethical practice of rhinology. The Society promotes excellence in patient care, research and education in Rhinology and Skull Base Disorders. The American Rhinologic Society is dedicated to providing communication and fellowship to the members of the Rhinologic community through on-going medical education, patient advocacy, and social programs. The ARS continuing medical education activities serve to improve professional competence, performance, and promote research.

Business/ACCME

Continuing Education

Accreditation Statement

The American Rhinologic Society (ARS) is accredited by the Accreditation Council for Continuing Medical Education to provide continuing medical education for physicians.

Credit Designation Statement - Live Content

The ARS designates the live activity portion for a maximum of *5.50 AMA PRA Category 1 Credits™.*

Credit Designation Statement - Enduring Content

The ARS designates the enduring material activity portion for a maximum of *23.25 AMA PRA Category 1 Credits™.* Learners should claim only the credit commensurate with the extent of their participation in the activities. The 5.50 live hours can not be claimed as enduring hours.

How to Obtain Your CME Certificate

Go to *ARS.CmeCertificateOnline.com* and click on "ARS 66th Annual Meeting" link. On the site, you will be asked to evaluate the overall conference. A certificate will be made available for you to print. Questions? Email *Certificate@AmedcoEmail.com*

Learning Objectives

Upon completion of the session the participants should be able to:

- Discuss proven and novel innovations for the medical and surgical management for rhinitis and chronic rhinosinusitis
- Appreciate the emerging role and application of biologics for CRSwNP
- Understand the impact of COVID 19 for a rhinology practice
- Describe the safety aspect needed for health care providers and patients in the COVID 19 era

ARS 2020 FRIENDS IN RESEARCH DONORS

Thank you to all donors who have helped get the 2020 Friends in Research Campaign off to a great start!!! We thank you for your generosity! With the monies donated over the past few years the ARS has heen able to continue the Friends in Research sponsored grant which is in addition to our traditional CORE efforts! New this year the ARS is also offering a three-year, multi-site Con-sortium Grant.

With your support, we can continue to fund the studies that provide clinical insights valuable to the care of our patients. This work not only advances the care of our patients through scientific innova-tion, but also generates important data establishing the efficacy and cost effectiveness of our care. In the current financial landscape, this is equally important to ensure that our patients have access to the treatment necessary to address their complaints. We thank you again for your help in this worthy endeavor!

Visit *american-rhinologic.org* and join us in our 2020 year campaign.

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David W. Kennedy Lectureship
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PROGRAM AT A GLANCE

Thursday, September 10, 2020 – 6:50 pm - 10:00 pm EST

Breakout Room 1

6:50 pm - 7:00 pm
Introduction – Robert Kern, MD, FARS – ARS President
Joseph Han, MD, FARS – President-Elect/Program Chair

Moderators: Troy Woodard, MD, FARS; Dana Crosby, MD, FARS; Waleed Abuzeid, MBBS

7:00 pm - 7:10 pm **Randomized trial on the effect of postoperative oral corticosteroids on QOL and biomarkers**
Sarina Mueller, MD

7:10 pm - 7:20 pm **Mepolizumab for chronic rhinosinusitis with nasal polyps**
Joseph Han, MD, FARS

7:20 pm - 7:30 pm **Prophylactic antibiotics after functional endoscopic sinus surgery: A randomized controlled trial**
Ashton Lehmann, MD

7:30 pm - 7:40 pm **The cost of rhinitis**
Lauren Roland, MD

7:40 pm - 7:50 pm **CRISP/Cas9 enables CFTR correction in the endogenous locus in airway stem cells**
Dawn Bravo, PhD

7:50 pm - 8:00 pm **Questions and Discussion**

8:00 pm - 8:10 pm **Inter Session Break**

8:10 pm - 9:00 pm **Panel: Nasal Polyp Management Algorithm**
Moderator: Joseph Han, MD, FARS
Panelists: James Palmer, MD, FARS; Jivianne Lee, MD, FARS; Anju Peters, MD; Kent Lam, MD; Zachary Soler, MD, FARS; Christine Franzese, MD, FARS

Breakout Room 2

6:50 pm - 7:00 pm **Introduction** – Robert Kern, MD, FARS – ARS President
Joseph Han, MD, FARS – ARS President-Elect/Program Chair

7:00 pm - 7:40 pm **David Kennedy Lectureship:** "Moving Forward: Rhinology in the Post-COVID Era"
Guest Speaker: Peter Hwang, MD, FARS

7:40 pm – 7:50 pm **Scientific Awards**
Presenters: Robert Kern, MD, FARS; Jean Kim, MD, FARS

7:50 pm - 8:00 pm **Inter Session Break**

Moderators: Jennifer Villwock, MD; Ian Humphreys, DO, FARS; Philip Chen, MD, FARS; Garret Choby, MD, FARS

8:00 pm - 8:10 pm **IL-13 acts on human sinonasal epithelial basal cells to increase hypoxia-associated gene expression**
Syed Khalil, PhD *(Presented by Nicholas Rowan, MD)*

8:10 pm - 8:20 pm **Predictors of rhinorrhea response after posterior nasal nerve cryoablation for chronic rhinitis**
Frederick Yoo, MD

8:20 pm - 8:30 pm **IL-17A levels are associated with increased prior ESS**
Nikita Chapurin, MD, MHS

8:30 pm - 8:40 pm **A randomized clinical trial to evaluate mometasone lavage versus spray for management of CRS**
Pawina Jiramongkolchai, MD

PROGRAM AT A GLANCE

8:40 pm - 8:50 pm **DMBT1 is the endogenous carrier ligand for eosinophil death receptor Siglec-8 in nasal polyps**
Jean Kim, MD, PhD, FARS

8:50 pm - 9:00 pm **Questions and Discussion**

9:00 pm – 10:00 pm **Women in Rhinology Reception: Introducing the Nominees for the next Governing Council**
Supported by Medtronic

Friday, September 11, 2020 – 4:00 pm - 5:00 pm EST

Women in Rhinology, Mentorship and Residents & Fellows Combined Session
"Payment and Quality in U.S. Healthcare: Preparing for an Era of Transparency"
Introduction: Murugappan Ramanathan, MD, FARS
Invited Guest Speaker: Marty Makary, MD, Professor of Surgery, Johns Hopkins School of Medicine

Saturday, September 12, 2020 – 11:50 am - 3:00 pm EST

Breakout Room A

11:50 am - 12:00 pm **Introduction** – Robert Kern, MD, FARS – ARS President
Joseph Han, MD, FARS – ARS President-Elect/Program Chair

Moderators: Corinna Levine, MD, FARS; David Gudis, MD, FARS; Angela Donaldson, MD, FARS

12:00 pm - 12:10 pm **Submucosal gland morphology and secretory cell identities are aberrant in chronic rhinosinusitis**
Onyekachi Nnabue, Medical Student

12:10 pm - 12:20 pm **Broad lipidomic analysis of patients with AERD undergoing aspirin desensitization**
Adam DeConde, MD

12:20 pm - 12:30 pm **Cell adhesion molecule expression in chronic rhinosinusitis**
Brennan Blight, BS

12:30 pm - 12:40 pm **Macrophages regulate olfactory regeneration through the IL-6/Stat3 pathway**
Andrew Lane, MD, FARS *(Presented by Kathleen Kelly, MD)*

12:40 pm - 12:50 pm **A novel device combining acoustic vibration and expiratory pressure for nasal congestion**
Rodney Schlosser, MD, FARS

12:50 pm - 1:00 pm **Questions and Discussion**

1:00 pm - 1:10 pm **Inter Session Break**

1:10 pm - 2:00 pm **Panel: Understanding the role, questions, and concerns of biologic in the management of NP**
Moderator: Amber Luong, MD, PhD, FARS
Panelists: Lauren Roland, MD; Kent Lam, MD; Jean Kim, MD, FARS; Rodney Schlosser, MD, FARS; Christine Franzese, MD, FARS

2:00 pm - 2:10 pm **Inter Session Break**

2:10 pm - 3:00 pm **Panel (Women in Rhinology): "Work-life Balance during COVID-19 Era"**
Moderator: Elina Toskala, MD, FARS
Panelists: Timothy Smith, MD, FARS; Mindy Rabinowitz, MD, FARS; Ian Koszewski, MD; Jivianne Lee, MD, FARS; Lori Lemonnier, MD

Breakout Room B

11:50 am - 12:00 pm	**Introduction** – Robert Kern, MD, FARS – ARS President Joseph Han, MD, FARS – ARS President-Elect/Program Chair
12:00 pm - 12:50 pm	**Panel: Clinical Importance of Bench Research** Moderator: Andrew Lane, MD, FARS Panelists: Justin Turner, MD, FARS; Benjamin Bleier, MD, FARS; Erin O'Brien, MD, FARS; Carol Yan, MD
12:50 pm - 1:00 pm	**Inter Session Break**
Moderators:	Theodore Schuman, MD, FARS; David Jang, MD, FARS; Alissa Kanaan, MD
1:00 pm - 1:10 pm	**SNOT-22 subdomain analysis of patients treated with Omalizumab for nasal polyposis** Joseph Han, MD, FARS
1:10 pm - 1:20 pm	**Sinonasal inflammation impairs resting-state functional brain connectivity** Aria Jafari, MD
1:20 pm - 1:30 pm	**Patient satisfaction with telemedicine clinical visits for chronic rhinosinusitis** Megan Morisada, MD
1:30 pm - 1:40 pm	**Red ginseng aqueous extract improves markers of mucociliary clearance in the Cystic Fibrosis rat** Do Yeon Cho, MD
1:40 pm - 1:50 pm	**Predictors of completion of sublingual immunotherapy** Sophia Song *Presented by Nanki Hura, BS*
1:50 pm - 2:00 pm	**Questions and Discussion**
2:00 pm - 2:10 pm	**Inter Session Break**
2:10 pm - 3:00 pm	**Panel: Utility of Pedicled Flap: Nose to Skull Base** Moderator: Eric Holbrook, MD, FARS Panelists: Stacey Gray, MD, FARS; Zara Patel, MD, FARS; Troy Woodard, MD, FARS; Waleed Abuzeid, MBBS; Jonathan Ting, MD, FARS

Breakout Room C

11:50 am - 12:00 pm	**Introduction** – Robert Kern, MD, FARS – ARS President Joseph Han, MD, FARS – ARS President-Elect/Program Chair
12:00 pm - 12:40 pm	**Panel: Management of CRS: Perspective Around the World** Moderator: Brent Senior, MD, FARS Panelists: Marcio Nakanishi, MD; Peter Hellings, Professor; Claus Bachert, MD, Professor; Claire Hopkins, Professor; Martin Desrosiers, MD;
12:40 pm – 12:50 pm	**Inter Session Break**
12:50 pm - 1:30 pm	**Panel**: **Impact of COVID 19 in Rhinology: From Office to OR** Moderator: Seth Brown, MD, FARS: Panelists: Zara Patel, MD, FARS; Abtin Tabaee, MD, FARS: Parul Goyal, MD, FARS; Arthur Wu, MD, FARS
1:30 pm – 1:40 pm	**Inter Session Break**
1:40 pm – 2:20 pm	**Panel: New and Innovative Management: From Rhinitis to Sinusitis** Moderator: Jeffrey Suh, MD Panelists: Benjamin Bleier, MD, FARS; Ashutosh Kacker, MD; Carol Yan, MD; Esther Kim, MD
2:20 pm – 3:00 pm	**Panel: Evidence versus Myth: Management of Allergic Rhinitis** Moderator: Stella Lee, MD Panelists: Seong Cho, MD; Sarah Wise, MD, FARS; Gregory Capra, MD, FARS

PROGRAM AT A GLANCE- On Demand Presentations

ORAL PRESENTATIONS

A comparison between anterior and lateral CSF leaks in meningocele patients
Rahul Alapati, BS

Adverse events with monoclonal antibodies
Mohamad Chaaban, MD, MSCR, MBA

Age-related changes in olfactory cleft anatomy and airflow using computational fluid dynamics
Ryan Little, MD

Antibody deficiencies in chronic rhinosinusitis
Chadi Makary, MD

Are rhinitis and eustachian tube dysfunction associated in United States adolescents?
Dara Adams, Dr.

Association of air pollutant exposure and sinonasal histopathology in chronic rhinosinusitis
Tirth Patel, MD

Association of nasopharyngeal inflammation in patients with eustachian tube dysfunction
Jeffrey Bergeron, MD

Automated 3D sinus CT evaluation
Vijay Ramakrishnan, MD, FARS

Azithromycin and ciprofloxacin inhibit IL-8 secretion without disrupting HSNEC integrity in vitro
Dong Jin Lim, PhD

Biologics in the management of CRSwNP
Ahmad Mirza, MBBS

Bone mineral density of the anterior skull base in spontaneous cerebrospinal fluid leak patients
Christopher Low, MD

Chemosensory dysfunction and diet quality
Christopher Roxbury, MD

Comparing CRS severity between Hispanics and non-Hispanics undergoing primary ESS
Corinna Levine, MD, FARS

Cost-effectiveness of antibiotic prophylaxis for nasal packing
Ximena Maul, MD

Delta neutrophil index in chronic sinusitis
Ki Il Lee, MD, PhD

Dupilumab efficacy in CRSwNP by NP surgery history in the SINUS-24 and SINUS-52 studies
Claire Hopkins, FRCS DM

Endoscopic repair of congenital basal encephaloceles decreases complications compared to open
Harrison Thompson, BS

Examination of SCL-90 subdomains in empty nose syndrome patients
Dayoung Kim

Gabapentin and postoperative pain after sinus surgery
David Lerner, MD

Gender-related differences in outcomes after FESS
Arthur Wu, MD, FARS

Health literacy in rhinology patients
Jakob Fischer, MD

Impact of novel CFTR modulator on sinonasal outcomes in patients with Cystic Fibrosis
Jennifer Douglas, MD

In vitro safety and efficacy of mitochondrially-targeted antioxidant mitoquinone after FESS
Michael Gouzos, MD

Intercarotid artery distance in the pediatric population: Implications for skull base approaches
Nyall London, MD, PhD

Medicare payment sex disparities for endoscopic sinus procedures
Jeremy Ruthberg, Medical Student

Microbiomics of irrigation with xylitol or Lactococcus lactis in chronic rhinosinusitis
Paul Lambert, MD

Mometasone irrigations compared to Budesonide irrigations
Peter Papagiannopoulos, MD

Mucin expression in allergic fungal sinusitis
Carly Clark, BA

Outcomes following exclusively endoscopic endonasal resection of benign orbital tumors
Aria Jafari, MD

Pain catastrophizing in chronic rhinosinusitis
Aasif Kazi, MD, PharmD

P-gp Inhibition with verapamil overcomes mometasone resistance in CRSwNP
Maie Taha, PhD

Practice of telemedicine in otolaryngology: Systematic review in the era of COVID-19
Jonathan Overdevest, MD, PhD

Predictors of revision surgery: An analysis of Draf 3 on index surgery and disease endotype
Tran Locke, MD

Predictors of survival outcomes in sinonasal squamous cell carcinoma
Nyssa Farrell, MD

Primary dural suturing via an endoscopic endonasal corridor: 3D printed model for training
Ivanna Nebor, MD

Psychometric properties of the brief version of the questionnaire of olfactory disorders
Jose Mattos, MD, MPH

Quality of life before and after ESS and ASA desensitization in AERD patients as measured by SF-12
Tran Locke, MD

Randomized trial of nasal theophylline irrigation for treatment of post-viral olfactory dysfunction
Jake Lee, MD

Readmission following inpatient functional endoscopic sinus surgery for chronic rhinosinusitis
Habib Khoury

Sinonasal mucin in aspirin exacerbated respiratory disease
Cameron Worden, BS

On Demand Presentations, cont'd.

Socioeconomic factors affect stage at presentation and survival in sinonasal squamous cell carcinoma
Aria Jafari, MD

Surgical outcomes for endoscopic versus open skull base resection for malignant tumors
Nicholas Lenze, BS

The association of frailty and chemosensory dysfunction in older adults
Nicholas Rowan, MD

The ENS6Q used to distinguish patients with empty nose syndrome from primary nasal obstruction
Ameen Amanian, MD

Topical budesonide is associated with decreased Nrf2
Murugappan Ramanathan, MD, FARS

Type 2 biologics versus aspirin desensitization with aspirin maintenance therapy
Auddie Sweis, MD

Type 2 inflammatory mediators decrease after ESS
Samuel Racette, MD

Vascular pathophysiology characterization in chronic rhinosinusitis
Nitish Khurana

2020 COSM ORAL PRESENTATIONS

Beta-amyloid plaques in murine olfactory bulbs during chronic olfactory inflammation
Andrew Lane, MD, FARS
(Presented by Omar Ahmed, MD)

Academic rhinologists' online rating and perception, scholarly productivity, and industry payments
Khodayar Goshtasbi, BS

Asthma control in patients with and without nasal polyps on biologic therapy
Prachi Patel, BA

Can frail patients safely undergo TNTS?
Jordan Sukys, MD

Chronic rhinosinusitis' impact on transsphenoidal surgery complications
Jake Lee, MD

Clinical correlation of 15LO1 and CCL26 in CRSwNP
Nadeem Kolia, MD

Clinical effectiveness of Benralizumab in severe asthma and chronic rhinosinusitis with nasal polyps
Chandala Chitguppi, MD

Complications of aspirin desensitization in aspirin-exacerbated respiratory disease
Auddie Sweis, MD

Denatonium benzoate bitter taste perception in chronic rhinosinusitis (CRS)
Alyssa Civantos, BA

Educational informed consent video non-inferior to standard verbal consent for FESS: A RCT
Rohit Nallani, MD (*Presented by Joseph Penn, BS)*

Electrical stimulation of olfactory neurons may improve regeneration after damage
Zara Patel, MD

Elevated urine leukotriene E4 levels associated with worsened objective asthma and CRS markers
Garret Choby, MD

Evaluating the safety of mometasone nasal lavage for patients with CRS
Pawina Jiramongkolchai , MD

Gender and age differences in aspirin-exacerbated respiratory disease
Tran Locke, MD

Histopathologic markers are not associated with QOL or olfactory function in patients with CRS
Nyssa Farrell, MD

IMPA redirects airflow and improves ENS symptomology: A CFD study
Jennifer Malik

Long-term follow up of nasal nitric oxide in chronic rhinosinusitis
Daniel Lee, MD

Machine learning of biomarkers and clinical observation to predict eosinophilic CRS
Ryan Thorwarth, MD

Mechanisms governing NSD symptoms
Jennifer Malik

Mepolizumab in eosinophilic chronic rhinosinusitis
Sophie Walter, Medical Student

Natural language processing phenotype algorithm in CRS
Robert Tuliszewski, MD

Non-sponsored evaluation of cryosurgical ablation device for rhinitis
Rohit Garg, MD, MBA

Olfactory function after surgical treatment of CRS
Jose Mattos, MD, MPH

On-demand sclerotherapy for HHT-related epistaxis
Andrew Peterson

Otologic outcomes after sinus surgery for chronic rhinosinusitis
Michael Chang, MD

Outcomes in ENT assisted and unassisted anterior skull base surgeries
Chris Choi, BS

Predictors of objective olfactory dysfunction following sinus surgery
David S. Lehmann

Prevalence of olfactory and neurocognitive dysfunction in patients with subjective smell disorder
Justin Morse, MD

Quantification of biomarker heterogeneity in control specimens used for analysis in CRS
Taylor Carle, MD

All information was taken from the original abstract submission

On Demand Presentations, cont'd.

Sinonasal inflammatory gene expression [illegible] with sleep dyWITHDRAWNNP
Katherine Lees, MD

Solitary chemosensory cells and its relation to cholinergic innervation
Jie Deng, MD

Surgeon cost feedback reduces cost in sinonasal surgery
Amarbir Gill, MD

Surgical outcomes in aspirin-exacerbated respiratory disease without aspirin desensitization
Elysia Grose, MD(c)

Synechia incidence after primary and revision FESS
William Yao, MD

Systematic review: Objective smell and taste in eating disorders
Evelyn Leland, BS

The detrimental effects of olfactory dysfunction as a non-motor symptom of Parkinson's Disease
Patrick Kim

The effect of pre-operative steroids on surgical field visibility during sinus surgery
Sen Ninan, BA

Treatment outcomes in patients with chronic rhinosinusitis and immunodeficiency: A systematic review
Shireen Samargandy, MBBS

TSLP and type 2 inflammatory cytokines in CRS, emerging endotypes
Joel Franco, MD

Unbiased measure of health-related qol in CRS reveals dominant modifiers in qol
Madison Epperson, MD

Under pressure: Differentiating CRS from non-rhinologic facial pain with facial and nasal symptoms
Thomas Higgins, MD, MSPH

Validation of sinus drug delivery CFD modeling with in vitro gamma scintigraphy
Kathryn Kudlaty, MD

POSTER PRESENTATIONS

A drug release and pharmacokinetic evaluation of novel mometasone furoate eluting matrices
Changcheng You, PhD

A prospective prevalence study of chronic rhinosinusitis associated with inflammatory bowel disease
India Dhillon, BScH

Adjunctive techniques to dacryocystorhinostomy: an evidence-based review with recommendations
Michael Yim, MD

Allergen sensitization patterns in chronic rhinosinusitis subtypes
Heather Ungerer, BA

An atypical, asymptomatic case of life-threatening rhino-cerebral mucormycosis
Agamemnon Pericleous, MBBCh, MRCS (ENT)

Analysis of public search queries relating to anosmia in the novel coronavirus-2019 pandemic
Humzah Quereshy, BA

Anosmia Google search and COVID-19 in the US
Christopher Xiao, MD

Antibiotic use following functional endoscopic sinus surgery
Mackenzie O'Connor, BS

Anxiety and opioid use after ESS
Brian Scott, MD

Are routine type and screens cost-effective in transsphenoidal surgery?
Aviv Spillinger, BS

Assessing the academic influence of otolaryngologists on sinus and allergy research
Zachary Grace

Assessing use and popularity of publicly available online videos in rhinology
Benjamin Bitner, MD

Assessing web-based audiovisual multimedia for patient education in skull base surgery
Amarbir Gill, MD

Association of environmental factors with allergic rhinitis
Victoria Lee, MD

Association of quality of life measures and otolaryngologic care in Cystic Fibrosis patients
Stephen Leong

Awareness and understanding of empty nose syndrome
Angela Yang, BS

BRAF V600E and KRAS gene expression in human nasal polyposis
Gul Acar, MD

Calvarium thinning in spontaneous cerebrospinal fluid leak patients
Dhruv Sharma, MD

Cardiovascular comorbidities and the anterior skull base
Aksha Parray

Cardiovascular comorbidities and the posterior skull base
Aakash Shah, BS

Centralization of care and patient travel for transsphenoidal surgery of the pituitary
Aisosa Omorogbe, BS

Characterization of AERD at a single institution
Uche Nwagu, BS

Chronic rhinosinusitis in patients with spontaneous cerebrospinal fluid leak
Emily Barrow, MD

Comorbidities in chronic rhinosinusitis
Amarbir Gill, MD

Comorbidities of chronic alcohol use and the anterior skull base
Aksha Parray

Complications from CSF leak repairs
Rashiqah Syed, BS

Current practices regarding middle turbinate resection among otolaryngologists
Andrea Ziegler, MD

On Demand Presentations, cont'd.

Development of CFD methodology appropriate for EDS performance evaluation
Marit Kleven

Diabetes as a risk factor for complications following ventral skull base surgery
Dongmin Kim

Diagnosis of anosmia: A systematic review
Abdul Saltagi, BS

Diet modification in AERD
Rijul Kshirsagar, MD

Differentiation of chronic rhinosinusitis and primary headache disorder via analysis of SNOT-22
Kolin Rubel, MD

Disease control after surgery for CRS: Prospective, multi-institutional validation of the SCT
Ryan Little, MD

Disease recurrence in the central compartment in eosinophilic chronic rhinosinusitis
Chadi Makary, MD

Disparities in access to care and outcomes following rhinoplasty
Aisosa Omorogbe, BS

Dupilumab improved smell outcomes in severe CRSwNP patients regardless of NP history
Joaquim Mullol, MD, PhD

Dupilumab improves pan-sinus opacification in patients with CRSwNP in SINUS-52
Stella Lee, MD

Dupilumab rapidly improves and sustains smell in CRSwNP
Joaquim Mullol, MD, PhD

Duration of frontal sinusotomy
Philip Chen, MD, FARS

Ectopic silent gonadotroph adenoma in the sphenoid sinus
Rachel Jonas, MD

Efficacy of adenoidectomy for chronic rhinosinusitis in children older than 7 Years of Age
Chengetai Mahomva, MD

Empty nose syndrome following endoscopic skull base surgery
Katie Melder, MD

Endoscopic approaches to the pterygopalatine fossa and infratemporal fossa: A systematic review
Max Newby, MD

Endoscopic endonasal repair of a sphenoid eningoencephalocele
Rafael Hijano, MD, PhD

Endoscopic endonasal surgery after maxillectomy and midface free flap reconstruction
Peter Filip, MD

Endoscopic fluorescein in the immediate post-operative period for evaluation of skull base leaks
Micah Timen, MD, MSc

Endoscopic outcomes in AERD patients treated with topical antibiotics and intranasal steroids
Jhon Martinez Paredes, MD

Endoscopic reconstruction of skull base defects using tutoplast allografts
Ghassan Alokby, MD, FARS

Endoscopic vidian canal landmarks: An anatomic relationship
Alice Liu

Ethmoid-to-maxillary inflammation ratio: A predictor of postoperative outcomes in nasal polyposis
Daniel Beswick, MD, FARS

Evaluating inflammation in an obstruction-based chronic rhinosinusitis model in rabbits
Stella Lee, MD

Evaluating the SNOT-22's "one most important symptom" over time
Michela Borrelli

Evaluation of chronic sinonasal tract inflammation as a potential risk factor for COVID-19
Michael Marino, MD, FARS

Evaluation of outcomes in patients with comorbid OSA following FESS
Leonard Estephan

Evaluation of the NEUROMARK™ system (Rhinitis Neurolysis Therapy™) in patients with chronic rhinitis
Douglas Reh, MD, FARS

Evidence-based recommendations for middle turbinate medialization in endoscopic sinus surgery
Ximena Maul, MD

Exploring adverse events in steroid-eluting stents using a FDA database
Chengetai Mahomva, MD

Extent of endoscopic sinus surgery
Yasuyuki Hinohira, MD, PhD

Extranodal NK/T cell lymphoma–nasal type mimicking chronic rhinosinusitis
Annick Aubin-Pouliot, MD

Frontal sinus delivery in Draf III by EDS confirmed with novel CFD
Narinder Singh

Functional status and posterior skull base procedures
Aakash Shah, BS

Fungal sinusitis: A spectrum of disease?
Ashleigh Halderman, MD

Granulomatous chronic invasive fungal sinusitis: A case report and review of literature
Derek Kong, MD

Hemiplegia and posterior skull base procedures
Aakash Shah, BS

IgG-4 related disease in the paranasal sinuses-an underrecognized pathology
Brett Comer, MD

Impact of postoperative budesonide irrigations after endoscopic sinus surgery on clinical outcomes
Jenna Bergman, Medical Student

Impact of preoperative dehydration in endoscopic transsphenoidal pituitary surgery
Dongmin Kim

Impact of prolonged steroid delivery by LYR-210 on four cardinal symptoms of CRS
Yina Kuang, PhD

Impact of sinusitis symptoms among the Latino population in Los Angeles
Erick Garcia

Improved CRS control with higher mometasone irrigation dose
Peter Papagiannopoulos, MD

Improving readability in patient targeted educational materials
Lori Lemonnier, MD

Insight into cervical lymph node metastases of sinonasal mucosal melanoma
Christopher Tseng, BS

On Demand Presentations, cont'd.

Laser vs microdebrider eustachian tuboplasty - A systematic review
Waqas Jamil, MBBS, MRCS ENT, Mch ENT

Locally recurrent solitary fibrous tumor with skull base reconstruction: A case report
Sydney Sachse

LYR-210 reduces sinonasal type 2 inflammation in chronic rhinosinusitis
Atsushi Kato, PhD

Management of a unique sinonasal undifferentiated carcinoma subtype in the Era of COVID-19
Jennifer Douglas, MD

Management of anosmia: A systematic review
Amit Nag, BS

Management of epistaxis during Covid-19 crisis
Abigail Walker, MBChB, MSc, MRCCS, DOHNS

Microbiology and histopathology of silent sinus syndrome
Henry Zheng, BA

Modern treatment of sinonasal melanoma
Abigail Walker, MBChB, MSc, MRCCS, DOHNS

Mometasone versus fluticasone in treatment of chronic sinusitis
Rajesh Havaldar, MS

Nasal cavity squamous cell carcinoma outcomes
Jordan Teitelbaum, DO

Nasal nitric oxide emission is driven by ethmoid sinuses and diffusion: A computational study
Kai Zhao, PhD

Nationwide trends in treatment and survival for sinonasal extramedullary plasmacytoma
Jeff Gao, BS

Neurologic comorbidities and the posterior skull base
Aakash Shah, BS

Odontogenic sinusitis: Clinical characteristics, treatments, and outcomes
Erik Risa, MD

Olfactory training for post-viral olfactory dysfunction
Edward McCoul, MD, FARS

Outcomes of skull base procedures in association with wound complication
Aksha Parray

Outcomes of skull base procedures in emergency settings
Aakash Shah, BS

Outcomes of skull base procedures in obese patients
Aakash Shah, BS

Outcomes of skull base procedures in patients with disseminated cancer
Aksha Parray

Paraganglioma of the nasal septum
Aasif Kazi, MD, PharmD

Patient satisfaction after chin fillers
Aakash Shah, BS

PDT to reduce post-operative infection after sinonasal surgery
Claire Hopkins, FRCS DM

Perioperative management of aspirin in AERD
Hannah Wangberg, MD

Perioperative opioid use in patients undergoing endoscopic sinus surgery based on OSA status
Glen D'Souza, MD

Posterior skull base outcomes in stroke patients
Aakash Shah, BS

Postoperative complications in CSF leak repairs
Rashiqah Syed, BS

Postoperative length of stay after elective CSF leak repair: Costs and outcomes
Davis Aasen, BS

Post-operative outcomes in posterior skull base procedures by immunosuppressant use and subspecialty
Aksha Parray

Posttraumatic cerebrospinal fluid fistula - Surgical management
John Symms, MD

Potential costs of dental treatment and endoscopic sinus surgery for odontogenic sinusitis
Haley Sibley, MD

Preoperative screening for obstructive sleep apnea in endoscopic skull base surgery: NASBS survey
Ryan Rimmer, MD

Preoperative smell changes as predictors of post FESS clinical difference in SNOT-22 scores
Emily Sagalow, BS

Prevalence of specific antibody deficiency in recurrent acute sinusitis and chronic rhinosinusitis
Anna Bareiss, MD

Prevention of [illegible]ontal sinus[illegible]stenosis
WITHDRAWN
[illegible]hoji, MD, PhD

Psychosocial improvements in CRS patients after FESS
Michela Borrelli

Pulmonary comorbidities and the anterior skull base
Aksha Parray

Pulmonary comorbidities and the posterior skull base
Aakash Shah, BS

Quality of life instruments in endoscopic endonasal skull base surgery – A systematic review
Aishwarya Shukla, MD, MPH

Radiographic Differences in Skull Base Height and Anterior Ethmoid Artery Location in AFRS
Dylan Erwin

Regional peak mucosal cooling predicts outcomes of radiofrequency treatment of nasal obstruction
Zhenxing Wu, PhD

Relationship between target registration error (TRE) and fiducial registration error (FRE)
Amin Javer, MD, FARS

Renal cell-like adenocarcinoma (SNRCLA) of the nasal cavity: Case report and literature review
Ellen Tokarz, MD

Responder analyses dupilumab NC and LoS scores
Claus Bachert

Role of ER stress in TGF-β1-induced EMT in airway epithelium
Heung-Man Lee, MD, PhD

Role of zileuton in treatment of aspirin exacerbated respiratory
Chadi Makary, MD

Salvage endoscopic nasopharyngectomy
Kerolos Shenouda, MD

SARS-CoV-2 viral inactivation using low dose povidone-iodine via sinonasal and oral cavity
Samantha Frank, MD

Sinonasal extranodal natural killer/t cell lymphoma: National analysis of a rare lymphoma
Jordon Grube, DO

Sinonasal mucormycosis: Revisited
Annanya Soni, MS

On Demand Presentations, cont'd.

Sinonasal outcomes using oral steroids in patients with CRSwNP and positive sinonasal cultures
Jhon Martinez Paredes, MD

Sinonasal schwannoma: Case series and literature review
Rosalie Machado

Sinus surgery and perceptions in social media
Prachi Patel, Research Fellow

SINUS-24 and SINUS-52 dupilumab smell recovery in asthma or N-ERD
Joaquim Mullol, MD, PhD

Skull base osteoradionecrosis
Kerolos Shenouda, MD

Skull base outcomes in septic patients
Aakash Shah, BS

Sleep subdomain of SNOT-22 is a useful screening tool for obstructive sleep apnea
Chandala Chitguppi, MD

Spectrum of tissue loss associated with empty nose syndrome
Sachi Dholakia, BS

Spindle cell sinonasal rhabdomyosarcoma in a 73-year-old man: A case report
Bronson Wessinger

Structured histopathologic comparisons of sinonasal tumors
Auddie Sweis, MD

Subjective smell & taste in skull base surgery
Nanki Hura, BS

The effect of diabetes mellitus on post-operative outcomes following endoscopic sinus surgery
Kolin Rubel, MD

The effects of burn pit exposure on the respiratory tract: A systematic review
James McLean, MD

The infratemporal fossa sign
Edward McCoul, MD, FARS

The role of anesthesia on intraoperative outcomes during endoscopic sinus surgery: A meta-analysis
David Moffatt

The turbinate pump: Targeted inferior turbinate decongestion in sinonasal surgery
Ashton Lehmann, MD

Three cases of sinonasal organized hematoma
Sei Kobayashi, Associate Professor

Treatment of PVOD: Evidence-based review
Nanki Hura, BS

Treatment patterns and survival of sinonasal diffuse large b-cell lymphoma in the United States
Gregory Barinsky, PharmD

Unfolded protein response in sinonasal inverted papilloma
Paul Lee, MS

Unique hemostasis in JNA
Anupam Mishra, MBBS, MS, DNB

Use of balloon sinuplasty in the management of secondary complications to acute frontal sinusitis
Agamemnon Pericleous, MBBCh, MRCS (ENT)

Utilization trends of surgical and endovascular management of refractory epistaxis
Matt Lelegren, MD

Validating starling resistor model of airway collapse in patients with sleep disorder breathing
Michael Schlewet, MD

Validation of intranasal fluorescein for cerebrospinal fluid detection: An in-vitro analysis
Christopher Pool, MD

COSM 2020 POSTER PRESENTATIONS

A case of orbital mucocele after endoscopic sinus surgery
Daniel Arkfeld, MD

A rare case of basaloid squamous cell carcinoma arising from the anterior nasal septum
Macaulay Ojeaga

Acute frontal sinusitis in a child presenting with acute ischemic stroke
Wesley Davison, MD

African rhinoplasty versus Asian rhinoplasty average patient satisfaction
Chris Choi, BS

Allergic rhinitis in an active duty population
Danielle Anderson, DO

An elderly patient with bilateral, progressively growing, symptomatic nasolabial cysts
Asad Haider, BA

Assessment of clinical patterns associated with diagnosis of rhinologic disease
Sean Parsel, DO

Atypical meningioma of the sinonasal tract
Linnea Fechtner, MD/MS

Automated skull base segmentation with atlas-based segmentation
Neeraja Konuthula, MD

Career patterns of Women in Rhinology
Kristen Echanique, MD

Centralization of care and patient travel for transsphenoidal surgery of the pituitary
Aisosa Omorogbe, BS

CF infection prevention protocol
Meghan Norris, MS

Clinical characteristics and cost of surgically managed nasal polyps patients
Krista Schladweiler, PhD

Clinical factors distinguishing orbital invasive fungal sinusitis from orbital cellulitis
Jeffrey Bernstein, MD

Complications after endoscopic sinus surgery in sinonasal cancer patients with mental illness
Gregory Barinsky, PharmD

Computational analysis of nose-to-brain drug delivery after nasal midvault reconstruction
Hannah Martin, BS

Contemporary diagnosis of primary ciliary dyskinesia
Erin Lopez, MD

Control of carotid bleed with nasoseptal flap
Matthew Kim, MD

CSF leaks due to electric scooter injury
Jeehong Kim, MD

Demographic predictors of complications in endoscopic sinus surgery in national database
Sonam Dodhia, MD

Determining population-wide interest in different sinus procedures using Google trends
David S. Lehmann, MD

On Demand Presentations, cont'd.

Disparities in access to care and outcomes following rhinoplasty
Aisosa Omorogbe, BS

Distinct histopathologic features of sinusitis complicated by orbital or intracranial extension
Hannah Brown, BS

Effect of nasal fluticasone exhalation delivery system on eustachian tube dysfunction
Arthur Wu, MD, FARS

Effects of smoking on post-operative outcomes in skull base procedures comparing ENT assisted and Unassisted Surgeries
Aakash Shah, BS

Empty nose syndrome
Macaulay Ojeaga

Endoscopic endonasal resection of a carcinoma ex-pleomorphic adenoma of the skull base
Tara Wu, MD

Endoscopic muscle graft to right carotid artery blowout
Shravani Pathak, BA

Endoscopic olfactory anatomy
Roberto Soriano, MD

Environmental exposure and histopathologic findings in WTC relief workers with CRS undergoing FESS
Rohini Bahethi, BS

Epithelial remodeling alters PAR-2 polarization
Ryan Carey, MD

Eustachian tube balloon dilation
Jose Alonso, MD

Exclusively endoscopic surgical resection esthesioneuroblastoma: A systematic review of outcomes
Daniel Spielman, MD

Extrasinus recurrence of inverting papilloma following previous Caldwell-Luc
Andy Chua, MBBS

Gender representation at national rhinology meetings
Kathryn Kreicher, MD

Hydraulic dissection technique during endoscopic sinus surgery using a novel balloon sinus dilation
Isaac Schmale, MD

Hypoalbuminemia in anterior skull base procedures
Chris Choi, BS

Impact of prophylactic antibiotics on healthcare utilization following endoscopic sinus surgery
Ashoke Khanwalkar, MD

Increased prevalence of sinusitis in Gulf War veterans
Kenric Tam, MD, MM

Inter-pathologist agreement on CRS structured histopathology
Ashwin Ganti, BA

Intranasal drug delivery to the ostiomeatal complex and maxillary sinus in chronic rhinosinusitis
Hannah Martin, BS

Invasive mucorales infection of the nasopharynx
Abel David, MD

Ki-67 as a marker for recurrence in pituitary adenoma
Kent Tadokoro, MD

Long term efficacy of interior turbinate outfracture in CRS patients
Gina Trinh, MD

Lymph node metastasis in maxillary sinus squamous cell carcinoma
Tapan Patel, MD

Metastasis to the sinuses
Nardin Derias, MS3

Middle turbinate concha bullosa osteoma
Rakhna Araslanova, MD

Modified endoscopic Denker's approach for management of anterior maxillary sinus tumors
Taylor Carle, MD

Nasoseptal flap for reconstruction of hard and soft palate defect
Anas Eid, MD

Nasoseptal rescue flap approach for endoscopic surgery of the clivus and upper cervical spine
Chetan Safi, MD

Nitric oxide nanotherapeutics to combat candida auris
Kevin Li, bs

Non-opioid vs. opioid analgesics for pain control after endoscopic sinus surgery for CRS
Jenna Bergman, Medical Student

Opioids after endoscopic skull base surgery
Alexander Kovacs

Ostial patency measurement analysis after endoscopic sphenoidotomies and frontal sinusotomies
Thomas Higgins, MD, MSPH, FARS

Outcomes in ENT assisted and unassisted anterior skull base surgeries for high risk patients
Chris Choi, BS

Outcomes of anti-hypertensive therapy in skull base procedures
Aakash Shah, BS

Patient satisfaction after septoplasty
Aakash Shah, BS

Patient satisfaction after surgical or nonsurgical rhinoplasty
Aakash Shah, BS

Perioperative management of spontaneous CSF leak repair
Justin McCormick, MD

Post-op outcomes in ENT assisted and unassisted surgeries for patients with steroid use
Aakash Shah, BS

Potential costs of dental treatment and endoscopic sinus surgery for odontogenic sinusitis
Haley Sibley

Practice patterns in the medical and surgical management of traumatic optic neuropathy
Megan Morisada, MD

Prelacrimal approach in managing sinonasal diseases
Yu-Hsuan Lin, MD

Quality of life outcomes 10 years after endoscopic sinus surgery
Kent Tadokoro, MD

Race, insurance, and facility affect treatment modality in SNSCC
Jesse Qualliotine, MD

Radioanatomic characteristics of the posteromedial intraconal space
Aria Jafari, MD

Radiologic algorithm for identification of maxillary and sphenoid sinus natural ostia
Julia Comer, MD

Real world attributes of patients on anti-asthma biologic therapy that have concurrent CRS
Devyani Lal, MD, FARS

Recurrent nasal hamartoma in DICER1
Lara Reichert, MD, MPH

On Demand Presentations, cont'd.

Responsiveness and convergent validity of the CRS-PRO in CRS patients undergoing sinus surgery
Katherine Lin, BS

Revision frontal sinus surgery
Mohamed Elsayed, MD, PhD

Sinonasal angiomatous polyp: Case report and review of imaging features
Eliezer Kinberg, MD

Sinonasal small cell neuroendocrine carcinoma – Case series of a rare malignancy
Nikita Chapurin, MD, MHS

Sinonasal symptoms in hospitalized patients
Kirsten Meenan, MD

Sinus irrigation penetration after a Draf IIA vs modified Draf IIA in a cadaveric model
Khalil Issa, MD

Skull base COREAH: Case report and literature review
Anna Flaherty, MD

Sleep outcomes lack association with mucosal eosinophilia or neutrophilia in patients with CRS
Nyssa F. Farrell, MD

Sociodemographic factors impact adjuvant treatment and survival in sinonasal mucosal melanoma
Sarek Shen, MS

Squamous cell carcinoma and pituitary adenoma, a collision tumor of the cavernous sinus
Lindsay Olinde, MD

Subacute IFS, a distinct entity from acute fulminant and chronic IFS
Thomas Edwards, MD

Surgical extent increases risk of post-operative epistaxis in outpatient sinus surgery in Florida
Jeffrey Bernstein, MD

Surgical management of world trade center relief workers with chronic rhinosinusitis
Lauren Williams

Surgical versus endovascular ligation for epistaxis in the anticoagulated patient population
Sarek Shen, MS

Survival outcomes by treatment modality in HPV+ sinonasal squamous cell carcinoma
Vivian Wung

Survival outcomes in patients with acute invasive sinusitis with intracranial extension
Nancy Wang, MD

Survival outcomes in sinonasal neuroendocrine carcinoma: An NCDB analysis
Khalil Issa, MD

Symptom scores and CT findings in CF sinusitis
Lindsey Ryan, MD

The case of a solitary fibrous tumor of the nasal cavity with expansion into the intracranial fossa
Randall Bloch, BS

The diagnostic utility of sinonasal pathology in systemic vasculitides
Ashton Lehmann, MD

The effects of sinus surgery and aspirin desensitization on sleep in AERD
Tran Locke, MD

The effects of site-specific metastases on nasopharyngeal squamous cell carcinoma survival
Christopher Tseng, BS

The impact of head position on sinonasal drug delivery via actuated nasal sprays
Joseph Conduff, MD

The impact of inspiration on sinonasal drug delivery via actuated nasal sprays
Joseph Conduff, MD

The impact of nasal steroid irrigations on the management of chronic rhinosinusitis
Auddie Sweis, MD

The impact of sinus surgery and aspirin desensitization on psychological burden in AERD
Theodore Lin

The influence of population density on survival in sinonasal cancer
Rushi Patel, BA

The role of CT and endoscopy in the evaluation of patients referred for intranasal cryoablation
Isaac Schmale, MD

Topical anesthesia for scope exams
Matthew Naunheim, MD, MBA

Transorbital sinonasal trauma due to Impalement with a felt tip marker
Habib Zalzal, MD

Treatment and clinical outcomes in acute orbital invasive fungal sinusitis
Bridget MacDonald, BA

Understanding nasopharyngeal lymphoepithelial carcinoma: A national analysis
Jeff Gao, BS

Utility of an ultrasonic aspirator in performing a frontal sinus osteoplastic flap
Dominic Catalano, MD

Utility of preoperative phone calls for endoscopic sinus surgery
Mallory McKeon, BA

Value of inferior meatal flap as an adjuvant approach in managing maxillary sinus lesions
Ahmed Mahmoud El Batawi, MD

Vitamin D level is inversely associated with Lund-Mackay score in AERD
Kevin Ig-Izevbekhai, MD

Woakes' Syndrome: A case series
Alexander Dickie, MD

YouTube as a surgical instructional tool for endoscopic transsphenoidal pituitary tumor removal
Victoria Lee, MD

All information was taken from the original abstract submission

Program at a Glance

As an added bonus, ARS registrants for the Annual Meeting, will have access to Rhinology/Allergy Week, from September 21-27, which is a part of this year's Annual American Academy of Otolaryngology virtual meeting format which will span over six weeks. Please join us for the following presentations and panels with ARS members presenting during this week:

Wednesday, September 23, 2020, 8:00 am – 9:00 am EDT

Biologics for Nasal Polyposis: "Dupi or Not Dupi" (Panel)
Moderator: Devyani Lal, MD, FARS
Panelists: Stella Lee, MD; Richard Orlandi, MD, FARS

The recent approval of dupilumab for severe cases of chronic rhinosinusitis with nasal polyposis (CRSwNP) provides clinicians with a novel therapeutic tool. Dupilumab is an expensive agent that can be exquisitely effective in some but not all CRSwNP patients. As of date, it is unclear how long patients may require to be maintained on dupilumab therapy, and what the long-term adverse effects and costs might be. Patients with true biological recalcitrance are likely the best candidates for biologics; however, many patients with recalcitrant nasal polyposis have other contributory causes. Inadequate surgery is often a cause of early recurrence of nasal polyps as well as recalcitrance to any postoperative medical therapy. These patients may be well served by appropriate and meticulous revision sinus surgery with excellent long-term outcomes. Given these considerations, care must be exercised in selecting patients for biologic therapy. Thoughtful interpretation of sinus CT sinus, lower airway and immunologic testing is crucial to determine the most appropriate therapeutic interventions. Patients with severe recalcitrant CRSwNP often have co-existent asthma, aspirin exacerbated respiratory disease, eosinophilic granulomatosis with polyangiitis and immunologic abnormalities. Multidisciplinary management of these patients by otolaryngologists and allergy-immunologists is optimal. This panel of seasoned otolaryngology and allergy-immunology experts will discuss indications and limitations of biologic therapy in CRSwNP. Using illustrative case presentations, we will outline how to identify patients best suited for dupilumab therapy. Additionally, we will also discuss practical steps and considerations in administering dupilumab. Other biologics under trial will also be discussed.

Thursday, September 24, 2020 – 8:00 am – 9:00 am EDT

Cerebrospinal Fluid Leask: A Crash Course for the Otolaryngologist (Expert Lecture)
Lead Presenter: Stilianos E. Kountakis, MD, PhD, FARS

The best way to prevent complications from cerebrospinal fluid rhinorrhea (CSF) is efficient diagnosis and quick endoscopic repair. Endoscopic endonasal approaches are efficacious and with decreased morbidity. In this session, presentation to the otolaryngologist's office, causes of CSF leaks as well as controversial aspects of evaluation and diagnosis will be discussed. Case studies of CSF rhinorrhea involving the frontal, ethmoid/cribriform and the sphenoid sinuses are presented and discussed. Surgical videos are shown demonstrating repair techniques for each individual location involved. Post-operative management will be discussed. This session will not discuss skull base reconstruction after ablative surgery for tumors.

Saturday, September 26, 2020 – 11:00 am – 12:00 pm EDT

Allergy: It's Not Just the Nose! (Panel)
Moderator: Jacob Pieter Noordzij, MD
Panelists: Maria C. Veling, MD; Peter C. Weber, MD, MBA

This session will provide up to date and evidence-based information regarding the effect of allergy on the ear, oral cavity, paranasal sinuses, pharynx and larynx. The role of allergy in diseases such as Eustachian tube dysfunction, chronic otitis media, Meniere's Disease, obstructive sleep apnea, chronic cough, laryngitis, chornic sinusitis, and oral allergy syndrome will be discussed by experts in each individual field. The pathophysiology, clinical features and treatment options will be reviewed. The learner will leave the session with a more comprehensive understanding of the impact and manifestations of allergic disease throughout the head and neck.

Saturday, September 26, 2020 – 11:00 am – 12:00 pm EDT

Sinus Headache, Migraine, and the Otolaryngologist (Expert Lecture)
Lead Presenter: Mark Mehle, MD

This program will review the literature regarding the medical and surgical management of sinus headache patients. A focus will be placed on the diagnosis and management of migraine in these patients, which is responsible for up to 90% of "sinus headache" complaints. A secondary focus will be on differentiating these migraineurs from patients with true rhinogenic headache. The goal is to provide a program that is useful clinically as well as enlightening academically.

ON DEMAND:

Panel Presentations

Balloon Sinus Dilation: Indications, Technique and Evidence
Waleed M. Abuzeid, MD; Satish Govindaraj, MD, FARS; Michael Setzen, MD, FARS; Spencer C. Payne, MD, FARS

Controversies in the Contemporary Management of Nasal and Sinus Disease
Joseph K. Han, MD, FARS; Pete S. Batra, MD, FARS; Rakesh K. Chandra, MD, FARS; Raj Sindwani, MD, FARS

Harnessing the Opportunities of Novel Office Based Treatment for Management of Rhinitis and Sinusitis
Amber U. Luong, MD, PhD, FARS; Jivianne Lee, MD, FARS; Martin J. Citardi, MD, FARS; R. Peter Manes, MD, FARS

Program at a Glance

On Demand, cont'd.

Leadership in Rhinology: Patient Care, Research, and Education
Stacey T. Gray, MD, FARS; Pete S. Batra, MD, FARS; Alexander G. Chiu, MD, FARS; Sarah K. Wise, MD, FARS

Think Outside the Box: Anterior Skull Base Lessons for all Otolaryngologists
Anand K. Devaiah, MD; Jean Anderson Eloy, MD, FARS; Stacey T. Gray, MD, FARS; Erin L. McKean, MD, MBA

Expert Lectures

Another Five Landmarks to Make You a Better Sinus Surgeon
Ralph B. Metson, MD, FARS

Aspirin Exacerbated Respiratory Disease: Beyond the Triad: Diagnosis, Management and Research Update for 2020
Spencer C. Payne, MD, FARS; Erin K. O'Brien, MD, FARS

Basic and Extended Approaches to the Sella and Parasellar Skull Base
Jennifer A. Villwock, MD; Zara M. Patel, MD, FARS

Comprehensive Management of HHT in the Office and in the OR
Jeffrey E. Terrell, MD

Contemporary Diagnosis and Endoscopic Management of Inverted Papilloma
Pete S. Batra, MD, FARS

Contemporary Pre-operative Planning and Intraoperative Execution for Frontal Sinus Surgery
Martin J. Citardi, MD, FARS; Peter John Wormald, MD; Philip G. Chen, MD, FARS

Diagnosis and Management of Sinonasal Papillomas
Jivianne Lee, MD, FARS; Jeffrey D. Suh, MD; Marilene B. Wang, MD, FARS

Endoscopic Orbital Surgery: Basic Techniques
Benjamin Saul Bleier, MD, FARS; Raewyn Campbell, MD, FARS

Frontal Sinus Surgery (I): Leveraging CT, Endoscopy and Instrumentation for Successful Surgery
Devyani Lal, MD, FARS; Peter H. Hwang, MD, FARS

Frontal Sinus Surgery (II): Mastering Advanced Techniques
Devyani Lal, MD, FARS; Peter H. Hwang, MD, FARS

Frontal Sinus Surgery: Basic and Advanced Techniques
Adam J. Folbe, MD, MS, FARS; Roy R. Casiano, MD, FARS

Gussak Memorial: Avoiding Bad Results in Sinus Surgery
Scott M. Graham, MD, FARS; Yvonne Chan, MD, FARS; Martin J. Citardi, MD, FARS

Inflammatory and Immunology Considerations in the Complex Rhinologic Patient
Jose G. Gurrola, MD; Bruce K. Tan, MD

Management of the Eosinophilic Patient after Sinus Surgery
Stilianos E. Kountakis, MD, PhD, FARS

Medical and Surgical Decision Making in Refractory Chronic Rhinosinusitis after Failed FESS
Donald C. Lanza, MD, FARS; Pete S. Batra, MD, FARS; Samer Fakhri, MD, FARS

Minimally Invasive Pituitary Surgery
Brent A. Senior, MD, FARS

Preventing and Managing Complications in Endoscopic Sinus Surgery: What's Next?
Bradley F. Marple, MD, FARS; R. Peter Manes, MD, FARS

Surgical Anatomy of the Sinuses
Brent A. Senior, MD, FARS

Tips and Tricks for Avoiding Complications in Endoscopic Sinus Surgery
Stacey T. Gray, MD, FARS; Zara M. Patel, MD, FARS

Understanding Olfactory Disorders
Zara M. Patel, MD, FARS; Eric H. Holbrook, MD, FARS

International Symposia

Abordajes Avanzados en la Ciruga Endoscapica de Senos Paranasales: Una Visia Panamericana (in Spanish)
Luis Fernando Macias-Valle, MD; Oswaldo A. Henriquez Ajami, MD; Camilo Reyes, MD; Alexandre Wady Debes Felippu

Innate Immunity and its Clinical Impact on Upper Respiratory Tract Inflammation
Hideaki Kouzaki; Hideyuki Kawauchi, MD; Emmanuel Prokopakis; Dong Young Kim

Management of Endoscopic Sinus and Skull Base Surgery Severe Complications
Hector De la Garza Hesles, MD; Marite Palma; C. Arturo Solares Rivera, MD; Ricardo Sanchez Santa Ana, MD

Management of Recurrent Sinonasal Polyposis: An International Perspective
Brent A. Senior, MD, FARS; Claire L. Hopkins, MD; T. Metin Onerci, MD; Richard J. Harvey, MBBS, FRACS, FARS

Pearls in Sinus Surgery an Expert Approach (in Spanish)
Ricardo Sanchez Santa Ana, MD; Miguel Soares Tepedino, MD; Hector De la Garza Hesles, MD; Alfredo-Jose Herrera Vivas, MD

Revision Endoscopic Sinus Surgery
Stilianos E. Kountakis, MD, PhD, FARS; T. Metin Onerci, MD; Cem Meco, MD; Sergi Karpischenko, MD

Sinonasal Malignancies of Anterior Skull Base – Endoscopic Techniques
Piero Nicolai, MD; Paolo Castelnuovo, MD; Cem Meco, MD; Jan Plzak, MD, PhD

PROGRAM ABSTRACTS

Thursday, September 10, 2020
6:50 pm - 10:00 pm

Breakout Room 1

6:50 pm - 7:00 pm
Introduction
Robert Kern, MD, FARS – ARS President; Joseph Han, MD, FARS – ARS President-Elect/Program Chair

Moderators: Troy Woodard, MD, FARS; Dana Crosby, MD, FARS; Waleed Abuzeid, MBBS

7:00 pm - 7:10 pm
Randomized trial on the effect of postoperative oral corticosteroids on QOL and biomarkers
Sarina Mueller, MD
Olaf Wendler, PhD
Philipp Grundtner
Susanne Mayr, MD
Abbas Agaimy, MD
Angela Nocera, MS
Heinrich Iro, MD
Benjamin Bleier, MD, FARS
Massachusetts Eye and Ear, Harvard Medical School, Friedrich-Alexander-Universitat Erlangen-Nurnberg

Objective:
The objective of this study was to determine whether post-operative systemic steroid administration in Chronic Rhinosinusitis with Nasal Polyps (CRSwNP) 1) impacted long-term sinonasal and general quality of life (SNQOL, GQOL) and 2) Whether risk of recurrence could be predicted using preoperative SNQOL, GQOL, and mucus/serum derived biomarkers.

Methods:
Prospective randomized placebo controlled trial of n=61 patient with CRSwNP. All patients underwent FESS followed by randomization to systemic corticosteroid (n=33) or placebo group (n=28) for 1 month. All subjects used topical nasal steroids for 3 months. Patients were followed for 2 years at 10 time points when SNOT-22 domain 1 and RSDI were assessed. Mucus and serum biomarker levels were also analysed at each time point.

Results:
Postoperative systemic corticosteroids were non-superior to placebo with respect to SNQOL and GQOL over time ($p>0.05$ for all) and had no impact on recurrence rates. Recurrences within 2 years could be predicted by a preoperative SNOT-22 d1 score of >19 and RSDI >96 (Sensitivity: 0.80 and 1.0; $p<0.01$ for both). Preoperative mucus CST2 and SerpinE1 levels were predictive of recurrent and stable patients independent of treatment. Mucus biomarkers were more accurate than serum at predicting recurrence ($p<0.05$).

Conclusions:
The addition of postoperative oral corticosteroids did not confer a benefit over topical corticosteroid nasal spray alone with respect to SNQOL and GQOL over 2 years. Simultaneously, the addition of postoperative oral corticosteroids had no impact on recurrence rates. Preoperative cut-off values of the SNOT-22 domain 1 and the RSDI may be able to predict early recurrences.

7:10 pm - 7:20 pm
Mepolizumab for chronic rhinosinusitis with nasal polyps
Joseph Han, MD, FARS
Claus Bachert, Professor
Wytske Fokkens, Professor
Martin Desrosiers, Professor
Martin Wagenmann, Dr.
Stella Lee, MD
Ana Sousa, Dr.
Steven Smith, Dr.
Neil Martin, Dr.
Robert Bhabita
Chan Mayer
Claire Hopkins, Professor
Eastern Virginia Medical School
USA

Background:
Chronic rhinosinusitis with nasal polyps (CRSwNP) is an inflammatory disease with recalcitrant symptoms. NP tissue eosinophils lead to recurrence, often requiring repeat surgeries. Synapse assessed the efficacy and safety of 4-weekly add-on mepolizumab 100mg SC in adults with CRSwNP.

Methods:
SYNAPSE(NCT03085797), a randomized, double-blind, placebo-controlled, multicenter, 52-week study, included patients with severe bilateral NP, treated with intranasal corticosteroids; with a prior NP surgery and eligible for repeat surgery. Co-primary endpoints: changes in total endoscopic NP score (Week 52) and nasal obstruction VAS score (Weeks 49–52). Secondary endpoints: time to first NP surgery (key); overall VAS symptom score, Sinonasal Outcome Test-22 score; systemic corticosteroid (SCS) use, composite and loss of smell VAS scores. Safety was assessed.

Results:
Total endoscopic NP score and nasal obstruction VAS score significantly improved ($p<0.001$) with mepolizumab(n=206) vs placebo(n=201). Median change in endoscopic NP score showed a 1-point improvement with mepolizumab (adjusted:-0.73 [95% CI:-1.11,-0.34]); median change in nasal obstruction VAS score showed a >3-point improvement (adjusted:-3.14 [-4.09,-2.18]). All secondary endpoints significant. Mepolizumab reduced NP surgery by 57% (hazard ratio 0.43 [0.25,0.76];$p=0.003$), improved SNOT-22, VAS (overall, composite, loss of smell) and SCS use. No new safety issues with mepolizumab.

Nasopharyngitis was the most common AE (23–25%).

Conclusions:
Mepolizumab improved NP size and sinonasal symptoms and reduced NP surgery and SCS use in adults with severe CRSwNP and may be a treatment option in this population.

7:20 pm - 7:30 pm
Prophylactic antibiotics after functional endoscopic sinus surgery: A randomized controlled trial
Ashton Lehmann, MD
Aaishah Raquib
Shan Siddiqi
Josh Meier, Physician
Marlene Durand
Stacey Gray, MD, FARS
Eric Holbrook, MD, FARS

Background:
Surgeons commonly prescribe prophylactic antibiotics following functional endoscopic sinus surgery (FESS), yet minimal data exist to support this practice.

Objective:
To assess the impact of post-FESS antibiotics on infection, quality of life, and endoscopic scores.

Methods:
In this randomized, double-blinded, placebo-controlled non-inferiority trial comparing amoxicillin-clavulanate to placebo after FESS (NCT01919411), adults with chronic rhinosinusitis (CRS) refractory to medical therapy were recruited from a tertiary clinic. Post-FESS, subjects were randomized to antibiotics or placebo and followed clinically (at mean 1.3±0.3 and 8.8±3.9 weeks postoperatively) to evaluate for infection. At baseline and follow-up, quality of life was measured by SNOT-22 scores, and Lund-Kennedy (LK) endoscopic scores were evaluated. Outcomes were analyzed with repeated-measures ANOVA and ANCOVA.

Results:
78 patients completed the study protocol (antibiotics, n=37; placebo, n=41). There was no significant difference between groups in postoperative infection rate (antibiotics: 2.7%, placebo: 0%; p=0.33) or in SNOT-22 (p=0.43) or LK (p=0.63) score trajectories over time. Based on a non-inferiority threshold of 9 SNOT-22 points, placebo was non-inferior to antibiotic prophylaxis (beta=0.20, one-tailed alpha<0.05). The risk of diarrhea was significantly higher with antibiotics (p=0.005).

Conclusions:
Following FESS for CRS, there was no significant difference in rates of postoperative infection whether antibiotics or placebo were administered, and placebo was non-inferior to antibiotics with regards to quality of life. These findings add to the growing evidence that post-FESS antibiotics are not indicated for routine prophylactic use.

7:30 pm - 7:40 pm
The cost of rhinitis
Lauren Roland, MD
Heqiong Wang
Christina Mehta
Sarah Wise, MD, FARS
Joshua Levy, MD, FARS
University of California San Francisco

Background:
Rhinitis is a prevalent condition and common complaint on presentation to multiple healthcare providers. The cost of procedures, clinic visits and medications associated with rhinitis is unknown.

Methods:
The MarketScan database, an insurance claims repository, was queried for patients with ICD-9/ICD-10 diagnosis codes for allergic and non-allergic rhinitis, excluding those with chronic rhinosinusitis, between 2009-2017. The incidence and cumulative cost of visits, procedures and diagnostic work-up was evaluated.

Results:
13,249,945 allergic and 2,440,411 non-allergic rhinitis patients were identified. Allergic and non-allergic patients had an average of 2.1 and 1.2 visits/year and a median cost per visit of $103 and $113, respectively. One percent of each group underwent inferior turbinate reduction (median cost of approximately $1,000) and 16% of the allergic and 18% of the non-allergic rhinitis patients underwent allergy testing (median cost of $270). A larger percentage of non-allergic patients underwent nasal endoscopy compared to allergic rhinitis patients (6% vs 1%) with a median cost around $220. The highest proportion of patients received nasal steroid sprays (over 30% in each group), followed by leukotriene modifiers, antihistamine sprays, anticholinergic sprays and combination (antihistamine and steroid) sprays. These medications have a yearly median cost between $28-179, with combination sprays being the most expensive.

Conclusion:
A large number of rhinitis patients were identified with significant cost and burden to the healthcare system. Additional resources are needed to improve treatment options and advocate for cost effective protocols in order to decrease the burden of this prevalent condition.

7:40 pm - 7:50 pm
CRISP/Cas9 enables CFTR correction in the endogenous locus in airway stem cells
Dawn Bravo, PhD
Stanford University School of Medicine

Cystic fibrosis (CF) is a monogenic disease of impaired production and/or function of the cystic fibrosis transmembrane conductance regulator (CFTR) protein. Recently approved modulators can potentially benefit

PROGRAM ABSTRACTS

>90% of CF patients but they must be taken daily and are not efficacious for patients affected by Class I mutations. Gene therapy has the potential to provide a durable cure for all CF patients but has been hampered by challenges by in vivo gene delivery. An ex vivo genome editing approach in which the CFTR cDNA is precisely inserted into the CFTR locus of stem cells may enable the development of a durable cure for all CF patients, regardless of the causal mutation. A 'knock-in' approach would also ensure proper dynamic physiologic expression of CFTR by the full suite of endogenous regulatory elements, but this approach has been hampered by the large size of the CFTR gene. We use CRISPR/Cas9 and two AAVs to sequentially insert two halves of the CFTR cDNA along with a truncated CD19 (tCD19) enrichment tag in upper airway basal stem cells (UABCs) and human bronchial basal stem cells (HBECs). The modified cells were enriched to obtain 60- 80% tCD19 + UABCs and HBECs from 11 different CF patients with Class I and II CFTR mutations. Differentiated epithelial monolayers cultured at air-liquid interface showed restored CFTR function that was >70% relative to the CFTR function observed in non-CF control samples. These experiments enable the development of an autologous airway stem cell therapy for all CF patients affected by mutations in the introns or exons of CFTR, including those patients who cannot be treated using current modulator therapies.

7:50 pm - 8:00 pm
Questions and Discussion

8:00 pm - 8:10 pm
Inter Session Break

8:10 pm - 9:00 pm
Panel: Nasal Polyp Management Algorithm
Moderator: Joseph Han, MD, FARS
Panelists: James Palmer, MD, FARS; Jivianne Lee, MD, FARS; Anju Peters, MD; Kent Lam, MD; Zachary Soler, MD, FARS; Christine Franzese, MD, FARS

Breakout Room 2

6:50 pm - 7:00 pm
Introduction
Robert Kern, MD, FARS – ARS President; Joseph Han, MD, FARS – ARS President-Elect/Program Chair

7:00 pm - 7:40 pm
David Kennedy Lectureship: "Moving Forward: Rhinology in the Post-COVID Era"
Guest Speaker: Peter Hwang, MD, FARS

7:40 pm – 7:50 pm
Scientific Awards
Presenters: Robert Kern, MD, FARS; Jean Kim, MD, FARS

7:50 pm - 8:00 pm
Inter Session Break

Moderators: Jennifer Villwock, MD; Ian Humphreys, DO, FARS; Philip Chen, MD, FARS; Garrett Choby, MD, FARS

8:00 pm - 8:10 pm
IL-13 acts on human sinonasal epithelial basal cells to increase hypoxia-associated gene expression
Syed Khalil, PhD *(Presented by Nicholas Rowan, MD)*
Andrew Lane, MD, FARS
Isaac Bernstein
Stephane Lajoie
Nicholas Rowan, MD
Johns Hopkins University School of Medicine

Introduction:
Respiratory epithelial basal cells (BC) are considered stem cells crucial for tissue repair and regeneration in the airway epithelium. Signaling between immune cells and BC is incompletely understood. Upregulation of hypoxia-associated genes such as HIF1A is associated with nasal polyps and is reported to cause hyperpermeability of airway epithelium. Whether Th2 inflammatory cytokines induce hypoxia-associated gene expression in sinonasal epithelial cells is unknown.

Methods:
Human air-liquid interface (ALI) SNEC cultures treated with recombinant IL-13 were analyzed by flow cytometry to determine the effect on epithelial cell subpopulations. Additionally, BC were flow-sorted from surgically-obtained sinus tissue and stimulated with IL-13 in suspension. qPCR was performed to measure the expression of the hypoxia-related genes HIF1A, ARNT, and EPAS1.

Results:
Treatment of human ALI cultures with IL-13 led to an increase in the BC population. qPCR showed a concurrent increase in HIF1A and ARNT mRNA expression. Although baseline levels of EPAS1 in flow-sorted BC was undetectable, IL-13 treatment led to a significant increase. In contrast, EPAS1 expression in non-BC epithelial cells was unchanged. In whole sinonasal epithelial tissue, HIF1A gene expression was elevated in CRSwNP compared to control subjects.

Conclusions:
In this study, we demonstrate that IL-13 acts specifically on epithelial BC to greatly induce expression of hypoxia-associated genes. This suggests a potential role of BCs in mediating epithelial hyperpermeability in Th2 inflammatory states.

8:10 pm - 8:20 pm
Predictors of rhinorrhea response after posterior nasal nerve cryoablation for chronic rhinitis
Frederick Yoo, MD
Edward Kuan, MD
Pete Batra, MD, FARS

Carmen Chan, Physician
Bobby Tajudeen, MD
John Craig, MD, FARS

Introduction:
Posterior nasal nerve (PNN) cryoablation has shown promise in improving rhinorrhea due to allergic and nonallergic rhinitis. Early case series have shown meaningful clinical improvement in 75-80% of patients, but variables predicting PNN cryoablation success have not been studied. The purpose of this study was to evaluate whether disease features and ipratropium nasal spray (IS) response predicted rhinorrhea response after PNN cryoablation.

Methods:
A multi-institutional retrospective case series of 55 patients who underwent PNN cryoablation for bilateral rhinorrhea due to allergic, nonallergic, or mixed rhinitis was conducted at three tertiary medical centers. Patients received a one-month trial of IS. Runny nose scores (RNS) of 0-5 from the 22-item Sinonasal-Outcome Test were collected prospectively, before and after PNN cryoablation.

Results:
The mean age was 55.3 years and 54.6% were female. Mean follow-up was 170 days. Nonallergic rhinitis comprised 62% of patients. Of the 48 patients who trialed IS, 33 (69%) had some response, and 15 (31%) had no response. Mean overall pre-cryotherapy RNS was 4.2±1.0. After PNN cryoablation, there was at least a 1 point decrease in RNS in 39 patients (71%). Only IS response predicted cryoablation success. For IS responders, 28/33 (85%) had improved RNS after cryotherapy, whereas 5/15 (33%) non-responders improved (p=0.001). For responders, IS use significantly decreased after PNN cryoablation (p=0.001).

Conclusions:
In chronic rhinitis patients, rhinorrhea response to ipratropium was predictive of rhinorrhea improvement after PNN cryoablation. This study has important implications for preoperative counseling and guiding patient expectations when considering PNN cryoablation

8:20 pm - 8:30 pm
IL-17A levels are associated with increased prior ESS
Nikita Chapurin, MD, MHS
Ping Li, MD
Rakesh Chandra, MD, FARS
Justin Turner, MD, PhD, FARS
Naweed Chowdhury, MD
Vanderbilt University Medical Center
Background:
Recent advances in molecular biology have enabled identification of potential inflammatory endotypes of chronic rhinosinusitis (CRS), with prior work suggesting differential short-term surgical outcomes based on mucus cytokine profiles. However, there is a paucity of data assessing long-term treatment failure and need for revision surgery based on inflammatory biomarkers.

Methods:
Retrospective analysis of prospectively collected data from 231 patients electing surgical therapy for CRS. Intraoperative specimens were quantitatively sampled for inflammatory cytokines using a multiplex flow cytometric assay. Univariate Spearman correlations between cytokine levels and prior number of surgeries were assessed. A stepwise adjusted multivariate Poisson regression analysis was used to model patient-reported prior sinus surgery counts as a function of cytokine levels.

Results:
Several cytokines (IL-1b,4,5,6,8,9,10,13,17A, TNF-a, IFNg, and Eotaxin) demonstrated significant positive correlations with previous surgery counts. However, only higher 17-A levels were independently associated with a higher number of prior sinus surgeries (beta = 0.345, p = 0.0003) after adjusting for the significant covariates of age (b = 0.018, p = 0.0036), Lund-Mackay score (b = -0.0466, p = 0.0198), history of aspirin exacerbated respiratory disease (b = 1.01, p<0.0001) and allergic fungal sinusitis (b = 1.08, p<0.0001). Higher levels of RANTES were conversely associated with a lower number of prior surgeries (b = -0.17, p = 0.048).

Conclusions:
An IL-17A predominant cytokine profile is linked to an increased number of prior sinus surgeries. Thus, Type 3 inflammatory markers may indicate a particularly difficult-to-treat, recalcitrant CRS endotype.

8:30 pm - 8:40 pm
A randomized clinical trial to evaluate mometasone lavage versus spray for management of CRS
Pawina Jiramongkolchai , MD
Andrew Peterson, Medical Student
Adam Liebendorfer
Dorina Kallogjeri, Research Statistician
Jake Lee, Resident Physician
Sara Kukuljan
John Schneider, Attending Physician
Cristine Klatt-Cromwell, Attending Physician
Andrew Drescher
Jay Piccirillo, Professor of Otolaryngology, Vice Chair of Research

Background:
The efficacy of intranasal corticosteroids in the management of chronic rhinosinusitis is well-established. However, penetration of intranasal sprays into the paranasal sinuses is limited. The study objective was to compare mometasone nasal lavage(Neticort) versus mometasone nasal spray for the management of CRS in non-polyp, surgery naïve patients.

Methods:
Single site, double-blinded, placebo-controlled RCT

PROGRAM ABSTRACTS

sponsored by the ARS Resident Research Grant. Participants 18 years of age or older who met clinical criteria for CRS were included. Individuals with nasal polyps and/or history of sinus surgery were excluded. Patients were randomized to receive 8-weeks of either Neticort or mometasone spray. The primary outcome measure was within-subject pre- to post-treatment change in SNOT-22 scores in the Neticort group as compared to that of the mometasone spray.

Results:
A total of 51 participants have been enrolled. To date, 36 participants have completed the trial, 17 were randomized to group A (mean (SD) age=48(12.3)years, n=11 females) and 19 to group B (mean(SD) age=46(12.3)years, n=11 females). The mean within-subject difference in SNOT-22 scores are 16 and 25 points for group A and B, respectively. Eleven participants (65%) in group A have clinically significant reduction in SNOT-22 scores compared to 16 (84%) in group B. No significant related adverse events have been reported.

Discussion:
The majority of study participants improve as demonstrated by a clinically meaningful reduction in SNOT-22 scores. While the investigators remain blinded to the intervention until trial completion in February 2020, group B participants appear to demonstrate greater improvement.

8:40 pm - 8:50 pm
DMBT1 is the endogenous carrier ligand for eosinophil death receptor Siglec-8 in nasal polyps
Jean Kim, MD PhD FARS
Virginia Drake, Otolaryngology, Head and Neck Surgery Resident
Anabel Gonzalez Gil, Postdoctoral Trainee
Hyun-Sil Lee
Tingjiao Li, Graduate Student, Department of Pharmacology
Ronald Schnaar, Professor of Pharmacology
Johns Hopkins University School of Medicine

We previously reported that deleted in malignant brain tumor-1 protein (DMBT-1), immunoregulatory gene, is overexpressed in chronic rhinosinusitis with nasal polyposis (CRSwNP). Polyps infiltrated by eosinophils are known to express eosinophil-specific death cell receptor Siglec-8 (S8). In this study we examined whether: (1) S8 ligand (S8L), like DMBT1, is overexpressed in CRSwNP; (2) DMBT1 serves as the carrier protein for S8L; (3) to identify the subcellular expression of S8L and DMBT1. Patients were stratified into CRSwNP, CRS and control groups according to established guidelines. Nasal lavage from 3 groups were analyzed for DMBT1 and S8L by Western immunoblot. Expression of DMBT1 and S8L in polyp tissue was analyzed by immunohisto- and immunoflourochemistry. Kruskall-Wallis nonparametric analysis of variance was used to compare between groups. Total of 58 nasal lavage samples were compared: CRSwNP (n=29), CRSsNP (n=12) and control (n=17). S8L/DMBT1 ratio was increased in CRSwNP vs control or CRS alone patients (p=.03). Elevated expression in CRSwNP remained unaffected by exposure to systemic steroid (n=6), anti-IL5 (mepolizumab, n=1) or anti-TNF-alpha (infliximab, n=1) biologics (p=.03). Immunohisto- and immunoflourchemical double-labeling demonstrated colocalization of S8L and DMBT1 expression in the submucosal glands located in the most proximal segment, and not in the distal tip, of nasal polyp tissue.

S8L/DBMT1 is the endogenous ligand for eosinophil-specific death cell receptor S8 in nasal airways. S8l/DMBT1 is elevated in CRSwNP compared to controls. S8l/DMBT1 is produced in the submucosal glands located at the proximal origin of polyps and secreted in response to mitigate the eosinophilic inflammation.

8:50 pm - 9:00 pm
Questions and Discussion (Live)

9:00 pm – 10:00 pm
Women in Rhinology Reception: Introducing the Nominees for the next Governing Council
Supported by Medtronic

Friday, September 11, 2020

4:00pm - 5:00pm EST
Women in Rhinology, Mentorship and Residents & Fellows Combined Session
“Payment and Quality in U.S. Healthcare: Preparing for an Era of Transparency” Introduction: Murugappan Ramanathan, MD, FARS
Invited Guest Speaker: Marty Makary, MD, Professor of Surgery, Johns Hopkins School of Medicine

Saturday, September 12, 2020

Breakout Room A

11:50 am - 12:00 pm
Introduction
Robert Kern, MD, FARS – ARS President; Joseph Han, MD, FARS – ARS President-Elect/Program Chair

Moderators: Corinna Levine, MD, FARS; David Gudis, MD, FARS; Angela Donaldson, MD, FARS

12:00 pm - 12:10 pm
Submucosal gland morphology and secretory cell identities are aberrant in chronic rhinosinusitis
Onyekachi Nnabue, Medical Student
Steven Pletcher, MD
Alison May
Sarah Knox
Jose Gurrola,MD
Andrew Goldberg, MD,FARS

Introduction:
Altered function of the sinonasal submucosal glands (SMGs) may cause the mucus accumulation and thickening found in chronic rhinosinusitis yet reported contributions of SMGs to upper airway disease initiation and progression remain contradictory.

Objective:
The purpose of this study is to characterize the cellular signatures of the SMGs in multiple regions of the sinonasal vestibule in both healthy and CRS adult subjects.

Methods:
Sinonasal biopsies from healthy and CRS subjects were collected and analyzed from four defined regions: posterior septum, posterior ethmoid, superior turbinate, and sphenoid. Glandular morphology and cellular markers were investigated using histological and immunofluorescent techniques.

Results:
Analysis revealed that healthy SMGs have diverse morphological signatures respective to different regions of the sinonasal vestibule. Altering ratios of mucous cells (MUC5B+) and serous cells (Lactoferrin+) were found in the posterior septum, ethmoid and superior turbinate. Additionally, we characterized a new subset of distal secretory cells in the SMGs identified by the secretory protein CRISP3. Interestingly, no glands were found in sphenoidal submucosa suggesting minimal contribution of the sphenoid to mucus propagation. Furthermore, aberrant morphology of the proximal SMG ductal compartment, as well as a significant depletion in distal secretory acinar cells was revealed in adult CRS patients, compared to healthy subjects.

Conclusion:
Here, we describe an atlas of protein markers that can be used to identify multiple cell types of adult SMGs and for the first time, conclude that aberrant SMG morphology and gland hyposecretion may contribute to mucus accumulation in CRS.

12:10 pm - 12:20 pm
Broad lipidomic analysis of patients with AERD undergoing aspirin desensitization
Adam DeConde, MD
Jana Bandrani
Alex Kim
Kellen Cavagnero
Sun-Mi Choi
Bruce Zuraw
Praveen Akuthota
Taylor Doherty
Sandra Christiansen
UC San Diego

Background:
Aspirin exacerbated respiratory disease (AERD) is associated with high levels of leukotrienes (pro-inflammatory eicosanoids) and low levels of PGE2 (anti-inflammatory eicosanoids). The recommended treatment for AERD includes aspirin (ASA) desensitization and maintenance. The relationship between lipidomic biomarkers, eicosanoid levels and reaction severity during ASA desensitization has not been previously explored.

Methods:
Patients with AERD undergoing aspirin desensitization were recruited for the investigation. Blood and urine samples were collected at baseline, reaction, and post-reaction timepoints for lipidomic and eicosanoid analysis. Reaction severity was measured by symptom score (high>8, intermediate=4-8 or low<4) and drop in FEV1.

Results:
A total of 12 patients were recruited. Based on the reaction symptom score 5 were high, 2 were intermediate, 4 were low, and 1 not determined. Of the 161 eicosanoids tested, 43 serum mediators and 21 urine mediators were detected. Symptom scores were positively correlated to the change in mediator levels for urine LTE4(r2 = 0.3359, P = 0.0617) and serum 15-HETE(r2=0.2290,P=0.2303). Symptom scores were negatively correlated to the change in mediator levels for serum 5,6-diHETrE(r2=0.5255,P=0.0419) and PGE2(r2=0.3925,P=0.0965). Lipoxins and resolvins were not detected in the panel.

Conclusion:
Low levels of baseline 15-HETE as well as increases during ASA desensitization correlated with heightened reaction severity. Levels of lipoxins and resolvins did not provide a mechanism to explain this relationship. The EET-DHET pathway of lipid metabolism, especially

PROGRAM ABSTRACTS

5,6-diHETrE, which negatively correlated with reaction severity are promising targets for further study of AERD.

12:20 pm - 12:30 pm
Cell adhesion molecule expression in chronic rhinosinusitis
Brennan Blight, BS
Shaelene Ashby, PhD, Director of Clinical Research
Chelsea E. Pollard, BS
Gretchen Oakley, MD, FARS
Jeremiah Alt, MD, PhD, FARS
Abigail Pulsipher, PhD
University of Utah School of Medicine

Background:
Chronic rhinosinusitis (CRS) is characterized by the recruitment and trafficking of inflammatory cells into the sinonasal mucosa. Cell adhesion molecules (CAMs) such as integrins and selectins facilitate these processes and have been implicated in CRS pathology. The roles and associations between systemically and locally expressed CAMs, however, have not been studied. Our objective was to understand the complex interplay between the local and systemic immune response, mediated in part, by CAM signaling in CRS.

Methods:
A prospective observational study was conducted using peripheral blood and anterior ethmoid tissues of patients with nasal polyps (CRSwNP, n=17), patients without nasal polyps (CRSsNP, n=17), and controls (n=10). Multiplex gene analysis and Pearson correlations were performed to identify associations between systemic and local gene expression of CAMs (ICAM-1, -2, and -3, PECAM-1, ITGA6, ITGAE, ITGAM, ITGAX, ITGB1, ITGB2, CDH5, SELL, SELPLG, and SELE).

Results:
CAMs were significantly elevated in the blood and sinonasal tissues of CRSwNP compared to CRSsNP and controls ($p < .05$). Strong positive correlations between genes expressed in blood and sinonasal tissues ($p < .05$) were observed, notably between ICAM3 and integrin genes ITGAX and ITGB2 and selectin genes SELL and SELPLG ($p < .01$).

Conclusion:
The local and systemic expression of CAMs was significantly upregulated in patients with CRSwNP compared to controls, suggesting that CAMs serve an integral role in immune signaling crosstalk in CRS.

12:30 pm - 12:40 pm
Macrophages regulate olfactory regeneration through the IL-6/Stat3 pathway
Andrew Lane, MD, FARS *(Presented by Kathleen Kennedy, MD)*
Zhexuan Li
Mengfei Chen
Johns Hopkins University School of Medicine

Background:
Olfactory neural progenitor/stem cell residing in the basal layer possess robust regenerative capacity to regenerate the neuroepithelium after injury. Previous evidence suggests a role of macrophages in the acute inflammatory response after injury and early regeneration. The mechanisms and signaling pathways through which macrophages modulate basal stem cell regeneration are not known.

Methods:
Wildtype or transgenic mice were treated with methimazole to lesion the olfactory epithelium. qPCR analysis was used to screen the mRNA expression of inflammatory cytokines. Olfactory tissue sections were stained with antibodies to the macrophage marker F4/80, interleukin-6, and phosphorylated Stat3. A mouse olfactory stem cell culture model was adopted to analyze signaling pathways in vitro.

Results:
The number of F4/80+ macrophages is increased in the olfactory mucosa lamina propria and reached a peak on day 3 after injury. Immunostaining of the regenerated olfactory epithelium demonstrated activated Stat3 as early as day 2 and decreasing after day 4. Infiltration of F4/80+ macrophages occurs in parallel with Stat3 signaling in the newly generated olfactory epithelium. Co-staining of F4/80 and IL-6 revealed macrophages to be an important source of IL-6 production.

Conclusions:
Elucidation of the mechanisms of olfactory regeneration in the setting of injury is critical to understanding failure of sensory recovery in patients with olfactory loss. The results here point to a potential function of macrophages in promoting neuroepithelial regeneration, acting through the IL6/Stat3 pathway.

12:40 pm - 12:50 pm
A novel device combining acoustic vibration and expiratory pressure for nasal congestion
Rodney Schlosser, MD, FARS
Zachary Soler, BA, FARS
Shaun Nguyen, Dr.
Craig Salvador
Lackland Thomas
Vincent Desiato
Kristina Storck
Medical University of South Carolina

Background:
Chronic nasal congestion impacts 20% of the population with significant quality of life impact. Current pharmacologic and surgical treatments demonstrate variable efficacy and side effects, thus novel treatments are needed. This study investigated the safety and efficacy of simultaneous administrating of nasal acoustic vibration and oscillating expiratory pressure for the treatment of nasal congestion.

Methods:
Patients with chronic nasal congestion participated in a prospective clinical study applying simultaneous acoustic vibrations and positive expiratory pressure to the nasal cavity twice daily over 5 weeks. Safety was assessed by rhinoscopy and patient questionnaires. Efficacy was assessed using peak nasal inspiratory flow (PNIF), visual analog scale (VAS) of nasal symptoms, Total Nasal Symptom Score (TNSS), Nasal Obstruction and Septoplasty Effectiveness (NOSE) score, and the 22-item Sinonasal Outcome Test (SNOT22).

Results:
Forty patients (mean age 39 years, 65% female) completed the study with no adverse effects. At the 2 week follow-up, PNIF improved by 25.0 L/min (31% increase from baseline, $p<0.001$). At the 5 week follow-up, nasal congestion VAS improved from mean (SD) of 5.8 (2.4) to 2.6 (2.3), TNSS improved from 7.2 (3.5) to 3.5 (3.1), NOSE improved from 50.4 (19.9) to 23.3 (17.2) and SNOT22 improved from 31.7 (20.3) to 14.2 (12.7), all $p<0.001$. Eighty percent of patients would use the device again and 87.5% would recommend to others.

Conclusions:
Simultaneous administrating of nasal acoustic vibration and oscillating expiratory pressure appears to be a safe treatment for chronic nasal congestion. Results from this initial study are promising with regard to efficacy.

12:50 pm - 1:00 pm
Questions and Discussion

1:00 pm - 1:10 pm
Inter Session Break

1:10 pm - 2:00 pm
Panel: Understanding the role, questions, and concerns of biologic in the management of NP
Moderator: Amber Luong, MD, PhD, FARS
Panelists: Lauren Roland, MD; Kent Lam, MD; Jean Kim, MD, FARS; Rodney Schlosser, MD, FARS; Christine Franzese, MD, FARS

2:00 pm - 2:10 pm
Inter Session Break

2:10 pm - 3:00 pm
Panel (Women in Rhinology): "Work-life Balance during COVID-19 Era"
Moderator: Elina Toskala, MD, FARS
Panelists: Timothy Smith, MD, FARS; Mindy Rabinowitz, MD, FARS; Ian Koszewski, MD; Jivianne Lee, MD, FARS; Lori Lemonnier, MD

Breakout Room B

11:50 am - 12:00 pm
Introduction
Robert Kern, MD, FARS – ARS President; Joseph Han, MD, FARS – ARS President-Elect/Program Chair

12:00 pm - 12:50 pm
Panel: Clinical Importance of Bench Research
Moderator: Andrew Lane, MD, FARS
Panelists: Justin Turner, MD, FARS; Benjamin Bleier, MD, FARS; Erin O'Brien, MD, FARS; David Jang, MD, FARS

12:50 pm - 1:00 pm
Inter Session Break

Moderators: Theodore Schuman, MD, FARS; Arthur Wu, MD, FARS; David Jang, MD, FARS; Alissa Kanaan, MD

1:00 pm - 1:10 pm
SNOT-22 subdomain analysis of patients treated with Omalizumab for nasal polyposis
Joseph Han, MD, FARS
Eastern Virginia Medical School, Norfolk, VA, USA

Background:
Nasal polyps are associated with substantial quality of life (QoL) impairment. The 22-item Sino-Nasal Outcome Test (SNOT-22) questionnaire is a widely accepted patient-reported outcome measure that evaluates impact of rhinologic disease, including chronic rhinosinusitis with nasal polyps (CRSwNP), on QoL. Factor analysis suggests grouping 22 questionnaire items in 4 subdomains (score range): nasal (0−40), otological/facial symptoms (0−20), sleep (0−40), emotional/psychological impact (0−10). Analyses of baseline (BL) and postintervention scores for each could show how treatment influences QoL. We explore omalizumab vs placebo for aspects of QoL using the 4 SNOT-22 subdomains in 2 replicate Phase III, randomized, placebo-controlled, studies of omalizumab treatment of nasal polyps: POLYP 1 (NCT03280550); POLYP 2 (NCT03280537).

Methods:
Post hoc analyses of pooled data from POLYP 1 (n=138) and POLYP 2 (n=127) used mixed-effect models for each subdomain score, calculated as the sum of

PROGRAM ABSTRACTS

all items comprising the domain, to estimate placebo-adjusted change from BL at Week 24.

Results:
Placebo-adjusted mean (95% CI) improvements from BL at Week 24 were significantly greater for omalizumab- vs placebo-treated patients across all subdomains; nasal (−5.68 [−7.24,−4.11]), otological/facial (−2.55 [−3.37,−1.73]), sleep (−5.50 [−7.39,−3.61]), emotional/psychological (−1.33 [−1.85,−0.82]); all P<0.0001. Overall safety results for these studies are available in Gevaert, et al. 2019.

Conclusions:
Significant/clinically meaningful improvements observed at the SNOT-22 total score level in POLYP 1/POLYP 2 were reflected across all subdomains, suggesting that all QoL aspects in SNOT-22 improved with omalizumab in patients with CRSwNP.

1:10 pm - 1:20 pm
Sinonasal inflammation impairs resting-state functional brain connectivity
Aria Jafari, MD
Laura De Lima Xavier, MD
Jeffrey Bernstein, BS
Kristina Simonyan, MD, PhD
Benjamin Bleier, MD, FARS

Background:
Patients with chronic rhinosinusitis (CRS) can have significant cognitive dysfunction. The goal of this investigation is to describe the effects of sinonasal inflammation on functional brain connectivity (Fc) which may underlie CRS-related cognitive changes.

Methods:
Subjects were selected from the open-access Human Connectome Project dataset. Of 1113 subjects, 22 had sinonasal inflammation (Lund-Mackay (LMS)≥10) and were compared to age- and gender-matched healthy controls (HC; LMS=0). Resting state Fc was analyzed within the default-mode (DMN), fronto-parietal, salience (SN), and dorsal attention networks. Patients were further stratified into moderate (MI) (LMS<14,n=13) and severe (SI) (LMS≥14,n=9) inflammation groups. Cognitive function was assessed using the NIH Toolbox Cognition Battery.

Results:
Patients with sinonasal inflammation showed decreased Fc within the fronto-parietal network, in a region involving bilateral frontal medial cortices (p =0.02). This region showed increased Fc to two nodes within the DMN(both p<0.05), and decreased Fc to one node within the SN (p = 0.02). The magnitude of these differences increased with inflammation severity. On cognitive testing, processing speed was significantly different between groups(MI:93.66±23.4, SI:118.6±12.2, HC:96.0±19.8,p=0.01).

Conclusion:
This is the first study to suggest potential neural correlates for CRS-related cognitive dysfunction. Sinonasal inflammation significantly impacts functional brain connectivity within the DMN and SN, which are involved in attention and detection of stimuli, as well as processing speed measures. Future prospective studies are warranted to determine the applicability of these findings to a clinical CRS population.

1:20 pm - 1:30 pm
Patient satisfaction with telemedicine clinical visits for chronic rhinosinusitis
Megan Morisada, MD
Joshua Hwang, Medical Student
Amarbir Gill, MD
Machelle Wilson
E. Bradley Strong
Toby Steele, MD

Background:
Telemedicine applications have become paramount to the care of rhinologic patients during the COVID-19 pandemic. They may be at risk for a perceived lower-quality exchange with their healthcare provider and subsequent decline in patient satisfaction. This study compares patient satisfaction scores between face-to-face clinic visits and telemedicine visits in chronic rhinosinusitis (CRS) patients.

Methods:
A retrospective chart review of 69 patients with CRS presenting to a tertiary rhinology clinic during March to April 2020 was performed and divided into two groups based on mandated state quarantine orders on March 19. Patient demographics, disease severity measures, and Patient Satisfaction Questionnaire-18 (PSQ-18) scores were collected and analyzed. Chi square test, Fisher's exact test, and univariate analysis were performed.

Results:
There were no significant differences in age(p=0.81), gender(p=0.55), CRS phenotype(p=0.16), and disease severity measures (Sinonasal Outcomes Test-22 (SNOT-22)(p=0.92); Lund-Mackay(p=0.96)) score between the telemedicine and clinic visit groups. There were no significant differences in PSQ-18 subdomain scores including: general satisfaction(p=0.73), technical quality(p=0.62), interpersonal manner(p=0.41), communication(p=0.31), financial aspects(p=0.89), time spent with doctor(p=0.88), and accessibility and convenience(p=0.47). SNOT-22, history of sinus surgery, and CRS phenotype were not predictive of PSQ-18 total score on regression analysis.

Conclusion:
Patient satisfaction with telemedicine in the COVID-19 pandemic parallels that of traditional face-to-face visits. During this pandemic era, video visits can serve as a viable alternative while maintaining high satisfaction.

1:30 pm - 1:40 pm
Red ginseng aqueous extract improves markers of mucociliary clearance in the Cystic Fibrosis rat
Do-Yeon Cho, MD
Harrison Thompson, BS
Daniel Skinner, BS
Shaoyan Zhang, PhD
Dong Jin Lim, PhD
Connor Koch, PhD
Jessica Grayson, MD
Steven Rowe, MD
Bradford Woodworth, MD, FARS
University of Alabama at Birmingham

Background:
Effective mucus clearance is an important component of host defense in the airways. Red ginseng aqueous extract (RGAE) improves mucociliary parameters (MCP) in both wild type and cystic fibrosis transmembrane conductance regulator (CFTR)-/- murine nasal epithelial cells by stimulating chloride (Cl-) secretion. We have previously identified RGAE as a significant potentiator of the calcium-activated Cl- channel TMEM16A that could serve as a rescue mechanism in CF airways. The objectives of this study are to assess the capability of RGAE to improve epithelial Cl- secretion and MCP in an in-vivo CF rat model.

Methods:
Six 4-month old Cftr-/-(knock-out) rats were randomly assigned to receive daily oral placebo (saline, n=3) or RGAE (Ginsenosides 0.4mg/kg/daily, n=3) for 4 weeks. Outcomes included nasal Cl- secretion (nasal potential difference (NPD) assay) as well as tracheal MCP (airway surface liquid (ASL) & periciliary liquid (PCL) depth, ciliary beat frequency (CBF)) using micro optical coherence tomography (μOCT).

Results:
The RGAE-treated rat cohort had greater mean NPD polarization with UTP (placebo= -5.96±2.3mV, RGAE= -12.51±1.04mV, p=0.058), indicating, at least in part, potentiation of UTP-mediated Cl- secretion through TMEM16A. All measured tracheal MCP were significantly improved in RGAE treated CF rats: 1) ASL depth, placebo= 6.63±0.16μm vs RGAE= 16.72±0.93μm (p<0.001); 2) PCL depth, placebo= 6.29±0.18μm vs RGAE= 7.32 ± 0.11μm (p<0.01); 3) CBF, placebo= 7.7 ± 0.39 Hz vs RGAE= 9.41 ± 0.44 Hz (p=0.04).

Conclusion:
RGAE improved all MCP in 4-month old Cftr–/– rats. These findings suggest RGAE has therapeutic potential for CF airway disease.

1:40 pm - 1:50 pm
Predictors of completion of sublingual immunotherapy
Sophia Song (*Presented by Nanki Hura, Medical Student)*
Nanki Hura, Medical Student
Rebecca Kamil, MD
Geraldine Pierre
Sandra Lin, MD, FARS

Background:
Sublingual immunotherapy (SLIT) has emerged as a promising alternative to subcutaneous immunotherapy (SCIT) given its improved safety profile and more convenient dosing. However, SLIT still relies on daily dosing for many years to optimize effectiveness. This study sought to investigate factors that influence patient completion of SLIT.

Methods:
We performed an institutional retrospective review of patients who received SLIT (2008-2020). Completion was defined as completing at least 36 months of SLIT. Patient demographics and characteristics, including the number of allergens included in the SLIT vial, history of asthma and sinus surgery, number of clinic visits, and total time undergoing SLIT, were documented. Univariate and multivariate models were used to analyze predictors of SLIT completion. Subgroup analysis was performed among patients who discontinued SLIT.

Results:
Of the 404 total patients, 249(61.6%) discontinued, 47(11.6%) completed, and 108(26.7%) were currently undergoing SLIT. The mean duration of therapy was 11.2 months for those who discontinued and 49.4 months for patients who completed SLIT. The odds of SLIT completion were twice as high with each additional clinic visit, and 10 times higher when the dosage was increased during therapy (p<0.001). With each additional allergen added to the vial, the likelihood of never picking up SLIT vials decreased by 10% (p=0.007). With each mile of distance traveled to clinic, the likelihood of being lost to follow-up after picking up the initial vials increased by 0.3% (p=0.04).

Conclusion:
Increasing the frequency of clinic visits and improving therapy availability may increase patient completion of SLIT.

1:50 pm - 2:00 pm
Questions and Discussion

2:00 pm - 2:10 pm
Inter Session Break

2:10 pm - 3:00 pm
Panel: Utility of Pedicled Flap: Nose to Skull Base
Moderator: Eric Holbrook, MD, FARS
Panelists: Stacey Gray, MD, FARS; Zara Patel, MD, FARS; Troy Woodard, MD, FARS; Waleed Abuzeid, MBBS; Jonathan Ting, MD, fARS

Breakout Room C

11:50 am - 12:00 pm
Introduction
Robert Kern, MD, FARS – ARS President; Joseph Han, MD, FARS – ARS President-Elect/Program Chair

12:00 pm - 12:40 pm
Panel: Management of CRS: Perspective Around the World
Moderator: Brent Senior, MD, FARS
Panelists: Marcio Nakanishi, MD; Peter Hellings, Professor; Claus Bachert, MD, Professor; Claire Hopkins, Professor; Martin Derosiers, MD

12:40 pm – 12:50 pm
Inter Session Break

12:50 pm - 1:30 pm
Panel: Impact of COVID 19 in Rhinology: From Office to OR
Moderator: Seth Brown, MD, FARS
Panelists: Zara Patel, MD, FARS; Abtin Tabaee, MD, FARS: Parul Goyal, MD, FARS; Arthur Wu, MD, FARS

1:30 pm – 1:40 pm
Inter Session Break

1:40 pm – 2:20 pm
Panel: New and Innovative Management: From Rhinitis to Sinusitis
Moderator: Jeffrey Suh, MD
Panelists: Benjamin Bleier, MD, FARS; Ashutosh Kacker, MD; Carol Yan, MD; Esther Kim, MD

2:20 pm – 3:00 pm
Panel: Evidence versus Myth: Management of Allergic Rhinitis
Moderator: Stella Lee, MD
Panelists: Seong Cho, MD; Sarah Wise, MD, FARS; Gregory Capra, MD, FARS

ON DEMAND SCIENTIFIC PRESENTATIONS

66th Annual Meeting - Oral Presentations

A comparison between anterior and lateral CSF leaks in meningocele patients

Rahul Alapati, BS
Glen D'Souza, MD
Prachi Patel, BA
Chandala Chitguppi, MD
Mindy Rabinowitz, MD, FARS
Tawfiq Khoury, MD
James Evans, MD
Christopher Farrell, MD
Elina Toskala, MD, FARS
Marc Rosen, MD, FARS
Gurston Nyquist, MD, FARS
Sidney Kimmel Medical College

Objective:
The optimal strategy for management of IIH in anterior and lateral cranial base meningoencephaloceles remains debated. Purpose of this study is to compare patient demographics, radiologic findings, and surgical outcomes between anterior and lateral cranial base meningoencephaloceles and to present a treatment algorithm for the management of IIH in these patient populations.

Methods:
Retrospective cohort study of 90 patients who underwent repair of anterior or lateral CSF leaks at an academic medical center.

Results:
48 anterior cranial base (ACB) defects and 42 lateral cranial base (LCB) defects were included. Our cohort had significantly more women (N=66, p=0.015) in the anterior cohort (86.7%) compared to the lateral cohort (59.5%).

Average body-mass index (BMI) >25 kg/m2 was significant (p=0.018), with a mean BMI of 34.49. The average BMI of ACB cases was 33.8 and LCB cases was 35.2, with no statistical significance between the two groups.

Thirty-nine (43.3%) had ICP>20 cm H2O. The average ICP was 20.10 cm H2O versus 21.87 cm H2O in LCB cases. 85 patients (94.4%) had closure of CSF leak at first attempt, with a 93% success rate in ACB (N=42) and 95% success rate in LCB (N=40). Patients who did not have complete closure had elevated ICP and did not have a Ventriculoperitoneal shunt (VPS) placed.

VPS were placed for long-term CSF diversion in ACB cases (N=23, 51.1%) and LCB cases (N=7, 16.7%), with significance in ACB cases (p<0.01).

Conclusion:
Patients in this cohort presented with elevated opening pressure or signs of elevated ICP. Long-term CSF diversion, in addition to surgical repair should be considered in patients with elevated intracranial pressure and other high-risk factors.

Adverse events with monoclonal antibodies

Mohamad Chaaban, MD, FARS
Chengetai Mahomva
University of Texas Medical Branch

Background:
Chronic rhinosinusitis with nasal polyposis in the western population is characterized by Th2 pathways involving eosinophils and elevated IL-5. Recently, biologics have been used variably in clinical trials with reported adverse events. However, no study have reported the adverse events reported to the FDA with the use of these relatively new medications.

Methods:
Between 2018 and 2019, the Food and Drug Administration's (FDA) Adverse Event Reporting System database was queried for adverse events related to monoclonal antibodies: Omalizumab, Mepolizumab, Reslizumab, Behralizumab and Dupilumab. Variables queried include age, sex, adverse event, country, year, report source, indication for use (chronic rhinosinusitis/asthma/uritcaria/other), concomitant use of other medications.

Results:
There were a total of 42,758 adverse events reported to the FDA including 781 deaths between 2018 and 2019 with the use of monoclonal antibodies. 73% of the patients were between 18-64 years old with majority females (64.4%). Headache, cough, and sinusitis were most commonly reported with Omalizumab (55%, 58%, and 65%, respectively). 43% of the reported deaths were with Mepolizumab while 33% with Omalizumab.

Conclusion:
As monoclonal antibodies are becoming widely used in chronic rhinosinusitis and asthma, otolaryngologists need to be familiar with their adverse events reported to the FDA. Otolaryngologic side effects such as sinusitis, headaches and cough warrant attention as they may disguise concomitant chronic rhinosinusitis flare ups. Additionally, risk of death should be weighed against risk of surgical intervention when options are considered with the patient.

PROGRAM ABSTRACTS

Age-related changes in olfactory cleft anatomy and airflow using computational fluid dynamics

Ryan Little, MD
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Background:
Age-related changes in nasal anatomy have previously been reported. The impact of these changes upon physiologic variables, such as odorant dose to the olfactory cleft and olfactory flowrate is unknown. This study aims to use computational fluid dynamics (CFD) simulations to identify key anatomic variables that vary with age and correlate with physiologic olfactory variables.

Methods:
Twenty computed tomography scans were analyzed on younger (N=10, age <30 years) and older (N=10, age >65 years) adults. The nasal cavity was divided into inferior, middle, and superior regions and anterior, middle, and posterior regions using axial and coronal planes. Anatomic variables included regional surface areas and cross-sectional areas. CFD simulations were performed with steady inhalation rate of 250 mL/s and laminar flow. The convection-diffusion equation was solved to simulate inhalation of 1ppm vanillin concentration at the nostrils. CFD variables included regional airflow allocation and wall fluxes of odorant particles. Anatomic variables were compared between age groups and then correlated with key physiologic variables.

Results:
Older adults had several anatomic differences, notably increased coronal cross-sectional areas in the center of the olfactory cleft (0.14 ± 0.08 cm2 vs 0.30 ± 0.09 cm2, P=0.002) and increased olfactory surface area (16.9 ± 4.1 cm2 vs 22.8 ± 6.1 cm2, P=0.03). Odorant dose and olfactory flowrate were significantly correlated with olfactory surface area.

Conclusion:
This pilot study confirms age-related changes in olfactory cleft anatomy that correlate with CFD modeling of olfactory physiology. The impact upon olfactory function remains an area for further study.

Antibody deficiencies in chronic rhinosinusitis

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Objective:
To evaluate the frequency and types of humoral immunodeficiencies (HID) in pediatric and adult patients with recurrent (RARS) and/or chronic rhinosinusitis (CRS). Patients with HID commonly present with upper respiratory tract infections. Their pathophysiology in children is different than adult counterparts. It is unknown how HID affects those two age groups.

Study design:
Retrospective cohort study

Methods:
We performed a retrospective chart review of pediatric (2-13 years old) and adult (18 years and older) patients who were evaluated in our pediatric and adult rhinology clinic between July 2009 and December 2019 and had the diagnosis of chronic (>12 weeks) or recurrent (>3 times/year) rhinosinusitis. Patients with cystic fibrosis, Aspirin Exacerbated Respiratory Disease (AERD), and ciliary dyskinesia were excluded. Demographic data and associated conditions were reviewed. Immunologic evaluation included complete blood cell count (CBC) with differential, serum immunoglobulin G, A, and M levels, and baseline and post-vaccination pneumococcal antibody titers.

Results:
There were 134 patients who met the inclusion criteria. 86 patients (64%) were children, 48 patients (36%) were adults. 46% of both age groups were female. 17.4% of children had abnormal immunologic findings: 8 had hypogammaglobulinemia, 2 had specific antibody deficiency (SAD), and 5 had selective IgA deficiency. 29.2% of adults ($p<0.0001$) had abnormal immunologic findings: 4 had hypogammaglobulinemia, 9 had SAD ($p<0.0001$), and 1 patient had both IgA deficiency and SAD.

Conclusion:
Humoral immunodeficiency, specifically SAD, seems to be more common in adult versus pediatric CRS that is refractory to treatment.

Are rhinitis and eustachian tube dysfunction associated in United States adolescents?

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Introduction:
Rhinitis and Eustachian tube dysfunction (ETD) may be linked, but population-level evidence is lacking, particularly among adolescents. We investigated the association between rhinitis and ETD in a nationally-representative sample of US adolescents.

Methods:
We performed cross-sectional analyses of 2005-2006 National Health and Nutrition Examination Survey data (n=2022, ages 12-19). Rhinitis (self-reported hay fever and/or nasal symptoms in the past 12 months) was stratified as allergic (AR) or nonallergic rhinitis (NAR) based on serum IgE aeroallergen positivity. History of ear disease and procedures was recorded. Tympanometry was classified by type (A, B, C). Multivariate logistic regression was performed, adjusting for age, race, gender, and exposure to tobacco smoke.

Results:
31.6% of US adolescents reported rhinitis (NAR 38.4%, AR 61.6%), and 13.8% had abnormal tympanometry. Adolescents with rhinitis were more likely to report a history of ≥3 ear infections (NAR: OR 2.39, 95% CI: 1.73-3.29, p<0.001; AR: OR 1.90, 95% CI: 1.22-2.95, p=0.007) and to report a history of tympanostomy tube placement (NAR: OR 3.65, 95% CI: 2.12-6.29, p<0.001; AR: OR 2.03, 95% CI: 1.30-3.14, p=0.004), compared those without rhinitis. There was no association between rhinitis and abnormal tympanometry (NAR: p=0.383; AR: p=0.682).

Conclusions:
Both NAR and AR are associated with a history of frequent ear infections and tympanostomy tube placement in US adolescents, supporting an association with ETD. This association is strongest for NAR, suggesting that specific inflammatory mechanisms may be involved in this condition and potentially explaining why treatments for AR are largely ineffective for ETD.

Association of air pollutant exposure and sinonasal histopathology in chronic rhinosinusitis

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The effects of air pollution on health are of increasing interest, but there is limited literature on how it affects chronic rhinosinusitis (CRS). This study aims to identify associations between certain sinonasal histopathologic characteristics in patients with CRS and levels of common air pollutants in their place of residence.

A structured histopathology report was created to analyze the tissues of CRS patients undergoing sinus surgery. An estimate for each patient's exposure to small particulate matter (PM2.5) and ground-level ozone was obtained using the Environmental Protection Agency's Environmental Justice Screening and Mapping Tool (EJSCREEN). Associations between pollutant levels and histopathology findings were identified.

Data from 291 patients were analyzed. Higher degree of inflammation was significantly associated with increased ozone exposure (p=.049). Amongst patients with chronic sinusitis with nasal polyposis (CRSwNP; n=131), there was a significant association between higher degree of inflammation and higher ozone level (p=.003) while the association between presence of eosinophilic aggregates and higher ozone level approached statistical significance (p=.072). A binary logistic regression model showed ozone level (p=.024) and minority population in the patient's census block group (p=.001) were both significant predictors of presence of eosinophilic aggregates in patients with CRSwNP.

Exposure to ambient air pollutants may contribute to the pathogenesis or severity of CRS. Increasing ozone exposure was linked to higher tissue inflammation and presence of eosinophilic aggregates in CRSwNP patients. This is the first study to examine the association between pollutant exposure and sinonasal histopathology.

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Association of nasopharyngeal inflammation in patients with eustachian tube dysfunction

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Background:
Eustachian tube dysfunction (ETD) is estimated to account for over 2 million adult patient encounters per year in the United States. Standardized diagnostic criteria for ETD have yet to be established. The purpose of this study was to characterize the relationship between Eustachian tube inflammation, ETD symptoms, and middle ear pressure.

Methods:
Patients presenting to a tertiary rhinology clinic from October 2018 to June 2019 were enrolled in a cross-sectional study. Included patients underwent nasal endoscopy and completed the 7-item Eustachian Tube Dysfunction Questionnaire (ETDQ-7) and the 22-item Sinonasal Outcome Test (SNOT-22). Nasopharyngeal inflammation identified on nasal endoscopy was quantified using the Endoscopic Evaluation of the Eustachian Tube (3ET) score. Tympanometry was performed as indicated. Comorbid conditions were assigned at the time of the patient encounter.

Results:
450 patients met inclusion criteria. While 3ET scores were not directly correlated to ETDQ-7 scores, on multivariate analysis the presence of either laryngopharyngeal reflux (LPR) or high SNOT-22 score predicted a high ETDQ-7 score. Among 67 patients who underwent tympanometry, the 3ET score had a positive predictive effect on the likelihood of an abnormal tympanogram (odds ratio, 2.85; 95% CI, 1.10-17.25).

Conclusion:
This study suggests a relationship between middle ear function and proximal Eustachian tube inflammation as visualized by nasal endoscopy. ETD symptoms are associated with the presence of LPR, which may be a cause of Eustachian tube inflammation. Additional study of the 3ET and its relationship to other parameters is needed to standardize the diagnosis of ETD.

Automated 3D sinus CT evaluation

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Background:
Computed tomography (CT) plays a key role in evaluation of paranasal sinus inflammation but there is a need for improved quantitative assessment. Computerized volumetric analysis has shown benefit over visual scoring, but relies on difficult and time-consuming manual image segmentation, limiting its implementation. We hypothesized that a convolutional neural network (CNN) algorithm can perform automatic, volumetric segmentation of the sinuses on CT enabling efficient, objective measurement of sinus opacification.

Objective:
To perform initial clinical testing of a CNN method for automatic quantitation of sinus opacification in the workup of patients with chronic upper and lower airway disease.

Methods:
Sinus CT scans were collected on 690 patients who underwent imaging during 2016-2017 as part of multidisciplinary clinical workup at a tertiary care respiratory hospital. A CNN was trained to perform automatic segmentation using a subset of CTs (n=180) that were initially segmented manually. A non-overlapping test set (n=510) was used for testing. In this group, automatic opacification scores were compared with Lund-MacKay (LM) scores and clinical markers of inflammation using Spearman correlation.

Results:
CNN scores were strongly correlated with LM (ρ=0.82, $p<0.0001$) and weakly to moderately correlated with forced expiratory volume in 1 second (FEV1) percentage predicted (ρ=-0.21, $p<0.0001$), FEV1 / forced vital capacity ratio (ρ=-0.27, $p<0.0001$), immunoglobulin E (ρ=0.20, $p<0.0001$), eosinophil count (ρ=0.28, $p<0.0001$) and exhaled nitric oxide (ρ=0.40, $p<0.0001$).

Conclusion:
Segmentation of sinus CTs can be automated using a CNN, providing objective, volumetric quantitation of sinonasal inflammation.

Azithromycin and Ciprofloxacin inhibit IL-8 secretion without disrupting HSNEC integrity in vitro

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Background:
We recently developed a ciprofloxacin and azithromycin sinus stent (CASS) to target recalcitrant infections in chronic rhinosinusitis (CRS). The objective of this study is to evaluate the anti-inflammatory activity of azithromycin released from the CASS and assess the impact on the integrity and function of primary human sinonasal epithelial cells (HSNECs).

Methods:
P. aeruginosa lipopolysaccharide (LPS)-stimulated HSNECs were treated with azithromycin and/or ciprofloxacin at concentrations attainable from CASS release. IL-8 secretion was quantified by enzyme-linked immunosorbent assay. Epithelial integrity (Transepithelial resistance (TEER), paracellular permeability, lactate dehydrogenase assays) and function (cilia beat frequency (CBF)) were also evaluated.

Results:
Azithromycin significantly reduced secreted IL-8 from P. aeruginosa LPS-stimulated HSNECs at all concentrations tested (control=5.77±0.39 ng/ml, azithromycin (6 µg/ml) = 4.58±0.40 ng/ml, azithromycin (60 µg/ml)=4.31±0.06, azithromycin (180 µg/ml)=4.27±0.26 ng/ml, $p<0.05$). Co-incubation with azithromycin (6 µg/ml) and ciprofloxacin (2.4 µg/ml) in LPS-stimulated HSNECs also displayed a significant reduction in secreted IL-8 when compared to P. aeruginosa LPS alone (co-treatment=4.61±0.29 ng/ml, P. aeruginosa LPS=7.35±0.89 ng/ml, $p<0.01$). The drugs did not negatively impact TEER, paracellular permeability, LDH release, or CBF indicating retention of cell integrity and function.

Conclusion:
Azithromycin decreased P. aeruginosa LPS IL-8 production in HSNECs at drug concentrations attainable with sustained release of azithromycin from the CASS. Anti-inflammatory properties of the CASS should provide further benefit for patients with recalcitrant CRS.

Biologics in the management of CRSwNP
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Background:
Chronic rhinosinusitis with nasal polyposis (CRSwNP) is a highly prevalent disease and challenging to treat. We aimed to evaluate the current and available evidence for biologics for CRSwNP.

Methods:
Three main databases were searched for potentially relevant systematic reviews from inception of each database through February 2020. Additionally, an updated review of randomized controlled trials (RCTs) from January 2018 to December 2019 was included. A Measurement Tool to Assess Systematic Reviews-version 2 (AMSTAR-2) was used to evaluate the quality of included systematic reviews. The biological modalities included anti interleukin (IL)–5 therapy, anti-IL-4, anti-IL-13 and anti-IgE monoclonal antibodies.

Results:
A total of 5 systematic reviews were included in this overview, along with one recent RCT. The AMSTAR-2 final summary was low to critically low. The biological modalities exhibited a remarkable improvement in the nasal polyp score, based on narrative syntheses. However, a meta-analysis demonstrated no significant improvement in the nasal polyps score after anti-IgE therapy. The proposed treatments with the exception of anti-IgE demonstrated consistent and significant improvements in both sinus opacification and Lund-Mackay total scores. Subjective quality-of-life assessment illustrated favorable results of biologics for CRSwNP, whereas no significant adverse events were reported.

Conclusion:
The current evidence supports the use of biologics for CRSwNP patients, with conflicting results for the utility of anti-IgE. Dupilumab, in particular, has promising findings in all measured parameters. However, the evidence should be cautiously adopted because of the methodological flaws in the included studies.

Bone mineral density of the anterior skull base in spontaneous cerebrospinal fluid leak patients
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Background:
Obesity has been shown to affect various aspects of bone metabolism and may regionally alter bone mineral density (BMD). This has been hypothesized as a contributing etiology of anterior skull base spontaneous cerebrospinal fluid (CSF) leaks. Thus, the purpose of this study is to utilize thin slice computed tomography (CT) to evaluate the BMD of the anterior skull base and to assess the relationship of BMD in patients with spontaneous CSF leaks compared to matched patients with normal BMI (20-25) or obese BMI (>35) without CSF leaks.

Subjects and Methods:
Spontaneous CSF rhinorrhea patients were identified and matched control (age and sex) groups with normal and obese BMI were identified. Two reviewers measured BMD and bone thickness at 8 pre-defined anterior skull base anatomic points using thin slice CT scans. BMD and bone thickness were compared between the groups.

Results:
Eighty one patients were included with a mean age of 57.1 years. There were no significant differences in BMD at any area of the skull base between the CSF leak group and either of the matched control groups ($p = 0.141 – 0.864$). The bone of the skull base was thinner in the CSF leak group compared to the matched

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control groups at each of the points of interest, but only reached statistical significance in the roof of the ethmoid ($p = 0.048$). The intraclass correlation coefficient (ICC) of the CT reviewers' measurements was strong (ICC > 0.88).

Conclusion:
There appears to be no difference in BMD of the anterior skull base between patients with spontaneous CSF leaks and normal BMI or obese control patients. Decreased BMD in the anterior skull base does not seem to play a role in spontaneous CSF leaks.

Chemosensory dysfunction and diet quality
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Introduction:
Evidence suggests chemosensory dysfunction (CSD) patients have altered diet behaviors, but population-level evidence assessing diet quality in CSD patients is lacking. We examined the association between CSD and diet quality in a representative sample of United States adults.

Methods:
This cross-sectional study included 2939 adults aged greater than 40 years from the 2013-2014 National Health and Nutrition Examination Survey who completed the taste/smell questionnaire and examination. Mean nutrient intake in subjects with self-reported olfactory/gustatory dysfunction (sOD/sGD) and measured olfactory/gustatory dysfunction (mOD/mGD) were compared to those without CSD using univariate Wilcoxon rank-sum tests. The Healthy Eating Index (HEI), a validated measure of diet quality, was calculated. The proportion of subjects with sOD, sGD, mOD, and mGD with bottom-quartile HEI was compared to those without CSD using multivariate logistic regression, adjusting for demographic and socioeconomic covariates.

Results:
The population-weighted prevalence of sOD, sGD, mOD, and mGD was 21.2%, 13.9%, 12.4% and 26.9%, respectively. Subjects with mOD had lower mean total fat, sodium, and potassium intake compared to subjects without CSD (72.6+/-2.7 vs 78.4+/-1.1 gm, 3153.4+/-97.8 vs 3352.6+/-39.8mg, 2519.4+/-73.6 vs 2682.3+/-27.2mg, $p<0.05$). Subjects with sOD and mGD were more likely to have bottom-quartile HEI compared to those without CSD (OR 1.48, 95% CI 1.10-1.99 and OR 2.13, 95% CI 1.34-3.38, respectively).

Conclusions:
This population-level study suggests an association between CSD and poor diet quality, which warrants further investigation and underscores the need to consider nutritional counseling for CSD patients.

Comparing CRS severity between hispanics and non-hispanics undergoing primary ESS
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Background:
The role of social determinants of health in chronic sinusitis (CRS) is poorly characterized. Our group previously discovered that among CRS patients, Hispanic patients report longer delays to receive CRS care and have higher preoperative SNOT-22 scores despite similar Lund-MacKay (LM) CT scores.

Hypothesis:
Longer care delays lead to more severe CRS at the time of primary endoscopic sinus surgery (ESS). This study investigates differences in CRS disease severity that are not reflected by LM CT scores.

Methods:
The prospective cohort study included consecutive patients having primary ESS for CRS between 7/2019-11/2019 with complete preoperative data. Data was collected during preoperative clinic and surgery. Relative risk (RR) compared CRS severity markers between cohorts.

Results:
30 Hispanic and 48 Non-Hispanic patients met inclusion criteria. Mean age, sex distribution, LM scores, and comorbidity scores were similar between cohorts. Hispanic patients tended to have a higher rate of private insurance (87% vs 69% Non-Hispanic). Hispanics presented with worse SNOT-22 (56;sd=18) compared to Non-Hispanics (38;sd=22) ($p<0.001$). Hispanics tended to have higher Lund-Kennedy endoscopy scores (4.6;sd=3.7 vs. 3.5;sd=3.5). Hispanics had a higher risk of severe CRS markers including nasal polyps RR=2.3 (95% CI:0.9-6.2), neo-osteogenesis RR=1.8 (95% CI:0.5-6.2), need for extended operative procedures (ie. draft III) RR=2.6 (95% CI:0.8-8.5), and tissue eosinophilia RR=1.67 (95% CI:0.6-4.3).

Conclusions:
Despite similar LM CT scores, Hispanics presenting with primary ESS have markers of greater CRS severity. The differences in CRS severity may account for the worse sinonasal quality of life experienced by Hispanic patients.

Cost-effectiveness of antibiotic prophylaxis for nasal packing

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Background:
Non-absorbable nasal packing is often placed for the treatment of epistaxis or after nasal, sinus, or skull base surgery. Antibiotics are often prescribed in these settings to prevent toxic shock syndrome (TSS), a rare, but potentially fatal occurrence. However, the risk of TSS must be balanced against the risk of major complications from antibiotic use. The purpose of this study is to evaluate in terms of cost-effectiveness whether antibiotics should be prescribed when nasal packing is placed.

Methods:
A clinical decision analysis was performed using a Markov model to evaluate whether antibiotics should be given when nasal packing is placed. Utility scores, probabilities, and costs were obtained from the literature. We assess the cost-effectiveness of antibiotic use when the risk of community-acquired Clostridium difficile colitis is balanced against the risk of TSS from nasal packing. Sensitivity analysis was performed for assumptions used in the model.

Results:
The incremental cost-effectiveness ratio for antibiotic use was 334,493 USD/QALY. Probabilistic sensitivity analysis showed that not prescribing antibiotics was cost-effective in 98.5% of iterations at a willingness-to-pay of 50K USD/QALY. Sensitivity analysis showed that when the risk of colitis from antibiotics was greater than 0.91%, or when the incidence of TSS after nasal packing was less than 49 per 100,000 cases, the decision to withhold antibiotics was cost-effective.

Conclusions:
Routine antibiotic prophylaxis in the setting of nasal packing should be reconsidered. Even if antibiotics are assumed to prevent TSS, the risk of complications from antibiotic use appears to be of greater consequence.

Delta neutrophil index in chronic sinusitis

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Introduction:
The delta neutrophil index (DNI) has been proposed as the diagnostic marker of immature granulocytes, which indicate an infection or sepsis in several diseases. In present study, we evaluated DNI as an early predictor of surgical decision in chronic sinusitis.

Methods:
This was a retrospective and observational study in outpatient setting. A total of 95 patients who were diagnosed with chronic sinusitis were enrolled in present study. Patients were grouped into either non-op group or op group. Laboratory datas including DNI, white blood cell (WBC) count, erythrocyte sedimentation rate (ESR), large unstained cell (LUC) were measured. Medical records and Lund-Mackay scores were also checked to clarify clinical and radiological differences between groups.

Results:
The op group included 52 patients(54%). Median initial DNI was significantly higher in the op group [0.85% vs. 0.37%, $p<0.05$] while there was no difference between groups in WBC, ESR, and LUC [7099 cells/mL vs. 6590 cells/mL, 14 mm/hr vs. 12 mm/hr, and 1.88% vs. 1.99%] Symptomatic hallmarks in op group were headache, hyposmia, rhinorrhea and nasal obstruction. CT score showed higher in op group than that of non-op group. Multiple logistic regression analyses revealed that DNI and CT score significantly predicted surgical need in chronic sinusitis. In the receiver operating curves, the area under curve(AUC) of DNI was good. The optimal cutoff value for predicting future surgical intervention according to the initial DNI level was approximately 1.0%.

Conclusions:
The DNI level in chronic sinusitis can be a useful predictive marker that complements clinical manifestations and radiologic findings to determine the need for surgical intervention.

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Dupilumab efficacy in CRSwNP by NP surgery history in the SINUS-24 and SINUS-52 studies

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Background:
Chronic rhinosinusitis with nasal polyps (CRSwNP), a type 2 inflammatory disease, is often treated with surgery when severe/refractory, but NP recurrence is common. Dupilumab (DPL), a fully human mAb, blocks the shared receptor for IL-4/IL-13, key and central drivers of type 2 inflammation in multiple diseases. We report DPL efficacy in CRSwNP patients (pts) from the SINUS-24 (NCT02912468)/SINUS-52 (NCT02898454) trials by number of prior NP surgeries and time since last surgery.

Methods:
Subgroup analyses were performed for DPL 300mg every 2 weeks and placebo (PBO) in pts with 0/1/2/≥3 prior surgeries (n=265/254/94/111) and pts who had surgery within <5/5–10/≥10 years (y; n=217/133/108).

Results:
Lund–MacKay (LMK), nasal congestion (NC), and smell (UPSIT) scores were worse in pts with prior surgery vs no surgery, but nasal polyp score (NPS) was lower; P<0.05 for all. NPS was more severe with a longer time since surgery (P<0.0001), but NC and UPSIT were similar across groups. DPL improved all outcomes at Week 24 regardless of the number of prior surgeries (LS mean difference vs PBO for 0/1/2/≥3 surgeries: NPS −1.75/−2.02/−2.06/−2.10; NC −0.71/−0.94/−0.95/−1.09; LMK −5.73/−5.91/−7.11/−6.76; UPSIT 10.45/11.04/12.13/8.71; SNOT-22 −15.64/−21.13/−20.75/−19.95) or years since last surgery (LS mean difference vs PBO for <5/5–10/≥10 y: NPS −2.45/−1.66/−1.31 [subgroup interaction for <5 vs ≥10: P<0.01]; NC −1.07/−0.84/−1.00; LMK −7.89/−6.08/−3.94 [subgroup interaction for <5 vs ≥10 y: P<0.0001]; UPSIT 11.60/10.35/8.31; SNOT-22 −21.38/−23.74/−16.14).

Conclusions:
DPL improved all CRSwNP outcomes regardless of the number of prior surgeries or time since last surgery, with more recent surgery associated with a better baseline NPS.

Endoscopic repair of congenital basal encephaloceles decreases complications compared to open

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Background:
Basal encephaloceles are rare congenital malformations that have historically been corrected with open approaches. More recently, transnasal endoscopic approaches provide less invasive treatment, but can be limited by working space within the nasal cavity. The objective of this study is to systematically review the available literature regarding outcomes of open versus endoscopic repair of congenital basal encephaloceles.

Methods:
A systematic review of the PubMed, EMBASE, and Cochrane databases was performed to identify studies in the past 50 years reporting cases of congenital basal encephaloceles. Demographics, location, operative approach, and surgical outcomes were collected.

Results:
Non-duplicated data in 160 articles were identified that included 484 patients with congenital basal encephaloceles. Surgical outcomes were reported in 394 patients (269 open approaches, 125 endoscopic) with an average age at operation of 5.3 years. There was a 1.3:1 male to female ratio. Clinical presentation included nasal obstruction (n=152), hypertelorism (n=163), and facial mass (n=119). Defects were classified as naso-ethmoid/foramen cecum (n=172), ethmoid/cribriform plate (n=122), and sphenoid (n=82). Postoperative complication rate was 12.8% for endoscopic and 50.2% for open approaches (p<0.0001). Mortality was lower for the endoscopic group (0.8%) compared to the open group (1.9%) although values were not statistically significant (p=0.43).

Conclusions:
Endoscopic repair of congenital basal encephaloceles resulted in decreased postoperative complications and mortality compared to open approaches. These findings support the endoscopic approach as the preferred technique in the management of basal encephaloceles.

Examination of SCL-90 subdomains in empty nose syndrome patients

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Background:
Empty nose syndrome (ENS) arises from the inferior turbinate loss and is often accompanied with psychological disturbance. The inferior meatus augmentation procedure (IMAP) is an implant surgery that mimics lost turbinate tissue. We aimed to characterize changes in psychological symptoms in patients undergoing IMAP through an analysis of SCL-90.

Methods:
Pre- and 6-month post-IMAP ENS6Q and SCL-90 data were collected from a gender-balanced sample of 12 ENS patients (baseline ENS6Q>=11). Additionally, 30 ENS patients' pre-treatment ENS6Q(>=11), SCL-90, and self-reported psychological diagnosis examined any correlations between underlying conditions and questionnaire scoring.

Results:
All nine symptom dimensions and three global scores of SCL-90 had baseline T-scores above the normative mean. Among subdomains, baseline depression scores were highest. Post-IMAP data exhibited score decrements in every subdomain of SCL-90. Notably, the positive symptom distress index (PSDI) of SCL-90 (T-score p=0.0078, raw score p=0.0161) and ENS6Q (p=0.0010) showed markedly significant improvement post-IMAP. Baseline data comparison of patients with and without self-reported psychological conditions showed statistical significance only in depression (T-score p=0.0247, raw score p=0.0498) and anxiety (T-score p= 0.0278, raw score p=0.0460) dimensions, within the scope of patient-reported diagnoses.

Conclusions:
ENS is correlated with elevated psychological symptoms compared to a healthy population, and IMAP is a reliable approach to restore turbinate tissue volume that improves overall psychological and nasal profile. Underlying psychological conditions seem to have a limited effect on the scope of patient-reported symptom severity.

Gabapentin and postoperative pain after sinus surgery

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Background:
The link between post-operative narcotic prescription and opioid abuse has spurred an effort to reduce peri-operative opioid use. Previous work has suggested that a single dose of gabapentin before functional endoscopic sinus surgery (FESS) may reduce post-operative pain and opioid consumption at the risk of sedative side effects, but the optimal regimen remains to be defined.

Methods:
Chronic rhinosinusitis (CRS) patients undergoing FESS with or without septoplasty were randomized to receive a 7-day pre- and post-operative course of placebo or gabapentin, starting at 300 mg daily titrated to 300 mg three times daily, in a double blind fashion. Power analysis was conducted to determine sample size of 60 patients. Primary endpoint was pain level using a validated visual analog scale (VAS). Secondary endpoints included post-operative opioid consumption, side effects, as well as modified Lund-Kennedy endoscopy, Lund-Mackay, and SNOT-22 scores.

Results:
Preliminary data analysis of 26 patients (14 gabapentin, 12 control) showed no significant difference in mean postoperative VAS (p = 0.79). There was no significant difference in postoperative opioid consumption between the placebo and gabapentin groups (1.3 and 2.5 acetaminophen-oxycodone tablets respectively, p = 0.83). 64% of patients in the gabapentin group reported sedative side effects including sleepiness and dizziness compared to 50% in the placebo cohort (p=0.46).

Conclusion:
Preliminary results are inconclusive regarding the effect of 7-day pre- and post-operative gabapentin on postoperative pain and opioid consumption after FESS with or without septoplasty. Additional data will be analyzed to clarify the effects of peri-operative gabapentin in this cohort.

PROGRAM ABSTRACTS

Gender-related differences in outcomes after FESS

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Background:
There is growing evidence that chronic rhinosinusitis (CRS) affects males and females differently, but there have been relatively few studies focused solely on the gender-specific differences in outcomes after functional endoscopic sinus surgery (FESS).

Objectives:
To measure CRS symptom severity in males and females using several validated quality of life (QOL) measurements.

Methods:
Consecutive patients undergoing FESS for CRS were administered the Sino-nasal Outcome Test (SNOT-22), the 7-Item Eustachian Tube Dysfunction Questionnaire (ETDQ-7), and the Voice-Related Quality of Life Questionnaire (VRQL) preoperatively and postoperatively between 3 and 6 months. The baseline QOL was compared between the two genders and the effect of FESS was measured by using student's t-test.

Results:
182 consecutive patients were enrolled. Females had worse baseline QOL measures using the SNOT-22 (43.96 + 22.75 for females vs 37.97 + 19.80 for males; $p < 0.0001$), ETDQ-7 (16.25 + 8.45 for females vs 14.59 + 8.24 for males; p=0.2215), and VRQL (84.87 + 15.77 for females vs 90.50 + 11.71 for males; p=0.1113) compared to their male counterparts though only the baseline difference in SNOT-22 was found to be significant. Both males and females significantly improved their SNOT-22 scores postoperatively. Males improved in the ETDQ-7 (11.15 + 5.30; p=0.0086) and VRQL (97.00 + 5.27; p=0.0012) postoperatively, but females did not experience significant improvements.

Conclusion:
Both males and females experience diminished sinonasal, ear, and voice-related QOL from CRS. While males experience improvements in QOL across the board after FESS, females only improve significantly in the SNOT-22.

Health literacy in rhinology patients

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Background:
Inadequate health literacy portends suboptimal patient outcomes. Health literacy amongst rhinologic patients remains poorly defined. We examined the association between health literacy and patient-reported outcomes within a tertiary rhinologic practice.

Methods:
A prospective, cross-sectional study was performed by administering the validated Brief Health Literacy Screen (BHLS), Sino-nasal Outcome Test (SNOT-22), and Nasal Obstruction Symptom Evaluation (NOSE) instruments to adult patients with rhinologic complaints. Inadequate health literacy was defined as a BHLS score of ≤ 9 and compared to patient demographics, NOSE, and SNOT-22 total and subdomain scores.

Results:
Preliminary analysis of this ongoing recruitment effort yielded 160 patients. The majority of patients were male (95, 59.4%), Caucasian (106, 66.2%), married (128, 80%), and active duty military (126, 78.8%). The average age was 45.6 (SD 14.8) years. When controlling for race and active duty status, lower BHLS scores correlated to an increase in overall SNOT-22 score (p=0.04) and higher psychological (p=0.05) and sleep subdomain scores (p=0.02). Post-traumatic stress disorder (n=20, 12.5%) and traumatic brain injury (7, 4.4%)were associated with lower BHLS score (p=0.05). There was no association identified between BHLS and NOSE score.

Conclusions:
Patients with inadequate health literacy have increased SNOT-22 scores and increased sleep and psychological subdomain scores. PTSD and TBI were also associated with lower BHLS scores. These patients may be at risk for worse outcomes and warrant additional education and counseling regarding diagnosis and interventions.

Impact of novel CFTR modulator on sinonasal outcomes in patients with cystic fibrosis

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Background:
Cystic fibrosis (CF) is a genetic condition caused by a defect in the cystic fibrosis transmembrane conductance regulator (CFTR), resulting in abnormal mucociliary clearance and frequent sinonasal symptoms. A novel CFTR modulator (Trikafta) was recently approved for patients with ΔF508 mutation, which is present in 85% of patients. This study evaluates the effect of Trikafta on sinonasal outcomes in CF patients.

Methods:
Retrospective review of CF patients on Trikafta followed by our rhinology division was performed. Patients with completion of the Sino-Nasal Outcome Test (SNOT-22) prior to and following initiation of Trikafta were included. Demographic data, rhinologic treatment, and SNOT-22 scores were collected.

Results:
Of the 70 CF patients on Trikafta seen by our division, twenty-one met inclusion criteria. Fourteen patients were female, with mean age 30.4 years. All patients had been trialed on at least one of four therapies (steroid sprays; saline, steroid, or antibiotic irrigations). Eighteen patients had undergone prior endoscopic sinus surgery (ESS); twelve patients underwent ESS at our institution. A two-tailed paired t-test showed significant decrease in total SNOT-22 score pre- and post-Trikafta (mean difference 10.3 points, p=0.0048), as well as in rhinologic (3.2 points, p=0.0130), extra-rhinologic (3.5 points, p=0.0006), and psychologic subscores (2.8 points, p=0.0469).

Conclusions:
Pilot data presented here shows a significant improvement in total SNOT-22 scores and three sub-score domains in CF patients initiated on Trikafta. Further research is necessary to better evaluate the impact of Trikafta on sinonasal outcomes.

In vitro safety and efficacy of mitochondrially-targeted antioxidant mitoquinone after FESS

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Background:
Favourable postoperative outcomes after sinus surgery hinge on avoiding re-establishment of a fastidious biofilm of bacteria and optimizing the quality of mucosal healing. Mitochondrial oxidative damage has been shown to antagonise both of these outcomes. The present study aims to evaluate both the in vitro safety, and antimicrobial and wound healing efficacy, of the mitochondrially-targeted antioxidant mitoquinone.

Methods:
A dose-response curve of cell migration and mitochondrial Reactive Oxygen Species (ROS) production in nasal fibroblasts was established for 1-20μM of mitoquinone using time-lapse confocal laser scanning microscopy (CLSM). An effective range of doses was then tested for activity against three strains of Staphylococcus aureus planktonic cells and biofilm using optical density, colony forming units and cell staining. Combination therapy with existing antibiotics was also assessed.

Results:
Mitoquinone showed a significant ($p < 0.05$), favourable slowing of fibroblasts across 1 to 5μM. 5μM mitoquinone produced a Log 4-5 reduction in planktonic colony forming units and killed an average of 51% of established biofilm ($p < 0.05$), whilst not provoking toxicity in human cells ($p < 0.05$). It also synergistically improved the activity of augmentin, doxycycline, clarithromycin and mupirocin ($p < 0.05$) against all strains of planktonic and biofilm S.aureus.

Conclusions:
Mitoquinone contains not only an antioxidant base that targets mitochondrial ROS, leading to a more favourable wound healing profile, but an antimicrobial moiety that is effective against a significant sinonasal pathogen. It can also synergize with existing antimicrobials to antagonize residual biofilms.

PROGRAM ABSTRACTS

Intercarotid artery distance in the pediatric population: Implications for skull base approaches

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Background:
Comprehensive quantitative evaluation of the intercarotid artery distance (ICD) in the pediatric population has not been sufficiently explored. The goal of this study was to measure the ICD at multiple levels of the skull base to assess changes in the ICD during development.

Methods:
Measurement of the ICDs between the bilateral paraclival, parasellar, and paraclinoid segments of the internal carotid artery (ICA) was performed on coronal MRI from 540 patients ranging from 0 to 17 years old (n=30 for each age). The degree of pneumatization rate of the sphenoid sinus was also assessed. Comparison of these indices in the very young (0-5 years, Group 1) and young (6-17 years, Group 2) patients was performed.

Results:
The narrowest ICD was located at the paraclinoid (89.4%) and parasellar (10.6%) ICAs. For children younger than 1 year old, the average ICD at the level of the paraclival, parasellar, and paraclinoid ICAs was 1.51±0.19 cm, 1.15±0.20 cm and 0.96±0.12 cm, respectively. The average ICD at the level of the paraclival, parasellar, and paraclinoid ICAs in Group 1 was 1.78±0.23cm, 1.34±0.20cm, and 1.11±0.21cm, respectively. The average ICDs at each measured level in Group 2 was 2.09±0.18cm, 1.56±0.21cm, 1.28±0.21cm, respectively ($p<0.05$ at every ICA level). The partial pneumatization of the sphenoid sinus was typically noted to commence around 3 years of age. Complete pneumatization started around 5 years of age achieving maximum pneumatization at approximately 16 years of age.

Conclusion:
While the ICD may be largely stable in the pediatric population after 5 years of age, developmental changes in the ICD may reduce surgical access during a transsphenoidal approach in very young patients (0-5 years old).

Medicare payment sex disparities for endoscopic sinus procedures

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Introduction:
Sex differences in Medicare payments are reported for various specialties, but data is lacking in otolaryngology. The present study assesses Medicare collections disparities between male and female ENTs performing endoscopic sinus procedures.

Methods:
A secondary cross-sectional analysis was performed on data from the Centers for Medicare & Medicaid Services Physician and Other Supplier Public Use File (POSPUF) for 2017, the most recently available reporting year. Outcome measures included the number of Medicare services rendered, total Medicare physician payments and average payment-per-provider per submitted charge. Payments were standardized for geographic variations in wages and operative costs.

Results:
A total of 843 ENT providers were captured in the present study who received Medicare payments for performing endoscopic sinus procedures in 2017. 63 of these providers were female (7.5%). For females and males, the average Medicare payment-per-service was $297.50 (IQR: $220.70–1,533.80) and $347.69 (IQR: $231.44-$1621.93), respectively. The median annual total Medicare payments-per-physician were $16,125 (IQR: $6,083-$53,768) and $22,390.90 (IQR: $7,357.40-$78,404.40) for females and males, respectively. The mean number of billed endoscopic sinus procedures for females and males were 62.59 and 62.08 services, respectively.

Conclusion:
Male ENTs collected higher average payment-per-service and total annual payments when compared to females, but the number of Medicare services rendered was similar between sexes. These findings are concerning as unconscious sex-based bias continues to be identified in the workplace. Future research is required to assess the reasons for these observed disparities.

Microbiomics of irrigation with xylitol or Lactococcus lactis in chronic rhinosinusitis

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Chronic rhinosinusitis (CRS) is currently approached as a disease of inflammation with incompletely understood microbiological contributions. Topical sinonasal rinse therapies may alter the local microbiome and possibly improve disease control. The objective of this study was to examine microbiome changes in post-surgical CRS patients when rinsing with commercially-available products containing xylitol or Lactococcus lactis.

A crossover-type protocol with a washout period was designed. Swab samples from anterior ethmoid cavities of CRS patients were collected prospectively as a baseline. Subjects were provided packets containing either L. lactis W136 or xylitol in non-blinded fashion and instructed to add it to their rinse bottles daily for 28 days, after which another swab was taken. A saline wash-out period was completed and a third swab taken. A final 28-day regimen of the opposite product was followed by a final swab. DNA extraction and sequencing of the 16S rRNA gene allowed for global microbiome analysis.

Twelve samples taken after use of L. lactis, and 9 after xylitol, were analyzed. An additional 12 samples taken after use of saline alone were also included. Increased detection of Lactococcus was observed after use of the product containing L. lactis W136. No significant difference in alpha-diversity as a result of treatment was observed. SNOT-22 score did not change significantly following treatment with xylitol, L. lactis, or saline.

We did not detect any differences in sinonasal microbiome alpha-diversity due to treatment with various topical rinse products. Further research is needed to elucidate these materials' clinical utility and possible probiotic effect.

Mometasone irrigations compared to Budesonide irrigations

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High volume mometasone and budesonide irrigations are commonly utilized for local control of mucosal inflammation in chronic rhinosinusitis (CRS). The effectiveness of mometasone irrigations when compared to budesonide have yet to be determined and may have a significant role in the medical management of CRS.

Methods:
This is a single institution retrospective review studying post-surgical CRS patients who were initially on Budesonide irrigations but were subsequently changed to Mometasone irrigations. Lund Kennedy (LK) and SNOT-22 scores were obtained across time points.

Results:
Regarding LK scores, 16 patients were analyzed. The reduction from baseline (5.06 ± 2.77) to post-budesonide treatment (3.94 ± 3.13) was not statistically significant ($p = 0.895$). However, the post-mometasone score (1.88 ± 1.26) was significantly lower than scores at baseline ($p = 0.002$) and post-budesonide ($p = 0.013$). Regarding SNOT-22 scores, 14 patients were analyzed. The reduction in SNOT-22 scores from baseline (29.71 ± 20.76) to post-budesonide treatment (20.50 ± 19.28) and from post-budesonide treatment to post-mometasone treatment (14.14 ± 12.91) were not statistically significant ($p = 0.366$ and $p = 0.057$, respectively). However, the reduction in SNOT-22 score from baseline to post-mometasone administration was statistically significant ($p = 0.012$).

Conclusion:
Use of mometasone irrigations resulted in improvement in LK scores and SNOT-22 scores when compared to Budesonide. Mometasone irrigations should be considered in the post-operative medical management of patients with medically refractory CRS although future safety studies are required before greater adaptation.

Mucin expression in allergic fungal sinusitis

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Background:
One of the primary components of mucus are mucins, a family of large molecular-weight glycoproteins. Mucin composition, including changes in the MUC5AC/MUC5B ratio, has been shown to reflect disease severity in lower airway diseases. However, little is known about sinonasal mucins. Our aim was to quantify the expression of MUC5AC and MUC5B in patients with Allergic Fungal Sinusitis (AFS) compared to healthy control populations.

Methods:
Sinonasal mucus samples were collected from 25 subjects (AFS, n=8; control, n=17) using atraumatic cytobrushes. Mucin concentrations were quantified via mass spectrometry. Nasal endoscopies performed on AFS patients were graded according to the Lund-Kennedy scoring system.

PROGRAM ABSTRACTS

Results:
The MUC5AC/MUC5B ratio in control subjects was 1.6 +/- 0.2 (SEM) compared to AFS subjects with 2.2 +/- 1.0 (p = 0.4). Lund-Kennedy scores were plotted against MUC5AC/MUC5B ratios and fit using linear regression. The slope was 0.47 (p = 0.014).

Discussion:
Overall, there was no difference in the MUC5AC/MUC5B ratio between control and AFS cohorts. As Lund-Kennedy scores increased, MUC5AC/MUC5B ratios increased, indicating there was a correlation between mucin ratio and endoscopic disease severity.

Conclusion:
This is a preliminary study examining changes in mucin composition associated with AFS. We demonstrate that increased MUC5AC correlates with increased Lund-Kennedy scores. Future longitudinal studies are needed to better understand how mucin profiles change with time, and if they can be used to objectively track disease severity.

Outcomes following exclusively endoscopic endonasal resection of benign orbital tumors
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Background:
The Cavernous Hemangioma Exclusively Endonasal Resection (CHEER) system was developed to enable standardized outcome analysis following orbital cavernous hemangioma (OCH) resection. It is unclear whether this system is be applicable to other benign orbital tumors (BOTs). The goal of this study was to retrospectively apply the CHEER stage to previously reported OCH and BOTs and compare outcomes by stage and histopathology.

Methods:
A systematic review of studies reporting exclusively endoscopic resections of OCH and BOTs (e.g. solitary fibrous tumor, schwannoma, and meningioma) was performed using PubMed, EMBASE, and Web of Science. Patient, tumor characteristics, and postoperative outcomes were recorded. All tumors were retrospectively assigned a CHEER stage. Outcomes were compared using chi-squared or Fischer's exact tests.

Results:
Of the 101 studies that met inclusion criteria, sufficient data was available in 35 studies, comprising 106 tumors (OCHs n=86, 81.1% and BOTs n=20, 18.9%). Baseline patient and tumor characteristics as well as intraoperative and short-term postoperative outcomes were not significantly different between OCH and BOTs (all $p>0.05$). Long-term outcomes (e.g. visual deficits, diplopia, cosmesis, resection extent, and recurrence) did not differ between OCH or BOT or when controlling for stage (all $p>0.05$).

Conclusion:
This review represents the largest collection of outcomes data following exclusively endoscopic endonasal resection of benign orbital tumors. Stage specific short- and long-term outcomes appear similar between OCH and BOT. These results suggest the validated CHEER staging system may be more broadly applicable to non-OCH benign primary orbital tumors.

Pain catastrophizing in chronic rhinosinusitis
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Background:
Psychological comorbidity is common in chronic rhinosinusitis (CRS) and is correlated with decreased disease-specific quality of life (QOL). Prior research reported that anxiety and depression, as measured by the hospital anxiety and depression score (HADS), are associated with worse CRS-specific QOL, as assessed via the Rhinosinusitis Disability Index (RSDI). Patients prone to anxiety/depression may display an exaggerated response to real or anticipated discomfort; the pain catastrophizing scale (PCS) is a validated instrument designed to measure this phenomenon. Our goal is to explore the role of pain catastrophizing in relation to anxiety, depression, and disease-specific QOL in patients with facial pain attributed to CRS.

Methods:
Diagnosis of CRS was based upon current AAO-HNS guidelines; all participants reported facial pain as a component of their symptomatology. RSDI, HADS and PCS questionnaires were administered, and objective measurements of sinonasal inflammation were obtained via nasal endoscopy and computed tomography (CT).

Results:
Seventy-five patients were prospectively enrolled in the study. Positive correlations were found between PCS and HADS, total RSDI, and RSDI emotional sub-scores ($p<0.05$). The incidence of objective sinus disease, as measured via nasal endoscopy and CT, was not significantly different in catastrophizing patients.

Conclusions:
Pain catastrophizing correlates with anxiety/depression and worse disease-specific QOL in patients meeting criteria for CRS. Otolaryngologists should be aware that catastrophic thinking can intensify the perception of

sinonasal symptoms and should consider management of psychological comorbidity in order to optimize rhinologic outcomes.

P-gp inhibition with verapamil overcomes mometasone resistance in CRSwNP

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Introduction:
P-glycoprotein (P-gp) is a membrane efflux pump which is overexpressed in Chronic Rhinosinusitis with Nasal Polyps (CRSwNP) and promotes type 2 inflammation. Glucocorticoids (GC) are substrates of P-gp suggesting that overexpression may additionally contribute to GC resistance in CRSwNP. This study aims to determine whether P-gp inhibition using verapamil enhances mometasone retention and efficacy in nasal polyp explants.

Methods:
IRB approved study in which organotypic polyp explants were exposed to mometasone (4.15 µg/mL) and verapamil (125 µg/mL) as mono and combination therapy. The effect of verapamil on mometasone intracellular retention over time was determined using HPLC. The effect of verapamil on mometasone anti-inflammatory effect was determined using ELISA for secreted IL-5, IL-6, and IL-17. Groups were compared using unpaired t-test.

Results:
P-gp expression strongly and significantly inversely correlated with mometasone retention 1hr after exposure ($r=-.83$, $p<0.01$). P-gp inhibition reversed this effect and significantly improved mometasone retention at 1hr relative to mometasone alone ($p<0.01$). The combination of mometasone and verapamil significantly reduced IL-5, IL-6, and IL-17 secretion relative to vehicle control ($p=0.01$, $p<0.001$, and $p=0.01$) and outperformed either treatment alone.

Conclusion:
Our study confirms that mometasone is a substrate of P-gp, exhibiting a nearly 6-fold reduction in intracellular retention between the lowest and highest P-gp expressing polyp explants. This P-gp mediated resistance was successfully reversed by addition of the P-gp inhibitor verapamil. Verapamil further significantly enhanced the anti-inflammatory effect of mometasone when given as a combination therapy.

Practice of telemedicine in otolaryngology: Systematic review in the era of COVID-19

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Background:
Public health measures during the COVID-19 pandemic have precipitated increased use of telemedicine, highlighting its potential to enhance access to care. Though otolaryngology providers have incorporated aspects of telemedicine into their practices for decades, the literature lacks a comprehensive overview of telemedicine in otolaryngology, herein “tele-otolaryngology”. In this scoping review, we aim to systematically review available literature to synthesize the development, broad applications, and current state of tele-otolaryngology.

Methods:
Per PRISMA-ScR guidelines, we performed systematic search queries in PubMed, Embase, and Cochrane databases. 426 unique references were identified and underwent title and abstract review by two independent reviewers, leaving 292 for full-text review and data extraction.

Results:
We first examined how telemedicine and eHealth in otolaryngology have evolved over time. We identified tele-otolaryngology practice trends, including forms of telemedicine used, applications in facilitating patient access and comprehensive care, integration of other health professionals, its role in global health, and emerging technologies. In addition, we reviewed the impact of tele-otolaryngology on patient satisfaction and mental health and examined financial, legal, and ethical considerations as well as patient and practitioner perceptions surrounding its use. Finally, we noted limitations & barriers to implementation.

Conclusions:
We provide a scoping review of tele-otolaryngology, documenting its evolution and identifying current use cases, limitations, and emerging ideas. This review serves as a foundation for future studies & guides appropriate implementation of tele-otolaryngology.

PROGRAM ABSTRACTS

Predictors of revision surgery: An analysis of Draf 3 on index surgery and disease endotype

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Background:
Revision rates following endoscopic sinus surgery (ESS) in chronic rhinosinusitis (CRS) vary widely and may be influenced by patient, disease, and surgical factors. This study seeks to determine factors associated with revision in a large contemporary cohort with a focus on underlying disease endotype and performance of Draf 3 on index surgery.

Methods:
Retrospective review of 1,635 patients with CRS who underwent ESS between 2011 to 2019 at a tertiary care academic institution. Eligible patients were stratified by revision status. After an initial univariate screen of demographic and clinical covariates, a multivariable logistic regression was performed modeling predictors of revision.

Results:
Of 1,635 patients who underwent ESS, 132 (8.1%) required revision during the study period. After multivariable analysis, factors independently associated with revision included asthma (odds ratio [OR] 1.62, 95% confidence interval [CI], 1.04-2.53), cystic fibrosis (OR 3.90, 95% CI, 1.43-10.6), allergic fungal sinusitis (OR 4.74, 95% CI, 2.99-7.51), and aspirin-exacerbated respiratory disease (AERD) (OR 2.07, 95% CI, 1.27-3.27). Draf 3 was independently associated with reduced odds of revision (OR 0.49, 95% CI, 0.27-0.91). On subgroup analysis, Draf 3 on index surgery reduced revision rates among AERD patients (21.5% vs. 9.1%, p = 0.04).

Conclusions:
Of patients undergoing ESS in this cohort, 8.1% required revision. Asthma, cystic fibrosis, allergic fungal sinusitis, and AERD were independently associated with increased odds of revision while performance of Draf 3 independently reduced the odds of revision. For surgical cases with a higher risk of revision surgery, upfront Draf 3 should be considered.

Predictors of survival outcomes in sinonasal squamous cell carcinoma

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Background:
Surgery and chemoradiation therapy (CRT) are the mainstays of therapy for sinonasal squamous cell carcinoma (SNSCC). However, induction chemotherapy (IC) may be useful for locally advanced disease. Here, we examined treatment outcomes for patients diagnosed with SNSCC.

Methods:
National Cancer Database (2004-2016) was queried for patients with SNSCC. 24 and 60-month overall survival (OS) were calculated across treatment modality.

Results:
3,893 patients with SNSCC were identified. 1,807 patients (50.1%) received primary surgery ± adjuvant radiation therapy (RT); 1,382 patients (38.3%) received definitive RT or CRT; 306 patients (8.5%) received IC followed by definitive CRT; 115 patients (3.2%) received IC followed by surgery and adjuvant therapy. Multivariate hazard modeling confirmed that treatment modality was significantly associated ($p<0.001$) with OS after adjustment for age, gender, race, Charlson-Deyo comorbidity index scores, clinical stage, and margin status. Patients who received primary surgical intervention ± adjuvant therapy were had improved 24-month and 60-month OS compared to definitive RT alone or CRT (HR>1.94; $p<0.001$) or IC followed by CRT (HR>1.68; $p<0.001$). Patients who received IC then surgery (n=115) had similar OS for both 24-month and 60-month outcomes as those who received primary surgery ± adjuvant therapy.

Conclusion:
Multimodality therapy that includes surgical intervention was associated with improved 24 and 60 month OS in patients with SNSCC. Induction chemotherapy followed by surgery was associated with improved OS compared IC followed by CRT and CRT alone. This study highlights the utility of surgery and IC towards optimizing survival in patients with SNSCC.

Primary dural suturing via an endoscopic endonasal corridor: 3D printed model for training

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Background:
Post-operative CSF leakage following endoscopic anterior skull base approaches is a major cause of morbidity. Endonasal dural suturing is a valuable method for repair but requires technical skill. We designed a model for simulated endonasal suturing and assessed its utility for surgical training.

Methods:
DICOM data was obtained from a sinus CT scan. A virtual model of the cranial base was created and printed in PLA using Ultimaker 2+3D printer. Dura was simulated with fresh chicken skin fixated to the cranial base. Participants were divided according to surgical experience, and performed two sutures using microneedle driver with a 0° endoscope. Time for task completion was assessed between groups and model accuracy was assessed using a Likert scale questionnaire.

Results:
Twenty-six total participants including 22 residents/fellows and 4 surgeons were divided into groups: Novice (14), Intermediate (8) and Expert (4). The mean task duration for Experts was 5.3 minutes faster compared to Novices ($p = 0.06$) and 3 minutes faster than Intermediates ($p = 0.3$). Nineteen (86.5%) individuals from Novice and Intermediate groups reported that the model would enhance their endoscopic dural suturing skills. However, only 15 (68.4%) felt the chicken skin was “excellent” or “good” at replicating dura mater. Three Experts (75%) described the model as “quite similar” to real surgical corridor.

Conclusion:
Our model was found to accurately simulate endonasal dural suturing. The materials needed are cheap and readily available for training. This model allows for young surgeons to develop their endoscopic surgical skills as well as gain familiarity with the endonasal corridor.

Psychometric properties of the brief version of the questionnaire of olfactory disorders

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Introduction:
The Questionnaire of Olfactory Disorders-Negative Statements (QOD-NS) is a 17-item instrument measuring olfactory-specific quality-of-life. However, in clinical research patients can be overwhelmed with multiple questionnaires. We recently developed the 7-item brief QOD-NS (B-QOD). Our objective was to evaluate the psychometric properties of the B-QOD in both the development (D) sample, and in a separate replication (R) sample.

Methods:
Testing on D (n=203) and R (n=281) samples included initial exploratory factor analysis (EFA), followed by internal reliability, information loss, and confirmatory factory analysis (CFA). Finally, incremental predictive utility analysis (IPUA) was performed by correlating the B-QOD with the SinoNasal Outcome Test (SNOT-22) survey.

Results:
EFAs of both D and R demonstrated an underlying single-factor structure (eigenvalue = 4.17 and 3.57, respectively) with comparable loading factors ($R>0.30$ for both). B-QOD also had good internal reliability in both D and R (Cronbach’s alpha=0.88 and 0.83, respectively). Also, there is minimal information loss with B-QOD compared to QOD-NS in both D and R ($R=0.98$ and 0.96, respectively). CFA indicates that the B-QOD single-factor model has good overall fit as measured by the Comparative Fit Index (CFI) and the Standardized Root Mean Squared Residuals (SRMSR) in the D and R samples (CFI=0.99 and 0.97; SRMSR=0.035 and 0.053). IPUA shows that the QOD-NS offers no additional predictive benefit of SNOT-22 scores when compared with B-QOD.

Conclusion:
The 7-item B-QOD captures a structurally coherent and reliable single dimension, with minimal information loss and excellent external predictive utility when compared to the QOD-NS.

Quality of life before and after ESS and ASA desensitization in AERD patients as measured by SF-12

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Background:
Aspirin-exacerbated respiratory disease (AERD) is optimally managed by endoscopic sinus surgery (ESS) followed by aspirin therapy after desensitization (ATAD). Most AERD quality of life (QOL) studies use the 22-item Sinonasal Outcomes Test (SNOT-22), which focuses predominantly on sinonasal outcomes. This study seeks to assess QOL outcomes in AERD patients after ESS and ATAD via the 12-item Short Form Survey (SF-12), a well-validated QOL measure for general health status of chronic conditions.

Methods:
Retrospective review of 112 AERD patients who underwent ESS followed by ATAD at our institution between 2016 and 2019. SF-12 was collected preoperatively, postoperatively/pre-aspirin desensitization (AD), and serially post-AD (1-3, 4-6, 7-12, and >12 months). Optum® PRO CoRE software was used to compare data to national norms. ANOVA was performed comparing physical component summary (PCS), mental component summary (MCS) and eight health domains (physical functioning, role physical, general health, bodily pain, vitality, social functioning, role emotional, and mental health).

Results:
AERD patients showed improvement in PCS scores across all timepoints after ESS and ATAD ($p=0.004$). When stratified by gender, women demonstrated an improvement in PCS scores ($p=0.004$). Within the domains, there were significant improvements in social functioning (SF), role physical (RP), and bodily pain (BP) at all timepoints (SF: $p=0.006$; RP: $p=0.005$; BP: $p<0.001$).

Conclusions:
AERD patients undergoing ESS and ATAD show improvement in physical QOL and 3 of the 8 health domains as measured by the SF-12. Moving forward, we can use the SF-12 to study the impact of AERD treatment versus other chronic diseases.

Randomized trial of nasal theophylline irrigation for treatment of post-viral olfactory dysfunction

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Background:
Effective treatments for post-viral olfactory dysfunction (PVOD) are limited. Prior studies of oral and nasal theophylline spray suggest a benefit but were limited by heterogeneous etiology, lack of controls, and non-standard olfactory measures.

Methods:
Between May 2019 and April 2020, we conducted a double-blinded, placebo-controlled randomized clinical trial of adults with PVOD of 6 to 36 months duration. Patients were randomized 1:1 to nasal theophylline (12 mg) saline irrigation or placebo saline irrigation twice a day for 6 weeks. The primary outcome was the within-subject Global Rating of Smell Change. Secondary outcomes were changes in the University of Pennsylvania Smell Identification Test (UPSIT) and Questionnaire of Olfactory Disorders-Negative Statements (QOD-NS).

Results:
A total of 22 patients completed the study, including 10 (46%) in Arm A (median [range] age 59.5 [32-67], n=6 females) and 12 (54%) in Arm B (age 57.5 [40-70], n=8 females). Slightly fewer patients in Arm A reported improved smell than in Arm B (-3.3%, 95% CI -42.3% to 35.6%). The median (range) change in UPSIT and QOD-NS scores were 0 (-8 to 5) and 1.5 (-4 to 19) in Arm A and 1 (-4 to 12) and -6.5 (-15 to 4) in Arm B, respectively. The median differences in UPSIT and QOD-NS change between the two Arms were -1 (95% CI -5 to 3) and 10 (95% CI 4 to 15). There were no adverse events, and serum theophylline levels were undetectable in 10/10 patients.

Conclusions:
Currently there is no clinically meaningful difference in changes in patient-reported and psychophysical measures of olfaction between the two Arms except for olfaction-related quality of life, which was better in Arm B. Recruitment continues, and the investigators remain blinded.

Readmission following inpatient functional endoscopic sinus surgery for chronic rhinosinusitis

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Background:
Readmission after surgery is associated with complications, increased healthcare costs, and potentially worse outcomes. Previous studies have characterized readmission following outpatient sinus surgery for chronic rhinosinusitis, yet none have investigated readmissions after inpatient surgery.

Methods:
The Nationwide Readmissions Database was used to characterize readmission after inpatient sinus surgery for chronic rhinosinusitis from 2015 to 2017. International Classification of Disease codes were used to identify the patient population, which included 5,644 patients. Incidence, causes, costs, and predictors of readmission were analyzed.

Results:
Among 5,644 patients who underwent surgery, 742 (11.6%) were readmitted within 30 days of discharge. On univariate analysis, patients who were readmitted were more commonly older than 70 years (23.3 vs. 16.2%), had a higher burden of comorbidities including chronic kidney disease (15.0 vs. 7.8%), diabetes (25.6 vs. 20.4%), and hypertension (13.5 vs. 8.5%), had a greater rate of postoperative complications (20.7 vs. 12.2%), and had a longer length of stay (12.4 vs. 6.9 days) compared to patients who were not readmitted. Readmissions cost $27,141 per patient. On multivariable analysis, age greater than 70 years, Medicaid insurance, several comorbidities, prolonged length of stay, postoperative neurologic complications, and lower hospital volume were independent predictors of 30-day readmission. The most common cause for readmission was infection (36.3%).

Conclusion:
Readmission following inpatient functional endoscopic sinus surgery is significant and costly. Strategies to reduce readmissions should be implemented to improve patient outcomes and decrease healthcare costs.

Sinonasal mucin in aspirin exacerbated respiratory disease

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Background:
Mucous glycoproteins (mucins) are one of the predominate components of mucus. Mucin composition, specifically the MUC5AC/MUC5B ratio, has been shown to reflect disease severity in the lower airway. However, little is known about sinonasal mucin composition, and no studies have investigated mucin profiles in chronic rhinosinusitis (CRS). Aspirin-Exacerbated Respiratory Disease (AERD), a subtype of CRS, is characterized by a triad of asthma, eosinophilic nasal polyposis, and respiratory non-allergic hypersensitivity to non-selective cyclooxygenase inhibitors. Our objective was to determine if mucin composition was different in patients with AERD compared to controls.

Methods:
Sinonasal mucus samples were collected from 41 subjects including 17 controls and 24 AERD patients using cytobrushes. MUC5AC/MUC5B profiles were quantitated by mass spectrometry.

Results:
Mean MUC5AC/MUC5B ratios were 2.8+/-0.5 (SEM) and 1.6+/-0.2 (p=0.17) in AERD and controls, respectively. The range of MUC5AC/MUC5B in AERD was 0.21-8.6 and 0.26-3 in controls.

Discussion:
Compared to published lower airway data, sinonasal MUC5AC/MUC5B was dramatically elevated in both control and AERD populations. MUC5AC/MUC5B ratios from bronchoscopy samples in healthy patients and patients with moderate chronic bronchitis were 0.1+/-0.04 (mean+/-SEM) and 0.5+/-0.1, respectively. This difference could indicate the predominate role of MUC5AC in sinonasal mucin composition compared to that of the lower airway.

Conclusion:
Sinonasal mucin composition in CRS phenotypes, such as AERD, may be significantly different than mucin profiles seen in inflammatory diseases of the lower airways.

Socioeconomic factors affect stage at presentation and survival in sinonasal squamous cell carcinoma

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Background:
Socioeconomic factors (SEF) affect oncologic outcome in sinonasal squamous cell carcinoma (SNSCC). However, the relationship between SEF and stage at presentation, a critical, early point in the care cycle, is not known. This study sought to determine the role of SEF in stage at presentation and overall survival (OS) in advanced SNSCC.

Methods:
A retrospective cohort study using the National Cancer Database (NCDB) was performed.
Patients with SNSCC and staging data were identified (n=6155): 2212 (35.9%) patients presented with Stage I or II ("early") disease, whereas 3943 (64.1%) patients presented with Stage III or IV ("advanced") disease. The impact of SEF on OS in advanced-stage patients was analyzed using parametric survival regression.

Results:
In multivariable analysis, Black (OR:2.26,CI: 1.80-2.85), Asian (OR:2.47,CI: 1.49-4.31) and uninsured (OR: 1.51,CI:1.18-1.95) patients were more likely to present as advanced-stage (all: 95% CI, p<.05). Younger (OR:0.99,CI: 0.98-1.00), privately-insured (OR:0.82,CI:0.71-0.93) patients were less likely to present as advanced-stage. In advanced-stage, OS was decreased with older age (HR: 1.03,CI:1.02-1.03), Asian (HR:1.40,CI:1.02-1.92) or Black race (HR:1.40,CI:1.22-1.61), while OS was increased with privately-insured (HR:0.85,CI:0.76-0.96) and highest income quartile (HR:0.78,CI:0.66-0.93) patients.

Conclusion:
Asian and Black race, income, and insurance status have significant influence both stage at presentation and OS in SNSCC. Asian and Black race demonstrated the strongest association with both variables, despite controlling for other SEF. Health literacy, access, and cultural barriers may play a role in presentation and survival in SNSCC.

Surgical outcomes for endoscopic versus open skull base resection for malignant tumors

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Background:
There is a paucity of comparative outcome data for open and endoscopic skull base surgery for patients with a malignant pathology in the United States.

Methods:
A retrospective review of 200 patients who underwent skull base surgery for a malignant pathology at our institution from 2008 to 2019 was performed. Chi-square tests, Fisher's exact tests, and logistic regression models were performed to assess patient characteristics and surgical outcomes by open and endoscopic resection.

Results:
Patients had a mean age of 59.7 years (SD 20.3). Sixty-two percent were male and 72% were white. An endoscopic-only resection was used in 41% of patients and an open resection in 59% of patients. Squamous cell carcinoma was the most common pathology (43.0%), followed by sarcoma (9.5%), advanced skin cancer (6.5%; 10 basal cell carcinomas, 2 squamous cell carcinomas; 1 melanoma), sinonasal undifferentiated carcinoma (SNUC) (6.5%), and adenocarcinoma (5.5%). The all-cause complication rate was 16.5%. Patients undergoing an open resection had a higher rate of intraoperative complications (7.6% vs. 1.2%; p=0.050) and postoperative complications (21.2% vs. 4.9%; p=0.001). In the logistic regression model, patients undergoing an open resection had significantly higher odds of having a complication (OR 6.35, 95% CI 2.14 to 18.87; p=0.001). The likelihood of early reoperation (< 6 months) or late reoperation (>6 months) did not significantly differ by surgical approach (p=0.847 and p=0.740, respectively).

Conclusions:
Patients with malignant skull base pathology undergoing endoscopic resection had a statistically significant reduction in intraoperative and postoperative complications compared to open resection for select patients.

The association of frailty and chemosensory dysfunction in older adults

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Introduction:
Olfaction and gustation are associated with age-related decline, and deficits in these chemosenses have been associated with detrimental comorbidities. Meanwhile, frailty, defined as a reduced physiological reserve, is well-correlated with mortality and worse health outcomes. We sought to analyze a nationally representative patient population to determine the association between chemosensory dysfunction and frailty.

Methods:
Cross-sectional analysis of US National Health and Nutrition Examination Survey (NHANES) 2013-14 was performed, using multivariate logistic regression to examine the association between chemosensory dysfunction and frailty in adults aged ≥ 40 years (n = 3,554). Self-reported olfactory (sOD) and gustatory (sGD) dysfunction and measured olfactory (mOD) and gustatory (mGD) dysfunction were assessed for all participants. Frailty was operationalized using a 39-item frailty index (FI) and stratified into four groups with validated cutoffs.

Results:
Participants with sOD and mOD had significantly higher mean FI scores (sOD: 0.18 vs 0.13, $P < 0.001$; mOD: 0.20 vs 0.14, $P < 0.001$), whereas subjects with sGD, but not mGD (0.14 vs 0.14, $P = 0.953$), had a higher mean FI score (sGD: 0.21 vs 0.13, $P < 0.001$). Multivariate logistic regression demonstrated frail participants had significantly greater odds of sGD ([OR: 4.11] CI: 3.46 – 4.88), sOD ([OR: 2.35] CI: 1.98 – 2.78), and mOD ([OR: 1.58] CI:1.22 – 2.05), but not mGD ([OR: 1.21] CI: 0.91 – 1.61). This association was strongest in the frailest group.

Conclusions:
Self-reported chemosensory dysfunction and measured olfactory dysfunction are independently associated with measures of frailty, suggesting a novel method to assess or predict frailty.

The ENS6Q used to distinguish patients with empty nose syndrome from primary nasal obstruction

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Background:
Empty Nose Syndrome (ENS) is a debilitating disorder characterized by paradoxical nasal obstruction despite patent nasal passages. Although ENS does not have an official diagnostic criteria, Otolaryngologists can utilize the validated Empty Nose Syndrome 6-Item Questionnaire (ENS-6Q) to identify patients suffering with ENS. However, the original validation has been scrutinized for not comparing ENS patients to those suffering with primary nasal obstruction (PNO).

Objectives:
To assess whether the ENS-6Q can differentiate patients with ENS from PNO, which includes Inferior Turbinate Hypertrophy (ITH) or Deviated Nasal Septum (DNS).

Methods:
This prospective study recruited patients with PNO at a tertiary rhinology centre. Patients must have had a subjective complaint of nasal obstruction and have objective findings of ITH or DNS or a combination of above. Participants completed the ENS-6Q and the SNOT-22 questionnaires within 5 days of each other for internal validity. The results were compared to the ENS cohort previously recruited in the original validation paper.

Results:
Forty-five patients were recruited into the study (ENS =15; PNO = 30). The Area Under the Curve (AUC) was 0.86 for the ENS-6Q to differentiate ENS from PNO patients. The ENS6Q cut-off score to reliably differentiate ENS from PNO patients was determined to be 12 out of a possible total score of 30. Overall, there was high internal consistency between the ENS-6Q at 0.92 and the SNOT-22 at 0.97.

Conclusion:
ENS is a debilitating disorder with no official diagnostic criteria. This study further validates the ENS-6Q as an adjunct in differentiating patients with ENS from those suffering with similar overlapping symptoms, in this case PNO.

Topical budesonide is associated with decreased Nrf2

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Introduction:
Nrf2 protects against oxidative stress and is the master regulator of the antioxidant response. Previous research has shown Nrf2 deficiency enhances susceptibility to CRS in mice, while enrichment of Nrf2 is protective. Steroids are commonly used in the CRS management, however, the impact of steroid use on the Nrf2 pathway in the nasal cavity is unknown. This study sought to understand how topical corticosteroids may impact the Nrf2 pathway in vitro and in vivo.

Methods:
C57/BL6 mice were treated with intranasal budesonide for 5 days. Human sinonasal epithelial cells (HSNECs) from control and CRSwNP patients were grown and exposed to budesonide with and without an Nrf2 activator. qPCR was performed from murine mucosal tissue and from HSNECs for downstream markers of Nrf2 activity.

Results:
Mice treated with intranasal budesonide had a 10-20 fold decrease in mucosal expression of Nrf2 genes ($p<0.05$). HSNECs from control and CRSwNP patients treated with budesonide demonstrated statistically significant decreases in Nrf2 genes that were partially reversible with Nrf2 activation. Compared to controls, HSNECs from CRSwNP patients demonstrated significantly lower Nrf2 levels (4-8 fold) after budesonide stimulation ($p<0.05$) and less reversibility with Nrf2 activation.

Conclusions:
We demonstrate that topical budesonide is associated with decreased Nrf2 antioxidants. Specifically, HSNECs from CRSwNP patients have a more pronounced decrease in Nrf2 levels after budesonide compared to controls. This state of Nrf2 deficiency induced by budesonide may contribute towards the often recalcitrant nature of CRSwNP. Nrf2 may be a therapeutic target in conjunction with topical corticosteroids in the management of CRSwNP.

Type 2 biologics versus aspirin desensitization with aspirin maintenance therapy

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Introduction:
Aspirin exacerbated respiratory disease (AERD) is optimally managed through the combination of endoscopic sinus surgery (ESS) followed by aspirin desensitization (AD) and long-term aspirin therapy after desensitization (ATAD). Type 2 (T2) biologics have been used for the management of AERD patients via their approvals for chronic rhinosinusitis with nasal polyps and eosinophilic asthma.

Objective:
To identify the number of patients who failed AERD management using ESS coupled with AD and ATAD and subsequently transitioned to T2 biologic management.

Methods:
A retrospective review of patients presenting to the Division of Rhinology at the University of Pennsylvania was performed between 2016 and 2019. AERD patients who underwent ESS, AD, at least 6 months of ATAD, and remained biologic-naïve up through this timepoint were included in the study. Sino-Nasal Outcome Test (SNOT-22) results were noted and patients were followed to determine if a T2 biologic was necessary for long-term symptom management.

Results:
105 patients met inclusion criteria. Due to failure in symptomatology control, as noted in SNOT-22 scores, 4 (3.8%) patients went on to receive biologics in the two-year post-operative time period. The mean SNOT-22 after six-months of ATAD for patients that went on to receive biologics was 49 ± 34 versus those that did not was 15 ± 14. The mean six-month change in SNOT-22 for patients who went on to receive biologics was an increase by 29 ± 17 versus those who did not was a decrease by 10 ± 20.

Conclusions:
ESS coupled with AD and ATAD is successful in the long-term management of the majority of AERD patients, with very few patients needing to supplement or replace this treatment regimen with T2 biologics.

Type 2 inflammatory mediators decrease after ESS

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Objective:
Type 2 inflammation at time of endoscopic sinus surgery (ESS) is associated with increased severity and recurrence in chronic rhinosinusitis (CRS). Whether ESS affects inflammatory mediators in nasal secretions and to which degree it relates to post-surgical radiographic and symptomatic outcomes is unknown.

Methods:
CRS patients (n=72; 30 CRSwNP, 42 CRSsNP) undergoing ESS had middle meatal secretions gathered at time of surgery and 6-12 months post-ESS. This was compared to secretions of 49 non-CRS patients undergoing nasal surgery. CT scans and SNOT 22 scores were obtained at 6-12 months. Levels of the type 2 mediators IL-4, IL-5, IL-13, and ECP were quantified in the secretions. We defined high type 2 inflammation when 1 out of 4 levels were above 90th percentile of control secretion levels.

Results:
Overall, 44.4% (n=32) of the CRS patients (63.3% CRSwNP and 30.9% CRSsNP) had high type 2 inflammation in nasal mucus. Compared to levels at ESS, post-ESS levels of IL-4 (-1.047pg, p=.199) , IL-5 (-0.205pg, p=.025), IL-13 (-0.410pg, p=.006) and ECP (-129.9ng, p=.229) were decreased 6-12 months after ESS. Of those initially classified as having high type 2 inflammation, 59.4% had resolution at 6-12 months. Interestingly, of the 40 patients who did not have high type 2 inflammation at the time of ESS, 17.5% (n=7) became elevated post-operatively. Presence of high type 2 inflammation post-operatively was associated with worse post-operative Lund-Mackay scores (p<.001) and trending higher SNOT-22 score (p=.099).

Conclusion:
ESS is associated with decreased type 2 inflammatory burden 6-12 months after surgery. Persistent or new type 2 inflammation after ESS was associated with worse radiographic and clinical outcomes

Vascular pathophysiology characterization in chronic rhinosinusitis

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Background:
An in-depth knowledge of vascular and endothelial barrier morphology and permeability within the context of health and disease is necessary for the design of safer and more effective systemic drug delivery platforms for improved patient outcomes. Such a knowledge of predominant vascular and endothelial barrier changes in chronic rhinosinusitis (CRS) is lacking. Our objective was to characterize the vascular pathophysiology in CRS.

Methods:
A prospective observational study was performed using anterior ethmoid tissues from controls (n=6) and patients with CRS with (CRSwNP, n=6) and without (CRSsNP, n=6) nasal polyps. Vascular and endothelial barrier morphology and fenestration sizes between endothelial cell tight junctions of capillaries were assessed using transmission electron microscopy (TEM). The severity of angiogenesis was quantified by multiplex gene expression array and immunohistochemical analysis.

Results:
Fenestration sizes (63-280 nm), particularly in nasal polyp tissue, were significantly increased in CRSwNP compared to CRSsNP ($p<0.05$) and controls (20 nm, $p<0.05$), whereas the number of blood vessels in CRSsNP was significantly increased compared to controls ($p<0.05$) and CRSwNP ($p<0.05$). Pro-angiogenic gene expression including, Platelet Endothelial Cell Adhesion Molecule (PECAM1) and Platelet Activating Factor Receptor (PTAFR) were significantly elevated in patients with CRSwNP compared to controls ($p<0.05$ to $p<0.001$). PECAM-1 protein expression was upregulated in CRS compared to controls.

Conclusion:
Endothelial vascular marker expression, blood vessel angiogenesis, and fenestration size are differentially expressed and regulated in patients with CRS compared to controls."

2020 COSM ORAL Presentations

Academic rhinologists' online rating and perception, scholarly productivity, and industry payments

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Background:
The emergence of popular online rating websites, social media platforms, and industry payment and scholarly output databases provide a complete physician online presence which may guide choice and satisfaction.

Methods:
All U.S. otolaryngology academic institutions were queried for fellowship-trained rhinologists. Online ratings were collected from Google, Healthgrades, Vitals, and RateMD websites to calculate a weighted 1-5 composite score. Google's narrative comments were categorized thematically. The Open Payments Database and PubMed.gov were utilized to acquire industry payments and scholarly outputs, respectively.

Results:
Our cohort consisted of 194 rhinologists comprising of 79% males and 16.4±9.7 years of practice. A total of 6041 ratings (31.1±46.0) provided an average score of 4.4±2.5, which was not different according to gender (p=0.21), geographic quartile (p=0.42), social media presence (p=0.25), or attending top-10 residency (p=0.52) or top-25 medical school (p=0.47). Of the 591 narrative comments (3.1±11.6), 76% (positive) and 7% (negative) had elements of clinical knowledge and outcome, 55% (positive) and 4% (negative) of communication and bedside manner, and 21% (positive) and 8% (negative) of office staff, cost, and wait time. Male physicians had a higher number of negative comments pertaining to knowledge/outcomes (p=0.03), bedside manner (p=0.01), and office/cost (p=0.04). Number of publication (44.8±52.4) positively correlated (p<0.01) with industry payments ($4385±14659).

Conclusion:
Academic rhinologists' online presence is multifaceted with online ratings, transparency of conflicts of interest, and scholarly outputs potentially affecting future opportunities and perceptual satisfaction

Asthma control in patients with and without nasal polyps on biologic therapy

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Objective:
To evaluate the overall control of asthma in patients with chronic rhinosinusitis with (CRSwP) and without nasal polyposis following initiation of biologics therapy.

Methods:
Retrospective review of patients with CRSwP and asthma on a biologic agent (benralizumab, omalizumab, dupilumab, mepolizumab). Asthma control test (ACT) assessed at baseline, 3 and 6 months.

Results:
82 patients met inclusion criteria; 42 (52.5%) patients with asthma, 40 (47.5%) with concurrent nasal polyps. The average ACT score for the non-polyp cohort was 13.13 + 5.14 at baseline, 14.69 + 4.95 at 3 months, and 15.00 + 6.21 at 6 months and 17.00 + 6.50, 18.28 + 6.22, and 21.42 + 3.75 for patients with polyps respectively. Patients with polyps had better control of their asthma at baseline than patients with no polyps (p=0.007), however both had overall poor baseline asthma control (ACT<19). Patients with polyps continued to have better overall control of their asthma at 3 months (p=0.003) and 6 months (p<0.001). By 6 months patients with polyps were, on average, able to achieve an overall ACT of > 19 (21.42), demonstrating better overall control of their asthma after initiation of biologic therapy. In addition, patients with polyps had a greater overall percent increase in ACT scores from baseline to 6 months: 26% vs.14.2%.

Conclusion:
Patients with and without nasal polyps who begin biologic therapy are shown to have significant improvements in their ACT score at follow-up. In addition, patients with polyps are shown to have notably better control of their asthma while on biologics than patients with no polyps. Comorbid CRSwP can be considered an additional marker when considering initiation of biologic therapy for severe asthma.

Beta-amyloid plaques in murine olfactory bulbs during chronic olfactory inflammation

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Background:
Neuroinflammation has been suggested to play a major role in the pathology of Alzheimer's disease (AD). Olfactory loss and olfactory bulb (OB) plaques and neurofibrillary tangles are early changes seen in AD. The relationship between olfactory epithelial neuroinflammation and AD-related brain histopathology has never been directly studied. Here we use a genetic model of chronic olfactory inflammation to investigate a possible connection between inflammation-associated olfactory dysfunction and AD pathogenesis.

Methods:
Prolonged olfactory inflammation was induced in the IOI mouse model for periods ranging from 8 weeks to 4 months. Thioflavine S and immunostaining were utilized to detect beta-amyloid plaques in OB histologic sections from chronic inflammation mice and age-matched controls.

Results:
Mice with chronic olfactory inflammation consistently demonstrated OB beta-amyloid staining, increasing in a time-dependent fashion. Immunostaining revealed the presence of rare beta-amyloid deposits localized to the external nerve layer as early as 8 weeks, with widespread plaques throughout the OB after 4 months of continuous inflammation. Beta-amyloid plaques were never observed in control mouse OB

Conclusions:
Our results demonstrate for the first time that chronic olfactory inflammation results in the deposition of beta-amyloid in mouse olfactory bulbs. This intriguing observation raises the possibility that chronic nasal inflammation induces brain neuroinflammation, with histopathologic changes bearing resemblance to Alzheimer's disease. Further studies are indicated to explore underlying subcellular mechanisms and establish correlations with human disease.

Can frail patients safely undergo TNTS?

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Background:
Trans-nasal trans-sphenoidal (TNTS) approaches to sellar mass resections are well-tolerated procedures that carry risk of severe complications due to duration and location of surgery. Frail patients have been shown to experience higher risk of complications in sinonasal and intracranial procedures, but no study has specifically investigated TNTS operations. In this study, we sought to assess the risk of severe complications in frail versus non-frail patients undergoing TNTS approaches to sellar mass resections.

Methods:
Cases of TNTS approaches to sellar mass excisions were collected from the American College of Surgeons National Surgical Quality Improvement Program (ACS-NSQIP) database between 2010-2013. The modified frailty index (mFI) was calculated using 11 variables available within the database. Clavien-Dindo classification IV complications were used to define severe complications. Associations with frailty were quantified using Pearson's correlation coefficient and by multivariate logistic regression.

Results:
588 cases were identified with 18 total Clavien-Dindo IV complications and 39 cases involving morbidity. Complications and morbidity were positively correlated with mFI (p=0.032, rho=0.936; p=0.028, rho=0.945 respectively). mFI was also associated with Clavien-Dindo classification IV complications by multivariate logistic regression analysis (p=0.013, OR 1.19-5.12).

Conclusions:
Frailty, represented by the mFI, is predictive of severe complications and morbidity in patients undergoing TNTS approaches to sellar mass resection. While both of these outcomes are rare, surgeons should consider frailty in their risk-benefit analysis when planning TNTS approaches to sellar mass resections.

Chronic rhinosinusitis' impact on transsphenoidal surgery complications

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Background:
Sinusitis is a relative contraindication to elective endoscopic transsphenoidal hypophysectomy (ETSH) due to fear of intracranial spread of infection. It is unclear whether chronic rhinosinusitis (CRS), which is more inflammatory-mediated than infectious, is a risk factor for postoperative complications, both infectious and non-infectious.

Methods:
A retrospective cohort study of patients who underwent primary ETSH between January 2015 and July 2019 was performed. CRS was defined by symptomatology and concurrent radiographic and/or endoscopic findings.

Results:
Of 182 subjects, 17% (n=30) met criteria for CRS. Median Lund-Mackay scores for the CRS group and non-CRS group were 3.5 (IQR 1 to 6) and 0.0 (IQR 0 to 1), respectively. For the entire cohort, 28% (51/182) developed postoperative acute sinusitis requiring antibiotics, 1% (2/182) developed meningitis, 7% (13/182) developed CSF leak, 12% (21/182) had epistaxis, and 8% (15/182) required repeat sinonasal surgery. CRS was strongly associated with postoperative acute sinusitis (OR 2.72, 95% CI 1.21 to 6.10). CRS may be associated with meningitis (OR 5.21, 95% CI 0.32 to 85.64), but the point estimate was imprecise due to case number. Conversely, CRS was not associated with epistaxis (OR 1.22, 95% CI 0.38 to 3.93), postoperative CSF leak (OR 0.40, 95% CI 0.05 to 3.22), or additional sinonasal surgery (OR 0.34, 95% CI 0.04 to 2.69). The number of postoperative debridements was significantly higher in the CRS group than the non-CRS group (β 0.61, 95% CI 0.08 to 1.15).

Conclusions:
CRS was a strong risk factor for acute sinusitis episodes after ETSH but was not associated with other complications such as postoperative CSF leak, epistaxis, or additional surgery.

Clinical correlation of 15LO1 and CCL26 in CRSwNP

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Background:
Chronic rhinosinusitis (CRS) is often associated with type-2 inflammation and eosinophilia. 15-lipooxygenase 1 (15LO1) and chemokine (C-C motif) ligand 26 (CCL26) have been shown to be increased in nasal epithelial cells (NEC) of patients with CRS with nasal polyps (CRSwNP). The clinical correlation of 15LO1 and CCL26 has not been investigated.

Objectives:
To establish the correlation between 15LO1 and CCL26 with clinical indicators of disease severity in patients with CRSwNP.

Methods:
Forty-one patients with CRSwNP who were undergoing surgery were recruited for this study. Middle turbinate tissue samples were collected during surgery. 15LO1 and CCL26 levels were evaluated in the NECs. Demographic and clinical information was collected, including pre-op 22-item Sinonasal Outcome Test (SNOT-22) and Zinreich's modified Lund-McKay (Z-LM) scores. Correlation was determined using spearman's rank correlation coefficient (ρ).

Results:
Average SNOT-22 score was 40.5 ± 23.4. Average 15LO1 and CCL26 levels were 28.0 ± 41.9 and 1.26 ± 0.98, respectively. Age was negatively correlated with CCL26 ($\rho = -0.34$, $p = 0.03$), but not with 15LO1 ($\rho = -0.17$, $p = 0.29$). Gender, comorbid asthma, and use of peri-operative steroids were not correlated with CCL26 or 15LO1. CCL26 was positively correlated with SNOT-22 scores ($\rho = 0.37$, $p = 0.02$), but not Z-LM scores ($\rho = 0.06$, $p = 0.74$). Age was not correlated with SNOT-22 scores ($\rho = -0.19$, $p = 0.23$). 15LO1 was not correlated with neither SNOT-22 nor Z-LM scores.

Conclusions:
Pre-op SNOT-22 scores correlated with CCL26 but not 15LO1. Therefore, CCL26 may be a more sensitive indicator of disease severity than 15LO1 and may also be a better therapeutic target.

Clinical effectiveness of Benralizumab in severe asthma and chronic rhinosinusitis with nasal polyps

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Objective:
To analyze the effectiveness of Benralizumab in severe Asthma (SA) and chronic rhinosinusitis with polyps (CRSwP).

Methods:
Retrospective review of patients with both CRSwP and SA on Benralizumab. Data assessed at 3 and 6 months (3m,6m).

Results:
23 patients were included, mean age was 50.47±16.92 years and 65% were males.

Pulmonary effects: In comparison to baseline Asthma controlled test (17.33±5.93; n=18), scores at 3m (p=0.46; 18.82±5.86; n=17) and 6m showed significant improvement (p=0.01; 22±3.6; n=16). Mean FEV1 trended towards improvement and was clinically impactful with a change of 240ml: baseline (2.06 ± 0.8, n=21), 3m (p=0.44; 2.4±0.64; n=4) and 6m (p= 0.52, 2.3±1.01; n=7).

Rhinologic effects: Pretreatment SNOT-22 scores were 45.76±24.97 (n=12). There was significant clinical improvement as the scores reduced at 3m (p=0.02; 25.78±22.97; n=14) and 6m (p=0.04; 27.25 24.53; n=12). Rhinologic sub-scores of SNOT 22 at 3m (p=0.007; 11.15±7.43) and 6m (p=0.07; 13.33±10.72) also showed improvement from baseline (19.66±8.91).

Endoscopic polyp grading scores showed non-significant reduction at 3m (p=0.58; 2.0±2.57; n=13) and 6m (p=0.29; 1.69±2.01; n=13) from baseline (2.44±1.97; n=19). 55% (6/11) and 64% (7/11) of patients showed polyp score improvement at 3m and 6m respectively. In fact, for 40% (4/10) and 36% (4/11) of patients, nasal polyps completely disappeared at 3m and 6m respectively.

Conclusion:
This population showed significantly improved asthma control and rhinologic quality of life. Also, there appears to be a meaningful subset of patients that have a significant reduction in polyp burden while others have persistent nasal polyps. Benralizumab should be considered in SA and CRSwP.

Complications of aspirin desensitization in aspirin-exacerbated respiratory disease

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Introduction:
Aspirin-exacerbated respiratory disease (AERD) is an aggressive inflammatory disorder of the upper and lower respiratory tract, whose treatment often includes endoscopic sinus surgery (ESS) and aspirin (ASA) desensitization with subsequent ASA maintenance therapy. The wide range of ASA doses during maintenance therapy may be associated with hematologic and hypersensitivity-mediated complications. Objective The primary objective of this study was to determine the rate of complications seen in patients during ASA therapy after desensitization.

Methods:
All AERD patients underwent ESS, ASA desensitization, and ASA therapy after desensitization. Hematologic and hypersensitivity-mediated complications that occurred while on maintenance therapy were collected and analyzed.

Results:
106 AERD patients underwent ESS, ASA desensitization with ASA therapy after desensitization from September 2009 to February 2019. 90 patients had no complications on maintenance therapy (85%). Only 1 patient (0.9%) developed a gastric ulcer. 3 patients (2.8%) experienced anaphylaxis requiring immediate cessation of ASA. The remaining complications consisted of mild epistaxis (2%), mild hematochezia (1%), mild bruising or minimal hemoptysis (8%). 1 patient developed a minor cutaneous reaction (0.9%). There was no significant correlation between complication rate and 1) ASA maintenance dose (<325 mg, 325 mg, 650 mg, 975 mg, 1300 mg) or 2) gender.

Conclusions:
In our study, ASA therapy after desensitization was only associated with a 0.9% risk of a clinically significant GI bleed, and only a 2.8% risk of anaphylaxis. This demonstrates that the majority of AERD patients (97%) are able tolerate ASA maintenance therapy without any major complications.

Denatonium benzoate bitter taste perception in chronic rhinosinusitis (CRS)

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Objective:
The objective was to demonstrate differential oral denatonium taste perception in control and CRS patients. Methods: CRSsNP (n=21), CRSwNP (n=25), and AERD (n=27) patients as well as controls (n=25) tasted six DB concentrations in a fixed, random order, and rated them on a scale of 0 (no intensity) to 12 (extremely intense), rinsing with water in between.

Results:
AERD patients rated DB as significantly more intense than controls at concentration 3.16E-08 M ($p<0.05$). CRSwNP patients did not show significant differences from controls. CRSsNP patients rated DB as significantly less intense than controls at concentrations 1.78E-08 M ($p<0.05$), 3.16E-08 M ($p<0.05$), and 1.00E-07 M ($p<0.05$).

Conclusions:
Using taste perception as a proxy for receptor function, CRS subgroups evinced differing sensitivities to DB, suggesting weakened SCC antimicrobial activity in CRSsNP and heightened SCC inflammatory responses in AERD. Concentration 3.16E-08 M may be ideal for further study of clinical utility

Educational informed consent video non-inferior to standard verbal consent for FESS: A RCT

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Background:
Informed consent is an integral part of pre-operative counseling. However, uniformity in informed consent is lacking. We hypothesized an educational video (Video) would be non-inferior to verbal informed consent (Verbal) in efficiency, knowledge gained, alleviation of concerns, and decision regret.

Methods:
Rhinology patients undergoing functional endoscopic sinus surgery (FESS) were enrolled in a randomized controlled trial and assigned to Video or Verbal consent. The Video group watched an educational video; the Verbal group received standard verbal consent from an Otolaryngology resident. Prior to and after consent, both groups completed surveys regarding Surgery Knowledge and Concerns. Both groups had the opportunity to discuss questions or concerns with their attending surgeon. Decision regret and patient satisfaction were assessed one-week post-operatively.

Results:
n=30, 15 in each group. Mean age was 47.5 (SD 17.6); two-thirds were female. Demographics, pre-knowledge, and pre-concerns were statistically similar between groups. For Video and Verbal groups, overall knowledge significantly improved ($p=0.004$; $p=0.018$) and concerns significantly decreased ($p=0.022$; $p=0.035$). There was no statistically significant difference in improvements between groups. Furthermore, resident time to complete consent, patient satisfaction, and decision regret were not significantly different between groups.

Conclusion:
Use of an educational video is non-inferior to standard verbal informed consent for patients undergoing FESS. Otolaryngologists should consider developing procedure-specific videos to allow allocation of time to other tasks, standardized education of patients, and streamlining of the informed consent process.

Electrical stimulation of olfactory neurons may improve regeneration after damage

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Background:
Olfaction is highly impactful on our wellbeing, social interactions, and quality of life. Loss of function not only affects those important factors, but also can be a window into the higher cognitive ability and processing of the brain. Current therapeutic options fall far short of cure. Electrical stimulation has been utilized for multiple purposes in both the central and peripheral nervous systems to improve neuronal regeneration. The purpose of our study was to examine the effects of electrical stimulation on olfactory nerves after damage to the mammalian olfactory epithelium.

Methods:
Sprague-Dawley rats were injected intraperitoneally with methimazole, known to be olfactotoxic in rodents, and randomized to receive or not receive electrical stimulation to the olfactory epithelium (OE). Behavioral olfactory testing via food finding assays were carried out at baseline, one week and one month. Rats in each group were sacrificed during this time period for histologic sectioning and labeled with olfactory marker protein (OMP) antibody for qualitative comparison.

Results:
The OE of animals that underwent trans-nasal electrical stimulation had improved quality and density of olfactory receptor cells, compared to those that did not, as indicated by anti-OMP immunofluorescence. Furthermore, on two-way ANOVA, stimulated animals had a significantly decreased latency on food finding assays compared to unstimulated animals (p=0.003).

Conclusions:
This preliminary data suggests that electrical stimulation of the OE speeds recovery from methimazole induced damage. Further research in this modality could potentially help human patients suffering from hyposmia and anosmia by improving neuronal regeneration.

Elevated urine leukotriene E4 levels associated with worsened objective asthma and CRS markers

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Introduction:
Urine leukotriene E4 (uLTE4) is a systemic marker of leukotriene synthesis and is known to be elevated in patients with aspirin-exacerbated respiratory disease (AERD). It can also be useful to help delineate aspirin-tolerant chronic rhinosinusitis with nasal polyposis (CRSwNP) patients from AERD patients. The purpose of this study is to determine if uLTE4 levels can be used as an objective marker of disease severity.

Methods:
Patients with a diagnosis of CRSwNP and corresponding sinonasal CT scan who also underwent uLTE4 testing were included. uLTE4 levels (measured on spot sample, liquid chromatography–mass spectrometry assay) were required to be within 60 days of the presenting SNOT-22 scores. Additional corresponding data was collected including pulmonary function tests, asthma control test (ACT) results, lab values including vitamin D levels and CBC, Lund-Mackay CT scores and number of previous surgeries.

Results:
Among the 122 patients who met inclusion criteria, univariate analyses showed uLTE4 levels to be positively associated with female gender (p=0.04), history of asthma (p<0.01), history of aspirin sensitivity (p<0.01), worse pulmonary function including FEV1 % predicted (p=0.01) and FVC % predicted (p=0.03) and CT scan Lund-Mackay scores (p<0.01). uLTE4 levels were not significantly associated with total SNOT22 scores (p=0.30), individual SNOT22 score domains (p=0.33 – 0.99), number of previous sinus surgeries (p=0.49) or ACT scores (p=0.43).

Conclusion:
Elevated LTE4 can be utilized as an objective marker of sinonasal and pulmonary disease severity in CRSwNP patients. Patient-reported measures such as ACT and SNOT-22 scores, however, do not appear to be associated with uLTE4 levels.

Evaluating the safety of mometasone nasal lavage for patients with CRS

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Background:
The safety of intranasal steroid sprays on the hypothalamic-pituitary-adrenal (HPA) axis function as measured by the cosyntropin-stimulation test is well established in the literature. However, the impact of mometasone nasal lavage (Neticort) on adrenal cortex function is unknown. The objective of this study was to evaluate the effect of Neticort on HPA-axis function.

Methods:
A nested study of 20 participants who were enrolled in a double-blinded, placebo-controlled RCT sponsored by the ARS Resident Research Grant that compared 8-weeks of Neticort to mometasone nasal spray in CRS management for non-polyp, surgery naïve patients. A subset of participants (10 from each intervention arm- A or B) were offered participation in the cosyntropin stimulation study. The primary outcome measure was the within subject change in post-stimulation cortisol levels pre- and post-intervention.

Results:
To date, a total of 17 participants have completed the cosyntropin stimulation study (Group A n=9, mean (SD) age= 51 (13) years, n=6 females; Group B n=8, mean (SD) age=44 (15) years, n=4 females). At baseline, the mean post-stimulation cortisol level was 23.4 µg/dL and 24.5 µg/dL for group A and B, respectively. After 8 weeks, the mean post-stimulation cortisol level was 23.9 µg/dL and 24.1 µg/dL for group A and B, respectively. To date, no participants

have post-stimulation serum cortisol levels indicative of adrenal suppression (≤ less than 18 µg/dL).

Discussion:
Short term use of Neticort does not appear to suppress HPA-axis function.

Gender and age differences in aspirin-exacerbated respiratory disease

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Introduction:
Aspirin-exacerbated respiratory disease (AERD) manifests with varying levels of severity. Treatment options includes corticosteroids, leukotriene modifiers, endoscopic sinus surgery (ESS), aspirin (ASA) desensitization, and biological immunomodulators. However, it is hypothesized based on clinical observation that premenopausal women require higher doses of ASA for disease control.

Objective:
Characterize the maintenance dose of ASA required for AERD based on patient demographics, specifically age and gender.

Methods:
All AERD patients underwent ESS, ASA desensitization, and ASA maintenance therapy. AERD severity was reflected by the ASA dose (mean ± SE) required during maintenance at 6 months. Patient characteristics and 6-month ASA maintenance doses were collected and analyzed based on gender, age, and menopause status. The average age of menopause in the U.S. is 51 and was used to determine pre- and post-menopausal status.

Results:
93 AERD patients successfully underwent ESS and ASA desensitization from September 2009 to February 2019 (33 males and 60 females). There were no significant differences in 6-month ASA maintenance doses between men and women (966 ± 58.8 mg vs. 837 ± 50.4 mg) or between men age > 51 and <= 51 (1056 ± 99.0 mg vs. 918 ± 72.7 mg). However, pre-menopausal women (age <= 51) required a significantly higher 6-month ASA maintenance dose compared to post-menopausal women (929 ± 66.8 mg vs. 704 ± 69.6 mg, p=0.0147).

Conclusions:
This study suggests that menopause may play a role in the amount of ASA required for maintenance therapy, possibly reflecting disease severity. These findings carry significant implications on the management of AERD, particularly among pre-menopausal women.

Histopathologic markers are not associated with QOL or olfactory function in patients with CRS

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Background:
Operating room (OR) costs are a large portion of health care expenses. This study evaluates the impact of a surgeon-targeted surgical receipt cost feedback system on OR supply costs in sinonasal surgery and individual components contributing to procedural cost.

Methods:
Itemized weekly surgical receipts detailing individual case supply costs were analyzed before and after the implementation of an unincentivized surgeon cost feedback system between January 2017 and June 2019. Supply cost data collected 15 months prior to intervention was compared to cost data 15 months after implementation of the weekly automated receipt dissemination to surgeons. Chi square was used for categorical data and the Wilcoxon test was used to compare change in cost. Univariate and mediation analyses were performed to assess variables impacting cost.

Results:
Of 502 sinonasal procedures analyzed, 239 were before and 264 after cost feedback implementation. There were no significant differences in age/gender, or indication for surgery. The median OR supply cost decreased from $1229.64 to $1097.22 (p=0.02) after receipt implementation. There were effects of procedure type (p=0.02), circulating nurse specialization (p=0.001), steroid eluting stent (p=0.002), and sinus drill (p=<0.001) on cost. Mediation analysis confirmed partial cost mediation by increasing use of Otolaryngology specific circulating nurses and significant mediation by decreasing use of steroid eluting stents.

Conclusion:
Surgeon cost feedback in the form of individualized OR surgical receipts is an effective model to reduce supply cost per case in sinonasal surgery.

IMPA redirects airflow and improves ENS symptomology: A CFD study

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Background:
Empty nose syndrome (ENS) is a controversial disease associated with inferior turbinate tissue loss. The inferior meatus augmentation procedure (IMAP) has been shown to improve ENS symptoms, but its precise mechanism of efficacy remains unknown.

Methods:
4 ENS patients who underwent bilateral IMAP via submucosal rib cartilage implant were enrolled. ENS6Q symptom scores were collected pre- and post-IMAP implant. Computational fluid dynamics (CFD) was applied on all patients based on pre- and 6 months post implant computed tomography (CT) to investigate intra-patient changes in airflow dynamics.

Results:
Post IMAP implant surgery, ENS patients have improved symptoms as indexed by ENS6Q scoring (pre:14.5±4.5,post:3.7±1.7, $p<0.02$). Using CFD, a significant shift in nasal airflow patterns was observed, in which airflow congregates towards the middle meatus pre-IMAP then deviates away from the middle meatus post-implant (pre:37.3±11.5%,post:28.8±8.6%,$p<0.05$). Surprisingly, no statistically significant changes were found in nasal resistance (pre:0.048±0.004,post:0.044±0.009 Pa/ml/s, $p=0.26$) and inferior meatus nasal airflow (pre:42.4±11.8%,post:40.6±13.1%, $p=0.86$). In addition, ENS6Q symptom improvement significantly correlated with percent reduction in airflow through the middle meatus ($R2 = 0.92$, $p=0.04$), but not with nasal resistance or others changes.

Conclusion:
This study illuminates a paradoxical, but consistent, change in nasal airflow following the restoration of inferior meatus turbinate tissue volume with IMAP. These findings further support our previous hypothesis that distorted nasal airflow with flow congregating to the middle meatus may contribute to ENS symptom, beyond the effect of nasal resistance.

Long-term follow up of nasal nitric oxide in chronic rhinosinusitis

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Background:
Nasal nitric oxide (nNO) is a potential biomarker of chronic rhinosinusitis (CRS), and correlates well with endoscopic and radiologic severity of disease. However, the long-term profile of nNO as a biomarker is not established in literature. The objectives of our study were to examine whether nNO can maintain this correlation in a 5-year follow-up following endoscopic sinus surgery (ESS) and to investigate whether nNO value can be used to prognosticate revision rates in patients with CRS.

Methods:
We enrolled CRS patients 5 years after they participated in our previous study. Patients underwent initial ESS at our institution between January 2013 and January 2015. Patients prospectively had the following measurements at baseline, 1-month, 6-month and 5-year post-ESS: nNO levels, Lund-Kennedy Endoscopy Score (LKES), and Sinonasal Outcome Test-22 (SNOT-22) score. We also compared the nNO levels between patients who underwent revision ESS and those who did not.

Results:
There were 32 patients included in the study with 8 patients undergoing revision ESS during the 5-year follow up. nNO levels were elevated at 1-month, 6-month and 5-year post-ESS compared to baseline. A significant negative correlation between nNO and LKES was found at 5-year post-ESS. nNO levels were significantly reduced at baseline and 6-month post-ESS in the revision cohort compared to non-revision cohort despite having comparable radiologic severity.

Conclusion:
nNO may serve as a non-invasive long-term biomarker to monitor sinus disease severity and to prognosticate patients with CRS. This has implications for potential integration into clinical practice.

Machine learning of biomarkers and clinical observation to predict eosinophilic CRS

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Background:
Subtyping chronic rhinosinusitis (CRS) by tissue eosinophilia has prognostic and therapeutic implications, and is difficult to completely predict using peripheral eosinophil counts or polyp status alone. Supervised machine learning can use multiple inputs for classification problems, and the objective of this study was to test machine learning for prediction of eosinophilic CRS (eCRS).

Methods:
Input variables were defined as peripheral eosinophil count, urinary leukotriene E4 (uLTE4) level, and polyp status. The output was diagnosis of eCRS, which was defined as tissue eosinophil count >10 per high power field. Patients undergoing endoscopic sinus surgery for CRS were retrospectively reviewed for complete input and output variable datasets. Univariate analysis was performed for each input as a predictor of eCRS. Multivariate machine learning models were developed using artificial neural networks (ANN), and experiments were conducted using random training/test datasets, as well as training using one surgeon's population to predict eCRS in a second surgeon's population.

Results:
A total of 80 patients met inclusion criteria. In univariate analysis, area under the curve (AUC) for peripheral eosinophil count and uLTE4 were 0.738 and 0.728, respectively. Presence of polyps was 94.1% sensitive, but 51.7% specific for eCRS. ANN using random training/test datasets resulted in AUC of 0.918, with sensitivity 88.2% and specificity of 80.0%. ANN using surgeon specific datasets resulted in an AUC of 0.956, with sensitivity of 92.3% and specificity of 85.7%.

Conclusions:
ANN machine learning of three clinical inputs can be used for prediction of eCRS with high sensitivity and specificity.

Mechanisms governing NSD symptoms

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Background:
In the US, 260,000 septoplasties are performed annually to address nasal septal deviation (NSD) associated nasal obstruction. Yet, we don't consistently understand what aspects of NSD result in symptoms.

Methods:
In a blinded study, two fellowship-trained surgeons reviewed CT sets of 45 healthy controls mixed with 9 confirmed NSD patients. All symptomatic patients were correctly identified, however 30/45 or 66.7% of healthy controls were falsely identified by both surgeons as patients, which were grouped as asymptomatic NSD (aNSD), while the remaining controls as Non-NSD (Healthy). Individual CT based computational fluid dynamics and nasal sensory testing was applied to investigate the characteristics of the symptomatic NSD.

Results:
The aNSD have no reported nasal sinus nor nasal obstruction symptoms - NOSE (Healthy:16.2±15.6;aNSD:9.65±11.5;NSD:62.5±13.3, $p<0.05$); SNOT22 (Healthy:16.1±18.1;aNSD:12.3±11.9;NSD:32.1±15.3, $p<0.05$); and visual analog scale scores (10 being most obstructed) on deviated (NSD:6.4±2.7;aNSD:1.55±1.33;Healthy:2.19±1.99) and non-deviated side (NSD:4.9±3.4;aNSD:1.73±1.88). No significant differences were found among these groups in nasal resistance, minimum cross-sectional area, wall shear stress, and heat flux. However, the NSD had significantly poorer nasal cool sensitivity as measured by menthol lateralization thresholds than both aNSD and healthy controls ($p<0.05$), with no significant differences between the latter two groups.

Conclusion:
This study sheds light on the mechanisms of NSD symptomatology and further supports our previous hypothesis that nasal obstruction complaints do not result directly from obstruction, rather from the capacity of our nose to subjectively sense airflow.

Mepolizumab in eosinophilic chronic rhinosinusitis

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Aims:
Eosinophilic chronic rhinosinusitis (eCRS) is a disease mediated by interleukin (IL)5 and other Th2 cytokines. Mepolizumab, a monoclonal antibody drug targeting IL5, is being trialled. There is negligible

information about the drug's effects in diseased mucosa. The aim was to determine the effect of mepolizumab on sinonasal inflammation and associated symptom outcomes.

Methodology:
Post-surgical eCRS patients received 100mg mepolizumab subcutaneously, four weeks apart. Ethmoid sinus tissue was biopsied at baseline, 4, 8, 16 and 24 weeks. On microscopy, tissue eosinophil number (cells/0.1mm2) and eosinophil peroxidase (EPX) deposition (scored 0-10) were quantified. The tissue Th2 cytokines (IL5, GMCSF, IL4, IL10, IL13, TNFa and IL1B [pg/mL]) were measured by immunoassay. Patient symptoms were assessed by the Sino Nasal Outcome Test (SNOT-22). The tissue and symptoms were analyzed to assess the response to mepoluzimab therapy.

Results:
Ten participants were assessed (47±10 years, 60% female). From baseline, tissue eosinophil number decreased (130[67-217] vs 11[1-46] cells/0.1mm2], p=0.001). EPX score was similar (6[4-7.0] vs 8[7-8], p=0.202). There was an increase in IL5 (332[108-438] vs 687[242-918] pg/mL, p=0.036) and GMCSF (45[31-56] vs 95[48-118] pg/mL; p=0.012). The concentrations of the other cytokines were unchanged. Patient symptoms reduced via SNOT-22 (46[41-62] vs 28[15-38], p=0.038).

Conclusion:
Mepolizumab decreased tissue eosinophils and was associated with symptom improvement. The elevated expression of the cytokine IL5 suggests that antagonism of IL5 may result in a local feedback loop. Potential for rebound disease after treatment cessation or increasing dose requirements needs further investigation.

Natural language processing phenotype algorithm in CRS

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Chronic rhinosinusitis (CRS) consists of a multitude of symptom combinations representing distinct phenotypes and disease processes. Electronic health record (EHR)-based phenotyping using discrete data elements has not been successful and we sought to analyze the nuanced clinical text that describes the symptoms of CRS employing medical informatics and applying open source natural language processing (NLP) tools to EHR data. The goal of our study was to predict CRS defined by EPOS epidemiologic criteria (symptom-based) within a large primary care population by identifying the four cardinal symptoms of the disease. Our algorithms used both NLP output and discrete EHR data elements. We used machine learning algorithms based on decision tree and stacking methods. In the stacking method, we used decision tree as the meta-classifier and random forest, XGBoost, SVM, logistic regression as base classifiers.

We first evaluated the performance of the NLP pipeline using chart review (n=55). There was 100% capture of the four cardinal symptoms. The negation feature had varying performance based on the symptom (25%-95%). Our gold standard dataset had 7,306 subjects, of whom 4923 (68%) had CRS. We had a PPV of 85%, sensitivity of 56%, specificity of 79% and AUC of 73% to predict CRS. We then developed symptom-based sub-phenotyping algorithms among those with both symptoms and objective evidence of disease (n=150). Applying the NLP-based algorithm to these subjects, nasal discharge and nasal obstruction had PPV of 89% and 83%, respectively.
Our study shows that an EHR-based NLP algorithm can be applied to a large population in the setting of a nuanced chronic disease.

Non-sponsored evaluation of cryosurgical ablation device for rhinitis

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Background:
Chronic rhinitis is a common problem in the United States affecting roughly 60 million people. A cryotherapy handheld device (Stryker Clarifix) targeting the postganglionic nerve fibers of the posterior nerve is now available as an additional option for therapy. To date, all outcome related literature of the device has been industry sponsored.

Objective:
To evaluate the safety and efficacy of the cryosurgical ablation device of the posterior nasal nerves (PNN) in the clinic setting.

Methods:
This was a non-sponsored prospective single-arm trial of 24 adult patients at seven locations within a large health maintenance organization (HMO) system. Patients with a diagnosis of rhinitis that failed medical therapy were offered an in-office cryosurgical ablation of PNN under local anesthesia. Patients completed the TNSS questionnaire consisting of 5 items reported based on the previous 12 hours and 2

weeks at the following time points: pre-treatment, 30 and 90 days post-treatment.

Results:
The procedure was successfully completed on all participants with no complicaitons. The 12 hour symptom score improved from 6.92 (mean pre procedure; standard deviation +/-2.87) to 3.17 at 30 days (P<0.001; SD +/- 2.43) and 2.92 at 90 days post treatment (P<0.001; SD +/- 1.35). Similar results were noted for the 2 weeks scores improving from 7.75 (pre procedure; SD +/-3.12) to 3.79 at 30 days (P<0.001; SD +/- 2.15) and 3.88 at 90 days (P<0.001; SD +/- 1.85). 64.7% of respondents stated the procedure decreased or eliminated nasal sprays at 3 months post treatment.

Conclusions:
Our non-sponsored evaluation of cryosurgical ablation of the posterior nasal nerves shows improvement in nasal symptoms over a 3-month period.

Olfactory function after surgical treatment of CRS

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Introduction:
After endoscopic sinus surgery (ESS), many chronic rhinosinusitis (CRS) patients have persistent olfactory dysfunction (OD). Existing studies lack control groups, and it is unclear if residual OD is due to CRS or other causes. This study compares olfaction after ESS in CRS patients to controls.

Methods:
Patient with CRS from a prospective multi-institutional cohort were compared to healthy individuals from a separate prospective cohort evaluating smell in the general population. Cases and controls completed baseline questionnaires, smell testing of threshold, discrimination, and identification (TDI), the Questionnaire of Olfactory Disorders (QOD-NS), and underwent olfactory cleft endoscopic scoring (OCES). Cases also completed post-operative evaluations.

Results:
Outcomes were examined on 113 cases and 164 controls of similar age and gender distribution. Cases had worse baseline TDI, QOD-NS and OCES than controls (p<0.001). Postoperatively, cases improved in TDI scores (mean change=3.7, p<0.001), QODS-NS (mean change=6, p<0.001), and OCES (mean change=1.9, p<0.001). 63% of anosmic cases reported improved olfaction, while 39% of hyposmic cases became normosmic. Postoperatively, a significant proportion of cases achieved olfactory metrics similar to controls, including TDI (45%), QOD-NS (51%) and OCES (52%). Multivariate regression identified that nasal polyposis (OR=0.4, p=0.05) and prior ESS (OR=0.31, p=0.02) decreased the likelihood of achieving olfactory function similar to controls, while concomitant septoplasty (OR=4.49, p=0.008) increased these odds.

Conclusion:
ESS improved multiple olfactory metrics and restored olfaction in CRS patients to levels similar to the healthy population in half of the cases.

On-demand sclerotherapy for HHT-related epistaxis

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Introduction:
Epistaxis is the greatest cause of morbidity in patients with hereditary hemorrhagic telangiectasia (HHT), and no standard of care treatment exists. The long-term effectiveness and consequences on the nasal mucosa of repeated sodium tetradecyl sulfate (STS) procedures are not well known. Feared concerns of the procedure are unilateral blindness or scarring of the nasal mucosa.

Methods:
Retrospective case series of all HHT patient visits in the otolaryngology clinics at Washington University HHT Center of Excellence from 01/2015 through 11/2019. The number of STS procedures, time between visits, longitudinal Epistaxis Severity Score (ESS), and adverse events were extracted from the chart.

Results:
A total of 381 STS procedures were performed during 487 clinic visits from 111 HHT patients. Number of visits ranged from 1-25 per patient with 78 of the patients having ≥2 visits. Median time between visits was 3.6 (range 0.1-57) months. ESS varied between and within patients. Thirty-three patients had ≥2 visits within 15 months of the first and 21(64%) showed up at the last visit with an ESS lower than the baseline by the minimally clinically important difference (0.71) or more.

There were 6 (1.6% of all procedures) total adverse events: 3 patients with vasovagal responses and 1 patient each with excessive pain, excessive bleeding, and ocular migraine. There were no cases of nasal perforation, blindness, transient ischemic

attack, or anaphylaxis. No scarring was seen on nasal mucosa.

Discussion:
STS is a safe and effective in-office procedure and warrants greater usage among otolaryngologists treating HHT patients with epistaxis.

Otologic outcomes after sinus surgery for chronic rhinosinusitis
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Objective:
To assess otologic outcomes following endoscopic sinus surgery (ESS) in chronic rhinosinusitis (CRS) with and without eustachian tube dysfunction (ETD).

Methods:
We prospectively studied adults with CRS undergoing ESS. Using the ETD Questionnaire (ETDQ7) threshold of 14.5, patients were divided into ETD+ and ETD- cohorts. Patients with other otologic diagnoses were excluded. Symptom scores, audiometry, and tympanometry were measured pre-ESS and post-ESS at 1, 4, and 8 weeks. Otologic symptoms were quantified using ETDQ7 and Cambridge Otology Quality of Life score (COQoL24). Lund-Kennedy score, Lund-McKay score, and surgery type were also examined. Regression analysis identified clinical factors associated with symptom improvement.

Results:
We studied 21 ETD+ and 22 ETD- patients. In ETD+ patients, mean ETDQ7 scores (baseline 24.3) improved at week 1 (17.2, p<.001) and week 8 (10.6, p<.001); mean COQoL24 scores (baseline 113.2) also improved at week 1 (95.6, p=.002), week 4 (28.0, p<.001), and week 8 (26.4, p<.001). ETD- patients had significantly lower pre-ESS mean COQoL-24 scores (18.3, p<0.001) and ETDQ7 scores (8.0, p<.001); neither metric changed significantly post-ESS. In the ETD+ group, only 1 had an abnormal pre-ESS audiogram, which normalized post-ESS, and only 2 had abnormal tympanograms, both of which normalized post-ESS. No abnormal audiograms or tympanograms were noted in ETD- patients. Apart from diagnosis of ETD, no other factors were significantly associated with otologic score improvement.

Conclusion:
CRS with ETD is associated with global otologic impairment, which greatly improves post-ESS. There is a discordance between perceived otologic symptoms and objective findings, warranting further study.

Outcomes in ENT assisted and unassisted anterior skull base surgeries
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Objectives:
To investigate the association between patients who underwent anterior skull base procedures with either otolaryngology assistance or neurosurgery alone.

Study Design:
Retrospective database review

Methods:
The 2005-2015 National Surgical Quality Improvement Program (NSQIP) database was used. Independent t-tests, chi-squared analysis and logistic regression were used to determine the independent effect of covariates on postoperative complication rates.

Results:
4053 individuals who underwent an anterior skull base surgery by either neurosurgeons alone or with otolaryngologist assistance were identified. Independent t-test revealed that total operation time were longer with otolaryngology assistance than when neurosurgeons operated alone (p<0.001). Univariate analysis revealed a higher percentage of anterior skull base procedure were performed with otolaryngology assistance (p<0.001). Multivariate regression analysis of this cohort indicated that patients were independently associated with higher rates of experiencing a complication following anterior skull base surgery if neurosurgeons were not assisted by otolaryngologists (OR 1.917, 95% CI 1.105–3.325, p=0.021).

Conclusions:
This analysis underscores the importance of a cooperative approach to anterior skull base procedures between neurosurgeons and otolaryngologists. The otolaryngologist-assisted approach was associated with lower risk of postoperative complications.

Predictors of objective olfactory dysfunction following sinus surgery

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Background:
Olfactory recovery after endoscopic sinus surgery (ESS) for CRS is variable. In this study, we evaluated predictors of objective olfactory dysfunction following ESS.

Methods:
90 CRS patients (50 CRSsNP, 40 CRSwNP) were evaluated 6-12 months after ESS. Olfaction was assessed using the B-SIT and Sniffin Sticks threshold tests; additionally, we collected radiographic, endoscopic, and SNOT-22 data. Computed tomography (CT) data was used to generate a 0-9-point total olfactory cleft opacification (TOCO) score.

Results:
The mean age of patients was 46. 45.6% (n = 41) were male, 11.1% (n = 10) had AERD, 24.4% (n = 22) previously or currently smoked and 66.7% (n = 60) had eosinophils noted in pathology. Median TOCO was 2 (IQR 7) which decreased to 1 post-ESS (IQR 3). The dependent variable, post-ESS B-SIT score (37.8% (n = 34) “abnormal/deficit”, 62.2% (n = 56) “normal”), correlated with Sniffin Stick threshold ($p < 0.001$, $r = 0.424$) and the SNOT-22 olfactory item ($p = 0.001$, $r = -0.369$). We performed pairwise comparisons of preoperative factors with post-ESS B-SIT and incorporated significant predictors—age, AERD and smoking status, presence of tissue eosinophils, and preoperative TOCO—into a multivariate logistic regression analysis. The model was significant overall ($p = 0.001$, R-squared = 0.296), but only smoking status (OR 3.33, 95% CI 1.06, 10.47, $p = 0.04$) and preoperative TOCO (OR 1.17, 95% CI 1.00, 1.37, $p = 0.04$) remained significant predictors of olfactory dysfunction.

Conclusions:
Olfactory deficits are common after ESS and associated with identifiable phenotypic and demographic factors, with smoking status and preoperative TOCO remaining significant on multivariate analysis.

Prevalence of olfactory and neurocognitive dysfunction in patients with subjective smell disorder

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Objectives:
Known associations exist between olfactory and neurocognitive dysfunction. This study aimed to describe the prevalence of neurocognitive conditions in an olfactory disorders clinic, determine if smell dysfunction was more pronounced in patients with those conditions, and elucidate differences between patients with subjective and objective smell dysfunction.

Methods:
171 patients with subjective olfactory/taste complaints were screened using the Smell Identification Test (SIT). Neurocognitive function was assessed using the Beck Depression Index-II (BDI), Montreal Cognitive Assessment (MOCA), and Brain Age Score (BAS). The prevalence of mood/neurocognitive dysfunction was computed using known cutoffs, and adjusted SIT scores were compared between groups. Patients with subjective hyposmia but normal SIT scores were also statistically compared across these neurocognitive scores to those with objective hyposmia.

Results:
12.8% of patients were found to be normosmic despite subjective hyposmia. There was no significant difference in BDI ($p=.3802$), BAS ($p=.5238$) or MOCA scores ($p=.6461$) between the normosmic and hyposmic subgroups. The overall prevalence of mood disorders (BDI>13) was 12%, compared to a prevalence of 33% for accelerated brain aging (BAS>3) and 20% for neurocognitive decline (MOCA<26). No statistically significant differences in SIT scores were noted between patients with and without mood/neurocognitive impairment.

Conclusion:
A significant subset of patients with subjective hyposmia do not demonstrate objective smell dysfunction. There is high prevalence of cognitive decline and mood disorders in this population; however, this study did not find evidence supporting differential olfactory impairment.

Quantification of biomarker heterogeneity in control specimens used for analysis in CRS

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Background:
Currently, no consensus exists on the appropriate control specimen to utilize in studies evaluating biomarkers in chronic rhinosinusitis (CRS). Studies thus far have utilized tissue from various anatomic sites despite regional heterogeneity. We set out to quantify the differences in biomarker levels present in inferior turbinate versus sphenoid sinus mucosa in paired healthy controls. We hypothesize that statistically significant differences in cytokine/chemokine expression exist between these two distinct sites.

Methods:
A 38-plex commercially available cytokine/chemokine Luminex Assay was performed on 54 specimens encompassing paired inferior turbinate and sphenoid sinus mucosa samples from 27 adult patients undergoing endoscopic anterior skull base surgery. Patients with a history of CRS were excluded. Paired sample t-tests were performed with an alpha level set at .01 to designate statistical significance as no correction for multiple comparisons was made.

Results:
Twenty-seven patients were included in the study, 10 male and 17 female with an average age of 48 years. The following 11 biomarkers had statistically significant concentration differences between inferior turbinate mucosa and sphenoid mucosa: Flt-3L, Fractalkine, IL-12p40, IL-12p70, IL-13, IL-1Ra, IP10, MCP1 and MCP3, MIP1b and VEGF.

Conclusion:
No consensus exists regarding the optimal choice of inflammatory control specimen for CRS research. We present statistically significant quantitative differences in biomarker levels between inferior turbinate and paired sphenoid mucosa samples. This confirms the presence of heterogeneity between different subsites of sinonasal mucosa and highlights the need for standardization in future CRS research.

Solitary chemosensory cells and its relation to cholinergic innervation

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Background:
Solitary chemosensory cells (SCCs) in the murine nasal epithelium are discrete specialized cells that respond to irritants and activate trigeminal nerve fibers through the release of acetylcholine (ACh) resulting in localized substance P release and neurogenic inflammation. In addition to releasing ACh, SCCs are the exclusive epithelial source of the potent type 2 inflammatory cytokine IL-25. In humans, SCCs have been demonstrated to be expanded in nasal polyps. However, the SCC-trigeminal synapse has yet to be demonstrated in human sinonasal epithelium.

Methods:
Immunofluorescence for trigeminal nerve fiber markers as, nicotinic ACh receptors as well as SCCs was performed in vibratome sections from polyp and healthy turbinate tissue.

Results:
Calcitonin gene-related peptide (CGRP) immunostaining was used to identify cholinergic nerve endings which were only evident in sections from the inferior turbinate and appeared adjacent to SCCs (α-gustducin positive cells). CGRP positive nerve endings were not identified in sections from nasal polyps. Human SCCs expressed nicotinic cholinergic receptors as well as ACh synthetic enzyme choline acetyltransferase indicating that human SCCs utilize ACh signaling.

Conclusions:
SCCs are innervated by trigeminal nerve endings in inferior turbinate in human nasal epithelia, but not in nasal polyps. SCCs from both anatomic locations express ACh receptors as well as choline acetyltransferase. Lack of innervation of polyp SCCs may contribute to unregulated expansion.

Surgeon cost feedback reduces cost in sinonasal surgery

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Background:
Operating room (OR) costs are a large portion of health care expenses. This study evaluates the impact of a surgeon-targeted surgical receipt cost feedback system on OR supply costs in sinonasal surgery and individual components contributing to procedural cost.

Methods:
Itemized weekly surgical receipts detailing individual case supply costs were analyzed before and after the implementation of an unincentivized surgeon cost feedback system between January 2017 and June 2019. Supply cost data collected 15 months prior to intervention was compared to cost data 15 months after implementation of the weekly automated receipt dissemination to surgeons. Chi square was used for categorical data and the Wilcoxon test was used to compare change in cost. Univariate and mediation analyses were performed to assess variables impacting cost.

Results:
Of 502 sinonasal procedures analyzed, 239 were before and 264 after cost feedback implementation. There were no significant differences in age/gender, or indication for surgery. The median OR supply cost decreased from $1229.64 to $1097.22 (p=0.02) after receipt implementation. There were effects of procedure type (p=0.02), circulating nurse specialization (p=0.001), steroid eluting stent (p=0.002), and sinus drill (p=<0.001) on cost. Mediation analysis confirmed partial cost mediation by increasing use of Otolaryngology specific circulating nurses and significant mediation by decreasing use of steroid eluting stents.

Conclusion:
Surgeon cost feedback in the form of individualized OR surgical receipts is an effective model to reduce supply cost per case in sinonasal surgery.

Surgical outcomes in aspirin-exacerbated respiratory disease without aspirin desensitization

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Background:
Aspirin exacerbated respiratory disease (AERD) represents a severe phenotype of chronic rhinosinusitis often requiring multiple sinus surgeries. While aspirin desensitization (AD) has been shown to be an effective therapeutic option, the natural history and course of sinus disease progression without AD remains unclear.

Methods:
A retrospective review was conducted of patients with AERD who underwent endoscopic sinus surgery (ESS) without AD between 2010 and 2019 at a tertiary care center. The primary outcome was surgery-free survival following ESS. A subgroup analysis on patients who received biologic therapy postoperatively was conducted. Postoperative changes in Sino-Nasal Outcome Test (SNOT-22) scores and Lund-Kennedy Endoscopy scores (LKES) were assessed.

Results:
One hundred and forty one patients (47 primary ESS, 94 revision ESS) were included with a median follow up time of 29 months (IQR 10-58). Thirty-seven patients (26.2%) underwent revision ESS at our center with a median time to revision of 40 months (IQR 26-59). The probability of remaining revision-surgery free at 1, 3 and 5 years was: 98.2% (95% CI: 95.7-100.0%), 78.8% (95% CI: 70.2-88.4%), and 44.8% (95% CI: 32.4-62.1%), respectively. SNOT-22 scores and LKES decreased significantly at 6 months and 1-year after ESS (p<0.05). Among those who received biologic therapy (n=16), 31% required revision ESS, with no difference in the time to revision surgery compared to patients not receiving biologic therapy (p=0.23).

Conclusion:
AERD patients undergoing ESS without AD had comparable rates of revision ESS and time to revision when compared to patients undergoing AD and ESS in the literature. Biologic therapy did not alter the time to revision.

Synechia incidence after primary and revision FESS

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Introduction:
Synechia formation is a complication of Endoscopic Sinus Surgery(ESS) that can lead to middle turbinate lateralization preventing visualization of paranasal sinuses and obstruct delivery of topical medications. Multiple studies have shown post-operative synechia rates ranging from 10%-40%. We sought to analyze our institutional synechia rate based upon revision status.

Methods:
A cross-sectional analysis was conducted on all patients with a history of ESS presenting to an academic rhinology center over a 6-week period. Synechia rates were correlated with laterality, revision status, comorbidities, and packing material. Exclusion criteria included middle turbinate resection.

Results:
There were 112 patients and 195 unique sides undergoing ESS of which 43% were primary, and 57% revision. Overall synechia rate was 6.7% (13/195) and higher in revision ESS at 9.6% (11/115) compared to 2.5% (2/80) in primary ESS; p=0.08. Synechia was 7% (7/100 sides) vs 5.6% (5/89 sides) in patients with chronic rhinosinusitis w/ (CRSwNP) and w/o polyps (CRSsNP), respectively. Synechia was not observed in patients with allergic fungal rhinosinusitis (AFRS), aspirin exacerbated respiratory disease (AERD) and autoimmune disease. Resorbable polyurethane dressing (NasoPore®) was associated with higher synechia rate (6/35; 17.1%) compared to chitosan dressing (PosiSep X®) (3/113; 2.6%; p<0.05).

Conclusion:
Our synechia rate of 6.7% is lower than historically reported rates. We observed a increased synechia rate in revision ESS. The use of resorbable polyurethane sponge was associated with a higher risk of synechia formation compared to chitosan dressing. A prospective clinical trial is needed to further examine these differences.

Systematic review: Objective smell and taste in eating disorders

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Objective:
Patients with chemosensory dysfunction, such as those with chronic rhinosinusitis (CRS), have associated quality of life disruptions, including reduced ability to enjoy eating. While chemosensory dysfunction has also been associated with eating disorders, it has not been well studied or understood. This review aims to characterize objective gustation and olfaction in patients with eating disorders.

Methods:
A systematic review and meta-analysis using 5 databases was completed following PRISMA guidelines. Studies with objective gustatory and/or olfactory function in patients with eating disorders were included.

Results:
Forty-one studies were included. Five studies assessed both chemosenses, while 24 and 12 assessed exclusively gustation or olfaction, respectively. In total, 1432 patients were included [67.3% anorexia nervosa (AN), 26.8% bulimia nervosa (BN), 5.9% other]; comorbid CRS was not reported. While patients with eating disorders rated taste intensity as similar to controls, flavor identification was impaired (24.4+/-4.8 vs. 27.6+/-2.8, p<0.0001). Olfactory discrimination was worse in patients with AN (12.4+/-2.3) vs. BN (13.3+/-1.9, p=0.014) and controls (12.9+/-2.1, p=0.018). Olfactory threshold and identification were similar in patients and controls.

Conclusion:
Patients with eating disorders have objective differences in chemosensory function compared to controls in this systematic review. This relationship warrants further investigation in other populations with objective chemosensory dysfunction, such as those with CRS, and whether this dysfunction impacts eating habits, with potentially broad psychosocial implications.

The detrimental effects of olfactory dysfunction as a non-motor symptom of Parkinson's Disease

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Objectives:
Olfactory dysfunction is known to impact patients living with Parkinson's Disease (PD). However, objective olfactory testing and the burden of olfactory dysfunction in PD are not frequently reported. The aims

of this study were to compare the Affordable Rapid Olfactory Measurement Array (AROMA), a novel, objective, essential oil-based test of olfaction, with Sniffin Sticks 12 test (SST12) among PD patients, and assess olfactory-related quality of life (QoL).

Methods:
PD patients and age-matched controls completed both AROMA (14 scents at 4 different concentrations) and SST12. Participants also completed two QoL instruments: Sino-Nasal Outcome Test (SNOT-22) and Questionnaire of Olfactory Disorders-Negative Statements (QoD-NS). Mann-Whitney U Tests compared cohort olfaction and QoL. Spearman's Rho correlations compared AROMA with SST12 results.

Results:
36 controls and 42 PD patients were enrolled (controls and PD were 83.3% and 76.2% male, respectively). Composite AROMA scores correlated significantly ($p \leq 0.01$) with SST12 in both the normal ($r=0.605$) and PD ($r=0.519$) cohorts. The PD group scored significantly worse on both AROMA (normal median=75, PD median=33.04; $p<0.001$) and SST12 (normal median=10.5, PD median=5; $p<0.001$). SNOT-22 scores were not significantly different between cohorts ($p=0.143$); QoD-NS scores were significantly worse in the PD group ($p=0.003$).

Conclusion:
PD patients perform consistently poorly across both AROMA and SST12. Certain scents are especially difficult for PD patients, which may help differentiate PD from other neurodegenerative pathologies. While SNOT-22 scores are not significantly different, PD patients report significantly lower olfactory-related QoL compared to controls.

The effect of pre-operative steroids on surgical field visibility during sinus surgery
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Background:
The quality of the surgical field can greatly influence outcomes in patients with chronic rhinosinusitis with nasal polyps (CRSwNP). While it is standard practice for surgeons to administer preoperative steroids to reduce mucosal edema and inflammation and reduce intraoperative bleeding, there is no consensus for the optimal preoperative steroid dosing regimen. This study was a double-blind, randomized controlled trial that evaluated the minimum effective preoperative steroid dose needed to improve the technical aspects and outcomes of functional endoscopic sinus surgery (FESS) in patients with CRSwNP.

Methods:
Patients with CRSwNP who are candidates for FESS were randomized to receive a low dose (10mg), moderate dose (30mg), or high dose (60mg) of preoperative prednisone five days prior to FESS. Anesthetic technique was controlled for in all patients. The differences in the Boezaart Surgical Field Visibility Scores, Modified Lund Kennedy Endoscopy Scores (MLKES), operative time, and total blood loss were compared between these three groups.

Results:
There was a trend towards a decrease in mean Boezaart scores and a decrease in mean total blood loss in the medium and high dose steroid groups compared with the low dose group. There is a downward trend in MLKES after the 5 day course of steroids in the medium dose group compared with the low dose group. Mean operative time was relatively unchanged between the three groups. There was a patient dropout in the high dose group due to intolerable side effects.

Conclusion:
The results suggest that a medium dose steroid regimen may achieve the optimal balance of improving the technical aspects of FESS while minimizing side effects.

Treatment outcomes in patients with chronic rhinosinusitis and immunodeficiency: A systematic review
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Background:
Immunodeficiency is a risk factor for recalcitrant chronic rhinosinusitis (CRS). Furthermore, there is no consensus on effective treatment modalities for immunodeficient CRS patients. This review aims to evaluate the existing evidence on the treatment outcomes in patients with CRS and immunodeficiency.

Methods:
MEDLINE, EMBASE, and CENTRAL were searched from inception to April 2019 for studies reporting measurable medical or surgical treatment outcomes for adult patients with CRS and underlying primary or secondary immunodeficiency.

Results:
Of the 2459 articles screened, 13 studies met the

inclusion criteria: two randomized control trials, two prospective case control studies, and nine case series. The high degree of study heterogeneity precluded a meta-analysis. Immunoglobulin replacement therapy was shown to improve sinonasal symptoms in patients with primary immunodeficiency (PID). Monotherapy with antibiotics was not linked with significant improvement in clinical, radiographic, or endoscopic outcomes. Outcomes from endoscopic sinus surgery (ESS) were reported in eight studies, which found that surgery was linked with improvement in symptoms, disease specific quality-of-life, endoscopy scores, and radiographic scores. ESS revision rates ranged from 0-25%, with most studies reporting an average rate of 15%. Limited ESS in this context was shown to have a higher revision rate compared to more extensive surgery (25% vs. 15%, respectively).

Conclusion:
Patients with CRS and immunodeficiency likely benefit from ESS based on the available evidence. Data supporting medical therapy in this targeted population is limited overall, but there is a potential role for immunoglobulin therapy in PID improving CRS.

TSLP and type 2 inflammatory cytokines in CRS, emerging endotypes

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Background:
Thymic stromal lymphopoietin (TSLP) is found in sinonasal tissues as well as mucus and triggers a type 2 inflammatory response. The aim of this study was to examine the presence and relationship between TSLP and various type 2 inflammatory cytokines in patients with and without chronic rhinosinusitis (CRS).

Methods:
Solid-phase sandwich ELISA was used to analyze protein levels in mucus (n=48), plasma (n=17), inferior turbinate (n=25), middle turbinate (n=26), and polyp (n=30) tissue, in patients with CRS with nasal polyps and controls without CRS (n=11). Tissue, mucus, and plasma were examined for the presence of TSLP, IL-4, IL-13, 15-LO-1, and CCL-26. Statistical analysis included Mann-Whitney U two-tailed test, and Linear regression with Pearson correlation coefficient test.

Results:
TSLP was elevated in the turbinates of CRS patients when compared to non CRS controls (p=<.05). IL-4 was elevated in polyps, and turbinate tissue (p=<.05). TSLP levels correlated only with IL-4 levels. This was demonstrated in polyps, mucus, and turbinates (p=<.05). Turbinate TSLP (p=<.05) correlated with worse pre and post operative SNOT-22 scores. Mucus IL-4 from CRS patients correlated with exhaled nitric oxide (FeNO) levels.

Conclusion:
The correlation between TSLP and IL-4 at the tissue level suggests a selective relationship in the local type 2 inflammation TSLP promotes. TSLP in CRS patients could be used in patient education regarding expected outcomes of sinus surgery. Future studies will examine a greater cohort of CRS as well as control patients in an effort to further elucidate both the cytokines present and their relationships to one another as well as patient characteristics/outcomes.

Unbiased measure of health-related qol in CRS reveals dominant modifiers in qol

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Introduction:
Chronic rhinosinusitis (CRS) is associated with a significant decrease in general health-related quality of life (QOL). The EuroQol 5-dimensional questionnaire measures general health-related quality of life through a health utility value (EQ-5D HUV)—based on 5 domains reflecting mobility, self-care, activities of daily life, pain/discomfort and anxiety/depression—and an unbiased visual analog scale (EQ-5D VAS). We sought to identify characteristics of chronic rhinosinusitis (CRS) patients with a high EQ-5D HUV but low EQ-5D VAS score.

Materials and methods:
Retrospective cross-sectional study of 300 CRS patients. All patients completed a 22-item Sinonasal Outcome Test (SNOT-22)—from which nasal, sleep, ear/facial discomfort and emotional subdomain scores were calculated, as well as the EQ-5D. Only patients with EQ-5D HUV equal to 1.0 (reflecting perfect health) were included. Low EQ-5D VAS was defined as a score less than 80.

Results:
On multivariate analysis, low EQ-5D VAS was associated with only the SNOT-22 sleep subdomain score (odds ratio [OR]=1.07, 95%CI: 1.02–1.12, p=0.003). Comorbid asthma was also associated with lower EQ-5D VAS (OR=2.16, 95%CI: 1.02–4.59, p=0.045). In contrast, polyps were negatively associated with having a lower EQ-5D VAS (OR=0.34, 95%CI: 0.17–0.69, p=0.003).

Conclusion:
There are patients with perfect general health-related QOL according to a health utility value-based meth-

odology (like the EQ-5D HUV) who report low general health-related QOL on an unbiased measure like the EQ-5D VAS. In CRS patients with perfect EQ-5D HUV, poor sleep and asthma were associated with low QOL on the EQ-5D VAS, while polyps were associated with higher QOL.

Under Pressure: Differentiating CRS from non-rhinologic facial pain with facial and nasal symptoms

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Background:
In patients with facial pain/pressure, differentiating chronic rhinosinusitis (CRS) from non-rhinogenic etiologies is an important step to developing an effective treatment plan.

Objective:
To evaluate the diagnostic utility of facial and nasal symptoms in distinguishing CRS and non-rhinogenic disorders.

Methods:
Data were collected prospectively on consecutive patients presenting for rhinologic evaluation of facial pain and pressure. All patients underwent complete history and physical examination, nasal endoscopy, computed tomography of the paranasal sinuses (CT), and completion of the 22-item SinoNasal Outcome Test (SNOT-22) with additional scores utilizing the same 6-point Likert scale (0-5) to describe their facial pain (FPa), facial pressure (FPr), nasal congestion (NCng), and nasal obstruction (NObs) separately. Diagnoses were established utilizing published criteria. The Mann-Whitney U test, receiver operating characteristic (ROC) curve analysis, and measures of diagnostic accuracy were calculated.

Results:
The analysis included 99 patients (50 CRS and 49 non-rhinogenic). CRS patients described lower FPa scores (p=0.007) and higher NObs scores (p=0.009) than non-rhinogenic patients, while differences were not observed in FPr (p=0.712) or NCng (p=0.102). ROC analysis demonstrated optimal cut-off scores of 2 for both NObs (PPV 65%) and FPa (NPV 77%). High predictive values were also found comparing relative severity of the symptoms, including FPr > FPa (PPV 75%) and NObs > NCng (PPV 67%). Combining these two variables resulted in 100% specificity and 100% PPV for CRS.

Conclusion:
Facial and nasal symptom scores help to accurately differentiate CRS from non-rhinogenic facial pain/pressure conditions.

Validation of sinus drug delivery CFD modeling with in vitro gamma scintigraphy

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Background:
Chronic rhinosinusitis (CRS) is a prevalent and disruptive disease. Medical management including nasal steroid sprays is the primary treatment modality. Computational fluid dynamics (CFD) has been used to characterize sinonasal airflow and intranasal drug delivery; however, variation in simulation methods indicates a need for large scale CFD model validation.

Methods:
Anatomic reconstructions of pre and post-operative CT scans of 3 FESS patients were created in MimicsTM. Fluid analysis and drug particle deposition modeling were conducted using CFD methods with FluentTM in 18 cases. Models were 3D printed and in vitro studies were performed using Tc99-labeled Nasacort. Gamma scintigraphy signals and CFD-modeled spray mass were post-processed in a superimposed grid and compared. Statistical analysis using overlap coefficients (OCs) evaluated similarities between computational and experimental distributions and Kendall's tau rank correlation coefficient was employed to test independence.

Results:
OCs revealed strong agreement in percent deposition and grid profiles between CFD models and experimental results (mean [range] for sagittal, axial, and coronal grids were 0.69 [0.57], 0.61 [0.49], and 0.78 [0.44], respectively). Kendall's tau values showed strong agreement (average 0.73) between distributions, which were statistically significant ($p < 0.05$) apart from the sagittal grid in a single case.

Conclusion:
CFD modeling demonstrates statistical agreement with in vitro experimental results. This validation study is the largest of its kind and supports the applicability of CFD in accurately modeling nasal spray drug delivery and using computational methods to investigate means of improving clinical drug delivery.

POSTER PRESENTATIONS

ARS 66th Annual Posters

A drug release and pharmacokinetic evaluation of novel mometasone furoate eluting matrices
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Background:
Intranasal corticosteroid sprays (INCS) used to treat chronic rhinosinusitis (CRS) are suboptimal due to limited penetration into the middle meatus, rapid clearance, and poor compliance. A bioresorbable, elastomeric drug matrix, developed with the XTreoTM drug delivery platform, may overcome the limitations of INCS by providing continuous dosing over several months to the nidus of CRS.

Methods: Drug matrices were formulated to release mometasone furoate (MF) over 60, 90, 120, or 180 days. Matrices were placed bilaterally into the maxillary sinuses of New Zealand white rabbits. Tissue and plasma MF concentrations were measured using HPLC and LC-MS/MS. Matrices in vivo and in vitro drug release kinetics were quantified and compared to rabbits receiving Nasonex.

Results: Sustained release of MF was demonstrated in vitro and/or in vivo for durations of 60-180 days. A Level A in vitro-in vivo correlation (IVIVC) was established with a time-scaling factor of 2 via the 90-day matrix. Therapeutic tissue levels of MF were achieved (>1000 ng/g) throughout the dosing duration. In contrast to variable peaks and troughs of Nasonex, sustained daily dosing via a single matrix administration is confirmed by quantifiable plasma MF concentrations over the intended dosing duration (Spearman's coefficient 0.90 and 0.97 for the 90-day and 180-day matrices, respectively).

Conclusions: MF drug matrices provided efficient dosing to tissue. Sustained drug elution was confirmed both in vitro and in vivo and an IVIVC was established. The novel XTreoTM matrix technology may provide precisely tuned drug delivery to sinus tissues out to 180 days in a single administration.

A prospective prevalence study of chronic rhinosinusitis associated with inflammatory bowel disease
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Background:
Inflammatory bowel disease (IBD) is characterized by chronic inflammation of the gastrointestinal tract. Extra-intestinal manifestations such as pulmonary diseases have been reported. Chronic Rhinosinusitis (CRS), an inflammatory condition of the sinonasal mucosa, has been associated with several lung diseases. Given the relationship between lung and intestinal pathologies, and lung and sinus pathologies, we aimed to determine the prevalence of IBD amongst CRS patients.

Methods:
Pilot prevalence study. 94 CRS patients were screened for IBD symptoms from October 2018 to January 2020. Patient-reported disease symptoms and overall quality of life was evaluated using the SNOT-22, SIBDQ and EQ-5D-5L questionnaires. The Modified Lund-Kennedy (MLK) endoscopic and Lund-Mackay grading systems were used to confirm CRS diagnoses. Individuals who reported subjective symptoms of IBD were referred to a gastroenterologist clinic for further diagnostic procedures.

Results:
19 of the 94 (20.2%, 95% CI: 12.6%, 29.8%) CRS patients reported symptoms of IBD and 4 individuals (4.26%, 95% CI: 1.17%, 10.5%) were subsequently diagnosed with IBD. Compared to patients without IBD symptoms, those with symptoms reported significantly worse SNOT-22 ($p=0.002$), SIBDQ ($p<0.05$), and EQ-5D-3L ($p=0.0063$) scores. However, these patients did not exhibit significantly different MLK ($p=0.81$) or LM ($p=0.04$) scores.

Conclusion:
The prevalence of IBD may be elevated among individuals with CRS relative to the general Canadian population. This pilot study suggests that CRS with IBD is associated with lower quality of life. Further cross-sectional studies with larger sample sizes are required.

Adjunctive techniques to dacryocystorhinostomy: An evidence-based review with recommendations

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Background:
There are many adjunctive techniques available for dacryocystorhinostomy (DCR), with varying levels of supportive evidence.

Methods:
Literature from Pubmed, EMBASE, and Cochrane Databases from Jan 1990 to Jan 2020 were reviewed to examine adjunctive techniques to DCR including mucosal flap preservation, concurrent septoplasty, use of stents, topical application of mitomycin C and 5-fluorouracil, and use of perioperative antibiotics and steroids. Recommendations were made based on the evidence found.

Results:
We examined 7 adjunctive techniques used in DCRs. The literature supported concurrent septoplasty when septal deviation is present. Silicone stents are recommended for external DCR approaches. Mitomycin C use is supported in external DCR and revision cases. The literature does not support the routine use of silicone stents or mitomycin C in primary endoscopic DCR. Mucosal flap preservation is an option with evidence showing comparable results with or without utilization. The level of evidence is limited for topical 5-fluorouracil as well as perioperative antibiotic and steroid usage.

Conclusion:
Recommendations for adjunctive techniques to external and endoscopic DCR surgeries can be made based on the current literature. Higher-level studies are needed to better optimize perioperative methods for DCR.

Allergen sensitization patterns in chronic rhinosinusitis subtypes

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Introduction:
We sought to characterize the prevalence of IgE-mediated perennial and protease allergen sensitization in patients with allergic rhinitis (AR), chronic rhinosinusitis (CRS), and CRS subtypes, in order to potentially identify sensitization patterns.

Methods:
We performed a retrospective review of patients with CRS or AR who underwent allergy skin testing between 2016 and 2018 at a tertiary academic otorhinolaryngologic allergy clinic. The likelihood of perennial and protease sensitization was compared between AR and CRS groups, and further analyzed among CRS subtypes using multiple-variable logistic regression.

Results:
515 patients were identified, 341 diagnosed with CRS and 171 diagnosed with AR. Perennial and protease allergen sensitization were more prevalent than seasonal and non-protease allergen sensitization among patients with CRS and patients with AR ($p<0.01$). In comparisons between CRS and AR, there was no difference in likelihood of perennial or protease allergen sensitization (OR perennial: 2.35, $p=0.39$; OR protease 0.64, $p=0.45$). Comparing CRS with nasal polyposis, CRS without nasal polyposis, allergic fungal rhinosinusitis, and aspirin-exacerbated respiratory disease, there was a higher prevalence of perennial and protease allergen sensitization within all subtypes ($p<0.01$), but no difference between subtypes.

Conclusion:
Among patients with CRS and allergic sensitization, the prevalence of perennial and protease allergen sensitization is greater than seasonal and non-protease allergens but similar to that of AR. This pattern is consistent across CRS subtypes.

An atypical, asymptomatic case of life-threatening rhino-cerebral mucormycosis

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Background:
Mucormycosis is a rare, aggressive, angioinvasive and often rapidly life-threatening disease that primary affects high-risk patients. Rhinocerebral mucormycosis is disseminated following inhalation of fungal spores into the paranasal sinuses that can eventually invade the central nervous system and lead to death (Galletti et al, 2019).
Rhinocerebral mucormycosis has been reported both as an acute as well as chronic presentation (Dimaka et al, 2014; Galletti et al, 2019). We report an atypical presentation of rhinocerebral mucormycosis in an immunosuppressed patient.

Methods:
We report on the atypical presentation of a 73 year old male patient with a background of chronic myelomonocytic leukaemia who was brought into hospital via ED following a fall. He was incidentally noted to have a red and swollen right eye with no symptoms and was consequently commenced on intravenous antibiotic treatment for possible periorbital cellulitis with antifungal cover that showed a poor response after 3 weeks. CT imaging revealed features of preseptal cellulitis, right pansinusitis with a break in the lateral wall of the ethmoid sinus.

Results:
The patient required two FESS procedures for sampling and debridement and histology revealed chronic inflammation consistent with mucormycosis. The patient was managed with an extensive course of antifungal treatment and made a good and gradual recovery.

Conclusions:
Mucormycosis should be considered in high risk patients presenting with features mimicking periorbital cellulitis. This was an atypical presentation as the patient described no rhinological/sinugenic symptoms, was only taken to theatres 3 weeks post-admission and had a good recovery despite his immunosuppressed status.

Analysis of public search queries relating to anosmia in the novel Coronavirus-2019 pandemic

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Introduction:
Coronavirus-Disease-2019 (COVID-19) can be heralded by anosmia as a major symptom in up to 60% of patients. The primary objective of this study was to characterize the temporal and geospatial distribution of anosmia in internet search queries, with direct correlates to changes in COVID-19 case volumes across the United States.

Methods:
We identified keywords "anosmia", "loss of smell" and "can't smell" to reflect searches relating to anosmia. Using normalized search volumes, Google Trends analysis was used to monitor the geospatial and temporal distribution of anosmia-related search queries. Similarweb technologies data were used to extract US website utilization for anosmia search queries from January to March 2020. COVID-19 positive results were determined from data reported by the CDC and state health departments.

Results:
As of April 17, 2020, New York, New Jersey, and Connecticut had the most anosmia-related search queries. In January and February 2020, search queries were at just 1.8% of the peak search volume on March 23, 2020. In March, searches for anosmia-related terms increased to 73,600, a 177% increase from February queries. The top websites resulting from queries in March were nytimes.com (10.1%), cnn.com (9.0%), and washingtonpost.com (5.7%), with "other" websites accounting for 48.5% of searches.

Conclusion:
States with high prevalence of COVID-19 showed significant increases in searches pertaining to anosmia during peak times of disease. Patients investigating their loss of smell have been routed to a wide variety of online resources. Further research is needed to explore the association between symptom-related search queries and disease incidence and prevalence.

POSTERS

Anosmia Google search and COVID-19 in the US

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Background:
Official COVID-19 counts can be unreliable due to insufficient testing. Prior reports suggest that Google Search Trends (GST) for symptoms may provide insights into infectious disease spread. Anosmia is frequently reported with COVID-19 and proposed as a potential search term for COVID-19 in a recent multi-country study. We aim to evaluate the association of GST with COVID-19 incidence at the subnational level in the United States.

Methods:
GST data for anosmia and dysgeusia-related search terms was compared to official case and death numbers for COVID-19 in the US. Geographic and time-based analyses were performed from the first US case of COVID-19 on 1/21/20 to present(4/16/20), with a pivot date of 3/20/20 to delineate the first report of anosmia associated with COVID-19. GST in early (1/21/20-3/19/20), late (3/20/20-4/16/20), and composite periods were analyzed and assessed with Pearson and Spearman tests.

Results:
Relative search volumes (RSV) for anosmia and dysgeusia-related terms significantly correlate with cumulative COVID-19 cases (0.572, $p<0.001$) and deaths (0.597, $p<0.001$) by state over the composite time period. In the early period, the correlation of cases (-0.167, $p=0.242$) and deaths (-0.032, $p=0.825$) is absent. In the late period, national search interest over time is inversely correlated with cases (-0.598, $p<0.001$) and deaths (-0.598, $p<0.001$).

Conclusion:
Anosmia-related search data may not be a reliable indicator for COVID-19. Increased media coverage since first report of anosmia with COVID-19 can drive RSV, and confound GST reliability. Our findings support the ecological fallacy that national associations may not exist at the subnational level.

Antibiotic use following functional endoscopic sinus surgery

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Objective:
This study analyzes surgical outcomes for patients with and without postoperative antibiotic use following functional endoscopic sinus surgery (FESS).

Methods:
A retrospective medical chart review of patients who underwent FESS (n=108) from October 2019–December 2019 was conducted. Groups included patients discharged on antibiotics due to evidence of intraoperative infection (n=17), patients discharged on prophylactic antibiotics (n=30), and patients who did not receive antibiotics (n=42).

Results:
Analysis of postoperative complications (ie: epistaxis, acute sinusitis requiring antibiotics), number of postoperative debridements and evidence of nasal adhesions on endoscopic evaluation at three postoperative visits revealed no difference between the three groups. Additionally, there were no significant differences in sinonasal morbidity between patients who received prophylactic antibiotics and those who received none. Mean SNOT-22 scores were not found to be significantly different, however, the mean rhinologic SNOT-22 subscore at three months postoperatively was found to be significantly lower in patients who received antibiotics for intraoperative infection, compared to patients given antibiotics prophylactically and those who received none, 8.53 vs. 19.80 vs. 15.21, respectively ($p=0.006$).

Conclusion:
Postoperative antibiotics in patients without obvious intraoperative infection do not appear to make a significant difference in postoperative infection rates, SNOT-22 scores, or complications. It may be reasonable to only offer postoperative antibiotics after routine FESS in cases where there is evidence of infection at the time of surgery.

Anxiety and opioid use after ESS

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Background:
In the ongoing effort to combat the opioid epidemic, there is a great need to understand pain and opioid-use patterns by patients undergoing endoscopic sinus surgery (ESS). Anxiety has been linked to increased pain following orthopedic and trauma surgery, but whether this holds true for ESS is unknown.

Methods:
Patients undergoing ESS between November 2019 and March 2020 were prospectively enrolled. Preoperatively, patients completed medical questionnaires including the generalized anxiety disorder 2-item, patient health questionnaire-2, and the sinonasal outcome test (SNOT-22). Patients were asked to quantify facial pain and opiate consumption every 48 hours following surgery via telephone calls. Electronic medical records and the Oregon prescription drug monitoring database were reviewed.

Results:
Data was collected on 108 patients. 29% of patients did not utilize opioids post-operatively. Patients who utilized opioids consumed a mean of 61 milligrams morphine equivalent (MME). 31% of patients screened positive for anxiety. Patients with anxiety had higher facial pain on postoperative day (POD) 2 and POD4 and used more opioids than those without anxiety (76.4 MME with anxiety, 33.4 MME without anxiety, p=0.03). Higher preop anxiety level about surgery was associated with increased post-operative opioid use (p<0.01). 24% of patients screened positive for depression. Patients with depression reported higher facial pain on POD2 and POD4 but did not use more opioids. Higher SNOT-22 and performance of a septoplasty were not correlated with increased opioid consumption.

Conclusion:
Preoperative anxiety but not depression is associated with increased opioid consumption following endoscopic sinus surgery.

Are routine type and screens cost-effective in transsphenoidal surgery?

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Background:
Many institutions rely on outdated protocols to guide preoperative type and screen (T&S) requirements in transsphenoidal surgery. Our objective was to determine blood transfusion rates for patients undergoing common transsphenoidal procedures, ascertain factors associated with receiving transfusions, and evaluate the cost-effectiveness of preoperative T&S practices.

Methods:
The 2006-2015 National Inpatient Sample (NIS) was queried to identify patients undergoing endoscopic endonasal approaches for hypophysectomy, craniopharyngioma, and CSF leak repair. A total of 93,516 cases were identified. Transfusion rates were then determined from NIS data. A cost-effectiveness analysis was performed to determine the incremental cost-effectiveness ratio (ICER) of obtaining preoperative T&S to prevent emergency-release transfusion (ERT), with a willingness to pay threshold of $1,500.

Results:
The overall transfusion rate was 2.1%. On multivariate modeling, statistically significant factors associated with receiving a transfusion included non-elective admission (OR 2.8), anemia (OR 4.68), coagulopathy (OR 5.09), congestive heart failure (OR 2.05), liver disease (OR 2.27), pulmonary circulation disorders (OR 3.22), and metastatic cancer (OR 7.50). The ICER of preoperative T&S was $3,303 per ERT prevented. One-way sensitivity analysis demonstrated that the risk of transfusion should exceed 4.35% to justify preoperative T&S.

Conclusions:
Routine collection of preoperative T&S does not represent a cost-effective practice in transsphenoidal surgery using nationally representative data. A selective T&S policy for patients with cardiopulmonary disease, anemia, coagulopathy, liver disease, and metastatic cancer can reduce costs.

POSTERS

Assessing the academic influence of otolaryngologists on sinus and allergy research

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Background:
Established by the National Institutes of Health (NIH), the novel iCite resource employs the Relative Citation Ratio (RCR) to quantify research influence. This analysis evaluates the academic influence of rhinologic scholarship, delineating the impact of otolaryngologists, allergists/immunologists, and other specialists.

Methods:
Topics including allergic rhinitis (AR), chronic rhinosinusitis (CRS), nasal polyps, allergy immunotherapy, food allergies, and inhalant allergies were identified in a top-down RCR approach for publications from 2011-2016. Beyond RCR, the number of citations per article was divided by citation number measuring production in the corresponding domain. Articles were categorized into basic, clinical, or database subcategories. Scholarly qualifications of the first, second, and last authors were queried.

Results:
In CRS and NPs, otolaryngologists comprised 72.5% and 73.4%, respectively, of influential authors (IAs) (compared to other specialties – RCR 4.22 vs. 3.72, RCR 5.07 vs. 4.20). In the disciplines of AR, immunotherapy, and food/inhalant allergies, the contribution of otolaryngologists was modest. For AR, otolaryngologists comprised 10.3% of IAs. For immunotherapy inquiry, otolaryngologists comprised only 2.7% of the IAs. In the field of food/inhalant allergies, the contribution of otolaryngologists was 0% (RCR, 0 vs. 7.40), (RCR, 0 vs. 5.61).

Conclusion:
Employing the novel iCite database and RCR system made available by the NIH, otolaryngologists contribute meaningful scientific influence in studying CRS and NP. In contrast, PIs trained in medicine subspecialties harbored substantial contributions when examining inquiry studying immunotherapy, AR, and food/inhalant allergies.

Assessing use and popularity of publicly available online videos in rhinology

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Objectives:
The use of video recording has become commonplace in rhinologic surgical cases and in evaluating patients in the office, greatly enhancing education, teaching surgical techniques, and highlighting unique cases. This study aimed to analyze and describe publicly available rhinology-specific videos.

Materials and Methods:
A video search was performed on YouTube using terms related to rhinology, yielding 4,263 videos. After further examination for relevance of each video, a total of 149 videos were found. Number of total views, likes, dislikes, video length, comment count, and time since video was uploaded were recorded. Academic versus private setting uploaded videos were compared and the popularity of each video was determined by calculating the Video Power Index (VPI).

Results:
There were 123 videos uploaded independently and 26 videos uploaded by an academic institution. Privately uploaded videos were viewed 108,377,701 times with an average of 881,119 +/- 8,121,470 views per video compared to 394,048 total views and 15,156 +/- 16,399 views per video for academic setting uploaded videos. Videos uploaded by academic institutions were typically longer (347.7 +/- 201.4 seconds) compared to private setting uploaded videos (287.2 +/- 405.1 seconds). Academic videos were statistically more likely to have more likes than dislikes ($p<0.001$) and have a higher VPI ($p=0.01$) with 92.3 +/- 7.4% and 9.6, respectively, compared to 86.5 +/- 15.6% and 4.1, respectively, for private setting uploaded videos.

Conclusions:
Endoscopic videos are rapidly growing in prominence and remain an important part of patient and resident/fellow education, as well as widely add value to the otolaryngology community.

Assessing web-based audiovisual multimedia for patient education in skull base surgery

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Background:
The Internet presents a rich milieu of multimedia options relating to pituitary and endoscopic skull base surgery (ESB). Misinformation creates discordance between patient and provider expectations. The purpose of this study is to analyze the quality of available ESB audiovisual patient information on YouTube and Google.

Methods:
The top 50 videos generated by searching “pituitary surgery” and “endoscopic skull base surgery” in both YouTube and Google were sorted by relevance. Two independent reviewers evaluated each for understandability and actionability based on the Patient Education Materials Assessment Tool. Institution, authorship, audience, and education/advertisement variables were collected. Chi-square test followed by univariate analysis was used to assess the association between variables and quality.

Results:
85 videos (52 YouTube and 33 Google) met inclusion criteria for analysis. There was no significant difference in the aforementioned variables between YouTube and Google ($p<0.05$). 72% of videos targeted patients and 28% targeted surgeons. Academic institutions uploaded 58% of videos. Surgeon-targeted videos were more educational ($p=0.01$); patient-targeted videos involved more advertisement ($p=0.01$). Understandability and actionability scores were below the 70% threshold for both YouTube (65±15, 38±33, $p=0.65$) and Google videos (66±12, 38±26, $p=0.94$). Patient-targeted videos ($p=0.002$) were more understandable; surgeon ($p<0.001$) and education focused videos ($p<0.001$) were more actionable.

Conclusion:
Understandability and actionability of YouTube and Google audiovisual patient information on ESB is poor. Consideration should be given to the formation of a standardized patient information resource.

Association of environmental factors with allergic rhinitis

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Background:
Allergic rhinitis (AR) is a widely prevalent condition, but significant knowledge gaps remain in the literature. There is a need for improved understanding of the risk factors for the development of AR. The purpose of this study was to assess the association of exposure to environmental factors, such as pollutants and tobacco smoke, with AR symptomatology.

Methods:
This cross-sectional study was conducted on data for 10,110 adults documented in the Asthma IQ database. AR was defined as having one of the following four symptoms: sneezing, nasal congestion, rhinorrhea or postnasal drip, and itchy nose or throat. Associations of exposure to pollutants, aeroallergens, and primary or secondary tobacco smoke, with AR were determined using adjusted logistic regression analyses. Odds ratios (OR) were calculated.

Results:
There were 3,380 (33%) adults with AR. Of those with AR, 2,392 (71%) were Caucasian, and the mean age was 46±17 years. Patients with a history of exposure to pollutants (OR: 1.4; 95% CI: 1.2-1.5; $p<0.05$) or aeroallergens (OR: 1.9; 95% CI: 1.7-2.1; $p<0.05$) were more likely to have AR. Exposure to primary (OR: 1.0; 95% CI: 0.9-1.2; $p>0.99$) or secondary (OR: 1.3; 95% CI: 0.9-1.8; $p>0.15$) tobacco smoke was not significantly associated with AR.

Conclusions:
Exposure to pollutants or aeroallergens was associated with AR in adults. These results suggest that exposure to primary or secondary tobacco smoke is not associated with AR in adults. Understanding the risk factors for AR may aid clinicians in the diagnosis and management of AR.

POSTERS

Association of quality of life measures and otolaryngologic care in Cystic Fibrosis patients

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Introduction:
Proper management of chronic rhinosinusitis among patients with cystic fibrosis (CF) is an important factor in improving quality of life and reducing airway exacerbations. Otolaryngologists are critical in controlling symptoms. We sought to characterize the level of otolaryngologic involvement and evaluate a role for quality-of-life measures to guide utility and timing for treatment of CF-related sinus disease.

Methods:
We performed a prospective, cross-sectional study of 105 consecutive patients presenting to a CF-accredited clinic between July-September 2018. Demographic data & sinus surgery history were collected with Sino-Nasal Outcome Test (SNOT-22) and Questionnaire of Olfactory Disorders (QOD-NS) scores. Analysis was conducted using chi-square, t-test, and univariate regressions.

Results:
Baseline well-care visits accounted for 71.4% of all evaluations. Prior otolaryngology evaluation was noted in 69 (66%) patients and 63 (60%) patients had a history of ESS. The average QOD-NS score was 5.49 (SD=6.44) for patients referred to otolaryngology and 3.21 (SD=5.71) for non-referred patients (p=0.09). The average SNOT-22 score was 33.1 (SD=20.5) for referred and 25.1 (SD=18.8) for non-referred patients (p=0.05). We found no correlation between SNOT-22 and QOD-NS (R2 of 0.19). SNOT-22 of 18 or more had significantly more otolaryngology referrals (p=0.033) and ESS (p=0.047). No QOD-NS score cut-off exhibited a significantly higher rate of ENT referral or ESS.

Conclusion:
CF patients with symptoms resulting in worse quality of life assessments were more likely to have otolaryngologic care. Further validation of the utility of these questionnaires in prompting multidisciplinary care is necessary in the CF population.

Awareness and understanding of empty nose syndrome

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Background:
Empty nose syndrome (ENS) remains a rare and controversial complication of turbinate reduction. We aim to evaluate the awareness of ENS, identify symptoms additional to those in ENS6Q, and recognize common reasons that confound for ENS.

Methods:
A retrospective review of new ENS evaluations between Jan-2015-Jan-2020 (n=185) was undertaken. Year of encounter, type of referral, symptoms reported, and assessments were recorded. Patients were classified as ENS+ (n=97) based on baseline ENS6Q score≥11 and a positive cotton test, or ENS- (n=88).

Results:
We identified a significant positive trend in annual patients referred for ENS evaluation (slope=6.7, p=0.0422) but none in self-referred patients (slope=0.2, p=0.8149). The difference between the trends is significant (p=0.0219). Prevalent physical complaints of ENS+ patients were post-nasal drip (33.0%), facial pain/pressure (30.9%), anterior nasal drainage (26.8%), and sleep disturbance (23.7%). Psychological complaints included suicidal ideation/depression (7.2%) and anxiety (6.8%). Common diagnosis of ENS- patients incorporated turbinate hypertrophy (30.7%), septal deviation (22.8%), anterior inferior turbinate tissue loss (14.8%), septal perforation (14.8%), and nasal vestibular body hypertrophy (13.6%).

Conclusion:
The positive trend in practitioner-referrals for ENS evaluation reflects an increase in awareness of ENS between providers but not the general public. However, the high proportion of ENS- patients out of all ENS evaluations may imply a misconception of ENS. The list of symptoms compiled may therefore aid as minor criteria related to ENS in addition to the ENS6Q to help practitioners better recognize this debilitating syndrome.

BRAF V600E and KRAS gene expression in human nasal polyposis

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Background:
Nasal polyposis (NP) is a common, chronic inflammatory disease of the nasal and sinus mucosa with unknown etiology. The aim of this study is to verify the relationship with nasal polyposis and KRAS and BRAF gene mutations.

Methods:
Thirty-two (32) patients were included in the study group. Three patients were excluded from the study for various reasons. Small pieces of the biopsies were taken from some nasal polyposis during operation, and immediately frozen in liquid nitrogen. For the control group (same patients), punch biopsies were obtained from the lower inferior turbinate or septum mucosa in the same operation, and these samples also were frozen in liquid nitrogen. Total RNA isolations were performed by using the Trizol method. cDNAs were generated via oligo dT primers with commercial cDNA Synthases Kit. KRAS and BRAF gene expression analyzes carried out by Real-Time PCR method by using the specific primers and normalized with GAPDH gene. Additionally, clinic and radiologic findings of these patients were evaluated with the genetic analysis.

Results:
In KRAS nasal polyp gene expression, although decreased in 8 of 29 patients, increased in 21 of 29 patients when compared with control biopsies.This statistical analysis showed that there was a significant difference between the results of the polyps and control samples (p=0.023). Like as KRAS, a decrease in gene expression of BRAF were seen in 6 patients, and increase were seen in 23 patients (p=0.011).

Conclusions:
We found that BRAF and KRAS gene mutations could play a role in the formation and possible recurrence of nasal polyposis. This finding is compatible with a genetic background of the disease.

Calvarium thinning in spontaneous cerebrospinal fluid leak patients

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Background:
Patients with spontaneous cerebrospinal fluid leaks (sCSF-L) of the temporal bone have obesity-independent, isolated calvarial and skull base thinning. The objective of this study was to determine calvarium thickness in patients with sCSF-L of the anterior skull base (ASB).

Methods:
A retrospective cohort study of patients who underwent surgical repair of an ASB sCSF-L from 2015 to 2019 compared to non-obese (body mass index, BMI < 30 kg/m2) and obese (BMI ≥ 30) control groups was conducted. All patients with high-resolution maxillofacial computed tomographic (CT) imaging were included. Calvarium and extracranial zygoma thicknesses were computed bilaterally with blinded, standardized volumetric analysis (n = 42 in the ASB sCSF-L group, n = 50 in each control group).

Results:
ASB sCSF-L patients had a mean [SD] age of 50.43 [10.19] years, an average [SD] BMI of 38.81 [8.92] kg/m2, and most were female (85.71%). The calvarium in patients with ASB sCSF-L was significantly thinner than the non-obese (2.55 mm [0.77] vs. 2.97 [0.67]; p = 0.006; 95% CI, 0.12 to 0.30; Cohen d, 0.58) and obese control groups (2.55 [0.77] vs. 2.92 [0.76]; p = .02; 95% CI, 0.05 to 0.34; Cohen d, 0.66). There was no significant difference in calvarium thickness between the two control groups. There was also no significant difference between the extracranial zygoma thickness among the three groups (ANOVA, p = 0.33).

Conclusions:
ASB sCSF-L patients have isolated calvarial thinning that is independent of obesity.

POSTERS

Cardiovascular comorbidities and the anterior skull base

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Background:
To investigate the association between various cardiovascular comorbidities and their effects on patients undergoing anterior skull base procedures with respect to hospital course duration, total operation time, and different postoperative complications.

Methods:
The 2005-2016 National Surgical Quality Improvement Program (NSQIP) database was used. Independent t-test and logistic regression were used to determine the independent effect of covariates on hospital course and postoperative complication rates. Retrospective database review of 4053 individuals.

Results:
Patient cohort of 4053 individuals were identified who underwent an anterior skull base surgery by either neurosurgeons alone or with ENT assistance. Independent t-test revealed that patients with the comorbidities of anti-hypertensive medication (6.01 vs 5.85 days, p=0.020) and diabetes (7.34 vs 5.68 days, p=0.001) undergoing skull base procedures experienced increased length of total hospital stay. However, patients with comorbid diabetes experienced decreased operation times (219 vs 226 minutes, p=0.039). Anesthesia length was decreased in patients with comorbid anti-hypertensive use (295.5 vs 316.5 minutes, p=0.001) and comorbid peripheral vascular disease (226.1 vs 311.2 minutes, p=0.05). No associated differences were found in patients with comorbid CHF, MI, angina, or intervention. Multivariate regression of overall complication risk revealed no significantly elevated risk of postoperative complications in patients with these comorbidities.

Conclusions:
While there were no significant differences in postoperative complications overall in patients with cardiovascular comorbidities, there was a statistical association with procedure timing.

Cardiovascular comorbidities and the posterior skull base

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Objectives:
To investigate the association between various cardiovascular comorbidties and their effects on patients undergoing posterior skull base procedures with respect to hospital course duration, total operation time, and different postoperative complications.

Study Design:
Retrospective database review

Methods:
The 2005-2016 National Surgical Quality Improvement Program (NSQIP) database was used. Independent t-test and logistic regression were used to determine the independent effect of covariates on hospital course and postoperative complication rates.

Results:
Patient cohort of 4239 individuals were identified who underwent an posterior skull base surgery by either neurosurgeons alone or with otolaryngologist assistance. Independent t-test revealed that patients with history of angina undergoing posterior skull base procedures experienced decreased total operation time (109.7 vs. 339.6, p=.045). Additionally patients with history of TIA (99.0 vs 78.1 hours, p< 0.001) and CVA (83.5 vs 77.8 hours, p=.034) both experienced increased length of surgical stay. Lastly, patients with history of type 2 diabetes were found to have increased total length of hospital stay (7.9 vs 6.4 days, p< 0.001). Multivariate regression analysis of overall complication risk revealed no significantly elevated risk of postoperative complications in patients with these cardiovascular comorbidities.

Conclusions:
While there were no significant differences in postoperative complications overall in patients with cardiovascular comorbidities, there was a statistical association between the specific morbidity and factors related to the posterior skull base procedures.

Centralization of care and patient travel for transsphenoidal surgery of the pituitary

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Introduction:
The benefits of care centralization for transsphenoidal surgery (TSS) of the pituitary have been studied. However, the effect of centralization on patient access to care, especially travel to the hospital, has yet to be established.

Methods:
From a statewide database, we identified patients who underwent TSS of the pituitary in New York from 2000-2015. Hospitals were categorized by annual caseload into low (0-25Th percentile), medium (26-75th percentile), and high (76-100th percentile) volume centers. Patients and hospitals were assigned to one of the eight health service areas (HSA). Traveling was defined as moving across HSAs.

Results:
6,468 patients underwent TSS of the pituitary at low (5%), medium (26%) and high volume (69%) hospitals. A significantly higher portion (28%) of patients who had surgery at high volume centers were traveling compared to low (3%) and medium (9%) volume centers ($p<0.001$). By 2015, the mean travel distances for high, medium and low volume hospitals were 19, 10 and 11 miles, respectively ($p<0.001$). From 2000 to 2015, the number of patients undergoing surgery at high volume hospitals significantly increased from 237 to 383 ($p<0.05$), while the number of high volume hospitals decreased slightly from 15 to 12. In the same period, the mean travel distance to high volume hospitals increased significantly from 15 to 19 miles ($p=0.045$). However, the proportion of patients traveling did not significantly change from 30% to 28% in this time period ($p=0.774$).

Conclusion:
Our results show that centralization of care towards high volume hospitals for TSS of the pituitary is occurring. This trend is associated with increased distance traveled for patients undergoing surgery at high volume hospitals.

Characterization of AERD at a single institution

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Objective:
Analyze characteristics and outcomes of (AERD) patients following treatment with biologics, aspirin desensitization (AD), and functional endoscopic sinus surgery (FESS) at a single institution.

Methods:
All patients (n=39) with AERD at our institute who underwent biologic therapy with FESS, AD with FESS, or FESS alone were included for outcome analysis.

Results:
Mean age at initial presentation was 43.59 years; 59.0% female and 66.7% Caucasian. 64.1% endorsed allergen hypersensitivity including dust, pollen, and cat/dog dander. Immunotherapy was reported at 34.2%. FESS, revision FESS, septoplasty, turbinectomy, and/or polypectomy was performed on 94.9% patients, with a mean of 2.57 revision surgeries performed on 56.8% (21 patients).
25.6% underwent biologic treatment and prior FESS, 35.8% AD and prior FESS, and 25.6% FESS alone. Sino-nasal outcome test (SNOT-22) scores were averaged for all 3 cohorts, and reported at pre-treatment and 3-4 month follow up. Scores for the AD and biologics cohorts were taken prior to therapy, but after FESS. Average pre-treatment SNOT-22 scores in the AD and prior FESS, biologic and prior FESS, and FESS only cohorts were 23, 35, and 56 respectively; average post-treatment scores were 25.5, 19, and 28.5. Asthma Control Test (ACT) scores were limited to AD + prior FESS and biologic + prior FESS, with pre-treatment average scores as 20.3 and 19 respectively, and post-treatment as 20.6 and 21.5.

Conclusion:
In this preliminary cohort, we observe a decrease in post-treatment SNOT-22 scores in the biologic + prior FESS group and the FESS only group, suggesting better therapy response in these two groups.

POSTERS

Chronic rhinosinusitis in patients with spontaneous cerebrospinal fluid leak

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Background:
Chronic rhinosinusitis (CRS) is known to cause osteoneogenesis while spontaneous cerebrospinal fluid (sCSF) rhinorrhea typically occurs in patients with significantly thinner skull bases. CRS affects 4.9 – 15.5% of the general population, however little is known about the incidence in patients with sCSF rhinorrhea.

Methods:
A retrospective review was performed on patients undergoing sCSF rhinorrhea repair from September 2008 to July 2019. Preoperative CTs were scored via Lund-McKay for all subjects. The relationship of sinus opacification to location of the CSF leak was evaluated.

Results:
Eighty subjects were included in the study (91% female; mean age 51y (18-79 y); mean BMI 35 (19-66)). Two (2.5%) patients had a clinical history of CRS. The cribriform plate (47.5%) and sphenoid lateral recess (20%) were the most common leak locations. 91% had an associated meningoencephalocele. All patients underwent CT sinus prior to surgery (mean 38 days pre-op; mean Lund-Mackay 1.9). 38.75% patients had no sinus opacification on CT while 52.5% had expected opacification adjacent to the region of leak. Eleven (13.75%) had opacification in areas other than the site of leak, primarily maxillary cysts or mild mucosal thickening. Only 2 patients (2.5%) had sinonasal opacification consistent with what is expected in CRS (Lund-McKay 13 and 15).

Conclusion:
In a review of 80 subjects undergoing sCSF leak repair, the prevalence of CRS identified by patient history and preoperative CT scan was notably less than the previously reported prevalence of CRS in the general population. Further studies may provide evidence that CRS is protective against spontaneous CSF leaks.

Comorbidities in chronic rhinosinusitis

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Background:
Medical comorbidities are commonly encountered in chronic rhinosinusitis (CRS) and may impact patient reported quality of life (QOL). The functional comorbidity index (FCI) is an instrument designed to account for this confounding by determining the effect of total patient comorbidities on function. The objective of this study was to determine whether CRS disease-specific QOL is independent of the effects of baseline medical comorbidities using the FCI.

Methods:
Patients meeting diagnostic criteria for CRS were prospectively enrolled in this cross-sectional study. Measures of disease status, including Sinonasal Outcomes Test-22, Lund-Kennedy and Lund-Mackay scores were recorded at enrollment. FCI was calculated retrospectively using the electronic medical record. Pearson's and Spearman's correlations followed by multivariate regression was used to assess the association between FCI and outcome measures.

Results:
103 patients met inclusion criteria for analysis. There were no significant differences in age, gender, and SNOT-22 scores between patients. The mean FCI for patients without (CRSsNP) and with (CRSwNP) nasal polyps was 2.02 and 2.24, respectively. This mean FCI score did not significantly differ between the two cohorts (p=0.565). Both FCI (p=0.01) and age (p=0.001) were significantly associated with worse SNOT-22 scores. Objective disease severity was not associated with the FCI.

Conclusion:
Total comorbidities were predictive of worse CRS disease-specific QOL as assessed by the SNOT-22, suggesting that CRS-specific QOL is indeed confounded by comorbidity status. FCI does not correlate with objective measures of disease severity.

Comorbidities of chronic alcohol use and the anterior skull base

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Background:
To investigate the association between various comorbidities related to chronic alcohol consumption and their effects on patients undergoing anterior skull base procedures with respect to hospital course duration, total operation time, and different postoperative complications.

Methods:
The 2005-2016 National Surgical Quality Improvement Program (NSQIP) database was used. Independent t-test and logistic regression were used to determine the independent effect of covariates on hospital course and postoperative complication rates. Retrospective database review of 4053 individuals.

Results:
Patient cohort of 4053 individuals were identified who underwent an anterior skull base surgery by either neurosurgeons alone or with otolaryngologist assistance. Independent t-test revealed that patients with comorbid alcohol consumption undergoing skull base procedures experienced greater anesthesia duration times (418.3 vs 307.4 minutes, p=0.04) as well as increased total operation time (329.6 vs 218.7 minutes, p=0.001). On independent t-test no associated difference were found in patients with history of comorbid ascites or esophageal varices. Multivariate regression analysis of overall complication risk revealed no significantly elevated risk of postoperative complications in patients with these comorbidities related to chronic alcohol use.

Conclusions:
While there were no significant differences in postoperative complications overall in patients with alcohol-related comorbidities, there was a statistical association between the specific comorbidities and aspects of procedure timing.

Complications from CSF leak repairs

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Objective:
Identify the prevalence of post-operative complications following anterior leak (AL) and lateral leak (LL) repair techniques.

Methods:
Retrospective chart review of patients with AL and LL repairs.

Results:
AL (n=45): 77% presented with encephaloceles and 6% with meningocele. 13% of patients presented with sinusitis treated with a course of antibiotics within 3 months of surgery (11% ultimately required surgical management), VP shunt complications (26%), and septal perforation (6%). 3 patients had postoperative leaks. Repair techniques included NSF (63%), superior turbinate flap (6%), and inferior turbinate flap (4%). There were no significant differences in sinonasal complications between NSF and turbinate flap repairs (p=0.2). LL (n=42): 92% presented with encephaloceles and 4% presented with meningoceles. 62% underwent transmastoid approach, 8% craniotomy, 29% with combined approach. Complications from LL repair included hearing loss (29%), VP shunt complications (14%), otogenic infection (29%), tinnitus (19%), VTE (2.4%), meningitis (2%). Patients undergoing a combined approach were at greater risk for complications (OR=1.2, p=0.04). 2 patients had postoperative leaks. Repair techniques included bone grafts (65%), collagen dural substitutes (DS) (45%), and DS + pericranial flap (31%). There was no significant difference in postoperative complications between repairs (p=0.3).

Conclusion:
Identifying complication rates between different approaches and repair techniques can guide clinical decision-making. For AL, NSF did not increase sinonasal morbidity when compared to other techniques, showing NSF as a versatile repair technique. For LL, there were more postoperative complications associated with combined approaches.

POSTERS

Current practices regarding middle turbinate resection among otolaryngologists

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Resection of the middle turbinate during endoscopic sinus surgery has been of controversial benefit among otolaryngologists for many years. Some studies advocate resection and have shown improved outcomes postoperatively while studies favoring preservation of the middle turbinate show a decreased incidence of postoperative complications.

We performed an electronic anonymous survey of practicing otolaryngologists regarding middle turbinate resection during endoscopic sinus surgery.

We found the majority of the 252 responders will perform a middle turbinate resection in certain clinical situations, while there is a small subset that supports never resecting the middle turbinate for inflammatory sinus disease (n=6, 2.4%). Participants were significantly more likely to perform middle turbinate resection in patients undergoing revision compared to primary endoscopic sinus surgery for all inflammatory conditions included (CRSsNP, CRSwNP, CF, AERD, AFRS). The complication of greatest concern among participants was iatrogenic frontal sinus obstruction while empty nose was of the least concern. The majority of participants responded that resection of the middle turbinate was of extreme or moderate benefit for improved visualization and drug delivery postoperatively. When compared to general otolaryngologists, fellowship trained rhinologists were less concerned about potential complications following middle turbinate resection and were more likely to perceive an extreme or moderate benefit from turbinate resection postoperatively.

In conclusion, there remains debate over middle turbinate resection, but the results of this study show the majority of otolaryngologists will perform a resection in certain clinical situations.

Development of CFD methodology appropriate for EDS performance evaluation

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Background:
Traditional CFD-models that terminate particle tracking after hitting a surface (“trap” boundary condition) do not account for liquid film buildup on the mucus deposition site. This is essential for EDS-delivery, due to the unique exhaled airflow/simultaneously emitted spray plume interaction. Droplets coalesce on sinus walls, forming a thin “wall film,” where droplets spread along the surface, splash, and/or break into secondary particles, depending on impact energy.

Methods:
Three CFD methods were applied to EDS-deposition in Draf III post-surgical geometry: using rudimentary “trap” boundary condition; using “wall film” boundary condition; and using “wall film” boundary condition with two-way coupling (to account for exhaled airflow/simultaneously emitted spray plume interaction) (ANSYS Fluent, release 2019R3). Contour plots (to visualize deposition) and data sets for each CFD model are compared with physical EDS-deposition in the same geometry (visualized by color changes with SAR-GEL-coating and fluorescein).

Results:
“Wall-film” modelling of EDS-delivery demonstrated increased surface coverage compared with the “trap” model. The “wall-film with two-way coupling” model demonstrated substantially improved deposition in remote frontal and maxillary sinuses, in agreement with physical cast experiments.

Conclusions:
CFD simulation of EDS-delivery using “wall-film” boundary condition with two-way coupling appears to best represent observations from physical experiments in the same geometry. Notably, deposition is significantly higher in the frontal/maxillary sinuses compared with one-way coupling, and the deposition pattern in both the frontal/maxillary sinuses more accurately matches findings from physical experiments.

Diabetes as a risk factor for complications following ventral skull base surgery

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Background:
Diabetes mellitus (DM) has been identified as a significant risk factor for complications in many otolaryngology procedures. This study investigates DM as a risk factor in ventral skull base surgery (VSBS).

Methods:
All VSBS from the 2005-2018 National Surgical Quality Improvement Program database were extracted using Current Procedural Terminology codes. Cases not performed by otolaryngologists or neurosurgeons were excluded, leaving a cohort of 2,394. Patients were stratified into two groups based on presence of DM.

Results:
Of the 2,394 patients who underwent VSBS, 413 (14.8%) were diabetic. The majority of DM patients were aged 61-80 (51.3%), female (51.8%), and white (53.6%). Patients with DM had an increased likelihood of having the following comorbidities: obesity, hypertension, bleeding disorders, anemia, and ASA class 3-4. On univariate analysis, the diabetic cohort had more instances of organ space surgical site infection (2.7% vs 1.1%; p=0.017), pneumonia (5.6% vs 2.6%; p=0.003), cerebrovascular accident/stroke (4.1% vs 2.1%; p=0.023), blood transfusions (13.8% vs 10.4%; p=0.040), sepsis (3.4% vs 1.4%; p=0.011), septic shock (1.9% vs 0.4%; p=0.002), overall surgical complications (17.7% vs 12.7%; p=0.008), overall medical complications (17.2% vs 10.7%; p<0.001), and any complications (28.1% vs 19.3%; p<0.001). Diabetic patients had a greater mean length of stay (7.7 vs 6.5 days; p=0.006). On multivariate logistic regression, DM was an independent predictor of cerebrovascular accident/stroke (OR 2.334; p=0.029).

Conclusion:
DM may be independently associated with heightened risk of cerebrovascular accident post VSBS. Further study is warranted to further elucidate morbidity associated with DM.

Diagnosis of anosmia: A systematic review

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Background:
Anosmia and hyposmia have many etiologies, including trauma, chronic sinusitis, and respiratory viral infections such as rhinovirus and SARS-CoV-2. We aimed to systematically review the literature on the diagnostic evaluation of anosmia/hyposmia.

Methods:
PubMed, EMBASE, and Cochrane databases were searched for articles published since January 1990 using terms combined with Medical Subject Headings (MeSH). We included articles evaluating diagnostic modalities related to anosmia that were written in the English language, used original data, and had two or more patients.

Results:
A total of 2061 unique titles were returned upon the initial search. Of these, 222 abstracts were examined, yielding 25 full-text articles meeting inclusion criteria (Level of evidence ranging from 1 to 4; most level II). The studies included a total of 12,879 patients. Diagnostic modalities for anosmia included psychosocial smell tests (such as the Sniffin' Sticks and the UPSIT), along with various imaging modalities (including MRI and CT). This review found that studies frequently utilized imaging to investigate findings among patients with olfactory dysfunction, as opposed to using imaging to primarily diagnose olfactory dysfunction.

Conclusion:
The literature includes several studies on validity and reliability for various smell tests in diagnosing anosmia.. With regards to imaging, the most widely studied modality is MRI, but criteria for the timing and sequence of imaging modalities are not unified.

POSTERS

Diet modification in AERD

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Background:
Aspirin□exacerbated respiratory disease (AERD) is the triad of asthma, nasal polyposis, and sensitivity to cyclooxygenase□1 inhibitors. Dietary modifications which affect leukotriene production have potential benefits in improving disease control.

Methods:
A systematic review of the literature was performed including PubMed, Ovid MEDLINE, and Cochrane Library from database inception to November 2019. Studies reporting dietary interventions in patients with AERD with subjective (22-item Sino-Nasal Outcome Test-22 [SNOT-22]) and objective (urine LTE4, Perioperative Sinus Evaluation [POSE] and Lund-Kennedy Endoscopic Score [LKES]) outcomes were included. Two investigators independently reviewed all abstracts.

Results:
Of the 1950 abstracts identified, 2 studies met final inclusion criteria. The studies included a total of 40 patients. 10 patients underwent a prospective, non-blinded high omega-3/low omega-6 dietary intervention for the treatment of AERD. Urinary LTE4 decreased 0.17 ng/mg (95% confidence interval [CI], −0.29 to −0.04; p = 0.02) and there was a 15.1-point reduction in SNOT-22 score (95% CI, −24.3 to −6.0; p = 0.01). No diet-associated adverse events were reported. 30 patients underwent a prospective, crossover single-blind multicenter study in which patients were randomized to either a low-salicylate diet or a regular diet. Patients had improvement in their median difference in scores when they followed the low-salicylate diet, including: SNOT-22: 15 (95% CI, 10 to 23.25), p < 0.001; POSE 6 (95% CI, 2.5 to 10), p < 0.001; and LKES: 2.5 (95% CI, 1.5 to 4), p < 0.001).

Conclusion:
Both high omega-3/low omega-6 and low-salicylate diets may be useful treatment adjuncts in patients with AERD.

Differentiation of chronic rhinosinusitis and primary headache disorder via analysis of SNOT-22

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Background:
Patients with chronic rhinosinusitis (CRS) or primary headache disorders (PHDs) can present with similar symptoms. Differentiating between the two can oftentimes be time and resource intensive for otolaryngologists and neurologists. The objective of this study was to analyze Sinonasal Outcome Test-22 (SNOT-22) score patterns in patients seen and evaluated by Neurology and diagnosed with PHD vs. patients seen and evaluated by Otolaryngology and diagnosed with CRS.

Methods:
Retrospective review of SNOT-22 scores in CRS patients diagnosed by an otolaryngologist and PHD patients diagnosed by a neurologist. Patients with concomitant PHD and CRS were excluded. PHD includes migraine, tension-type headaches, and trigeminal autonomic cephalgia.

Results:
A total of 194 patients with CRS and 32 patients with PHD were included. Total SNOT-22 scores were significantly lower for patients with PHD versus CRS (p=0.004). Patients with PHD had significantly lower scores for rhinologic (p<0.001), extranasal rhinologic (p<0.001), and ear/facial (p=0.028) symptom domains while there were no significant differences for psychologic (p=0.425) or sleep (p=0.613) symptom domains.

Conclusion:
Patients with neurologist-diagnosed PHD have lower total SNOT-22 scores, as well as lower scores on the rhinologic, extranasal rhinologic, and ear/facial domains than CRS patients. The SNOT-22 could be a useful tool for neurologists to employ when there is concern for overlapping symptoms with CRS.

Disease control after surgery for CRS: Prospective, multi-institutional validation of the SCT

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Background:
The Sinus Control Test (SCT) is a patient-reported questionnaire that assesses disease control in chronic rhinosinusitis (CRS). This prospective, multicenter study examines SCT outcomes following endoscopic sinus surgery (ESS), further validating its use as a control instrument for CRS.

Methods:
Adults with CRS undergoing ESS were prospectively enrolled from 5 centers across North America. The SCT was administered at baseline and 6 months after surgery. Quality of life and disease burden were evaluated using the Sino-Nasal Outcome Test 22 (SNOT-22), Lund-Kennedy endoscopy scores and polyp grade. Linear regression was used to determine whether specific demographic, comorbidity or disease severity measures were independently associated with changes in SCT scores postoperatively.

Results:
Two hundred and eighteen patients, 111 females (50.9%) and 107 males (49.1%), were enrolled with a mean age of 50.1 ± 15.6 years. Mean SCT score improved from 8.9 ± 3.5 to 4.3 ± 3.7 postoperatively, resulting in the majority of patients being categorized as controlled ($p<0.001$). Change in SCT score correlated independently with change in SNOT-22 ($r=0.500$, $p<0.001$) and endoscopy scores ($r=0.310$, $p<0.001$). Demographics and comorbidities were not associated with change in SCT.

Conclusion:
Improvement in disease control following ESS as measured by the SCT correlated with improvements in SNOT-22 and endoscopy scores. The SCT is a simple instrument easily administered by any provider without the need to perform nasal endoscopy. The SCT provides meaningful information about disease control in CRS which complements information from existing instruments.

Disease recurrence in the central compartment in eosinophilic chronic rhinosinusitis

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Objective:
To evaluate disease recurrence in the central compartment in different endotypes of eosinophilic chronic rhinosinusitis.

Methods:
Patients with eosinophilic chronic rhinosinusitis treated from 2008-2020 were divided into 3 endotypes: Aspirin Exacerbated Respiratory Disease (AERD), Allergic Fungal Rhinosinusitis (AFRS), and eosinophilic chronic rhinosinusitis with nasal polyps (eCRSwNP). CT scans were reviewed for central compartment (CC) involvement, defined as the area between the superior nasal septum (SNS) and middle turbinate (MT). CC involvement was measured based on the degree of opacification (0 when there was no opacification, 1 for up to 50% opacification, and 2 for >50% opacification), and distance from SNS to MT (in mm). Demographic data and number of surgeries were also collected.

Results:
34 AERD, 152 AFRS, 320 eCRSwNP patients were included. Average number of surgeries was 2.5 in AERD ($p=0.05$), 2 ($p=0.4$) in AFRS, and 1.7 in eCRSwNP. Preoperative CC distance was significantly higher in AERD vs AFRS and eCRSwNP: 5.6 mm vs 2.2 mm ($p=0.002$, CI=5.2-1.5), and 5.6 vs 3.3 ($p=0.01$, CI=3.9-0.6). Postoperatively, CC distance and degree of opacification were significantly higher in AERD vs AFRS and eCRSwNP: 6.9 mm and 1.7 vs 2.8 mm and 0.3 in AFRS ($p<0.0001$, CI-5.2-2.2 and 1.8-0.8), and 3.8 mm and 0.9 in eCRSwNP ($p=0.002$, CI=5-1.3 and 1.5-0.06). Within the AERD group, CC involvement got worse postoperatively; however, values didn't reach statistical significance.

Conclusion:
CC involvement is more significant in AERD patients. This area could represent a nidus for recurrence in these patients, and it should be addressed in the treatment.

POSTERS

Disparities in access to care and outcomes following rhinoplasty

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Introduction:
There is a paucity of data on disparities in care and outcomes for patients undergoing rhinoplasty. This study aims to characterize disparities in access to care based on provider and hospital volume and the subsequent effects on outcomes following rhinoplasty.

Methods:
A New York statewide database was queried for patients undergoing rhinoplasty. Hospital and Surgeons were categorized by annual caseload into low (0-25th percentile), medium (26-75th percentile), and high volume (76-100th percentiles) centers. Outcomes of interest were 30-day all cause hospital admission and 30-day admission due to hemorrhagic/epistaxis complications.

Results:
143,123 patients undergoing rhinoplasty were identified. Patients who were older, female, insured, white, and in the top income quartile were more likely to operated on by a high volume surgeon ($p<0.05$). Patients undergoing rhinoplasty at high volume facility were more likely to be younger, female, insured, non-white, and in the top income quartile ($p<0.05$). Multivariate analysis of outcomes, while controlling for surgeon and hospital volume, demonstrated that patients who had Medicaid and were of Black or Hispanic race were more likely to be admitted to a hospital within 30 days of undergoing rhinoplasty. Furthermore, 30-day admissions due to hemorrhagic/epistaxis complications were associated with older age, male gender, and non-White race. Association between either outcome and hospital and surgeon volume was not significant.

Conclusion:
Our results display marked disparities in access to high volume facilities and surgeons among patients undergoing rhinoplasty. However, after controlling for differences in healthcare access disparities in outcomes continue to persist.

Dupilumab improved smell outcomes in severe CRSwNP patients regardless of NP history

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Background:
In patients (pts) with CRSwNP, loss of smell (LoS) is one of the most troublesome symptoms impacting quality of life. In phase 3 SINUS-24/52 (NCT02912468/NCT02898454) studies, dupilumab (DPL) significantly improved sense of smell in pts with severe CRSwNP and was well tolerated. However, data are lacking on improvement in smell outcomes categorized by years since CRSwNP diagnosis.

Methods:
This post hoc analysis reports the effect of DPL vs placebo (PBO) on smell outcomes from baseline (BL) to Week (Wk) 24 in subgroups categorized by years since first CRSwNP diagnosis (<5 [n=236], 5 to <10 [n=157], 10 to <15 [n=118], ≥15 [n=208] years) pooled from SINUS-24/52 studies. Smell outcomes were daily LoS (0–3) and SNOT-22 smell/taste item scores (0–5) (higher scores indicate greater impairment); UPSIT (0–40, lower score indicates greater impairment); and % anosmia (UPSIT ≤18).

Results:
At BL, in pts with <5, 5 to <10, 10 to <15, ≥15 years since CRSwNP diagnosis, mean smell scores were: LoS (2.7, 2.8, 2.8, 2.8), SNOT-22 smell/taste item (4.2, 4.3, 4.4, 4.3), UPSIT (15.8, 13.6, 13.4, 12.6), and % anosmia (67.7%, 78.1%, 81.0%, 85.9%). At Wk 24, DPL significantly improved scores (least square mean difference vs PBO): LoS (−1.1, −1.1, −1.2, −0.9); SNOT-22 smell/taste item (−2.1, −2.2, −1.9, −1.7); and UPSIT (+10.6, +11.4, +9.8, +10.4). At Wk 24, % anosmia was significantly lower in DPL vs PBO groups (range 22.4–43.7% vs 68.8–90.2%, odds ratio range 0.06–0.11; all $P<0.001$ in favor of DPL) irrespective of years since diagnosis.

Conclusions:
In uncontrolled CRSwNP, improvement in smell outcomes from BL to Wk 24 was consistently demonstrated in DPL groups vs PBO groups regardless of years since CRSwNP diagnosis.

Dupilumab improves pan-sinus opacification in patients with CRSwNP in SINUS-52

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Background:
Bilateral pan-sinus inflammation is common in patients (pts) with chronic rhinosinusitis with nasal polyps (CRSwNP). Standard-of-care treatment with intranasal corticosteroids (INCS) usually has limited effect. Dupilumab (DPL), a fully human mAb, blocks the shared receptor component for IL 4/IL-13, key and central drivers of type 2 inflammation in multiple diseases. In the phase 3 SINUS-52 study (NCT02898454), DPL improved outcomes in CRSwNP pts and was well tolerated. We report effects of INCS with DPL or placebo (PBO) on sinus opacification in SINUS-52 pts.

Methods:
Pts were randomized to receive SC DPL 300 mg every 2 weeks (q2w) for 24 weeks, then every 4 weeks (q4w) (n=145), DPL 300 mg q2w (n=150), or PBO (n=153) as an add-on to daily INCS for 52 weeks. Sinus CT scans at baseline (BL), Week (Wk) 24, and Wk 52 were reviewed centrally by blinded, independent reviewers to assess opacification using Lund–Mackay (LMK) CT score (0–12 each side).

Results:
At BL, enrolled pts had almost complete sinus opacification (mean total LMK-CT scores: 17.81 [DPL q2w-q4w]; 18.42 [DPL q2w]; 17.65 [PBO]). Sinus opacification improved in DPL vs PBO pts at Wk 24 (LS mean reduction from BL in total LMK-CT score: –4.82 [q2w–q4w], –5.43 [q2w]) and Wk 52 (–5.71 [q2w–q4w], –6.94 [q2w]); all P<0.0001 for DPL vs PBO. DPL- vs PBO-treated pts showed significantly reduced bilateral opacification at Wks 24 and 52 in the maxillary, anterior ethmoid, posterior ethmoid, sphenoid, and frontal sinuses and the ostiomeatal complex, and continued improvement in each sinus between Wk 24 and Wk 52.

Conclusions:
DPL significantly improved sinus disease vs PBO in pts with CRSwNP. Improvements were observed in all paranasal sinuses bilaterally through Wk 52.

Dupilumab rapidly improves and sustains smell in CRSwNP

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Background:
Loss of smell (LoS) is one of the most difficult-to-treat symptoms in patients with chronic rhinosinusitis with nasal polyps (CRSwNP).

Methods:
This analysis studied the rapid and sustained improvement in University of Pennsylvania Smell Identification Test (UPSIT), daily LoS, and % anosmia with dupilumab 300 mg every 2 weeks vs placebo from the pooled phase 3 studies SINUS-24/SINUS 52 (NCT02912468/NCT02898454), categorized by number of prior sinonasal surgeries (SNS).

Results:
At baseline, patients with 0/1/≥ 2 prior SNS had mean UPSIT (16.02/12.87/12.71), daily LoS (2.65/2.76/2.82), and % anosmia (UPSIT ≤ 18; 64.9/83.1/82.0), respectively. UPSIT improved at Week 2 (least squares [LS] mean difference for dupilumab vs placebo: +6.70/+5.38/+4.25; all P < 0.0001) and continued to Week 24 (+10.45/+11.04/+10.00; all P < 0.0001). LoS improved during Week 1 (LS mean difference for dupilumab vs placebo: Day 7: –0.28/–0.17/–0.13; all P < 0.05) and continued to Week 24 (–0.96/–1.14/–0.99; all P < 0.0001). For dupilumab, % patients with anosmia was 32.5/48.6/56.8 at Week 2 and 19.5/30.9/36.4 at Week 24 vs 60.6/77.3/78.6 at Week 2 and 66.7/82.3/83.1 at Week 24 for placebo.

Conclusions:
Patients with prior SNS had higher baseline impact on smell. Dupilumab caused rapid and sustained improvement in sense of smell in patients with CRSwNP with and without previous SNS.

POSTERS

Duration of frontal sinusotomy

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Background:
Frontal endoscopic sinus surgery can be difficult due to bleeding or anatomical factors such as obstructive cells. The effect of surgical and patient cofactors on operative times has yet to be objectively described. This study aims to define factors associated with increased physician work as reflected by surgical time.

Methods:
A multi-institutional, observational trial of subjects undergoing frontal sinusotomy by nine early-career fellowship-trained rhinologists in North America was performed. Data was prospectively collected. Clinical and surgical characteristics thought to be associated with surgical difficulty or intraoperative visualization were collected. 17 cofactors were evaluated. Logistic regression modeling was used to generate a predictive model of cofactors associated with operative time.

Results:
Data for 182 frontal surgeries was collected. The mean surgical time was 18.8 min (SD 12.4, range 3-82). Frontal mucocele, revision surgery, extent of surgery, frontal Lund Mackay, global osteitis score, frontal ostium diameter, number of endoscopes utilized and tissue removal all significantly increased surgical time on univariate analysis ($p<0.05$). Frontal mucocele, extent of surgery, and number of endoscopes also significantly increased surgical time on multivariate analysis ($p<0.01$).

Conclusion:
Several objective factors significantly increase mean frontal sinus surgical times, including the extent of planned surgery. Given the influence of estimated operative times on the ultimate reimbursement for a given procedure, additional study is needed to evaluate the appropriateness of current valuation models for endoscopic frontal sinus surgery.

Ectopic silent gonadotroph adenoma in the sphenoid sinus

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Background:
Ectopic pituitary adenoma (EPA) are rare, benign pituitary neoplasms completely separate from the adenohypophysis. EPAs arise from neoplastic proliferation of embryological remnants along the path of migration of Rathke's pouch. Non-functional tumors are divided into silent adenomas, which stain positive for anterior pituitary hormones or their transcription factors but do not secrete clinically significant levels of hormones, and null cell adenomas, which show no immunopositivity.

Methods:
A chart review was performed on a single individual.

Results:
We present a 71-year-old female with a well-defined lytic sphenoid sinus lesion incidentally found on imaging after a ground level fall. The nuclear features of the specimen were similar to a neuroendocrine tumor. Staining for ACTH, LH, FSH, prolactin, and GH were negative. However, SF-1, the transcription factor for gonadotroph differentiation, was positive. The final diagnosis was a silent gonadotrophic ectopic pituitary adenoma. No pre-operative endocrine labs were obtained. However, the patient showed no signs or symptoms of hormone hypersecretion. Post operatively, prolactin, IGF-1, free T4, cortisol and FSH levels were within normal limits.

Conclusion:
EPAs are rare, with the majority being ACTH-secreting functional adenomas. We present a case of a silent gonadotrophic ectopic pituitary adenoma, diagnosed based on positive staining for SF-1, the transcription factor for gonadotroph differentiation. Although rare, EPAs should be considered in the differential diagnosis of a sphenoid mass in patients both with and without clinical or chemical evidence of hormone hypersecretion.

Efficacy of adenoidectomy for chronic rhinosinusitis in children older than 7 years of age

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Background:
While adenoidectomy is often first-line surgical management of chronic rhinosinusitis (CRS) in young children, evidence regarding its utility in older children is lacking and there is no consensus on the optimal surgical management. This study aimed to assess the efficacy of adenoidectomy in children 7-18 years old regarding symptom control, postoperative medication use, and need for additional surgery.

Methods:
Single-institution retrospective chart review of patients ages 7-18 undergoing adenoidectomy for CRS from 2009-2019. Patients with cystic fibrosis and ciliary disorders excluded. Comorbidities, preoperative and postoperative symptoms (rhinorrhea, congestion, anosmia, facial pain), medication use (antibiotics, antihistamines, nasal steroids, irrigations) and Lund-Mackay scores were extracted. McNemar's or Wilcoxon Rank Sum Tests were used to assess rates of symptom control and medication use. Fisher's exact or Chi-square tests were used to asses for factors associated with symptom persistence.

Results:
97 patients with a mean age of 9 years (range 7-18) were identified. Statistically significant decreased rates of rhinorrhea (64.9% vs 20.6%, <0.001), congestion (95.9% vs 26.8%, <0.001), facial pain (17.5% vs 3.1% 0.001), use of nasal steroids (79.4% vs 36.1%, <0.001), antihistamines (47.4% vs 20.6%, <0.001) and number of antibiotics (median 1 vs 0,<0.001) after adenoidectomy identified. No patient or disease factors were associated with symptom persistence. Nine patients (9.3%) required additional nasal surgery.

Conclusion:
Adenoidectomy may provide adequate symptom control and medication reduction in older children with CRS. Additional studies are required to identify patients likely to need additional surgery.

Empty nose syndrome following endoscopic skull base surgery

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Background:
As indications of endoscopic endonasal skull base surgery (ESBS) expand, balancing the preservation of nasal structure with surgical access is an important consideration. Empty nose syndrome (ENS) may result from turbinate reduction or removal and is accompanied by significant nasal dysfunction and impaired quality of life (QOL). The incidence of ENS and it potential effect on QOL by SNOT-22 were reviewed in ESBS cohort.

Methods:
A tertiary center experience was queried and identified 4 ESBS cohorts by the extent of the surgical approach: transsellar, transcribriform, transclival or contralateral transmaxillary (CTM) from January 2016-April 2019. Combined approaches, revision ESBS surgery, prior radiation therapy and follow up less than 10 months were excluded. Patients were contacted and administered the Empty Nose Syndrome 6-item Questionnaire (ENS6Q) via telephone and SNOT-22 was obtained from their patient records.

Results:
Of 184 patient that met criteria, 92 patients (50%) were reached and administered the ENS6Q. The incidence of ENS6Q greater than/equal to (>/=) 11 for transsellar, transcribriform, transclival and CTM was 11.9%, 18.8%, 17.2%, and 20% respectively. The average SNOT-22 of patients with ENS6Q >/= 11 was 22.3 compared with ENS6Q < 11 of 15.1 (p=0.126). The average number of turbinates removed was not different based on ENS6Q. The nasal crusting subscore of ENS6Q contributes a significant portion (25.5%) of the total score in those with scores >/= 11.

Conclusion:
The incidence of ENS in the ESBS population may be higher than initially believed with long-term follow-up. Higher ENS6Q was associated with worse QOL, but nasal crusting may be a confounding symptom.

POSTERS

Endoscopic approaches to the pterygopalatine fossa and infratemporal fossa: A systematic review

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Background:
Historically tumors of the pterygopalatine fossa (PPF) and infratemporal (ITF) were removed via open approaches with significant morbidity.). Recently, endoscopic approaches have become more popular, yet little is known about the efficacy or the complications associated with these approaches (orbital, sensory, motor, or vascular).

Methods:
As systematic review of the literature was performed using PubMed, Web of Science, and Cochrane databases from 2000 until present.

Results:
26 articles with a total of 137 patients were included in the study 114 tumors were benign. 23 tumors were malignant. The overall recurrence rate was 14.5% with a mean follow-up of 3.2 years.. When looking at the type of approach the recurrence rates were 10.9% transnasally and 26.3% with transmaxillary. There was no statically significant difference in recurrence rates by approach (p = 0.0954). Overall serious complications rates were low (2/137 internal carotid injuries, 0% post-operative bleeding events, 0% stroke, 4.5% ocular, 40.2% sensory nerve, 10.6% motor nerve, and 9.9% intra-operative cerebral spinal fluid leak (CSF). Comparing the transnasal versus the transmaxillary approaches, the relative risk of sensory nerve complication after transmaxillary approaches was significantly higher (RR=1.71, 95% CI 1.08-2.71, p = 0.022). Similarly, CSF leaks rates were higher following transmaxillary approaches (RR=6.35, 95% CI 1.27 – 31.70, p = 0.024).

Conclusions:
Endoscopic approaches to the IFT and PPF are effective with recurrence rate after 3.2 years was 14.5%. Transmaxillary approaches have higher rates of complications with higher rates of CSF leaks and sensorineural deficits.

Endoscopic endonasal repair of a sphenoid meningoencephalocele

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Background:
Spontaneous sphenoidal meningoencephalocele is a rare entity, even rarer through the Sternberg's canal. Obesity and benign intracranial hypertension have been reported as a combined mechanism allegedly contributing to meningoencephaloceles through congenital skull base defects. They could be asymptomatic or associated with meningitis.

Case report:
A 38 years-old female was diagnosed with meningitis after a seizure and loss of conscience. An MRI was performed showing a right sphenoidal meningoencephalocele in contact with the temporal lobe and an area suggestive of gliosis. The PL was positive for an S. Pneumoniae. An endonasal endoscopic technique (2 nostrils-4 hands) was used to dissect the meningoencephalocele, identify the underlying cranial base defect and close it in a multilayered fashion. No CSF leak was reported after the procedure and the patient was discharged home 5 days after the surgery without any symptom.

Discussion/conclusion:
Endoscopic endonasal management of sphenoid meningoencephalocele provides a good view of the surgical field while being less invasive than transcranial approaches, as well as the outcome in terms of closure of the skull base defect is also good.

Endoscopic endonasal surgery after maxillectomy and midface free flap reconstruction

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Background:
Midface reconstruction after maxillectomy utilizes a combination of osseocartilaginous structural support and soft tissue bulk to restore midface volume, oronasal separation, and the orbital floor. Patients often require adjuvant chemoradiation; scarification and impairment of mucociliary clearance with resulting sinonasal obstruction and recurrent sinusitis merits revision. Endoscopic surgery with free flap modification may be offered to select patients.

Methods:
Patients undergoing endoscopic surgery and or modification of free flap reconstruction for chronic sinusitis or persistent nasal obstruction from January 1st, 2016 to March 31, 2020 were identified. A retrospective case-series review was performed for clinical and demographic factors, including pre- and post-operative sinonasal outcome test (SNOT-22) and Nasal Obstruction Symptom Evaluation (NOSE) scores in addition to surgical techniques.

Results:
6 patients who underwent endoscopic endonasal modification of midfacial free flap reconstruction were identified, 4 of which had pre- and post-operative surveys available. The average SNOT-22 score decreased from 65 to 46.3 (p=0.234) while average NOSE score decreased from 76.3 to 43.8 (p=0.07). Four patients underwent bilateral maxillary antrostomy, ethmoidectomy, sphenoidotomy and frontal sinusotomy. Two patients suffered nasal obstruction, one required soft tissue debulking and posterior septectomy to for choanal atresia, and another required modification of the osseous component of a scapular tip.

Conclusions:
Patients with sinonasal complaints after midfacial free flap reconstruction may benefit from endoscopic endonasal surgery to alleviate nasal airway obstruction and optimize topical therapy.

Endoscopic fluorescein in the immediate post-operative period for evaluation of skull base leaks

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Background:
Postoperative cerebrospinal fluid (CSF) leaks are a complication of endoscopic skull base surgery that can sometimes be challenging to diagnose. Patients commonly report nonspecific rhinorrhea, and this often results in extensive diagnostic tests, prolonged hospital stay, and return to the operating room. Intrathecal fluorescein can aid in diagnosis in this setting.

Methods:
Retrospective chart review for all recipients of anterior skull base surgery from a single rhinologist at NYU. 112 patients were reviewed from January 2017- March 2020; of which, 26 were suspected of leaking. Each chart was reviewed to identify the tests and factors that best indicated the presence of a CSF leak. Operative reports and Beta 2 Transferrin tests were used as the “Gold Standard” to confirm the presence of a leak.

Results:
71 (63%) were female and average age was 52.4. Majority of the lesions were Pituitary Macroadenomas (45%). There were 25 (22%) fluorescein injections for suspected leaks. Of those injected with fluorescein, 4 were true positives, 1 false negative, 18 true negatives and 0 false positives. Sensitivity for this screening test was 80%, specificity was 100%, and positive and negative predictive value was 100% and 94.7%, respectively.

Conclusion:
A simple screening test for CSF leaks remains elusive. We have demonstrated a potential a valuable method for early detection. Further validation is needed; however, ultimately this test can be used to reduce morbidity and costs associated with continued monitoring.

POSTERS

Endoscopic outcomes in AERD patients treated with topical antibiotics and intranasal steroids

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Background:
Evidence on topical antibiotics use in chronic rhinosinusitis with nasal polyposis (CRSwNP) is lacking. Current consensus guidelines recommend against the use of topical antibiotics, but recent reviews show some benefit in recalcitrant disease after endoscopic sinus surgery (ESS). CRSwNP subtypes such as aspirin-exacerbated respiratory disease (AERD) are at high risk of persistent symptoms after ESS. We aim to evaluate the effect of topical antibiotics on sinonasal outcomes in AERD patients who have undergone ESS.

Methods:
A retrospective chart review of CRSwNP patients who had a sinus culture taken preoperatively or intraoperatively. This cohort includes 212 patients that were stratified based on their use of topical antibiotics postoperatively. All patients used topical steroids. Preoperative and 4-6 months postoperative SNOT-22 and modified Lund-Kennedy (MLK) scores were analyzed using linear regression analysis.

Results:
Sixteen of 19 patients had a positive culture. The use of topical antibiotics combined with topical steroids showed a significant improvement on MLK ($p<0.02$) compared to those using topical steroids alone regardless the AERD status. After adjusting for AERD status, the use of topical antibiotics showed a significant improvement on MLK in AERD patients ($p<0.02$). There was not a significant difference in SNOT-22 with the addition of topical antibiotics in CRSwNP patients ($p=0.48$).

Conclusion:
In CRSwNP patients with concern for infection, the combination of topical antibiotics and topical steroids in the post-operative period may improve endoscopic scores more than topical steroids alone. AERD patients may benefit from the combination of topical antibiotics and steroids, more than non-AERD patients.

Endoscopic reconstruction of skull base defects using Tutoplast Allografts

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Introduction:
Various graft materials have been used in endoscopic repair of skull base defects . Based on its origin , grafts can be classified to autografts , xenografts, allografts or alloplastic . Tutoplast® (Tutogen Medical GmbH) is an allogeneic natural collagen matrix that is processed through the Tutoplast process which is a scientific method of virally inactivating, preserving, and sterilizing human tissue, which can be safely used as an allograft.
The purpose of this study is to report our experience in the management of skull base defects with the use of Tutoplast as primary graft material or as a part of a multilayer repair in the endoscopic reconstruction of skull base defects.

Methodology:
It is a retrospective study for patients who underwent endoscopic reconstruction of skull base defects for the repair of primary cerebrospinal fluid leak or post tumor resection at three tertiary care centers (King Faisal Specialist Hospital and Research Center, King Fahad Medical City and Prince Sultan Military Medical City) in riyadh Saudi Arabia. Data were collected during the period between 2017 and 2020 . All repairs were performed by a transnasal, endoscopic approach.

Results:
Tutoplast® (allogeneic, Tutogen Medical GmbH) was used as the primary graft material or as a part of a multilayer repair in 30 cases. Outcome of this study showed success of graft take in 28/30 of cases.
2 cases needed further intervention in the from of lumbar drain placement.

Conclusion:
Tutoplast can be used safely and effectively for skull base repair defects

Endoscopic vidian canal landmarks: An anatomic relationship

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Background:
The vidian canal (VC) serves as an important anatomic landmark in endonasal endoscopic approaches to lateral skull base pathologies. The aim of this study was to analyze and better define the relationship between the VC and other landmarks.

Methods:
The CT sinus studies of 79 consecutive adult patients were analyzed. Measurements were recorded of the VC to the: sphenopalatine foramen (SPF), palatovaginal canal (PVC), maxillary nerve (V2) and medial pterygoid plate. Onodi cells, if present, and the type of sphenoid pneumatization (defined by Rhoton et al.) were logged. Means and standard deviations of measurements were calculated. A two-tailed t-test and ANOVA were run to determine statistical significance.

Results:
In 76.5% of cases, the VC was superior or at the same height as the SPF. In 55% of cases, the VC was medial to the SPF. The VC was always lateral to the PVC and medial to V2. When Onodi cells were present (11.3% of cases), the VC was lower compared to the SPF ($p < 0.011$). Type C sphenoid pneumatization was correlated to the VC being lateral to the SPF and Type D was correlated to the VC being medial to the SPF ($p < 0.05$).

Conclusions:
In the majority of patients, the VC was superior or at the same height as the SPF and medial to the SPF. The type of sphenoid pneumitazation affected the location of the VC.

Ethmoid-to-maxillary inflammation ratio: A predictor of postoperative outcomes in nasal polyposis

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Background:
Inflammatory profiles for patients with chronic rhinosinusitis with nasal polyposis (CRSwNP) vary between North American (NA) and Asian populations. An elevated ethmoid-to-maxillary (E/M) opacification ratio on preoperative imaging is associated with certain postoperative outcomes in Asian/non-type 2-dominant populations. This study explored this factor in NA/type 2-based populations.

Methods:
Adult patients from a NA population with CRSwNP who underwent endoscopic sinus surgery (ESS) were prospectively enrolled into an observational, multi-institutional study. The 22-question SinoNasal Outcome Test (SNOT-22), Brief Smell Identification Test (BSIT) and Lund Kennedy (LK) endoscopic scores were obtained preoperatively and postoperatively. Patients were stratified according to increasing E/M ratios based on Lund-Mackay scores.

Results:
Significant within-subject improvement was found on average for all patients (n=165) for SNOT-22 total and BSIT results ($p<0.019$). Preoperatively, elevated E/M ratio was correlated with worse BSIT scores ($r=-0.343$, $p<0.001$). Postoperatively, elevated E/M ratio correlated with BSIT improvement ($r=0.284$, $p=0.002$), but not with SNOT-22 improvement or polyp recurrence. An elevated E/M ratio was associated with greater likelihood of reporting a minimal clinically important difference in BSIT scores ($\chi 2=9.96$; $p=0.041$).

Conclusions:
Elevated E/M ratios are associated with worse baseline olfaction and an increased likelihood of achieving postoperative improvement in olfaction in this population with CRSwNP. Elevated E/M ratios did not associate with postoperative SNOT-22 measures or polyp recurrence, suggesting prognostic factors may vary across geography and inflammatory profile.

Evaluating inflammation in an obstruction-based chronic rhinosinusitis model in rabbits

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Background:
Rabbit models for sinonasal inflammation are used as representative models of chronic rhinosinusitis (CRS), yet reproducible methods to characterize inflammation remain a challenge. Various numerical scoring systems exist to assess opacification by micro-computed tomography (microCT) and inflammation severity by histopathology analysis.

Methods:
CT# (Hounsfield units) and novel histopathology scoring of 8 criteria encompassing damage/hyperplasia to the ciliated epithelium, edema, glandular inflammation, basement membrane involvement and granulocyte infiltrate were used to quantify inflamma-

tion. Disease was induced in 18 rabbits by reversibly obstructing the left ostiomeatal complex. CT# within the left and right maxillary sinuses was compared between baseline and established disease states. 4 weeks later, correlations between CT# and histopathology criteria were evaluated (n=14).

Results:
Evidence of sinus opacification presented as significantly elevated CT# at the disease state (left mean=-502, range: -803 to +45, right mean=-656, range -825 to -428) compared to baseline (bilateral mean=-744, range -828 to -662; $p<0.05$). A moderate and significant correlation was observed between CT# and two histopathology criteria, epithelial cell damage and cilia damage (adjusted R-squared=0.339, p=0.017 and adjusted R-squared=0.362, p=0.014, respectively).

Conclusions:
Induction of chronic inflammation in a rabbit model is possible with demonstrated sinonasal inflammation by microCT and histopathology. Inter-subject variability suggests that more robust methods for disease induction should be investigated to establish CRS in this animal model for improved in vivo evaluation of pathophysiology and treatment strategies.

Evaluating the SNOT-22's "one most important symptom" over time

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Background:
Although the SNOT-22 is widely used, there has been no evaluation of patients' most important symptoms (MIS) over time. This study sought to evaluate CRS patients' MIS over time and how they relate to outcomes following FESS.

Methods:
The SNOT-22 was distributed to 922 continuous patients undergoing FESS for CRS. Patients were asked to mark the one most important symptom (OMIS) of the 22 listed on the SNOT-22. The SNOT-22 was distributed preoperatively and again at 3 and 6 months postoperatively.

Results:
A total of 351 patients completed the OMIS question preoperatively. The top 5 symptoms and the % of patients that chose them were as follows: nasal obstruction (27%), post-nasal drip (11%), lack of good night's sleep (8.8%), facial pain/ pressure (8.5%), and fatigue (6%).
78 patients completed the OMIS question at the 3-month follow-up. The top 5 symptoms were loss of smell/ taste (17%), nasal obstruction (12%), post-nasal drip (12%), lack of good night's sleep (7.7%), facial pain /pressure (7.7%), ear fullness (7.7%). 140 patients completed the OMIS question at the 6-month follow-up. Patients chose post-nasal drip (12%), nasal obstruction (11%), need to blow nose (8.6%), fatigue (7.1%), loss of smell/taste (7.1%), and lack of good night's sleep (7.1%). Only nasal obstruction and postnasal drip remained in the top 5 MIS at each time point. The most reliably improved symptoms at 6 months were nasal obstruction, post-nasal drip, fatigue, wake up tired, and lack of good night's sleep, which interestingly overlap 4 of the top 5 preoperative MIS.

Conclusions:
CRS patients' MIS are highly varied. Post-nasal drip and nasal obstruction were the only consistent symptoms in the top 5 MIS across all time points.

Evaluation of chronic sinonasal tract inflammation as a potential risk factor for COVID-19

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Background:
The COVID-19 pandemic has impacted the care of otolaryngology patients from potential risks posed by high nasal and nasopharyngeal viral loads and aerosol generating procedures (AGP). COVID-19 symptomatology also overlaps with chronic sinonasal inflammatory conditions such as chronic rhinosinusitis (CRS) and allergic rhinitis (AR). The purpose of this study was to evaluate CRS and AR as risk factors for suspected and confirmed COVID-19.

Methods:
A retrospective cohort study was performed using confirmed and suspected COVID-19 and active non-COVID-19 patient registries at Mayo Clinic sites. Exposure was defined as diagnosis of CRS or AR in the medical record, and the outcome of interest was confirmed or suspected COVID-19. Logistic regression, controlling for age and sex, was used to examine potential relationships.

Results:
Diagnosis of CRS or AR was associated with suspected COVID-19 (adjusted odds ratio [aOR]=2.35, 95% confidence interval [CI]=2.22-2.48) and confirmed COVID-19 (aOR=1.83, 95% CI=1.46-2.29). In the subgroup of AR patients, the diagnosis remained associated with suspected COVID-19 (aOR=2.09, 95% CI=1.96-2.23) and confirmed COVID-19 (aOR=1.90, 95% CI=1.48-2.43). CRS diagnosis was

associated with suspected COVID-19 (aOR=3.05, 95% CI=2.81-3.31), but not confirmed COVID-19 (aOR=1.41, 95% CI=0.93-2.14).

Conclusions:
Diagnoses of CRS and AR are associated with suspected COVID-19, and may be due to overlapping symptomatology. Associations with confirmed COVID-19 remain significant with AR, but not for CRS. Understanding the risk of COVID-19 in CRS and AR patient populations may aid clinicians in decision making regarding the use of AGPs and personal protective equipment in treating these chronic conditions.

Evaluation of outcomes in patients with comorbid OSA following FESS

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Background:
Comorbid obstructive sleep apnea (OSA) has been shown to influence peri-operative outcomes in various surgical subspecialties. This study assesses peri-operative outcomes in patients with suspected or diagnosed OSA, and without OSA undergoing functional endoscopic sinus surgery (FESS).

Methods:
Retrospective chart review of patients that underwent FESS at a single tertiary care institution from March 2018-December 2019 was conducted. Patients were separated into an OSA group (defined by historical patient data and STOP-BANG score ≥3), or non-OSA group (defined as STOP-BANG score < 3). Outcomes measured included anesthesia emergence time, time spent in post-anesthesia care unit (PACU), hospital discharge time, 30-day readmissions, post-operative complications, and overnight hospital stays. Patients without same-day discharge were excluded from PACU and discharge time analysis.

Results:
105 patients were included: 52 OSA and 53 non-OSA. The OSA group was older (58.1 vs. 44.1 years, p<0.001), and had a higher body mass index (29.7 vs. 26.6 kg/m2, p=0.002). OSA vs non-OSA patients revealed no difference in post-operative complications (17.3 vs 9.4%, p=0.23), or need for overnight admission (19.2 vs. 9.4%, p=0.15). 30-day readmissions were lower in OSA patients (0 vs. 7.5%, p=0.04). OSA patients experienced slower emergence time (4.9 vs. 2.5 minutes, p=0.036) and progression through PACU phases (165.7 vs. 139.0 minutes, p=0.017). Time to discharge was comparable (211.8 vs. 188.8 minutes, p=0.07).

Conclusions:
Comorbid OSA did not appear to negatively affect post-anesthetic outcomes or complications after FESS in this small cohort. Despite prolonged emergence and PACU time, these findings are unlikely significant clinically.

Evaluation of the NEUROMARK™ system (Rhinitis Neurolysis Therapy™) in patients with chronic rhinitis

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Background:
Sphenopalatine nerve resection or ablation; the reduction of parasympathetic neural input, has been described as an effective surgical treatment for allergic and nonallergic rhinitis. Alternative parasympathetic input to the nasal cavity from areas outside the sphenopalatine foramen has been described. It remains unclear how much of the parasympathetic input is lysed by existing procedures. We report preliminary results from the RELIEVE study; the first series of patients treated for chronic rhinitis using the NEUROMARK™ system targeting primary and accessory innervation pathways into the nasal cavity.

Methods:
This is a prospective, single-arm (non-randomized), bilateral safety and technical feasibility evaluation of the NEUROMARK™ system in patients with chronic rhinitis. Adults (>18 years) with rhinitis, (allergic or nonallergic) presenting with rhinorrhoea and/or congestion symptoms (≥2 Total Nasal Symptom Score [TNSS]) were enrolled. Sleep Difficulty was included as a symptom within the TNSS reported measures and scaled 0-3.

Results:
Ten adults were enrolled with a TNSS (total nasal symptom score) baseline of 6.6/15 ± 0.7. The procedure was successfully completed in 100% of patients; with no serious adverse events or complications. There were no reported headaches or procedure-related discomfort. There was an 80% positive responder rate (subjects with at least one TNSS class improvement or ≥20% TNSS score reduction); with significant reduction of TNSS at 1-month of 3.5/15 ± 0.4 (P<0.001). Allergic and non-allergic sub-cohorts both benefitted from treatment.

Conclusion:
This study provides initial data that the NEUROMARK™ procedure is safe and well tolerated. Symptoms were decreased at 1 month.

POSTERS

Evidence-based recommendations for middle turbinate medialization in endoscopic sinus surgery

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Background:
Lateralization of the middle turbinate (MT) is a frequent problem following endoscopic sinus surgery (ESS) and a common reason for revision surgery. A variety of methods for MT medialization have been described in the literature to prevent lateralization and scarring of the middle meatus. The objective of this study is to provide evidence-based recommendations for the different MT medialization techniques used in ESS.

Methods:
Guidelines for development of an evidence-based review with recommendations were followed. The inclusion criteria comprised of adults undergoing ESS, stated technique for middle turbinate management, and reported rates of synechia or MT lateralization. Treatment recommendations were based on the American Academy of Pediatrics guidelines, with defined grades of evidence and evaluation of research quality and risk/benefits associated with each treatment.

Results:
The literature search identified 4 techniques for MT medialization: suturing to the septum, intentional adhesion to the septum, use of stents/spacers in the middle meatus, and partial resection of the MT. The aggregate level of evidence for each technique is C. There is a preponderance of benefit over harm for suture and intentional adhesion to the septum as well as partial resection. A balance of benefit and harm was found for stents/spacers.

Conclusions:
Based on the available evidence, suture or intentional adhesion of the MT to the septum or partial resection of the MT are recommended techniques of MT medialization in ESS. The evidence for the use of stents/spacers in ESS is equivocal, therefore, their use must be judicious.

Exploring adverse events in steroid-eluting stents using a FDA database

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Background:
The practice of deploying steroid-eluting stents (SESs) in the sinuses is an increasingly popular and successful management strategy for chronic rhinosinusitis with nasal polyposis. So far, no studies have looked at FDA reported adverse events regarding SESs and post-operative complications following their use.

Methods:
The FDA's Manufacturer and User Facility Device Experience (MAUDE) database was queried for adverse events for SESs reported between January 2012-March 2020. Adverse events were classified into: device malfunction, device migration into the oropharynx, acute sinusitis, fungal sinusitis, epistaxis, orbital complication, CSF leak, pain and scarring.

Results:
25 adverse events were reported. The majority of cases consisted of device migration into the oropharynx (20%, n=5), fungal sinusitis (20%, n=5), orbital complications (16%, n=4), and scaring (16%, n=4). Additional adverse events included acute sinusitis (8%, n=2), CSF leak (8%, n=2), device malfunction (4%, n=1), severe pain (4%, n=1) & epistaxis (4%, n=1). All patients with fungal sinusitis required additional surgery for debridement. Invasive fungal sinusitis was confirmed in one immunocompromised patient. Most orbital complications involved pain and decreased vision. Single cases of herpes zoster ophthalmicus and increased intraocular pressure were reported.

Conclusion:
While use of SESs is generally considered innocuous, rare adverse can occur and are probably underreported. This report shows that serious complications with the use of SESs are also possible. More studies are needed to understand the risk profile associated with deploying SESs especially in high risk patients such as those with immunocompromised states and glaucoma.

Extent of endoscopic sinus surgery
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Introduction:
Eosinophilic chronic rhinosinusitis (ECRS) is known as refractory sinusitis with nasal polyps showing remarkable eosinophil infiltration. ECRS cases with bronchial asthma are classified as severe type in Japanese epidemiological survey, and multiple ESS may be required due to persistent nasal polyp recurrence. We have applied extended ESS of both the frontal and ethmoid sinuses to severe ECRS cases in order to overcome conventional ESS. The surgical procedures are shown, and the outcome is demonstrated in this study.

Cases & methods:
Extended ESS of both the frontal and the ethmoid sinuses was performed on 27 severe ECRS cases. The cases including 9 AERD consisted of 8 males and 19 females, and are from 31 to 69 years old. Submucous resection of the nasal septum cartilage and the inferior turbinate bone were done. Extended ethmoid surgery as a new approach we advocated aims to extend the middle nasal meatus laterally. From the lateral to the anterior part of the middle nasal meatus was punched and/or drilled out up to the nasolacrimal duct to clearly open the lateral ethmoid and frontal recess cells, and this procedure facilitate to manage the frontal sinus lesion. Draf IIb surgery was then performed after the first branch of the olfactory nerve was identified.

Outcomes and conclusion:
No complication was found during surgery. Postoperative CT and endoscopic scores 1 year after surgery remarkably reduced from 60.2 to 14.6 and 14.0% although long-term follow-up study is necessary. Our extended ESS is acceptable for severe ECRS.

Extranodal NK/T cell lymphoma–nasal type mimicking chronic rhinosinusitis
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Background:
Extranodal NK/T cell lymphoma, nasal type (ENKTL-NT) is a rare, aggressive form of extranodal non-Hodgkin lymphoma most commonly encountered East Asia and Latin America. Although presentation may be variable, characteristic descriptions include ulcerative, necrotic lesions, frank nasal cavity masses and nasal/nasofacial skin involvement. We present a case of ENKTL-NT clinically mimicking chronic rhinosinusitis.

Case Report:
67-year-old woman with a history of obesity, diabetes mellitus, and hypertension complicated by end-stage renal failure, status post kidney transplant requiring daily prednisone and tacrolimus who presented to otolaryngology clinic with an 18-month history of nasal obstruction and pressure around her bilateral brow and maxillary regions unresponsive to antibiotics. Nasal endoscopy demonstrated nasal crusting and underlying inflammatory mucosa of the septum and bilateral inferior and middle turbinates. Computed tomography showed bilateral maxillary and ethmoid mucosal thickening. She underwent endoscopic sinus surgery, with pathology initially showing chronic inflammation, with symptomatic improvement. She was admitted three months post-operatively with a progressively worsening lower extremity rash with areas of ulcerations. Biopsy of her leg lesions showed NK/T-cell lymphoma triggering re-evaluation of her sinus pathology. The re-review was congruent, solidifying the diagnosis of the post-transplant lymphoproliferative disorder: ENKTL-NT.

Conclusion:
We describe a case of ENKTL-NT presenting as an indolent form of chronic rhinosinusitis without typical sinonasal symptoms. The otolaryngologist should be aware of this rare presentation of ENKTL-NT.

Frontal sinus delivery in Draf III by EDS confirmed with novel CFD
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Background:
The EDS device has demonstrated broad distribution of topical medications in post-ESS (Draf III) sinuses, using both CFD and physical models. Conventional CFD techniques appear to underestimate frontal/maxillary distribution compared with physical models because these techniques consider droplets “trapped” when hitting a surface and do not account for the unique airflow/simultaneously-emitted spray plume interaction that takes place upon actuation of the EDS device. We developed a more sophisticated CFD model incorporating “wall-film” effects and two-way air flow/droplet interactions that may more accurately represent actual delivery with EDS.

Methods:
The computed tomography (CT) scan of a patient after Draf III surgery was used to create both physical casts and a 3D-digital model suitable for CFD simulations. 1) Sophisticated CFD simulations incorporating both “wall-film” effects and the unique EDS-aerodynamics (ANSYS Fluent, release 2019R3) were performed; and 2) color-change experiments in

physical casts with SAR-GEL-coating and fluorescein were used to analyze the effect of 2 EDS-actuations of 102µL fluticasone propionate each.

Results:
Sophisticated CFD modelling of EDS-delivery demonstrated liquid film spreading, in agreement with observations in physical cast models with surface coating, confirming substantial deposition in the frontal/maxillary sinuses.

Conclusions:
The deposition pattern shown using novel CFD-modelling, incorporating liquid "wall-film" effects and two-way airflow/droplet interactions, correlates more accurately with physical models and demonstrates improved post-Draf III frontal/maxillary sinus drug delivery using the EDS device.

Functional status and posterior skull base procedures

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Background:
To investigate the association between with diminished functional status (either totally or partially dependent) and rates of postoperative complications in patients undergoing posterior skull base procedures with either otolaryngology (ENT) assistance or neurosurgery alone.

Methods:
The 2005-2016 National Surgical Quality Improvement Program (NSQIP) database was used. Logistic regression were used to determine the independent effect of covariates on postoperative complication rates in 534 patients.

Results:
Patient cohort of 534 individuals were identified who underwent an posterior skull base surgery by either neurosurgeons alone or with otolaryngologist assistance with a diminished functional status. Univariate analysis revealed that these patients were more likely to receive ENT assistance (p= .008) compared to patients without this comorbidity. Multivariate regression analysis of overall complication risk revealed no significantly elevated risk of postoperative complications following posterior skull base surgery with ENT assistance in patients with decreased functional status. However, multivariate regression analysis of individual complications revealed significantly elevated risk of postoperative requirement of ventilation for more then 48 hours (OR 3.260, CI 95% 1.060-10.027, p=.039) in posterior skull base surgeries with ENT assistance.

Conclusions:
While there was no significant difference in postoperative complications overall in patients with decreased functional status, there was significantly elevated risk of of requiring post-operative ventilation for more then 48 hours in this population of patients undergoing posterior skull base procedures.

Fungal sinusitis: A spectrum of disease?

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Introduction:
Fungal rhinosinusitis (FS) presents in a variety of forms classified by invasion and host response. Cases of conversion from allergic fungal sinusitis (AFS) to invasive fungal sinusitis (IFS) have been reported, suggesting some forms of FS may represent different points on the same spectrum of disease rather than distinct diseases. These rare instances are notable for significant morbidity. Identifying patients at risk could allow for improved outcomes. The goal of this study was to investigate risk factors and patterns of conversion.

Methods:
A retrospective chart review of cases with pathologically confirmed conversion of AFS to IFS was performed. Patient demographic and disease specific information was recorded. Next, a systematic review was performed of English language articles from Ovid and PubMed using PRISMA. Studies identifying cases of conversion were included.

Results:
Seven cases were analyzed. All patients were male, 5 African American (AA) and 2 Caucasian (CA). AA cases were younger than CA cases (27.8 vs 40.5). AFS converted to chronic granulomatous IFS (CGIFS) in all 5 AA cases, whereas both CA cases converted from AFS to acute IFS (AIFS) following surgery.

Conclusions:
In cases of converted AFS, male gender is a risk factor. Ethnicity appears to influence conversion patterns as well. These findings may suggest that CGIFS represents an extreme form of AFS in a subset of patients. Providers managing patients with AFS, particularly young AA males, should maintain an increased index of suspicion for disease conversion in this patient population.

Granulomatous chronic invasive fungal sinusitis: A case report and review of literature

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Background:
Chronic invasive fungal sinusitis (CIFS) is characterized by a prolonged yet aggressive clinical course that primarily affects immunocompetent individuals and can be separated into granulomatous and non-granulomatous forms. Granulomatous CIFS is rare in the U.S. and more common in Northern Africa and the Middle East. We report a case of granulomatous CIFS in an immunocompetent patient with extensive skull base and intracranial involvement.

Methods:
Case report and review of literature.

Results:
A 60-year-old male with history of asthma, cocaine abuse, and left orbital fracture with residual diplopia presented to rhinology clinic with one year of left temporal and occipital headaches. The patient described pain, weight loss, nasal obstruction and hyposmia, as well as numbness in the V1 and V2 distributions. CT and MRI showed infiltrative skull base lesion involving the left pterygoid process and infratemporal fossa extending into the brain. Biopsy of mass in the pterygopalatine fossa was called poorly differentiated malignancy on frozen section but deemed negative for malignancy on final pathology. Repeat imaging showed progression of disease in temporal lobe, thus patient underwent a craniotomy with temporal lobe excision. Pathology showed multinucleated giant cells with Aspergillus, consistent with granulomatous CIFS. The patient was started on IV voriconazole and discharged on long-term oral voriconazole.

Conclusions:
Granulomatous CIFS presents nonspecifically and mimics inflammatory or neoplastic processes. Early diagnosis and prompt surgical and medical management could lead to improved outcomes, but limited literature exists. Predisposing factors and appropriate management remain to be more clearly understood.

Hemiplegia and posterior skull base procedures

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Background:
To investigate the association between patient's history of hemiplegia and rates of postoperative complications in patients undergoing posterior skull base procedures with either otolaryngology (ENT) assistance or neurosurgery alone.

Methods:
The 2005-2016 National Surgical Quality Improvement Program (NSQIP) database was used to extract 534 patients. Independent T-tests and logistic regression were used to determine the independent effect of covariates on postoperative complication rates.

Results:
Patient cohort of 534 individuals were identified who underwent an posterior skull base surgery by either neurosurgeons alone or with otolaryngologist assistance with a history of hemiplegia. Univariate analysis revealed that patients with a hemiplegia history were more likely to receive ENT assistance (p= .045) compared to patients without this comorbidity. Independent t-test revealed that total length of hospital stay (11.5 vs. 7.1 days, p<.001) was longer when ENT assisted neurosurgery in patients with hemiplegia during posterior skill base surgeries. Multivariate regression analysis of overall complication risk revealed no significantly elevated risk of postoperative complications following posterior skull base surgery with EbNT assistance (OR 1.85, CI 95% 0.78-4.35, p=.161) in patients with hemiplegia. Multivariate regression revealed no significance for individual complications as well in these patients.

Conclusions:
There was no significant difference in overall and individual postoperative complication rates in hemiplegic patients undergoing posterior skull base procedures. However, this patient population is more likely to involve ENT surgical assistance and experience lengthier hospital stay.

IgG-4 related disease in the paranasal sinuses- An underrecognized pathology

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Background:
IgG4-related disease (IgG4-RD) is a solitary immune-mediated process that for decades was thought to be several unrelated processes. The hallmark of IgG4-RD is swelling of tissues with IgG4-positive plasma cells, and some patients have elevated serum IgG4 concentrations as well. Expedient recognition of IgG4-RD is important because of the rapid and sometimes irreversible damage it can do to tissues. The purpose of this series is to improve awareness of IgG4-RD in the sinonasal region, and also to present several unifying themes of presentation and management of the disease process.

POSTERS

Methods:
A retrospective chart review from two tertiary rhinology clinics at the University of Kentucky was performed, looking for patients with sinonasal IgG4-RD was performed.

Results:
A total of four patients with IgG4-RD were found in a two-year period-of-time. Common themes of history, presentation, and management were noted.

Conclusions:
Otolaryngologists should be keenly aware of IgG4-RD, particularly in the following patient subgroups:
#1) Patients who have medically-refractory non-polypoid chronic sinusitis both on endoscopic evaluation and radiologic imaging.
#2) Patients who have had multiple prior procedures for chronic sinusitis, and possibly procedures elsewhere in the body with biopsy results that show generalized inflammation.
#3) Patients who have "sinusitis" and/or orbital proptosis that is particularly responsive to steroids but recur quickly after therapy cessation.

Otolaryngologists can play a critical role not only preventing additional procedures and/or rounds of medical therapy by early identification of IgG4-RD, but also expediating appropriate treatment for this underrecognized entity.

Impact of postoperative budesonide irrigations after endoscopic sinus surgery on clinical outcomes

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Background:
Budesonide nasal irrigations (BNI) are frequently used in the management of patients with chronic rhinosinusitis (CRS). This study compared postoperative outcomes after endoscopic sinus surgery (ESS) between patients who used BNI and nasal saline rinses versus nasal saline rinses alone.

Methods:
This study compared a retrospective cohort to a prospective cohort of consecutive post-operative ESS patients between 2017-2018. All patients received pre and post-operative endoscopic evaluations, nasal blockage visual analog scale (VAS), and the 22-item Sino-Nasal Outcome Test (SNOT-22). Post-operatively, the retrospective control cohort used saline irrigations at least four times daily for 4 weeks. The prospective cohort used budesonide additive in two of the four daily nasal irrigations. Pre and post-operative outcomes at 10-16 weeks were compared between the cohorts.

Results:
112 subjects were included: 44 control and 68 BNI. Cohorts were comparable by age, sex, and race with more identifying as Hispanic in the BNI group (60% vs. 40%). Both cohorts had clinically meaningful post-operative improvement in SNOT-22 scores: control median 22 points [IQR 4, 30] compared to budesonide median 14.5 [IQR 1, 31]. The difference between cohorts was not statistically significant (p=0.44). A similar clinically meaningful postoperative improvement in the VAS and endoscopy score was seen in both cohorts. No difference was observed between cohorts in regard to postoperative smell improvement, oral steroid use, or number of infections.

Conclusion:
BNI did not significantly improve the short-term outcomes after ESS when compared to saline irrigations. BNI did not increase the risk of infection in the immediate postoperative period.

Impact of preoperative dehydration in endoscopic transsphenoidal pituitary surgery

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Background:
Preoperative dehydration has been shown as an independent predictor of postoperative complications in numerous procedures over many surgical disciplines. This study aims to elucidate the impact of dehydration in endoscopic transsphenoidal pituitary surgery.

Methods:
In this retrospective database analysis, the 2005-2018 National Surgical Quality Improvement Program was queried with Current Procedure Terminology code 62165 for cases of endoscopic transsphenoidal pituitary surgery. Exclusion criteria included renal failure, emergency cases, and disseminated cancer. 188 cases met criteria and were included. Preoperative dehydration was defined as the ratio of preoperative blood urea nitrogen to creatine greater than 20.

Results:
Of the cases meeting inclusion criteria, 43 (22.9%) had preoperative dehydration, and 145 (77.1%) cases did not. The majority of the preoperative dehy-

dration cohort were of ages 41 to 60 (48.8%), female (51.2%), and white (58.1%). Preoperative dehydration was associated with dependent functional health status (7.0% vs 0.7%; p=0.039) and greater mean hospital length of stay (8.2 vs 4.6 days; p=0.010). On univariate analysis, no significant differences in any postoperative complications were found between the two cohorts. Multivariate logistical regression showed dependent functional status was weakly associated with dehydration (OR 7.406; p=0.133). Similarly, the relationship between dehydration and increased length of stay trended towards significance (OR 1.055; p=0.066).

Conclusion:
Preoperative dehydration does not increase the risk of postoperative complications in patients undergoing endoscopic transsphenoidal pituitary surgery, although it may be associated with an increased length of stay.

Impact of prolonged steroid delivery by LYR-210 on four cardinal symptoms of CRS

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Background:
The four cardinal symptoms (4CS) of chronic rhinosinusitis (CRS) are a direct measure of disease and include nasal blockage, nasal discharge, facial pain/pressure, decreased sense of smell. A 4CS score focusing on local CRS symptoms, and the SNOT-22 measuring global patient burden, both provide critical information on the patient impact of CRS. We evaluated cardinal symptoms as a composite score and assessed correlation with SNOT-22 after treatment with a steroid-eluting implant, LYR-210, over 24 weeks.

Methods:
Twenty surgically naïve CRS subjects (12 without nasal polyps) received bilateral middle meatus placement of LYR-210, an implant providing continuous mometasone furoate for 24 weeks in a multicenter, open-label study. Symptom improvements were evaluated using SNOT-22 every 4 weeks over the 24-week treatment duration. The 4CS (from SNOT-22) were compared with SNOT-22 total and domain scores.

Results:
At baseline, patients complained of the individual 4CS frequently (90-100%) that were moderate-severe (2.6±1.4 to 3.8±0.8 on 0-5 scale). Patients reported rapid and durable improvement by the composite or individual 4CS (paired t-test P<.05) that is strongly consistent with the SNOT-22 (Pearson r=0.80-0.88), the rhinologic (r=0.60-0.83), extra-facial rhinologic (r=0.83-0.93), and ear-facial (r=0.60-0.83) domains. These findings are independent of polyp status.

Conclusions:
The 4CS score is a disease-specific measurement that correlates strongly with the SNOT-22 in surgically naïve CRS patients treated. A single treatment with LYR-210 without adjunctive daily steroids affected the 4CS through 24 weeks. The 4CS score provides a direct view of the impact of a treatment on specific patient CRS symptoms.

Impact of sinusitis symptoms among the Latino population in Los Angeles

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Background:
Sinusitis is an inflammation of the paranasal sinuses and nasal cavity that can present with nasal congestion, nasal discharge, facial pressure or pain, and decrease or change in sense of smell. This study aims to determine the impact of sinusitis symptoms as well as identify any associations between symptoms and various health and sociodemographic factors among the Latino population in the Los Angeles area.

Methods:
A cross-sectional analysis of 149 surveys administered from July to August 2019 to participants in a primary care community clinic was completed. Inclusion criteria included: >18 years of age, self-identifying as Latino(a), and residing in Los Angeles county. The survey included sociodemographic questions, a validated quality of life survey, and the Sino-Nasal Outcome Test (SNOT-22) questionnaire. Patients who reported any sinusitis symptoms were compared to those without sinusitis symptoms.

Results:
Participants with sinusitis symptoms (n=53) compared to those without sinusitis symptoms (n=94) had significantly higher SNOT-22 scores (31.6 vs 13.4, p <0.05) and a worse quality of life (7.8 vs 6.8, p = 0.01). A multivariate analysis of risk factors associated with sinusitis symptoms demonstrated that a history of asthma (OR = 12.3, p=0.03) or recent cold (OR=4.5, p<0.01) were significant predictors. A history of allergies, gastroesophageal reflux, lung disease, migraines, or chronic cough were not associated with sinusitis symptoms.

Conclusions:
Latino patients in a primary care clinic who present

with sinusitis symptoms have decreased quality of life compared to those without sinusitis symptoms and should be screened for a history of asthma or a recent cold.

Improved CRS control with higher mometasone irrigation dose

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High volume mometasone and budesonide irrigations are commonly utilized for local control of mucosal inflammation in chronic rhinosinusitis (CRS). Mometasone has more favorable pharmacokinetic profile with limited systemic absorption and may allow for titration of dose to better treat mucosal inflammation. The effects of higher dose mometasone irrigations have yet to be determined and may have a significant role in medical management of CRS.

Methods:
This is a single-institution, retrospective review of postsurgical CRS patients who were treated with higher dose mometasone rinses to improve control of mucosal inflammation. Lund- Kennedy (LK) and SNOT-22 scores were obtained across three time periods: baseline, at least one month after initiation of low dose mometasone, and at least one month after transition to high dose mometasone.

Results:
20 patients were included in the analysis. Regarding LK scores, there was a statistically significant decrease in scores from baseline (6.95 ± 2.86) to low dose mometasone (3.90 ± 2.49) ($p = 0.005$), from low dose mometasone to high dose mometasone (1.50 ± 1.93) ($p = 0.003$), and baseline to high dose mometasone ($p < 0.001$). Regarding SNOT-22, there was a statistically significant decrease in scores from baseline (35.55 ± 17.85) to low dose mometasone (15.60 ± 11.10) ($p = 0.001$) and from baseline to post-high dose mometasone (13.25 ± 12.77) ($p < 0.001$).

Conclusion:
Increasing mometasone dose resulted in improvement in LK scores and SNOT-22 scores in patients with CRS. This treatment may be potential option for improved local control in medically refractory CRS although future safety studies are required before greater adaptation.

Improving readability in patient targeted educational materials

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Background:
Given the wealth of medical information available on the internet to the public, it is important that physicians provide reliable and digestible educational materials to their patients. The readability of a document is the ease with which a reader can understand the material. An 8th grade reading level is generally accepted as appropriate for the average American adult. The purpose of this project was to assess and optimize the readability of physician authored patient educational content on rhinologic topics provided by the American Rhinologic Society.

Method:
41 rhinologic patient educational topics were either updated or newly authored by members of the American Rhinologic Society. The website Readable.com was then used to calculate the Flesch Kincaid grade level and identify the relative complexity of each sentence structure. Each document was then further revised to decrease the grade level, yet maintain the scientific content.

Results:
The mean Flesch Kincaid grade level at initial evaluation was 11.9 (range 9.4 - 16.5). Following targeted revisions to decrease both word and sentence length, the mean grade level was 9.5 (range 7.0 - 11.8).

Conclusions:
When creating educational content it is important to be able to reach as wide an audience as possible. However, achieving a balance between delivering accurate medical information and terminology, and optimizing readability can be a challenge for physicians. Resources exist to identify weaknesses in presentation, which when modified, can improve the readability and utility of patient educational materials.

Insight into cervical lymph node metastases of sinonasal mucosal melanoma

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Mucosal melanoma (MM) is a rare primary malignancy of the sinonasal tract. Though local lymph node involvement can indicate more aggressive disease progression, the impact of cervical node metastases on MM prognosis has not been well defined. The

goal of this study is to identify predictors of nodal metastases and their effect on sinonasal MM survival. The National Cancer Database was queried for all patients with sinonasal MM in 2004-2016 (n=1,719). Cases were then divided into those with cervical node involvement (n=134) and those without (n=1,585). Demographic and clinicopathologic characteristics were compared with univariate and multivariate analysis. The majority of sinonasal MM patients with cervical node involvement were ≥60 years old (73.1%), white (89.4%), and had a nasal cavity primary site (74.6%). Nodal level II had the highest rate of involvement (39.1%), followed by level I (29.8%) and level III (13.3%). Older age (p=0.034) and larger tumor size (p=0.032) were significantly associated with nodal involvement on univariate analysis, but were not after multivariate regression. Nodal metastases portended a worse 5-year survival (10.4% vs 25.7%, p<0.001). When controlling for patient clinicopathologic characteristics, age ≥60 (HR 1.65, p<0.001), any nodal metastases (HR 1.80, p<0.001), multiple nodal metastases (HR 2.49, p=0.01), and tumor sizes ≥2 cm (p<0.05) were associated with higher mortality. Sinonasal MM patients with cervical lymph node metastasis had lower survival than those without. Though no individual factor had significantly higher odds of nodal involvement, any nodal metastases, age ≥60, and primary tumor sizes ≥2cm were associated with increased mortality.

Laser vs microdebrider eustachian tuboplasty - A systematic review

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Objectives:
To determine and compare the safety and efficacy of Laser Eustachian tuboplasty and Microdebrider Eustachian tuboplasty.

Data sources:
A total of 12 electronic databases were searched up to April 2018 for published and unpublished literature in the English language.

Methods:
A systematic review was undertaken. Studies dealing with Laser Eustachian tuboplasty and Microdebrider Eustachian tuboplasty in adults for the treatment of long-term Eustachian tube dysfunction fulfilling inclusion/exclusion criteria of this systematic review were included. Outcomes assessed were: primary outcomes- subjective improvement in symptoms (ETDQ-7), audiometric improvement, improvement of negative middle ear pressure, objective improvement of tympanic membrane retraction. Secondary outcomes- the ability to auto-insufflate Eustachian tube i.e. Valsalva manoeuvre, quality of life, complications, further procedures. Results are reported in a narrative synthesis as a meta-analysis was not possible due to heterogeneous data.

Results:
Three small scale case series (13 to 38 participants) met inclusion criteria. Subjective and objective improvement of Eustachian tube function was reported in all studies. But all included studies were at high risk of bias and subject to multiple limitations. No major complications were reported from either intervention.

Conclusions:
Based on current evidence, it was not possible to recommend the clinical use of either of these two interventions. Lack of controlled studies was identified as a gap in evidence. Future research should be directed toward designing randomised controlled trials. Future trials should use strict standard methodology and reporting criteria, and make use of consensus statement doc.

Locally recurrent solitary fibrous tumor with skull base reconstruction: A case report

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Background:
Solitary fibrous tumors (SFTs) are spindle cell tumors classically found in the thorax with rare instances arising from the serosal surfaces of the head and neck. Extrathoracic SFTs recur at a rate of 10 to 25%, with events reported as late as 16 years after initial presentation.

Methods:
A 33-year-old male with a previously resected skull base tumor presented with 3 weeks of headache and diplopia. 11 years following his initial resection, he was found to have a 9.5 x 7.5 x 6.3 cm mass with anterior extension through the cribriform plate into the suprasellar region wrapping around bilateral orbits and inferior extension to the level of the inferior turbinates. The nasal mass was found to be an SFT.

Results:
The patient underwent resection via a bifrontal craniotomy with a combined open subcranial and endoscopic endonasal approach. Bilateral optic nerves and critical frontal structures were preserved. Preoperative embolization was not performed. Anterior skull base reconstruction was achieved with a multilayered closure using a biologic dural graft, pericranial flap, and vastus lateralis free flap. The frontal bar was removed for access and then resecured with cranial plates to restore the anterior naso-orbital con-

tour. Following gross tumor resection, the patient underwent adjuvant radiation therapy. One year surveillance imaging has revealed no recurrence.

Conclusion:
We present the resection of a recurrent locally aggressive SFT with complex skull base reconstruction followed by radiation therapy. A comprehensive review of primary and recurrent SFT management including consideration of pre-operative embolization, recommended resection margins, and adjuvant therapy will be provided.

LYR-210 reduces sinonasal type 2 inflammation in chronic rhinosinusitis

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Background:
Patients with chronic rhinosinusitis (CRS) who received LYR-210, a 24-week mometasone furoate implant, placed in the middle meatus showed promising clinical efficacy in a Phase I clinical study. This study evaluated how LYR-210 influences type (T) 1, T2, and T3 inflammatory responses in CRS.

Methods:
Nasal swabs and the 22-item Sino-nasal Outcome Test (SNOT-22) questionnaire were collected at baseline and 4 and 12 weeks after treatment with LYR-210 in a multicenter, open-label Phase I clinical trial which enrolled 20 CRS patients (12 CRSsNP and 8 CRSwNP). Protein markers for T1, T2 and T3 inflammation in nasal swabs were determined by Luminex. RNA markers were determined by quantitative RT-PCR in RNA samples in which quality and quantity standards were met.

Results:
LYR-210 significantly ($p<0.05$) reduced T2 markers IL-13 (57% reduction, n=18), IL-21 (64% reduction, n=18), and periostin (95% reduction, n=11). Other T2 markers, IL-5 and Charcot-Leyden crystal galectin (CLC) showed a trend toward reduction by LYR-210. Baseline expression of T2 markers, CCL26 (Spearman r=0.452, p=0.045), CLC (r=0.395, p=0.085), and periostin (r=0.366, p=0.113) positively correlated with baseline rhinologic domain scores from SNOT-22 (n=20). Baseline expression of the T2 marker CCL26 also correlated with the reduction of rhinologic domain scores by LYR-210 at 12 weeks (r=-0.461, p=0.045, n=20). T1 markers, IFN-gamma, CXCL9 and CXCL10, and T3 markers, IL-17A and IL-23, were not affected by LYR-210.

Conclusions:
Clinical efficacy by LYR-210 may result from a reduction of T2 inflammation. T2 inflammatory response correlates with symptom improvement and can be a potential objective measure of response.

Management of a unique sinonasal undifferentiated carcinoma subtype in the era of COVID-19

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Background:
Sinonasal undifferentiated carcinoma (SNUC) is a rare, poorly differentiated malignancy. While SNUC has itself a poor prognosis, a subset of neoplasms with inactivation of the SMARCB (INI-1) tumor suppressor gene exhibits particularly treatment-recalcitrant disease. This pathology was first reported in the pathology literature in 2015 but has yet to be detailed in the otolaryngology literature. Here we present a case report of an individual with a sinonasal mass ultimately diagnosed with SMARCB (INI-1) deficient sinonasal carcinoma, and the unique management required during the COVID-19 pandemic.

Methods:
A retrospective case report.

Results:
A 60-year-old female presented for evaluation of nasal congestion refractory to conservative measures. Nasal endoscopy identified a left nasal mass concerning for malignancy. CT sinus demonstrated a 4.3 cm left nasal cavity mass with osseous remodeling; MRI was deferred given COVID-19 pandemic. The decision was made to proceed with intraoperative biopsy, which confirmed a malignancy, followed by endoscopic resection. Due to tumor involvement of the cribiform plate, a small CSF leak was encountered which was repaired with nasoseptal flap and abdominal fat graft. Final pathology showed SMARCB1 (INI-1) deficient sinonasal carcinoma and the patient was referred for adjuvant therapy.

Conclusions:
SMARCB (INI01) deficient sinonasal carcinoma is a unique subset of SNUC with particularly poor prognosis. The workup and treatment of an atypical nasal mass in the era of COVID-19 is challenging from a patient and physician's stand point. Nevertheless, it warrants prioritized work up and thorough patient counseling.

Management of anosmia: A systematic review

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Background:
Anosmia and hyposmia have many etiologies, including injury, inflammatory disease, and viral infections, such as rhinovirus and SARS-CoV-2. We aimed to systematically review the literature on the management of idiopathic and post-viral anosmia/hyposmia.

Methods:
PubMed, EMBASE, and Cochrane databases were searched for articles published since January 1990 using terms combined with Medical Subject Headings (MeSH). We included articles evaluating management of anosmia and hyposmia written in the English language, with original data, a minimum of 6 months of follow-up, at least 2 patients, and well-defined and measurable outcomes.

Results:a
A total of 2064 unique titles were returned upon the initial search. Of these, 225 abstracts were examined, yielding 20 full texts meeting inclusion criteria (5 with level 1 evidence, 5 with level 2, and 10 with Level 4). The studies included a total of 1481 subjects, with follow up ranging from 3 to 72 months. Endpoints were based on clinically significant improvements of olfactory functions as measured through validated smell tests. Treatments with the most robust data were systemic steroids and olfactory training.

Conclusion:
The literature on the treatment of anosmia and hyposmia includes randomized trials showing the efficacy of a few modalities. Currently, no treatment option demonstrates dramatic or broad efficacy and further research is warranted to expand the therapeutic options for this debilitating condition.

Management of epistaxis during Covid-19 crisis

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Covid-19 has placed unprecedented pressure upon healthcare services across the world. Epistaxis is the most common rhinologic emergency requiring admission to secondary care; it disproportionately affects patients who are older, frail, and have concurrent comorbidities. Sadly, these patients are also likely to be those with the worst outcomes from coronavirus infection. ENT UK recognised the need to protect epistaxis patients from unnecessary or repeated admissions to hospital. However, evidence emerged early in the pandemic that highlighted the potential risk to healthcare workers in instrumenting or examining the nasal cavity to due the high viral load and potential aerosol generation. Thus, a consensus group was rapidly formed to guide physicians in the safe and effective care of patients with epistaxis whilst balancing the need to protect healthcare workers from Covid-19. The consensus group examined a previous ENT UK national audit of epistaxis outcomes and highlighted the potential for use of strategies such as bioresorbable packing and ambulatory management of patients with nonresorbable packs. These guidelines were agreed with a group of leading UK rhinologists, and disseminated nationally by open access. Simultaneously, the trainee network within ENT UK initiated a national audit of outcomes of this Covid-19 specific process to allow rapid updates to be published to the guideline as the pandemic progressed. Here, we report the process and development of this epistaxis care pathway and our learnings of agile guideline development in rhinology during the Covid-19 crisis.

Microbiology and histopathology of silent sinus syndrome

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Background:
Silent sinus syndrome (SSS) is a condition characterized by negative pressure within the maxillary sinus, potentially leading to inferior displacement of the orbital floor and enophthalmos. The etiology for SSS remains unknown; however, this case series describes the microbiological and histopathological characteristics associated with SSS.

Methods:
A single institution retrospective case series of patients diagnosed with chronic maxillary sinusitis was conducted to identify patients with SSS. 20 out of 40 SSS patients had complete microbiology and histopathology reports collected during endoscopic sinus surgery, which were then reviewed to determine common characteristics.

Results:
There were no polyps in any SSS patients, and diagnosis of odontogenic sinusitis was infrequent (5%). The most common aerobes were staphylococcus species (25%), although corynebacterium, citrobacter, and klebsiella were also observed. The most common anaerobes were propionibacterium species (65%). No fungal growth was observed from any cul-

tures. The overall degree of inflammation was usually mild-to-moderate (85%) with an eosinophil count of <10 per high-power-field (95%), and either lymphocytic or lymphoplasmacytic inflammatory predominance (95%). Hyperplastic change (5%), mucosal ulceration (0%), or squamous metaplasia (5%) were infrequent. There were no fungal elements, Charcot-Leyden crystals, or eosinophil aggregates in any mucin samples.

Conclusions:
Overall histopathology was consistent with mild to moderate lymphocytic and lymphoplasmacytic inflammation. Staphylococcus species represented a plurality of cultures obtained. Characterization of this microbiology and histology may help elucidate the pathophysiology of SSS.

Modern treatment of sinonasal melanoma
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Mucosal melanoma (MM) is an extremely rare but lethal disease; 5-year survival rates are notoriously bleak. It is most often reported in the head and neck, and the majority are within the sinonasal cavity. The backbone of MM has traditionally been surgical, but the success of immunotherapy in cutaneous melanoma (CM) has led to hopes that it may see similar success in MM. This systematic review (SR) reviews the evidence for immunotherapy in sinonasal MM.

Methods:
Literature search was conducted using multiple engines, most notably but not limited to, PubMed, EMBASE, Cochrane, MEDLINE, and Google Scholar, up to November of 2019. The query employed various keywords, such as 'mucosal melanoma' and 'sinonasal melanoma'. Inclusion criteria were available full text articles in English language reporting treatment outcomes (disease free survival and 5 year survival) ; exclusion criteria included animal trials, conference abstracts; and where reporting of site of MM did not report sinonasal disease as a specific subgroup.

Results:
232 articles were identified which reported treatment of MM in the Head and Neck; 83 of these specified treatment of sinonasal MM. 56 articles reported use of immunotherapy in sinonasal MM. 24 reports were excluded on basis of the above criteria. No randomised trials or case-control trials were found reporting the use of immunotherapy in sinonasal MM.

Conclusion:
Evidence quality is limited to small case series and solitary reports; however there are cautiously optimistic reports of success of immunotherapy in extending disease free survival. However, outcomes for MM remain bleak in comparison to CM and although results of immunotherapy are promising there is not yet compelling evidence for long term efficacy.

Mometasone versus fluticasone in treatment of chronic sinusitis
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Aims:
To compare the effectiveness between topical mometasone furoate nasal spray versus topical fluticasone furoate nasal spray in the treatment of chronic rhinosinusitis.

Materials and Methods:
Randomized Control Trial was conducted involving 70 patients. One group received topical mometasone furoate nasal spray and the other group received fluticasone furoate nasal spray for three weeks. All patients were prescribed oral ciprofloxacin for three weeks and were subjectively evaluated using the Lund and Mackay Staging system and objectively using nasal endoscopy by the Lund and Kennedy scoring system.

Results:
There was no inter group significance but all patients improved significantly after the administration of either of the steroid sprays.

Conclusions:
Following administration of steroid nasal sprays, there was clinically significant improvement in the symptoms and signs of chronic rhinosinusitis, but there was no statistical significance between the two study groups. Thus, steroid nasal sprays significantly improve the symptoms and resolution of signs of chronic rhinosinusitis. The choice of drug still remains uncertain to the clinician. However, long term studies with more sample size is needed to arrive at sound conclusions. Keywords: Chronic rhinosinusitis, Mometasone Furoate, Fluticasone Furoate, Randomized Control Trial, Ciprofloxacin

Nasal cavity squamous cell carcinoma outcomes
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Background:

Squamous cell carcinoma of the nasal cavity (NCSCC) is a challenging malignancy. Surgical resection of this tumor can cause significant facial deformity, and indications for adjuvant or organ preservation therapies are not well-described.

Methods:
The National Cancer Database was queried for NCSCC from 2004-2014. Patient demographics, tumor characteristics and treatment regimen were compared. Multivariable Cox proportional hazards regression was performed for statistical analysis of treatment regimen on overall survival for early and late stage.

Results:
A total of 1883 patients were identified. For early stage patients (n=977), age (HR:1.05, p < 0.001), T stage between T1 and T2 (HR:1.29, p=0.02) and N stage (HR: 2.61 for N1 and HR 2.86 for N2/3, p<0.001) showed significant differences in overall survival (OS). There was no significant difference in OS between patients treated with surgery compared to definitive radiation (RT) or chemoradiation (HR: 1.09, p=0.47).
For late stage patients (n=285), age (HR: 1.02, p=0.02, T stage between T3 and T4 (HR: 1.60, p=0.03) was significant with no difference in N stage on OS. Patients with late stage disease undergoing surgery with adjuvant RT had statistically significant higher overall survival (HR: 1.65, p=0.02) than patients undergoing surgery with adjuvant chemoradiation.

Conclusions:
T stage may be a significant prognostic factor for both early and late stage NCSCC, and N stage may only be significant in early stage. Organ preservation therapy using definitive radiation or chemoradiation may be considered for early stage NCSCC with no impact on OS compared to surgery.

Nasal nitric oxide emission is driven by ethmoid sinuses and diffusion: A computational study

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Introduction:
Sinus ventilation is important to nasal physiopathology, especially to Nitric Oxide (NO) emission, as paranasal sinuses are the major reservoirs of NO. Yet, factors or which sinuses that contribute most to such emission process are not well-understood.

Methods:
Exhaled nasal NO tracings were measured in one healthy control and one rhinitis patient using a NO analyzer connected via a face mask. We then performed the first computational fluid dynamics NO emission investigation based on individual CT scans and compared to experimental data.

Results:
Simulated exhaled NO tracings match well with experimental data (R2>0.95, p<0.001) for both subjects, with peak reaching 145 ppb for the healthy control, and 311 ppb for the rhinitis patient. The CFD simulation accurately captured the peak differences, even though the initial sinus NO concentration for both cases was set to the same 9000 ppb based on literature value. Next, we surprisingly found that ethmoid sinuses contributed the most (>70%, other sinuses combined <30%) to total nasal NO emission in both cases and that the diffusion process contribute more than convective transport. By turning off diffusion (setting NO diffusivity to ~0), the NO emission for both cases dropped to <30%.

Conclusion:
Historically, nasal NO emission was thought to be contributed mostly by maxillary sinus (the largest sinus) and active air ventilations (movement). Here, we showed that Ethmoid sinuses and diffusive transport dominates the process. This outcome may fundamentally change the view of nasal NO emission mechanisms and the sinus physiopathology in general.

Nationwide trends in treatment and survival for sinonasal extramedullary plasmacytoma

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Background:
Sinonasal extramedullary plasmacytoma (SN-EMP) is a rare plasma cell malignancy that is mostly described in case reports. The objective of this study is to investigate the impact of patient, disease, and treatment factors on the survival of patients with SN-EMP.

Methods:
The National Cancer Database was queried for all patients with SN-EMP between 2004-2016 (n=381). Univariate and multivariate analyses were used to examine patient demographics, tumor characteristics, and survival.

Results:
The majority of SN-EMP patients were over 60 years old (57.0%), male (69.8%), and white (86.2%). The

most common treatment modality was radiotherapy alone (38.6%), followed by surgery plus radiotherapy (37.8%), and surgery alone (12.4%). Five-year overall survival (OS) was 74.0% and median survival was 9.1 years. Patients who underwent surgery plus radiotherapy had a five-year OS of 83.5%, compared to 75.2% for surgery alone and 72.8% for radiotherapy alone (p<0.001). Accounting for other patient demographics and tumor characteristics in a multivariate model, the following groups had reduced OS: older than 60 (HR 2.09, p=0.015) and frontal sinus primary site (HR 11.9, p=0.001). Patients who received any radiotherapy (HR 0.48, p=0.02) or surgery (HR 0.47, p=0.003) had decreased mortality, while patients who underwent chemotherapy (HR 2.47, p=0.005) had increased mortality.

Conclusion:
Factors associated with decreased survival for patients with SN-EMP include age older than 60, and cancer at a frontal sinus primary site. Receiving surgery plus radiation was associated with the highest five-year OS. Receipt of radiation or surgery was associated with greater survival while chemotherapy was associated with greater mortality.

Neurologic comorbidities and the posterior skull base

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Background:
To investigate the association between various neurologic comorbidties and their effects on patients undergoing posterior skull base procedures with respect to hospital course duration, total operation time, and different postoperative complications.

Methods:
The 2005-2016 National Surgical Quality Improvement Program (NSQIP) database was used to extract 4239 patients. Independent t-test and logistic regression were used to determine the independent effect of covariates on hospital course and postoperative complication rates.

Results:
Patient cohort of 4239 individuals were identified who underwent an posterior skull base surgery. Independent t-tests have demonstrated paraplegic patients (53.3 vs 78.8 hours, p=.048) have decreased surgical stays relative to the patients without these comorbidities. Patients with impaired sensorium, such as acute or chronic mental status changes demonstrated an increased length of total hospital stay (14.97 vs 6.93 days, p=.006). And patients unconscious for greater than 24 hours were found to have decreased duration of anesthesia (230.6 vs 447.7 minutes, p=.007). Lastly, patients with either impaired sensorium (228.5 vs 347.0 minutes, p=.005) or those unconscious greater than 24 hours (167.6 vs 341.9 minutes, p=.008) were found to have decreased total operation time. Multivariate regression analysis of both overall and individual complication risks revealed no significant difference in postoperative complications.

Conclusions:
Specific neurologic comordities had individual effects on various intra-operative measures, but the comorbidities investigated revealed no changes in risk of postoperative complications.

Odontogenic sinusitis: Clinical characteristics, treatments, and outcomes

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Background:
To review and describe the clinical characteristics, treatments, and outcomes in a set of shared patients with odontogenic sinusitis between two private practice Otolaryngology and Endodontics groups.
Methods-This is a retrospective case series derived from a prospectively maintained database for 64 patients between 2008 and 2020 in the greater Spokane region.

Results:
Clinical characteristics

Symptoms:
Congestion (94%), sinus pain (84%), & nasal drainage (84%). History: prior sinusitis (87%), prior antibiotics (84%), > 9 months of symptoms (75%), prior root canal therapy (65%), & prior sinus surgery (46%). Endodontic evaluation.

Periapical:
Acute apical periodontitis (35%), chronic apical periodontitis (32%), & chronic apical abscess (10%); without periapical disease (23%). Pulpal: necrosis (33%), pulpless (33%), irreversible pulpitis (10%), necrosis & pulpless (10%), & normal pulp (10%). Radiographic: prominent periapical lesions (65%) & miscellaneous periodontal findings (35%).

Treatment:
Endodontics: Root canal therapy (RCT) (78%), root extraction (10%), apicoectomy (7%), RCT & root extraction (3%), & no treatment (3%).
Otolaryngology: Medications (67%), medications & functional endoscopic sinus surgery (FESS) (27%), FESS alone (3%), & no treatment (3%). Most patients (94%) received a combination of endodontics & otolaryngology treatments, RCT with medications (49%) +/- FESS (26%).

Outcomes:
Improvement: dental (94%), radiographic (84%), & sinus (71%). When unimproved, patients were more likely to have undergone endodontics or otolaryngology monotherapy.

Conclusions:
This study highlights the importance of shared management of patients with odontogenic sinusitis between endodontists & otolaryngologists alike.

Olfactory training for post-viral olfactory dysfunction

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Purpose:
Post-viral olfactory dysfunction (PVOD) is a common problem and clinical challenge. Olfactory dysfunction has been reported in 6-13% of patients presenting with viral upper respiratory infection. PVOD outcomes are variable: Some cases transiently self-resolve, while others are prolonged or permanent; similarly, PVOD severity ranges from mild hyposmia to anosmia. There is currently a lack of consensus on appropriate management for PVOD. We sought to summarize the efficacy of olfactory training (OT) for patients with PVOD by systematic literature review.

Methods:
Following PRISMA guidelines, PubMed, Embase, and Web of Science databases were queried, and abstracts screened independently by two investigators. We included studies evaluating the efficacy of OT for PVOD, and excluded studies evaluating only pharmacologic/surgical interventions or olfactory loss from other causes.

Results:
Sniffin' Sticks olfactory testing results were reported in 14 studies (93%) as threshold (T), discrimination (D), and identification (I) subscores, as well as TDI total scores. Nine studies (60%) reported clinically significant results after OT, defined as score improvements of: TDI>5.5, T>2.5, I>3, or D>3. In four studies suitable for meta-analysis, patients with PVOD who underwent OT demonstrated significant improvements in TDI scores compared to controls (mean difference 4.50; 95% CI 2.53-6.47).

Conclusions:
Current literature supports the efficacy of OT for clinically meaningful olfaction improvement in patients with PVOD. Though PVOD treatments are limited, greater adoption of OT may offer significant utility in existing and newly emerging cases.

Outcomes of skull base procedures in association with wound complication

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Background:
To investigate the association between wound classification and rates of postoperative complications in patients undergoing posterior skull base procedure with either otolaryngology (ENT) assistance or neurosurgery alone.

Methods:
The 2005-2016 National Surgical Quality Improvement Program (NSQIP) database was used. Independent t-tests, chi-squared analysis and logistic regression were used to determine the independent effect of covariates on postoperative complication rates. Retrospective database review of 4239 individuals.

Results:
Patient cohort of 4239 individuals were identified who underwent an posterior skull base surgery by either neurosurgeons alone or with otolaryngologist assistance. Independent t-test revealed that total length of hospital stay (p=.000) was longer when ENT assisted neurosurgery in patients with wound contamination during posterior skill base surgeries. Univariate analysis revealed that patients with wound contamination were more likely to receive ENT assistance (p= .01) compared to patients without this comorbidity. However, univariate analysis also demonstrated no significance regarding ENT assistance and wound infection (p=0.499). Multivariate regression analysis revealed no significantly elevated overall or specific postoperative complications risk following posterior skull base surgery with ENT assistance in patients with wound contamination (OR 0.292, CI 95% 0.034-2.514, p=0.262).

Conclusions:
This analysis demonstrates no significant difference in postoperative outcomes in patients with wound contamination undergoing posterior skull base procedures between ENT assistance and neurosurgery alone.

POSTERS

Outcomes of skull base procedures in emergency settings

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Background:
To investigate the association between emergent cases and rates of postoperative complications in patients undergoing posterior skull base procedure with either otolaryngology (ENT) assistance or neurosurgery alone.

Study Design:
Retrospective database review

Methods:
The 2005-2016 National Surgical Quality Improvement Program (NSQIP) database was used. On 4239 patients, Independent t-tests and logistic regression were used to determine the independent effect of covariates on postoperative complication rates.

Results:
Patient cohort of 4239 individuals were identified who underwent an posterior skull base surgery. Independent t-test revealed that total length of hospital stay (13.1 vs. 6.28 days, p< 0.001) was longer when ENT assisted neurosurgery in emergent cases requiring posterior skull base surgeries. However, anesthesia duration (262.95 vs 445.4 minutes, p=.001) and total operation time (195.3 vs. 335.3 minutes, p< 0.001) were shorter in emergent cases when ENT assisted neurosurgery in emergent cases requiring posterior skull base surgeries. Multivariate regression analysis of overall complication risk revealed no significantly elevated risk of postoperative complications following posterior skull base surgery with ENT assistance (OR 1.85, CI 95% 0.78-4.35, p=.161) in emergency settings. Multivariate regression revealed no significance for individual complications as well in this setting.

Conclusions:
There was no significant difference in overall and individual postoperative complication rates. However, emergent cases requiring posterior skull base approach experience a lengthier hospital stay but shorter duration of anesthesia and operation time.

Outcomes of skull base procedures in obese patients

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Background:
To investigate the association between obese and rates of postoperative complications in patients undergoing posterior skull base procedure with either otolaryngology (ENT) assistance or neurosurgery alone.

Methods:
The 2005-2016 National Surgical Quality Improvement Program (NSQIP) database was used to extract 4239 patients. Independent t-tests, chi-squared analysis and logistic regression were used to determine the independent effect of covariates on postoperative complication rates.

Results:
Patient cohort of 4239 individuals were identified who underwent an posterior skull base surgery by either neurosurgeons alone or with otolaryngologist assistance. Independent t-test revealed that total length of surgical stay (p=.05) was longer when ENT assisted neurosurgery in obese patients during posterior skill base surgeries. Univariate analysis revealed that obese patients were more likely to receive ENT assistance (p= .021) compared to patients without this comorbidity. Multivariate regression analysis revealed no significantly elevated overall or specific postoperative complications risk following posterior skull base surgery with ENT assistance in obese patients (OR 1.184, CI 95% 0.754-1.859, p=0.463).

Conclusions:
This analysis demonstrates no significant difference in postoperative outcomes in obese patients undergoing posterior skull base procedures between ENT assistance and neurosurgery alone.

Outcomes of skull base procedures in patients with disseminated cancer

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Background:
To investigate the association between disseminated cancer and rates of postoperative complications in patients undergoing posterior skull base procedure with either otolaryngology (ENT) assistance or neurosurgery alone.

Methods:
The 2005-2016 National Surgical Quality Improvement Program (NSQIP) database was used. Independent t-tests, chi-squared analysis and logistic regression were used to determine the independent effect of covariates on postoperative complication rates. Retrospective database review of 4239 individuals.

Results:
Patient cohort of 4239 individuals were identified who underwent an posterior skull base surgery by either neurosurgeons alone or with otolaryngologist assistance. Independent t-test revealed that total length of hospital stay (p=.022) was longer, while both anesthesia duration (p=0.005) as well as total operation time (p=0.00) were shorter when ENT assisted neurosurgery in patients with disseminated cancer during posterior skill base surgeries. Univariate analysis revealed that patients with a comorbidity of disseminated cancer were more likely to receive ENT assistance (p= .000) compared to patients without this comorbidity. Multivariate regression analysis revealed no significantly elevated overall or specific postoperative complications risk following posterior skull base surgery with ENT assistance in patients with a pre-existing comorbidity of disseminated cancer (OR 0.522, CI 95% 0.202-1.345, p=0.178).

Conclusions:
This analysis demonstrates no significant difference in postoperative outcomes in patients with disseminated cancer undergoing posterior skull base procedures between ENT assistance and neurosurgery alone.

Paraganglioma of the nasal septum
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Objective:
To present a rare case of paraganglioma of the nasal septum and review the diagnosis and management of this unusual neoplasm.

Methods:
Chart review and comprehensive review of the literature using PubMed and Google Scholar.

Results:
A 70-year-old male with a history of a septoplasty done 10 years ago presented for management of persistent post-nasal drip and coughing. Upon evaluation he was found to have a polypoid mass on the posterior nasal septum causing partial obstruction of the nasopharynx. He underwent in-office biopsy which was concerning for paraganglioma. He ultimately underwent transnasal excision of the mass. Post-operative visits have not shown any recurrent disease to date.

Conclusions:
Paragangliomas are slow growing neuroendocrine tumors originating from neural crest cells. They are usually found in the adrenal gland but can occasionally be found in other parts of the body, including the head and neck region where they present as carotid body or glomus tumors. The mainstay of therapy for paragangliomas is surgical although radiation therapy has been used as an adjunct for unresectable tumors. While presentation in the nasal cavity and nasopharynx is rare, it should remain on the differential diagnosis for nasopharyngeal lesions.

Patient satisfaction after chin fillers
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Background:
Chin fillers are performed by many board-certified physicians such as ENT trained surgeons, plastic surgeons, and ophthalmology trained oculoplastic surgeons. Through the use of cosmetic surgery reviews online, these physicians can be compared in their patient satisfaction rates as well as the makeup of their practice.

Methods:
The top 30 most reviewed physicians performing chin fillers in the metropolitan areas of New York (NY) and Los Angeles (LA) were taken from RealSelf cosmetic surgery review website with a radius of 30 miles from city center. Statistical analysis was implemented based on their patient satisfaction after procedure, number of reviews, and the number of by chin fillers-specific reviews.

Results:
ENT trained physicians are the major provider of chin fillers in both NY and LA based off reviews (50% vs. 50%). Most clinical practices in the NY and LA area do not have mentoplasties making up a majority of their clinical practice (2.61% vs. 1.65%, p=.471). When comparing geographic differences, there was no difference in the care provided in terms of patient satisfaction for NY and LA (4.75 vs. 4.95, p=.106). There was no significant difference in average patient satisfaction rate when comparing ENT surgeons, plastic surgeons, and ophthalmologists (4.85 vs. 4.70 vs. 5.00, p=.316) and in the percentage of chin fillers performed as a part of their clinical practice (1.75 vs. 2.33 vs. 2.70, p=.895).

Conclusions:
There are no significant differences between overall average patient satisfaction in chin filler procedures regardless if the surgeon is trained in plastics, ENT or ophthalmology trained facial plastics.

PDT to reduce post-operative infection after sinonasal surgery
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Introduction:
High rates of nasal colonisation with pathogenic bacteria, such as staph aureus, use of packing material and refined secretions and dried blood after sinonasal surgery contribute to an incidence of post-operative infection estimated to be as high as 15%. In order to prevent such infections, post-operative antibiotics are widely used, but with increasing rates of antibiotic resistant, reductions in usage are a global priority. We set out to assess if pre-operative nasal treatment with photodynamic therapy reduced post-operative prescription of antibiotics for presumed infection.

Methods:
PDT was used for 40 consecutive sinonasal procedures for a 6 month period, with an identical number of cases selected as a case control prior to introduction of the technique. All patients with pre-existing MRSA were excluded. All patients in the treatment arm underwent nasal photo disinfection with the MRSAid system immediately before surgery. Post-Operative care was unchanged, with antibiotics being prescribed to patients complaining of fever or heavy mucopurulent secretions. Antibiotic usage was compared between the 2 groups.

Results:
Prior to introduction of PDT, 9 patients (22.5%) were prescribed antibiotics by either the operating ENT surgeon or GP in the first 3 weeks after surgery. Following nasal photo disinfection this was significantly reduced to only 2 patients (5%) (P=0.02).

Conclusions:
This pilot study suggests that routine use of photo-disinfection prior to sinonasal surgery may help reduce routine prophylactic usage or prescription for presumed infection. However, the unblinded study is prone to bias and a further blinded randomised study is proposed, with microbiological assessment to supplement results.

Perioperative management of aspirin in AERD
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Background:
Patients with aspirin-exacerbated respiratory disease (AERD) often require sinus surgery for nasal polyposis, yet the risk of high dose aspirin therapy on surgical outcomes is unknown. The purpose of this study was to investigate perioperative management and

perceived risks associated with sinus surgery in patients with AERD.

Methods:
A survey was distributed electronically to the American Rhinologic Society and responses were collated on REDCap. 54 responses were received. The majority of respondents (79.6%) had been in practice more than five years. Of sinus surgeries performed by respondents 11.3% were on patients with AERD.

Results:
87.0% of respondents reported a lack of consensus regarding aspirin management in AERD patients undergoing sinus surgery. Only 18.3% of respondents were aware of an aspirin perioperative protocol for AERD, and of those only 16.7% reported adherence to the protocol. The bleeding risk for aspirin was perceived to be different than non-aspirin NSAIDs and the majority of respondents (50.0%) reported the greatest risk of aspirin in sinus surgery was an inability to visualize the surgical field. Prior to sinus surgery, respondents advised discontinuing aspirin 3-6 days (24.1%), 1-2 weeks (63.0%), and 2-3 weeks (11.1%) before surgery, respectively.

Conclusions:
There is significant inconsistency with regard to perioperative management in AERD patients on aspirin therapy. Aspirin therapy is currently the first-line medical management for AERD, and prolonged cessation of aspirin therapy may result in loss of desensitization. This study highlights the need for enhanced evidence-based recommendations for AERD patients on aspirin therapy undergoing endoscopic sinus surgery.

Perioperative opioid use in patients undergoing endoscopic sinus surgery based on OSA status
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Objective:
To analyze perioperative opioid usage in patients undergoing functional endoscopic sinus surgery (FESS) with known, suspected and no obstructive sleep apnea (OSA).

Methods:
Retrospective review of 104(N) patients who underwent FESS, grouped into known OSA (based on patient's history), suspected OSA (based on STOP-BANG score>3), and no OSA (based on preoperative diagnosis and STOP-BANG<3). Type and requirement of opioids used (in-MME-morphine milligram equivalents); post-operative complications, anesthesia and post-operative recovery unit (PACU) duration with total time to discharge were analyzed.

Results:
Of 104(N) patients, 18(17.3%) had OSA, 31(29.8%) were OSA suspected and 55(52.9%) were without OSA. Mean total opioids received peri-operatively by OSA(43.9 MME), suspected OSA(53.3 MME) and non-OSA(47.2 MME) groups were similar, however, in PACU, patients with suspected OSA required significantly greater MME compared to those with OSA and no OSA(MME-21.5 vs 13.3 vs 12.5; p=0.02). Fentanyl intraoperatively and fentanyl and hydrocodone-acetaminophen 5/325 mg in PACU were the most used opioids. Patients with suspected OSA [(p= 0.006),22.6%] were significantly more likely to require overnight stay when compared to those with OSA [(p=0.33),5.6%] or without OSA[(p=0.083),5.5%]

Conclusion:
Suspected OSA patients received significantly higher doses of opioids in PACU and were more likely to require overnight stay when compared to those patients with known and no OSA. This data suggests that the STOP-BANG may be a useful tool for the preoperative assessment of patients undergoing FESS. This group may benefit from similar treatment with regards to perioperative narcotic use, however, further investigation is warranted.

Posterior skull base outcomes in stroke patients
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Objectives:
To investigate the association between patients prior histroy of a cerebrovascular accident (CVA) and rates of postoperative complications in patients undergoing posterior skull base procedures with either otolaryngology (ENT) assistance or neurosurgery alone.

Study Design:
Retrospective database review

Methods:
The 2005-2016 National Surgical Quality Improvement Program (NSQIP) database was used. Chi-squared analysis and logistic regression were used to determine the independent effect of covariates on postoperative complication rates.

Results:
Patient cohort of 534 individuals were identified who underwent an posterior skull base surgery by either neurosurgeons alone or with otolaryngologist assistance. Univariate analysis revealed that patients with a CVA history were more likely to receive ENT assistance (p= .002) compared to patients without this comorbidity. Multivariate regression analysis of overall complication risk revealed no significantly elevated risk of postoperative complications following posterior skull base surgery with ENT assistance (OR 1.328, CI 95% 0.661-2.670, p=.425). However, multivariate regression analysis of individual complications revealed significantly elevated risk of postoperative CVA (OR 3.062, CI 95% 1.028-9.119, p=.044), superficial surgical site infection (OR 25.178, CI 95% 1.213-522.537, p=.037) and more likely to require ventilation for more then 48 hours (OR 3.152, CI 95% 1.276-7.783, p=.013).

Conclusions:
While there was no significant difference in overall postoperative complications, there was significantly elevated risk of developed specific individual postoperative complications in this population of patients.

Postoperative complications in CSF leak repairs

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Objective:
Identify postoperative complications in anterior leak (AL) and lateral leak (LL) repair techniques.

Methods:
Retrospective review of patients with AL and LL repairs.

Results:
AL (n=45): 77% presented with encephalocele and 6% with meningocele. 98% underwent transsphenoidal approach. Complications included sinusitis (22%), VP shunt infection (8%), septal perforation (6%). 3 patients had postoperative leaks. 62.7% had NSF repairs, 6% superior turbinate flaps, 4% bone grafts, and 4% inferior turbinate flaps. There was no significant differences in sinonasal complications between NSF and turbinate flaps (p=0.2). LL (n=42): 92% presented with encephaloceles and 4% presented with meningoceles. 62% underwent transmastoid approach, 8% craniotomy, 30% with combined approach. Complications of transmastoid approach included hearing loss(27%), VP shunt infection (14%), otogenic infection (OI) (9%); craniotomy included hearing loss(25%) and tinnitus(25%); combined included hearing loss(33%), tinnitus(27%), OI (13%), VTE (7%). There were no significant differences in 30-day readmission or postoperative leaks between approaches (p=0.7). The combined approach had greater risk of complications (OR=1.2, p=0.04). 65% had bone graft repairs, 45% collagen dural substitute alone, and 31% had collagen dural substitute and pericranial flap. There was no significant difference in postoperative complications between each repair (p=0.3).

Conclusion:
Identifying complications for different approaches and repair techniques can guide clinical decision making. For AL, NSF did not increase sinonasal morbidity, proving to be an effective repair technique. For LL, there were more postoperative complications associated with combined approaches.

Postoperative length of stay after elective CSF leak repair: Costs and outcomes

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Background:
Cerebrospinal fluid (CSF) leak repair is often employed to prevent adverse consequences. Certain pathologies permit advanced scheduling for repair. This study evaluated how postoperative length of stay (PLOS) impacts cost and outcomes after elective CSF leak repair.

Methods:
A retrospective analysis of elective CSF repair procedures was performed using the 2014 National Readmission Database, a nationally representative sample. Demographic, procedural, complication and economic data were abstracted. Rates of readmission, reoperation for recurrent CSF leak, intracranial infection, and costs of initial admission and total hospital care were considered within 30 days of discharge. Patients were divided into groups by PLOS: (1) <1 day, (2) 1-3 days, and (3) >3 days.

Results:
A survey-weighted total of 594 subjects were included and categorized into group 1 (n=83), group 2 (n=69), and group 3 (n=442). Age, lumbar drain placement, acute illness severity level, and number of preexisting chronic conditions were similar across groups. Sex differences existed across groups

(p=.009), however multivariate analysis did not reveal an impact of sex on outcomes. For the entire cohort, rates of readmission, reoperation and intracranial infection were 8.3%, 1.9%, and 2.7%, respectively, with no differences across groups for these complications (p=0.826, p=0.297, p=0.342, respectively). Initial admission and total costs were greater in group 3 compared to group 1 (median total costs $11,449 vs. $7,218, p <.001).

Conclusions:
Shorter PLOS after elective CSF leak repair does not increase adverse outcomes and is associated with lower healthcare costs. Further investigation to verify these findings is warranted.

Post-operative outcomes in posterior skull base procedures by immunosuppressant use and subspecialty

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Background:
To investigate the association between steroid and immunosuppressant usage and rates of postoperative complications in patients undergoing posterior skull base procedure with either otolaryngology (ENT) assistance or neurosurgery alone.

Methods:
The 2005-2016 National Surgical Quality Improvement Program (NSQIP) database was used. Independent t-tests, chi-squared analysis and logistic regression were used to determine the independent effect of covariates on postoperative complication rates. Retrospective database review of 4239 individuals.

Results:
Patient cohort of 4239 individuals were identified who underwent an posterior skull base surgery by either neurosurgeons alone or with otolaryngologist assistance. Independent t-test revealed that total length of hospital stay (p=.007) as well as total operation time (p=0.001) was longer when ENT assisted neurosurgery in patients on steroid and immunosuppressive therapy, during posterior skill base surgeries. Univariate analysis revealed that patients on immunosuppressive therapy were more likely to receive ENT assistance (p= .008) compared to patients without this comorbidity. Multivariate regression analysis revealed no significantly elevated overall or specific postoperative complications risk following posterior skull base surgery with ENT assistance in patients with steroid and immunosuppressive therapy usage. (OR 0.78, CI 95% 0.367-1.678, p=0.531).

Conclusions:
This analysis demonstrates no significant difference in postoperative outcomes in patients on steroid or immunosuppressive therapy undergoing skull base procedures between subspeciality.

Posttraumatic cerebrospinal fluid fistula - surgical management

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Objectives:
Anterior skull base fractures represent a major cause of cerebrospinal fluid (CSF) fistula. Cases that do not resolve with conservative management require surgical repair. Endoscopic endonasal approaches (EEA) to the anterior skull base avoid the morbidity of a craniotomy in many cases while large or inaccessible defects still require a combined approach. We report our experience with surgical repair of traumatic CSF fistulae of the anterior skull base.

Design:
Chart Review

Methods:
Charts were reviewed for adult patients undergoing surgical repair of traumatic anterior skull base CSF fistula (n=13) via EEA (n=8) and EEA + craniotomy (n=5) in a single tertiary-care institution. Patient demographics, mechanism of injury, fracture characteristics, surgical technique, and hospital course were recorded. Outcomes reported include resolution of CSF rhinorrhea, revision surgery, perioperative complications. Intraoperative images and video were obtained.

Results:
Average age at surgery was 49 years (range: 24-90) and 69 percent of patients were male. Most common mechanisms of injury were motor vehicle crash (5/13) and ground level fall (5/13). Mean fracture displacement and cross sectional area were 3.8 mm and 10.3 mm2, respectively, in the EEA group, compared to 12.3 mm and 1245.2 mm2 in the EEA + craniotomy group. Graft material varied in both groups. Repair was successful in all patients. One patient required EEA for a contralateral fistula three years after initial surgery.

Conclusions:
Many traumatic CSF fistulae can be repaired through EEA. Large defects still require open approach and EEA is a useful adjunct in these cases. Successful skull base repair relies on proper surgical technique rather than graft material.

POSTERS

Potential costs of dental treatment and endoscopic sinus surgery for odontogenic sinusitis

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Background:
Successful management of odontogenic sinusitis (ODS) may require dental treatments and endoscopic sinus surgery (ESS). Significant variation exists in the literature with regard to recommended dental procedures and extent of ESS for ODS. No study has discussed the costs of these different treatment options. This study determined the costs of different combinations of dental treatments and ESS for ODS.

Methods:
Using Medicare and Fair Health databases, cost data were obtained for dental and sinus surgical treatments across the United States. Costs for the following treatments were analyzed: root canal therapy (RCT), revision RCT, apicoectomy, dental extraction, oroantral fistula (OAF) closure, dental implant, bone graft, and ESS (maxillary, anterior ethmoid, frontal sinus surgery). Cost ranges were determined for primary dental extraction, RCT, OAF closure, and ESS treatment pathways, accounting for the costs of potentially necessary revision or additional dental procedures.

Results:
Depending on the need for revision or additional dental procedures, mean primary dental extraction cost was $231 (max: $5,643), mean RCT cost was $1,909 (max: $13,610), and mean OAF closure cost was $1,132. ESS cost ranged from $1,792-3,583 depending on extent of surgery. Total costs varied based on the combinations of dental procedures and extents of ESS.

Conclusion:
While dental extraction alone is the least expensive treatment option for ODS, patient costs will vary based on the need for subsequent dental procedures, ESS, and medical and dental insurance coverage. Treatment costs increase significantly if revision dental procedures are required, or if dental implants are considered.

Preoperative screening for obstructive sleep apnea in endoscopic skull base surgery: NASBS survey

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Introduction:
Obstructive sleep apnea (OSA) can be a comorbidity in many patients who undergo endoscopic skull base surgery and may influence perioperative decisions. Current practice patterns for preoperative OSA screening are poorly understood. The objective of this study was to assess how surgeons screen patients for OSA, and how knowledge of OSA affects perioperative decision-making.

Methods:
Seven-question survey distributed to members of the North American Skull Base Society.

Results:
Eighty-eight responses were received. Most respondents were from academic centers with surgical volume >50 cases per year. Most respondents noted that preoperative knowledge of OSA and its severity affects postoperative care and increases concern for complications. Fifty percent of respondents noted that preoperative knowledge of OSA and its severity affects intraoperative skull base reconstruction decision-making.
Seventy percent of respondents did not currently use a preoperative OSA screening protocol. Body mass index and patient history were most frequently used by those who screened. Validated screening questionnaires were rarely used. 76% of respondents agreed or somewhat agreed that a preoperative polysomnogram should ideally be performed for patients with suspected OSA; however, 47% of respondents reported that <20% of patients with suspected OSA are advised to obtain preoperative polysomnogram.

Conclusion:
Most endoscopic skull base surgeons agree that OSA affects postoperative care, but only a minority of respondents have a preoperative screening protocol in place. Additional study is needed to assess most appropriate screening methods and perioperative protocols for OSA in patients undergoing endoscopic skull base surgery.

Preoperative smell changes as predictors of post FESS clinical difference in SNOT-22 scores

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Objective:
To identify significance of patient variables in achieving post FESS minimal clinically important difference (MCID) in SNOT-22 scores.

Methods:
Retrospective chart review of 89 patients who underwent FESS for CRS. Pre- and post-operative SNOT-22 scores were compared 4, 4-8, and 8-16 weeks after surgery. Variables were compared between those who attained MCID and those who did not. Statistical significance was analyzed using SPSS 26.

Results:
89 patients had SNOT-22 scores, recorded pre- and post-operatively.

4 weeks: 29 patients achieved MCID. Charlson Comorbidity Index- a survival analysis score (p=0.047), pre-surgery anosmia (p=0.029), smell disturbance (p=0.01), nasal blockade (p=0.03) and discharge scores (p=0.01) showed significance in attaining MCID.

4-8 weeks: 18 of 37 (48.6%) patients with SNOT-22 scores achieved MCID. 7 maintained MCID from previous follow-up, 11 newly achieved MCID. The same variables at 4 weeks and total Lund-McKay score attained significance.

8-16 weeks: 18 of 35 (51.4%) patients continued to achieve MCID. Those who used nasal rinses were significantly more likely to attain MCID (p=0.025).

Variables like gender, age, BMI, smoking status, AERD status, asthma status, previous nasal or sinus surgery, sinuses involved and operated upon, additional surgeries like septoplasty or turbinate reduction, post-operative antibiotics, nasal rinses or steroids did not gain statistical significance in attaining or maintaining MCID.

Conclusion:
Low Charlson Comorbidity Index, pre-operative symptomatic smell domain, nasal blockage and discharge scores, and post-operative nasal rinse predict long term maintenance of SNOT-22 MCID.

Prevalence of specific antibody deficiency in recurrent acute sinusitis and chronic rhinosinusitis

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Background:
Specific antibody deficiency (SAD) is defined by recurrent respiratory infections and impaired antibody response to a polysaccharide vaccine despite normal immunoglobulin levels. The prevalence of SAD in patients with recurrent acute bacterial sinusitis (RABS) has not been reported, and has been the subject of limited study in chronic rhinosinusitis (CRS).

Methods:
A retrospective cross-sectional study included adult patients in a large healthcare center diagnosed with RABS or CRS who had laboratory data showing deficient S. pneumoniae antibody titers as well as subsequent 23-valent pneumococcal polysaccharide vaccine administration. Each of 14 S. pneumoniae serotype titers were analyzed pre- and post-vaccine per patient. Patients were considered to have inadequate S. pneumoniae titer levels if >/=50% of the serotypes were below a reference standard (<1.3 µg/mL). Persistence of low titers of >/=50% of serotypes after PPV administration was consistent with a diagnosis of SAD.

Results:
Of 96 patients diagnosed with CRS, 63 patients (66%) had an adequate response to the pneumococcal polysaccharide vaccine while 33 patients (34%) had an inadequate response consistent with a diagnosis of SAD. Of 21 patients diagnosed with RABS, 11 patients (52%) had an adequate response to the vaccine while 10 patients (48%) had an inadequate response.

Conclusion:
Insufficient specific antibody titers are common among patients with RABS and CRS and suggest the need for routine immunological evaluation.

POSTERS

Psychosocial improvements in CRS patients after FESS

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Background:
Psychosocial symptoms (PS) have been suspected to impact patients with chronic rhinosinusitis (CRS), although studies showing the relationship between functional endoscopic sinus surgery (FESS) and PS are sparse. This study demonstrates the impact of FESS on the psychosocial subdomain scores of the SNOT-22 on CS patients.

Methods:
The Sino-Nasal Outcome Test (SNOT-22), a 22-item validated sinus QOL instrument was distributed to patients suffering from moderate to severe CS undergoing FESS. A subset of 7 SNOT-22 questions were used. Summing the patient's response from each of the 7 questions gives a total psychosocial score ranging from 0 to 35. This score was calculated both preoperatively and at 3, 6, and 12 months postoperatively and analyzed using student's t-test. Higher scores denote more severe psychosocial symptoms.

Results:
Nine hundred twenty-two (922) continuous CRS patients were asked to complete the SNOT-22. A total of 885 patients, 376 females and 509 males completed the form preoperatively. Prior to surgery, the mean calculated psychosocial score + standard deviation (SD) was 12.62 + 8.59. 358 patients completed the SNOT-22 after 3 months, the mean score was 5.80 + 7.45. 241 patients completed the SNOT-22 after 6 months, the mean score was 4.81 + 6.76. 162 patients completed the SNOT-22 after 12 months, the mean score was 4.63 + 6.34. A t-test comparing preoperative psychosocial scores and scores at 3, 6, and 12 months all gave $p < 0.0001$.

Discussion:
This study shows that CS patients suffer from psychosocial symptoms. Undergoing FESS has a statistically significant effect on psychosocial symptoms in CS patients at 3, 6, and 12 months postoperatively.

Pulmonary comorbidities and the anterior skull base

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Background:
To investigate the association between various pulmonary comorbidities and their effects on patients undergoing anterior skull base procedures with respect to hospital course duration, total operation time, and different postoperative complications.

Methods:
The 2005-2016 National Surgical Quality Improvement Program (NSQIP) database was used. Independent t-test and logistic regression were used to determine the independent effect of covariates on hospital course and postoperative complication rates. Retrospective database review of 4053 individuals.

Results:
4053 individuals were identified who underwent an anterior skull base surgery by either neurosurgeons alone or with otolaryngologist assistance. Independent t-test revealed that patients with history of COPD undergoing skull base procedures experienced increased total hospital stay (9.31 vs 5.85 days, p=.001). Patients with comorbid smoking history were found to have increased total hospital stay (7.15 vs 5.68 days, p=0.003) and increased total operation time (246.8 vs 220.8 minutes, p=0.001). On independent t-test no associated differences were found in patients with comorbid pneumonia, dyspnea, and ventilator usage exceeding 48 hours. Multivariate regression analysis of overall complication risk revealed no significantly elevated risk of postoperative complications in patients with these pulmonary comorbidities.

Conclusions:
While there were no significant differences in postoperative complications overall in patients with pulmonary comorbidities, there was a statistical association between the specific comorbidity and factors related to the anterior skull base procedures.

Pulmonary comorbidities and the posterior skull base

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Background:
To investigate the association between various pulmonary comorbidties and their effects on patients undergoing posterior skull base procedures with respect to various intra-operative variables and post-operative complications.

Methods:
The 2005-2016 National Surgical Quality Improvement Program (NSQIP) database was used to extract 4239 patients. Independent t-test and logistic regression were used to determine the independent effect of covariates on hospital course and postoperative complication rates.

Results:
Within the NSQIP database, there were 4239 patients identified who underwent a posterior skull base surgery. Independent t-test analysis of patients with chronic obstructive pulmonary disease were found to experience increased overall length of total hospital stay (11.4 vs 6.4 days, p<.001) compared to patients without this specific comorbidity. Patients with recently diagnosed pneumonia and/or receiving antibiotic treatment were found to experience increased length of surgical stay (99.0 vs 78.4 hours, p=.027). Additionally, patients who have smoked cigarettes within the past year prior to admission also demonstrated shorter length of total surgical stay (92.0 vs 94.0 hours, p=.007). On multivariate regression analysis, there was no significant difference in overall or individual risk of postoperative complications.

Conclusions:
Patients with individual pulmonary comorbidities experience specific changes to intra-operative variables and/or hospital course. However, amongst the comorbidities studied, there were no changes in post-operative complications found in these patients related to their posterior skull base procedure.

Quality of life instruments in endoscopic endonasal skull base surgery – a systematic review

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Background:
Quality of life (QOL) outcomes are increasingly important in endoscopic endonasal skull base surgery (EESBS), and are used to quantify patient outcomes and measure surgical success. QOL instruments assist in patient counseling and surgical-decision making, however available QOL metrics are not widely adopted and have intrinsic shortcomings. This systematic review sought to review and provide guidance on available QOL instruments for patients undergoing EESBS.

Methods:
Eight databases (PubMed, Embase, Cochrane Library, CINAHL Plus, PsycINFO, Web of Science, Scopus and ClinicalTrials.gov) were queried. Articles were included if they described the development and/or validation of a disease specific QOL instrument in adult EESBS patients. Instrument characteristics and psychometric properties were assessed.

Results:
Eight studies, representing the development and/or validation of six QOL instruments, were included. The included instruments were the Skull Base Inventory (SBI), Endoscopic Endonasal Skull Base and Sinus Surgery Questionnaire (EES-Q), Anterior Skull Base Nasal Inventory (ASK-9 and ASK-12), the Anterior Skull Base QOL Questionnaire (ASBQ) and the Sino-Nasal Outcome Test for Neurosurgery (SNOT-NC). Instruments differed in their length (9-41 items), measured domains (e.g. physical, emotional, social, specific symptoms), number of disease-specific items and time or difficulty to complete.

Conclusions:
This review serves as a practical guide for surgeons assessing QOL outcomes in EESBS. Multiple instruments exist, each with their own strengths and weaknesses. Increased utilization of these instruments is important in advancing our understanding and management of patients with skull base pathologies.

POSTERS

Radiographic differences in skull base height and anterior ethmoid artery location in AFRS

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Background:
The anterior ethmoid artery (AEA) is an important structure to identify during endoscopic sinus surgery (ESS) for Allergic Fungal Rhinosinusitis (AFRS) to prevent injury and potential complications. We sought to determine if the expansion from fungus put AEA at greater risk of being in a mesentery. We also sought to determine if specific anatomic variants were more prevalent in AFRS such as Keros measurement, distance from the AEA to skull base (AEA-SB) and the presence of the supraorbital ethmoid air cell (SOEC).

Methods:
A retrospective review of patients undergoing sinus surgery at a tertiary center from March 2014 – December 2017 was completed. Two independent reviewers evaluated CT scans for radiographic evidence of AFRS (n=69) and healthy controls (n=25). Reviewers evaluated Keros measurements, AEA-SB, and presence of SOEC. Comparison between the groups were made using Students t-test. The difference between the groups was considered statistically significant at a two-sided p value of < 0.05.

Results:
The groups did not differ by age or gender. AEA-SB was significantly greater in patients with AFRS (2.77 and 2.71 mm, right and left, respectively) compared to the control group (1.19 and 0.69 mm, right and left, respectively) ($p < 0.05$). A SOEC was present in 28% of controls versus 44% with AFRS ($p < 0.05$).

Conclusion:
AEA-SB length was greater (more likely to be in mesentery) and presence of SOEC more likely in those with AFRS. These factors should be accounted for when performing ESS.

Regional peak mucosal cooling predicts outcomes of radiofrequency treatment of nasal obstruction

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Introduction:
Low energy radiofrequency has been reported to offer effective treatment for narrow or obstructed nasal valve, yet its precise mechanism is not fully understood.

Methods:
20 patients with internal nasal valve obstruction underwent office based Vivaer treatment (Aerin Medical, Inc) under local anesthesia. Computational fluid dynamics (CFD) models were constructed based on the pre- and 90 days post procedure CT scans to identify salient changes in nasal airflow parameters.

Results:
Patients' Nasal Obstruction Symptom Evaluation (NOSE score: pre-treatment 78.89±11.57; post-treatment 31.39±18.30, P=5e-7) and Visual Analogue Scale (VAS score: pre-treatment 6.01±1.83; post-treatment 3.44±2.11, P=1e-4) improved significantly. Nasal airway volume in the treatment area increased ~7% (pre-treatment 5.97±1.20, post-treatment 6.38±1.50 cm3, P=0.018), yet there were no statistically significant changes in the measured peak nasal inspiratory flowrate (PNIF, pre-treatment: 60.16±34.49; post-treatment:72.38±43.66ml/s; P=0.13) and CFD computed nasal resistance (pre-treatment: 0.096±0.065; post-treatment:0.075±0.026Pa/(ml/s); P=0.063). As validation, PNIF correlated significantly with nasal resistance (r=0.47, P=0.004). Among all the variables, only the peak mucosal cooling posterior to the nasal vestibule significantly correlated with the NOSE at baseline (r=-0.531, P=0.023) and post-treatment improvement (r=0.659, P=0.003).

Conclusion:
Minimal remodeling of the nasal valve may have a profound effect on perceived nasal obstruction, despite little effect on nasal resistance or PNIF. This outcome may have the potential to assist patients and clinicians in planning effective, well-informed, personalized therapeutic strategies.

Relationship between target registration error (TRE) and fiducial registration error (FRE)

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Background:
This paper studies the impact of the number of registration landmarks on the navigation accuracy in image guided sinus surgery. We demonstrate that lower Fiducial Registration Error (FRE) does not necessarily lead to better Target registration Error (TRE).

Method:
The commercially available optical navigation system (Navient Image guided navigation system - ClaroNav Kolahi Inc., Toronto, Canada) was used on 30 patients from Feb-2019 to Mar-2020. Each patient was registered using 7 anatomical landmarks. Since mounting CT fiducials on the real patients is invasive and impractical, we developed a novel noninvasive method to measure the distance from the navigation probe to the patient's skin as a new metric to quantify navigation accuracy. The measurements were taken from multiple points on the patient's forehead, temples and base of nose. These anatomical locations were chosen carefully to represent navigation accuracy in all three planes. Our method also eliminates Target Localization Error (TLE), which is the main source of error in TRE studies. Post-operatively we reduced the number of registration landmarks to 4, and using a computer simulation computed the navigation accuracy.

Results:
When compared to 4-landmarks for registration, the 7 landmarks had significant improvement on the TRE. The additional time spent for marking 3 additional landmarks was insignificant.

Conclusion:
We successfully demonstrate that using more landmarks for registration leads to a better TRE (Target registration Error). Furthermore, we demonstrated that lower FRE (fiducial registration error) does not necessarily equate to better TRE, and deleting a landmark to improve FRE is wrong practice.

Renal cell-like adenocarcinoma (SNRCLA) of the nasal cavity: Case report and literature review

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Background:
Renal Cell-like Adenocarcinoma (SNRCLA) is a newly defined, rare malignant tumor of the nasal cavity. Due to the new pathological delineation of the tumor, the clinical course and response to treatment remains uncertain. The purpose of this study is to report a new case of SNRCLA and review previously reported cases to determine clinical characteristics and recurrence.

Methods:
We report a case of SNRCLA in a 26-year-old male who presented with epistaxis and review previously reported cases.

Results:
A 26-year-old male presented to our institution with epistaxis and nasal obstruction. Initial biopsy revealed probable adenocarcinoma. Primary surgical excision with combined endonasal and coronal incision with craniotomy was performed followed by postoperative radiotherapy (RT). After RT, the patient had persistent disease and secondary endonasal surgical resection was performed. The patient is currently free of disease. Our literature review revealed 15 previously reported cases of SNRCLA (cases with questionable diagnosis were excluded). The most common presenting symptoms was epistaxis, surgical excision was primary treatment in 14/16, 10/16 patients received RT and 2/16 cases had persistent or recurrent disease.

Conclusion:
Although previous studies describe pathologic characteristics of SNRCLA, there is a sparsity of literature on the clinical characteristics of the disease. Our study reviews specifically the clinical aspects of this disease, including presentation, treatment course, and follow up. We can conclude that the recurrence rate is low, but the prognosis of the disease and best practice for treatment is yet to be determined.

POSTERS

Responder analyses dupilumab NC and LoS scores

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Background:
Currently, there are no chronic rhinosinusitis with nasal polyps (CRSwNP) consensus guidelines on the definition of clinically meaningful changes in patient-reported nasal congestion (NC) and loss of smell (LoS) scores. To contextualize the impact of dupilumab vs placebo, responder analyses were conducted across a range of within-person change thresholds for improvement in NC and LoS scores.

Methods:
In the phase 3 SINUS-24/SINUS-52 (NCT02912468/NCT02898454) studies, patients reported NC and LoS on a scale of 0 (no symptoms) to 3 (severe symptoms). Pooled study data were used to compare proportion of dupilumab vs placebo patients with improvement in NC and LoS scores of ≥ 0.5, ≥ 0.75, and ≥ 1 from baseline to Week 24. Cumulative distribution function (CDF) curves evaluated responders in dupilumab vs placebo across the entire spectrum of responder definitions.

Results:
Proportion of dupilumab/placebo patients with ≥ 0.5, ≥ 0.75, ≥ 1.0 improvement in NC score was 77.2% vs 39.4%, 72.6% vs 32.9%, 65.6% vs 24.5%, respectively; all $P < 0.0001$. Similarly, proportion of dupilumab/placebo patients with ≥ 0.5, ≥ 0.75, ≥ 1.0 improvement in LoS score was 70.9% vs 22.0%, 68.4% vs 18.1%, 64.4% vs 15.2%, respectively; all $P < 0.0001$. CDF curves supported the previous results, with distinct separation between dupilumab and placebo curves across all responder definitions.

Conclusions:
A significantly greater proportion of dupilumab patients experience improvement in NC and LoS vs placebo regardless of within-person change threshold used.

Role of ER stress in TGF-β1-induced EMT in airway epithelium

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Epithelial-mesenchymal transition (EMT) is a biological process that allows epithelial cells to assume a mesenchymal cell phenotype. EMT is considered as a therapeutic target for several persistent inflammatory airway diseases related to tissue remodeling. Herein, we investigated the role of endoplasmic reticulum (ER) stress and c-Src in TGF-β1-induced EMT. A549 cells, primary nasal epithelial cells (PNECs), and inferior nasal turbinate ex vivo organ cultures were exposed to 4-phenylbutylic acid (4PBA) or PP2 and then stimulated with TGF-β1.

We found that E-cadherin, vimentin, fibronectin, and α-SMA expression was increased in CRS compared to inferior turbinates. TGF-β1 increased the expression of EMT markers such as E-cadherin, fibronectin, vimentin, and α-SMA and ER stress markers (XBP-1s and GRP78), an effect that was blocked by PBA or PP2 treatment. 4-PBA and PP2 also blocked the effect of TGF-β1 on migration of A549 cells and suppressed TGF-β1-induced expression of EMT markers in PNECs and ex vivo organ cultures of inferior turbinate. 4-PBA or PP2 also inhibited TGF-β1-induced cell migration and invasion.

In conclusion, we demonstrated that 4PBA inhibits TGF-β1-induced EMT via the c-Src pathway in A549 cells, PNECs, and inferior turbinate ex vivo organ cultures. These results suggest an important role for ER stress and a diverse role for TGF-β1 in upper airway chronic inflammatory disease such as CRS.

Role of zileuton in treatment of aspirin exacerbated respiratory

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Objective:
to evaluate the long-term effect of zileuton on sinonasal outcomes in patients with Aspirin Exacerbated Respiratory Disease (AERD). Chronic rhinosinusitis (CRS) patients with AERD have high rate of treatment failure.

Methods:
All patients with AERD treated from 2008-2020 were reviewed. Those patients were divided into two cohorts, depending if they were treated with zileuton at any point in their clinical course. Demographic data, 22-item sinonasal outcome test (SNOT-22), Lund-Kennedy (LK) endoscopy score, Lund-Mackay

(LM) CT score, duration of treatment on zileuton, and number of sinus surgeries performed were collected.

Results:
40 AERD patients were included, with follow-up duration up to 10 years (avg of 5.2 years). All patients were treated with topical saline and budesonide irrigations, intranasal steroid spray, and montelukast. 19 patients had uncontrolled sinus and lung disease requiring multiple steroid tapers and were switched from montelukast to zileuton (cohort 1, 47.5%) at some point in their treatment. 21 patients (cohort 2, 52.5%) never needed zileuton. The average duration of treatment with zileuton was 6 years. Average age was 52 years for cohort 1 vs 48 years for cohort 2 (p=0.329). Patients who required zileuton (cohort 1) had a worse SNOT-22 (27.7 vs 19, p=0.1), worse LK score (8.1 vs 7.8, p=0.504), and higher average number of surgeries (1.9 vs 1.6, p=0.343). The addition of zileuton improved SNOT-22 from 32.1 to 27.4 (p=0.617) and LK score from 7.9 to 6.2 (p=0.092); and it lowered the number of surgeries needed to an average of 0.5 (p<0.0001).

Conclusion:
Zileuton is a viable treatment for recalcitrant CRS in patients with AERD. It may help decrease the number of sinus surgeries needed.

Salvage endoscopic nasopharyngectomy
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Background:
Locally recurrent or persistent nasopharyngeal carcinoma presents a therapeutic challenge since options for re-irradiation and/or chemotherapy are limited, with poor tolerance and toxicities. Several open surgical approaches have been described, however, due to the proximity of vital structures and poor visualization, each carry significant morbidity. More recently, endonasal endoscopic nasopharyngectomy has emerged as a viable alternative.

Aim:
To assess the oncologic outcomes of patients with recurrent or persistent nasopharyngeal carcinoma who underwent salvage endoscopic endonasal nasopharyngectomy.
Methods: A systematic review of published literature on recurrent NPC and salvage endoscopic surgeries from 1970 to 2020 on Pubmed, Embase, Cochrane and Web of Science databases was conducted. Data were extracted regarding patient demographics, oncologic stage at recurrence, surgical treatment details, follow up and survival outcomes.

Results:
Twenty-five journal articles comprising a total of 661 patients were included. Average follow-up was 22.9 months (range 5-121 months). Approximately three quarters of the patients were male (73.96%). The majority of patients were re-staged at rT1 (49.4%), rT2, rT3 and rT4 comprising 24.1%, 18.8%, and 7.7%, respectively. Aggregate 1-year, 2-year and 5-year disease-free survival were 93.7%, 58.1% and 38.5%, respectively. Aggregate 1-year 2-year and 5-year overall survival were 98.2%, 81.7% and 66.6%. The most severe outcome reported was ICA injury in 1 patient, most common complaint was headaches.

Conclusion:
Endonasal endoscopic salvage nasopharyngectomy is a safe and viable alternative to open approaches. Further study is warranted to assess long term outcomes.

SARS-CoV-2 viral inactivation using low dose povidone-iodine via sinonasal and oral cavity
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Background:
The workflow for Otolaryngologists has radically changed due to the current COVID-19 pandemic caused by the SARS-CoV-2 virus. SARS-CoV-2 is highly transmissible and has high viral loads in the nasopharynx and oropharynx in both symptomatic and asymptomatic patients. Nasal decontamination techniques should be implemented as an important adjunct to personal protective equipment. We describe a protocolized approach towards nasal decontamination in patients prior to nasal and oral procedures, as well as routine use in healthcare workers.

Methods:
We have chosen a povidone-iodine solution with specific activity against coronaviridae, including SARS-CoV and MERS. An aqueous concentration of 0.5% (v/v) has been selected to optimize efficacy while minimizing risk. Safety has been adequately demonstrated for long term use at this concentration. We describe a specific protocol for use in bilateral nasal cavities and the throat in conscious and unconscious patients immediately prior to undergoing intranasal or intraoral procedures. In addition, we put forth a specific protocol for healthcare workers to use twice daily, as well as whenever donning and doffing a mask in high risk settings.

Conclusions:
This protocol should serve as an approach to routine decontamination procedures for Otolaryngologists as

we return back to work in the era of COVID-19. It can be implemented in Otolaryngology clinics, emergency departments, and operating rooms.

Sinonasal extranodal natural killer/T cell lymphoma: National analysis of a rare lymphoma

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Background:
Extranodal natural killer/T Cell Lymphoma (ENKTL), is a rare, aggressive non-Hodgkin's lymphoma that is infrequently seen in the United States and Europe, but is more common in East Asia, South, and Central America. In this study, we analyze clinicopathologic and treatment factors that affect survival in sinonasal ENKTL (SN- ENKTL).

Methods:
The National Cancer Database was queried for all cases of SN-ENKTL from 2004-2015 that had complete treatment and survival data (n=613). Kaplan-Meier analysis and Cox proportional hazards modelling were used to determine factors associated with survival.

Results:
The majority of patients were aged 18-59 (66.9%), male (65.6%), and had a Charlson-Deyo comorbidity score of 0 (86.8%). 61.2% of patients presented with stage IE disease, 18.3% with stage IIE, and 20.6% with stage IIIE-IVE. For the entire cohort, five-year overall survival (5YOS) was 55.0%, with a median survival of 8.5 years. Surgery plus chemoradiotherapy (CRT) had the highest 5YOS (76.2%), followed by CRT (63.4%) and surgery plus radiotherapy (RT) (59.4%). After Cox regression modelling to control for all significant variables on Kaplan-Meier analysis, RT or chemotherapy was associated with increased survival (HR 0.559, p=0.006; HR 0.265, p<0.001; respectively). Surgery conferred a slight benefit to survival although insignificant (HR 0.741, p=0.187). Stage IIE (HR 1.803) and stage IIIE-IVE (HR 3.347) disease had significantly worse prognosis than stage IE (p<0.001). Race other than white or black had better survival (HR 0.631, p=0.018).

Conclusion:
RT and chemotherapy are associated with increased survival in SN-ENKTL; the benefit of surgery is less clear.

Sinonasal mucormycosis: Revisited

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Aim:
To report our experience in presentation, treatment and outcome of sinonasal mucormycosis in our institute.

Methods:
Retrospective analysis of medical records of 30 patients with mucormycosis seen over a period of 5 years.

Result:
Data of 30 patients, (22 males and 8 females) with a mean age of 47.3 was analysed. Among these 25 patients had uncontrolled diabetes mellitus, 3 were post renal transplant and 2 were post bone marrow transplant and on immunosuppressive drugs. Ophthalmic signs and symptoms were present in 12 patients, intracranial involvement was present in 11 patients. CT/MRI revealed involvement of para nasal sinuses in all patients. All were treated with amphotericin-B (3-7 gm) and 29 patients underwent surgery. Posaconazole/ caspofungin was started as adjuvant treatment in certain cases.

Conclusion:
Mucormycosis is a rapidly spreading fungal disease with high mortality. Early diagnosis and immediate management without delay and generous debridement is necessary for saving the patient

Sinonasal outcomes using oral steroids in patients with CRSwNP and positive sinonasal cultures

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Background:
The presence of biofilms, underlying immunodeficiency, and mucociliary dysfunction have all been associated with recalcitrant sinus disease. Patients with chronic rhinosinusitis with nasal polyps (CRSwNP) and positive sinonasal cultures may represent a therapeutic challenge due to the additional local inflammatory response associated with a bacterial infection. This study aims to evaluate the effect of oral steroids on sinonasal outcomes in patients with CRSwNP who underwent endoscopic sinus surgery (ESS) and had a positive culture in the preoperative or intraoperative time period.

Methods:
A retrospective chart review of patients with CRSwNP who had a sinus culture taken pre-operatively or intraoperatively. This cohort includes 212 patients seen between 2012 and 2019 that were further stratified based on their use of oral steroids for at least two weeks during the post-operative period. All patients used topical steroids during the post-operative course. SNOT-22 and modified Lund-Kennedy (MLK) scores were assessed pre-operatively and 4-6 months postoperatively. Only patients who used oral steroids were included in the linear regression analysis.

Results:
Twenty-two patients were included, and 81.8% of them had a positive culture. The use of oral steroids in addition to topical corticosteroids had a statistically significant improvement on SNOT-22 ($p<0.05$) in patients with positive culture compared to negative cultures. The addition of oral steroids did not affect the post-operative MLK score regardless of culture results ($p>0.05$).

Conclusion:
Oral steroids may provide more symptomatic benefit in culture-positive CRSwNP patients compared to culture-negative CRSwNP patients undergoing ESS.

Sinonasal schwannoma: Case series and literature review
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Objective:
To retrospectively review our institution's experience in the treatment of sinonasal schwannomas. To perform an exhaustive review of the current literature and provide information regarding presentation, diagnostic techniques, pathologic considerations, and treatment modalities.

Methods:
A retrospective case series of sinonasal schwannoma treated at a tertiary care institution and literature review of all reported sinonasal schwannomas to date was performed.

Results:
The varying duration and presentation of symptoms were examined. Presenting symptoms varied depending on the extent of the lesion. Common imaging modalities included Computer Tomography (CT) and Magnetic Resonance Imaging (MRI) which are supportive, but non-diagnostic of sinonasal schwannoma. Diagnosis is confirmed by histopathology. Treatment modalities are examined, but transnasal endoscopic excision with adequate resection of bony attachment sites were commonly performed. Follow up data and recurrence rates are reviewed.

Conclusion:
We report a case series and provide an updated review of the literature for sinonasal schwannomas. Our experience suggests that endoscopic surgery can be an effective method of management.

Sinus surgery and perceptions in social media
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Background:
Analysis of social media can determine specific population dynamics and identify patterns in community perceptions. Sinus surgery is a common rhinologic procedure, however little is known about underlying patient concerns and attitudes regarding the procedure. Social media can help identify publicly addressed information regarding sinus surgery that otolaryngologists may not initially recognize.

Methods:
Study of all Twitter posts (tweets) in 2019 regarding sinus surgery. Exclusion criteria: vague, duplicated, or fragmented posts. Tweets were grouped into overarching themes (concerns, experiences, attitudes) for qualitative analysis. 1464 tweets were analyzed.

Results:
Posts most often expressed concerns regarding postoperative pain and recovery time, cost of sinus surgery, and surgical complications. 20.2% of posts discussed complications from surgery (ie: epistaxis), postoperative pain, and concerns regarding costs and recovery time from surgery. 30% of posts discussed general public values concerning sinus surgery ("heard that the recovery period following sinus surgery is the worst"). Tweets posed as questions were often answered with tendentious statements ("treat sinusitis with natural supplements instead of surgery", "change in diet can prevent sinus surgery"). 39% of all tweets were from professional and/or academic accounts, most commonly advertising a specific outpatient procedure/practice or highlighting recent publications.

Conclusion:
Identifying patient-reported perspectives and experiences surrounding sinus surgery may guide clinicians in surgical counseling and educate patients on appropriate and effective peri-operative and postoperative care, leading to less hesitancy and fear regarding the procedure.

SINUS-24 and SINUS-52 dupilumab smell recovery in asthma or N-ERD

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Background:
We report the effect of dupilumab 300 mg every 2 weeks vs placebo on smell outcomes in the pooled intention-to treat population of patients with chronic rhinosinusitis with nasal polyps (CRSwNP) with comorbid asthma or coexisting NSAID-exacerbated respiratory disease (N-ERD) in the SINUS-24 (NCT02912468) and SINUS-52 (NCT02898454) phase 3 studies.

Methods:
The effect of dupilumab vs placebo was assessed in smell outcomes: daily smell loss (0–4), University of Pennsylvania Smell Test (UPSIT; 0–40), 22-item Sino-Nasal Outcome Test (SNOT-22) smell/taste item (0–5), and % anosmia (UPSIT ≤ 18).

Results:
Overall, 59.1% of patients had comorbid asthma and 28.2% coexisting N-ERD. Week 24 least squares (LS) mean changes from baseline vs placebo in patients with/without asthma were: UPSIT: +11.1 vs +9.8; SNOT-22 smell/taste item: −2.1 vs −1.8; daily smell loss: −1.1 vs −0.9. Week 24 LS mean changes from baseline vs placebo in patients with/without N-ERD were: UPSIT: +10.2 vs +10.7; SNOT-22 smell/taste item: −2.1 vs −0.9; daily smell loss: −1.0 vs −1.1. All P values vs placebo < 0.0001. Anosmia at baseline for dupilumab-treated patients was 86.5%/65.1% for patients with/without asthma, and 33.7%/19.8% at Week 24. In patients with/without N-ERD, this was 87.4%/74.0% at baseline and 39.8%/23.3% at Week 24. Dupilumab was well tolerated.

Conclusions:
Dupilumab treated patients with severe CRSwNP experienced improvements in all smell outcomes regardless of asthma or N-ERD status.

Skull base osteoradionecrosis

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Background:
Skull base osteoradionecrosis (ORN) is a serious post-radiation complication, particularly in nasopharyngeal carcinoma (NPC) patients. While there are no standardized treatment protocols, there is emerging evidence that endoscopic management of these patients
may result in improved outcomes.

Aim:
To describe trends and outcomes in endoscopic management of skull base ORN.

Methods:
A systematic review of the literature on Pubmed, Embase, and Cochrane databases was conducted. Relevant studies were identified, and data extracted regarding patient demographics, surgical treatment, follow up and surgical outcomes.

Results:
Eighteen articles comprising 179 patients met inclusion criteria. NPC was the most common pathology reported, 94%. Mean time to ORN diagnosis from end of radiation was 80.8 months (range 1-384mo). Re-irradiation was a significant risk factor for ORN, present in 43.1% of all patients. Headaches were the most common presenting symptom followed by foul smelling rhinorrhea, in 94.4% and 73.2% of patients, respectively. Wide sequestrectomy and local mucosal pedicled flap reconstruction were performed in 77.7% of patients. Outcomes were reported for only 100 patients; in this subset, complete symptom resolution was achieved in 61% of patients; another 33% experienced at least some improvement. Carotid blowouts and massive hemorrhages were the most devastating complications in the immediate and long term postoperative period, accounting for 24 of 34 reported deaths.

Conclusion:
Endoscopic debridement and reconstruction of skull base ORN is feasible and safe. Combined approaches can achieve even wider exposure. Further study is warranted to elucidate reconstruction techniques that will optimize outcomes.

Skull base outcomes in septic patients

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Background:
To investigate the association between patients with sepsis 48 hours prior to surgery and rates of postoperative complications in patients undergoing posterior skull base procedures with either otolaryngology (ENT) assistance or neurosurgery alone.

Methods:
The 2005-2016 National Surgical Quality Improvement Program (NSQIP) database was used. Independent t-tests, chi-squared analysis and logistic regression were used to determine the independent effect of covariates on postoperative complication rates in 4239 patients.

Results:
Patient cohort of 4239 individuals were identified who underwent an posterior skull base surgery by either neurosurgeons alone or with otolaryngologist assistance. Independent t-test revealed that the total time of operation (332.17 vs 250.81, p<.004) was longer when neurosurgery operated alone but, total length of hospital stay (13.25 vs 6.34 days, p=.001) was significantly longer for ENT-assisted posterior skull base surgeries in patients with recent history of sepsis. Univariate analysis revealed that patients with recent history of sepsis were more likely to receive ENT assistance (p= .024) compared to patients without this comorbidity. Multivariate regression analysis revealed no significantly elevated risk of postoperative complications following posterior skull base surgery with ENT assistance in patients with recent history of sepsis (OR 1.747, CI 95% 0.603-5.059, p=.304).

Conclusions:
This analysis demonstrates no significant difference in postoperative outcomes in patients with sepsis within the last 48 hours of undergoing posterior skull base procedures between ENT assistance and neurosurgery alone.

Sleep subdomain of SNOT-22 is a useful screening tool for obstructive sleep apnea

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Objective:
Although comorbid OSA increases the risk of perioperative complications following endoscopic sinus surgery (ESS), pre-ESS OSA screening is not routinely performed. The study objective was to assess if the sleep subdomain of SNOT-22 score (SD-SNOT) can be utilized to screen for obstructive sleep apnea (OSA) in patients undergoing ESS for chronic rhinosinusitis (CRS)

Methods:
Electronic records of patients who underwent ESS for CRS were reviewed retrospectively between November 2019 - January 2020. SNOT-22, STOP-BANG scores & OSA status were collected. Preoperative and post-operative (at 2 months) SD-SNOT scores were compared with the presence or absence of OSA. Study enrollment is currently ongoing

Results:
Out of 108 patients, 19% (n=20) had OSA. Comparison of OSA and non-OSA groups revealed comparable age distribution, a higher male predominance (75%) and a higher BMI; (40.8±40.7vs.27.3±6.2;p<0.0001) in OSA group

SD-SNOT scores preop (22.4±12.9 vs.14.7±11.4;p=0.02) and post-operatively (20.8±15.0 vs. 6.8±8.6;p=0.02) were significantly higher in OSA group. Postop (6.5±0.7vs.1.8±0.7;p=0.02) STOP-BANG scores were significantly higher in OSA cohort. While preoperative STOP-BANG scores were higher in the OSA group, it was not statistically significant (4.0±2.82vs.1.93±0.88; p=0.22)

There was no significant correlation between SD-SNOT and STOP-BANG scores: preop (p=0.3), postop (p=0.05). The lowest SD-SNOT scores that were significantly associated with diagnosis of OSA were: Preop: 21 (OR:3.5; CI:1.1-10.7; p=0.02) & postop: 16 (OR:10.5; CI:1.3-83.5; p=0.03)

Conclusion:
SD-SNOT is a useful parameter in screening for OSA. Scores >20 (preop) & >15 (at 2 months postop) may represent comorbid OSA.

Spectrum of tissue loss associated with empty nose syndrome

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Introduction:
Empty Nose Syndrome is a debilitating disease often associated with significant tissue loss of the inferior turbinates (IT). However, we have noted a spectrum of tissue loss among ENS patients and sought to characterize these patients based on the extent of IT tissue loss.

Methods:
ENS patients with a baseline ENS6Q score ≥ 11, a positive cotton test and CT imaging were included. 51 patients met inclusion criteria and were categorized based on extent of tissue loss. ENS6Q scores and surgical and ENS-associated treatment history were recorded.

Results:
14 patients had mild IT loss, 15 patients had partial IT trim, and 22 patients had aggressive near-total/total IT loss. The average ENS6Q score for each group was 20.1, 19.5, and 16.9, respectively (p=0.62). Among patients with post-cotton ENS6Q scores accessible, the average drop in ENS6Q scores was 12.2, 13.1, and 10.7, respectively (p=0.28). The average number of total sinonasal surgeries in each group was 3.6, 4.6, and 4.4, respectively (p=0.31). All patients had a history of IT reduction. Among all patients, 30/51 (58.8%) underwent ≥ 1 Prolaryn injection and 40/51 (78%) underwent ≥ 1 inferior meatus augmentation procedure (IMAP). Patients who completed research questionnaires for injections (19/30) and IMAP (32/40) had significant decreases in ENS6Q scores at 1 week and 1 month post-injection ($p<0.0001$, $p=0.0081$) and 6 months post-IMAP ($p<0.0001$), which is consistent with previous data.

Conclusions:
ENS is associated with a wide gamut of IT loss, with symptom severity among these groups being similar based on ENS6Q scores. Patients with a history of ITR and ENS-like complaints should be formally evaluated for ENS, regardless of the extent of IT loss.

Spindle cell sinonasal rhabdomyosarcoma in a 73-year-old man: A case report

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Background:
Rhabdomyosarcoma (RMS) is a malignant soft tissue neoplasm differentiating into primitive mesenchymal cells with partial skeletal muscle differentiation. It is rare, especially in the sinonasal cavity. We review available literature on sinonasal RMS and present a case report involving spindle cell sinonasal RMS, one of the rarest subtypes.

Methods:
Case report and literature review.

Results:
A 73-year-old man with months of right-sided epiphora and nasal obstruction had abnormal soft tissue and calcification in the right nasal cavity on CT. Nasal endoscopy revealed a smooth, firm mass involving the inferior turbinate. The mass was removed en bloc via endoscopic partial medial maxillectomy and ethmoidectomy. Gross pathologic examination revealed a mottled red, tan, firm, bosselated, and glistening mass, with irregular fragments of soft tissue and bone. Histologic examination showed a variably myxoid and fibrous neoplasm with hyalinization. Tumor cells were spindled with moderate pleomorphism and low mitotic activity. Immunohistochemistry was extensively positive for desmin and myoD1 and focally positive for smooth muscle actin. A diagnosis of sinonasal RMS, grade 2, was made.

Conclusions:
This is the first reported case of spindle cell RMS originating from the inferior turbinate. Sinonasal RMS has the worst prognosis of all primary sites, especially with age >65, alveolar subtype, primary tumor > 5cm, high stage/group, and distant metastases. While the risk stratification system accounts for surgical and pathologic factors, more research is needed to determine how this guides selection of resection and/or chemoradiation.

Structured histopathologic comparisons of sinonasal tumors

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Introduction:
Structured histopathologic reporting identifies markers that may help guide our work up and management of various sinonasal pathologies. The etiology of inverted papilloma (IP) is not entirely clear. One theory is IP may result from chronic inflammation. Currently, there are no studies that investigate the histopathologic features associated with the sinonasal mucosa surrounding IP. Objective: Identify and compare histologic patterns associated with IP to sinonasal malignancies.

Methods:
A structured histopathologic report and comparison of 12 variables was generated on tissue samples from 25 patients who underwent primary endoscopic resection of IP and 25 patients who underwent primary resection of sinonasal malignancies (esthesioneuroblastoma, sinonasal undifferentiated carcinoma, or small cell neuroendocrine carcinoma). Tissue samples were taken from (1) the tumor, (2) ipsilateral surrounding nasal cavity mucosa, and (3) contralateral nasal cavity mucosa. Statistical comparisons were performed using Fisher's exact test.

Results:
Malignant tumors were associated with increased mucosal ulcerations (p=0.034) and neutrophilic infiltrate (p = 0.001). IP was associated with increased squamous metaplasia (p = 0.006). Histopathologic features of IP and malignant tumors did not correlate with any histopathologic features of the surrounding ipsilateral and contralateral nasal mucosa.

Conclusions:
Significant histopathologic differences in the sinonasal tissue surrounding benign and malignant tumors were identified in this study. However, the mucosa surrounding IP does not appear to have unique structured histopathologic features when compared to other sinonasal neoplasms.

Subjective smell & taste in skull base surgery

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Background:
As endoscopic endonasal skull base surgery (EESBS) for sellar pathology has become routine, there is increasing awareness of quality of life (QOL) outcomes related to this approach. Similarly, there is a growing interest in postoperative chemosensory function, with an emphasis on olfaction and the psychosocial implications of olfactory dysfunction. Meanwhile, there has been minimal direct investigation into gustatory outcomes. We sought to investigate subjective chemosensory function and rhinologic-specific QOL following EESBS for sellar pathologies.

Methods:
Comprehensive clinical characteristics and prospective sinonasal QOL assessments, measured using Anterior Skull Base Nasal Inventory-12 (ASK Nasal-12), were collected from 38 patients undergoing EESBS for sellar pathology.

Results:
Thirty-eight patients were included: 63.2% female, average age 52.6 years(range: 27-89). The most common pathology was nonfunctioning pituitary adenoma (n=22). Preoperative ASK Nasal-12 scores (mean=0.81) demonstrated postoperative worsening at mean 15 days (mean=2.50, p<0.0001), but no difference at mean 50 days (mean=1.14, p=0.1032) or 4.5 months (mean=0.59; p=0.255). There was significant postoperative worsening of subjective smell (p<0.0001, p=0.0001) and taste (p<0.0001, p<0.0001) at mean 15 days and 50 days, with a return to baseline 4.5 months postoperatively (smell p=0.371, taste p=0.093).

Conclusions:
Patients undergoing EESBS for sellar pathologies experience anticipated, temporary, disruptions in sinonasal QOL, but may have longer lasting perturbations in subjective olfaction and gustation. Given the increasing use of the endoscopic endonasal corridor, further investigation in postoperative chemosensory function is essential.

The effect of diabetes mellitus on post-operative outcomes following endoscopic sinus surgery

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Background:
Diabetes Mellitus (DM) and its associated immune dysfunction are well-studied risk factors for adverse surgical outcomes. The literature regarding endoscopic sinus surgery (ESS) is less robust and there have been conflicting reports on post-operative complications and surgical results in this patient population. The purpose of this study was to analyze the impact of diabetes mellitus on outcomes after ESS via rates of post-operative medical intervention and need for revision ESS.

Methods:
This was a retrospective cohort study of 176 subjects who underwent ESS from 2015-2019 at a single institution by two fellowship-trained rhinologists. Subjects were divided into two groups, those with a documented HbA1C > 6.5 or diagnosis of DM (N=38) and those with HbA1C < 6.5 (N=138). Outcomes were measured by need for additional oral antibiotics, oral steroids, or new antibiotic/steroid sinus rinses in the first six months post-operatively and by rate of revision ESS.

Results:
There were no significant differences between the two groups in post-operative use of oral antibiotics (26.32% vs. 18.12%, p = .27), antibiotic rinses (7.89% vs. 9.42%, p = .76), oral steroids (7.89% vs. 13.04%, p = .38), additional steroid rinses (7.89% vs. 10.87%, p = .59) or revision ESS (5.26% vs. 6.52%, p = .78).

Conclusions:
Patients with diagnosis of diabetes mellitus do not appear to have worse post-operative outcomes when compared to patients without diabetes.

The effects of burn pit exposure on the respiratory tract: A systematic review

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Background:
Burn pits are widely used by the U.S. military for waste disposal while in conflicts abroad. Significant adverse health effects may be linked to burn pits, but limited data exists examining the impact on the respiratory tract. The purpose of this systematic review is to characterize these effects on both the upper (URT) and lower respiratory tracts (LRT).

Methods:
A systematic review was performed according to the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) guidelines on articles published from 2001 to present. PubMed, EMBASE, and Ovid MEDLINE databases were queried for studies examining the effect of burn pits on the URT and LRT amongst U.S. soldiers.

Results:
A total of 143 articles were identified, with six meeting inclusion criteria. Each article assessed the LRT, while one examined both the URT and LRT. Outcome measures were heterogenous across all studies precluding meta-analysis. Patient-reported LRT symptoms increased as exposure to burn pits increased. Limited study has assessed the impact of exposure on the URT. No association between burn pit exposure and objective measures of disease was identified.

Conclusion:
Soldiers deployed to combat zones report a significant exacerbation of respiratory symptoms following exposure to burn pits. LRT symptoms appear to be more prevalent. There is a paucity of data on the effects of burn pits on the URT. Prospective, long-term, and outcome-based studies are necessary to examine the effects of burn pits on the URT and LRT of U.S. soldiers.

The infratemporal fossa sign

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Background:
Discomfort in or around the ear is a common complaint in otolaryngology practice. Distinguishing the source of this symptom from obstructive Eustachian tube dysfunction (ETD), temporomandibular joint dysfunction (TMJD), or other causes presents a diagnostic challenge. The infratemporal fossa (ITF) sign, in which a patient points to a specific location below the auricle, is proposed as an indicator of non-obstructive Eustachian salpingitis (ES).

Methods:
Subjects were enrolled from a tertiary rhinology practice who had a primary complaint of aural discomfort and underwent nasal endoscopy and tympanometry. Subjects were prompted to localize aural discomfort using a single finger. Group 1 localized using the ITF sign, group 2 localized to deep within the external ear canal (suggesting ETD), and group 2 localized to the preauricular region (suggesting TMJD). Endoscopic findings of inflammation at the medial ET were reported using the Endoscopic Evaluation of

the Eustachian Tube (3ET). Patients completed a Eustachian Tube Dysfunction Questionnaire (ETDQ-7) for symptom assessment.

Results:
Five patients with each diagnosis were included. The mean (SD) 3ET score was 3.6 (0.5) for group 1, 4.0 (1.2) for group 2, and 1.4 (0.5) for group 3, signifying greater inflammation in the first 2 groups. Tympanometry and otoscopy were uniformly abnormal for group 2 and uniformly normal for groups 1 and 3. ETDQ-7 scores were similar across groups.

Conclusion:
These preliminary findings define ES as a phenotype of ET disease characterized by symptomatic inflammation without abnormal middle ear pressure. The ITF sign may be a useful addition to the physical examination in establishing a diagnosis of ES.

The role of anesthesia on intraoperative outcomes during endoscopic sinus surgery: A meta-analysis

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Background:
Previous studies have led to incongruent results when total intravenous anesthesia (TIVA) and inhalational anesthesia (IA) are compared in endoscopic sinus surgeries in regards to intraoperative bleeding and visibility.

Methods:
A systematic review and meta-analysis of studies comparing TIVA and IA in endoscopic sinus surgery for chronic rhinosinusitis was performed in February 2019. Utilizing EMBASE, PubMed, and Medline databases, articles were systematically screened for analysis for a total of 13 articles. Primary outcomes included rate of blood loss (mL/kg/min) and intraoperative visibility using the validated Boezaart and Wormald scores. Secondary outcomes included total blood loss, surgical numerical rating scores (SNRS) and anesthesiologist NRS (ANRS).

Results:
12 randomized controlled trials were utilized for meta-analysis. IA had higher average rate of blood loss by 0.26 mL/kg/min that was not significantly different than TIVA (p=0.193). For Boezaart surgical field ratings, TIVA had 0.275 points higher than IA on average with no statistical significance (p=0.804). TIVA had significantly lower average surgical grade compared to IA in Wormald scores indicating better endoscopic visibility (-0.918, p<0.001). Total blood loss outcomes demonstrated no statistical significance (p=0.08). For SNRS with separate and combined Lund Mackay groups, TIVA had 0.651 and 0.547 points insignificantly lower on average respectively (p=0.318 and p=0.108 respectively). Finally, TIVA had 0.817 lower points on average for ANRS (p=0.001).

Conclusions:
Overall, TIVA and IA during endoscopic sinus procedures did not differ in blood loss measurements but demonstrated significant difference in Wormald scores for visibility.

The turbinate pump: Targeted inferior turbinate decongestion in sinonasal surgery

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Background:
Enlarged inferior turbinates can interfere with visualization and access during sinonasal surgery. This study describes a novel injection technique which targets a plexus of vessels along the lateral nasal wall – the turbinate pump – to obtain rapid decongestion with a minimum volume of vasoconstrictive agent at the start of surgery.

Methods:
At the start of respective surgeries, ten inferior turbinates were injected in five patients (mean age 38.2±13.0 years) with 0.5ml of vasoconstrictive agent (epinephrine 1:100,000 with or without lidocaine 1%) into the turbinate pump located along the anterosuperior aspect of the inferior turbinate. The change in surface area and time to maximal decongestion of the inferior turbinates were analyzed with imaging software.

Results:
The average percent decrease in the surface area of the inferior turbinate anterior face following injection was 55.0%±20.6% (range 21.6-88.5%). The average time to maximal decongestion was 37.7±9.7 seconds (range 19-49 seconds). When lidocaine and epinephrine were injected separately (n=3), turbinate decongestion only occurred with epinephrine. There were no complications.

Conclusion:
A focal injection of vasoconstrictive agent into the turbinate pump along the anterosuperior aspect of the inferior turbinate provides rapid and effective decongestion. Targeting this site may improve visualization and reduce the need for more voluminous or diffuse injections at the start of sinonasal surgery.

Three cases of sinonasal organized hematoma
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Introduction:
Organized hematoma of the sinonasal tract is a rare clinical disease, which requires differential diagnosis from malignant tumor. We report three cases of organized hematoma. In all cases, we were able to perform radical treatment by surgery.

Case:
66 year-old female visited our clinic, complaining of oral bleeding. The easily bleeding tumor-like lesion was found in the left gingivabuccal sulcus. Computed tomography (CT) showed well-defined expansive soft tissue shadows with bone erosion. The lesion showed intermingled high intensity in T1 and intermediated low intensity in T2-weighted magnetic resonance imaging (MRI). Caldwell-Luc operation for total removal of the tumor was performed because biopsy samples had been suspected to the malignant disease. The pathological diagnosis was organized hematoma.

28 year-old female visited our clinic, complaining of the right nasal bleeding from polyps in the middle nasal meatus. CT and MRI showed the mass lesion existing from the right nasal cavity to the maxillary sinus with bone erosion. Caldwell-Luc operation for total removal of the tumor was performed. The pathological diagnosis was organized hematoma.
70 year-old male visited our clinic, complaining of the frequent epistaxis. Rhinoscopy revealed easily bleeding mass lesion in the middle nasal meatus. CT showed the mass lesion located in frontal sinus and ethmoid sinus with bone erosion. The lesion showed low intensity in T1 and high intensity in T2-weighted MRI. Extranasal approach combined with endonasal endoscopic surgery was performed. The pathological diagnosis was organized hematoma.

No recurrent lesion has been seen in the three cases.

Discussion:
Organized hematoma of the sinonasal tract is very rare.

Treatment of PVOD: Evidence-based review
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Background:
Post-viral olfactory dysfunction (PVOD) is one of the most common causes of olfactory loss. Despite its commonality, optimal treatment strategies remain unclear. This article provides a comprehensive review of PVOD treatment options and evidence-based recommendations for their use.

Methods:
A systematic review of the Medline, Embase, Cochrane, Web of Science, Scopus, and Google Scholar databases was completed according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines. Studies with a defined intervention and olfactory outcomes of patients treated for PVOD were included. The Clinical Practice Guideline Development Manual and Conference on Guideline Standardization instrument recommendations were followed in accordance with a previously described, iterative process to create an evidence-based review with recommendations.

Results:
From 552 initial candidate articles, 36 studies with data for 2183 patients with PVOD were included. The most common olfactory outcome measure was Sniffin' Sticks. Broad treatment categories included: olfactory training, systemic steroids, topical therapies, a variety of heterogeneous non-steroidal oral medications, and acupuncture.

Conclusion:
Based on the available evidence, olfactory training is a recommendation for the treatment of PVOD. The use of short-term systemic and/or topical steroids is an option in select patients after careful consideration of potential risks of oral steroids. Though some investigations offer promising preliminary results for systemic and topical medications alike, a paucity of high-quality studies limits the ability to make meaningful evidence-based recommendations for the use of these therapies for the treatment of PVOD.

Treatment patterns and survival of sinonasal diffuse large b-cell lymphoma in the United States
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Background:
Diffuse large B-cell lymphoma (DLBCL) is the most common type of non-Hodgkin lymphoma and rarely manifests as sinonasal DLBCL (SN-DLBCL). Presenting symptoms and features are often non-specific, posing a diagnostic challenge. The purpose of this study is to use a national dataset to analyze demographic and treatment factors that affect survival in SN-DLBCL.

Methods:
The National Cancer Database was used to extract cases of SN-DLBCL between 2004-2016. A total of 1607 cases were identified and underwent analysis. Kaplan-Meier (KM) and Cox proportional hazards analysis were used for survival analysis.

Results:
The mean age of SN-DLBCL patients was 70.5 with an even distribution between males and females (51.3% vs. 48.7%). The majority of patients were white (88.4%) and in the highest income quartile (35.3%). Most tumors were in the maxillary sinus (38.1%) and the nasal cavity (30.2%). 5-year overall survival (5Y-OS) was 63.1% and median survival was 8.0 years. Surgery plus chemoradiation (CRT) had the highest 5Y-OS (81.8%), followed by CRT (74.0%) and surgery plus chemotherapy (65.0%). Age, race, insurance, stage, B symptoms, radiotherapy, and chemotherapy were significant predictors of survival on KM analysis ($p<0.05$). After multivariate regression, poor prognostic factors included stage IIE (HR 1.274, $p=0.022$), stage III-IVE (HR 1.773, $p<0.001$), and B symptoms (HR 1.757, $p<0.001$). Receipt of radiotherapy (HR 0.725, $p<0.001$) or chemotherapy (HR 0.393, $p<0.001$) improved survival. Surgery had no impact on survival (HR 0.981, $p=0.831$).

Conclusion:
Older age, advanced stage, and B symptoms are associated with decreased survival in SN-DLBCL. Treatment modalities using chemotherapy and radiotherapy had the highest survival.

Unfolded protein response in sinonasal inverted papilloma

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Objectives:
Sinonasal inverted papilloma is a benign but locally aggressive tumor in the nasal cavity. Treatment is challenging due to its high recurrence rate and potential for malignancy. The unfolded protein response has become a popular target in certain head and neck cancers. It could offer an effective therapeutic approach for inverted papilloma. The objective of this study is to determine whether unfolded protein response signaling is increased in inverted papilloma, as compared to normal nasal mucosa, that could be leveraged as an anti-proliferative target.

Methods:
Inverted papilloma tissue samples and normal sinus mucosa were collected from fresh surgical specimens and evaluated for the expression of a key unfolded protein response chaperone called BiP/GRP78. Immunohistochemistry was used to quantify the expression of BiP/GRP78 protein based on the product of staining intensity (0-3) and the percentage of stained area (0-20%=1, 21-80%=2, 81-100%=3). This analysis was carried out in a blinded fashion by two independent reviewers using 44 inverted papilloma tissue samples and 22 normal tissue samples that were arranged in a tissue microarray.

Results:
There is a statistically significantly increased expression of BiP/GRP78 in inverted papilloma compared to normal tissue samples in terms of intensity and widespread area ($p<0.001$ for both reviewers). There was no significant difference between both reviewers ($p=0.09$).

Conclusions:
BiP/GRP78 is significantly upregulated in inverted papilloma tissue compared to normal mucosa. This is the first study to show an increased unfolded protein response in inverted papilloma that may help direct future therapeutic options.

Unique hemostasis in JNA

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Background:
Juvenile nasopharyngeal angiofibroma (JNA) characterized by significant intraoperative hemorrhage seldom present any problem with postoperative hemostasis but definitely reveals an abnormal coagulation of hemorrhagic blood.

Material and methods:
Haemostatic profile of systemic (pre-, and post-operative) and intraoperative (hemorrhagic) blood was analyzed for 18 JNA male patients and compared with the tumor profile. In addition in-vitro comparison of clotting was undertaken along with the effect of mixing oropharyngeal secretions (OS). Sample from arterial hemangioma was taken as control. An analysis of intratumoral (20 snap frozen samples of JNA) heparin levels is currently been undertaken as a second part of the study.

Results:
The hemorrhagic blood failed to coagulate normally and 88% strikingly revealed small miniscule friable clots akin to disseminated intravascular coagulation. FDP or d-dimers could be demonstrated in 12 cases suggesting fibrinolysis while normal fibrinogen level

without clotting was seen in 3 cases. The systemic blood samples did not show any hemostatic abnormality while tumor size and degree of hemorrhage did influence postoperative prothrombin time significantly. The results of intratumoral heparin concentration will be further elaborated in the support of the current evidence.

Conclusion:
Intratumoral 'heparin/ plasmin-like-substance' is likely to influence clotting, enhance intraoperative hemorrhage and prevents pathological consumption of coagulation factors. Postoperative prothrombin time was significantly associated with tumor size/ intraoperative hemorrhage and can be regarded as a loose surrogate marker to identify advanced cases subclinically influencing haemostatic mechanism.

Use of balloon sinuplasty in the management of secondary complications to acute frontal sinusitis
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Background:
Balloon dilatation was approved by FDA in 2008 through the use of the 'Relieva Sinus Balloon Catheter'. Balloon sinuplasty has reported successful outcomes in the management of acute complicated and uncomplicated frontal sinusitis (Mistry and Kumar, 2011). Its use in acute frontal sinus infections has been considered a safe method of sinus drainage due to minimal intra-operative complications such as mucosa trauma and intracranial complications. The technique has also been deemed safer in situations where the sinus is acutely inflamed with a deranged anatomy (Hopkins et al, 2009). Although a number of case series and a non-randomized trial have previously reported on the effectiveness of balloon sinuplasty , very few studies report on its use in the management of secondary complications to acute frontal sinus infections.

Methods:
We present a case and video series of 3 cases (2 male: 1 female) presenting with acute frontal sinusitis that were all managed successfully with balloon sinuplasty in two London centres; the Royal London Hospital and Charing Cross hospital within 2 consecutive years.

Results:
The first patient had a background of a previous FESS surgery and was admitted with an infected frontal mucocele and symptoms in keeping with sepsis and meningitis. The second patient had a background of chronic myelocytic leukaemia, was immunocompromised and presented with symptoms of meningitis and scan findings consistent with frontal sinusitis. The third case presented with fronto-orbital cellulitis.

Conclusions:
Balloon sinuplasty is a safe and effective procedure in the management of secondary complications to acute frontal sinusitis. Further studies are required to assess its effectiveness long-term.

Utilization trends of surgical and endovascular management of refractory epistaxis
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Background:
Endoscopic sphenopalatine artery ligation (ESPAL) and endovascular arterial embolization (EAE) are increasingly common treatment options for patients with refractory epistaxis. The objective of this study is to compare the utilization trends, outcomes, and cost between ESPAL and EAE within a single multi-hospital network over a 9-year period.

Methods:
A retrospective study of a single healthcare network, consisting of 14 geographically disparate hospitals, was conducted. All patients, who underwent ESPAL and/or EAE within any of the hospital facilities between 2008 and 2017, were included for chart review. We evaluated differences in utilization across hospitals based on hospital size, teaching status, and geographic location. Secondary outcome measurements included the successful management of epistaxis, intraoperative and postoperative complications, and visit costs.

Results:
Forty-five patients underwent ESPAL and 35 patients underwent EAE from 2008 to 2017. The majority of ESPALs and EAEs were performed at teaching institutions (60% and 80%, p=0.55) and larger hospitals (73% and 80%, p=0.49). Neither intervention was performed at rural hospitals. Success rates for ESPAL and EAE were comparable (93% and 83%, respectively, p=0.17). The mean direct cost of treatment for EAE was significantly higher than the cost for ESPAL ($13,294 versus $5,950, p<0.0001). ESPAL had no complications compared to 4 complications associated with EAE.

Conclusions:
The majority of both interventions was performed at teaching facilities and larger facilities. While both ESPAL and EAE showed equivalent efficacy for management of epistaxis, ESPAL demonstrated lower direct costs and fewer associated complications when compared to EAE.

Validating starling resistor model of airway collapse in patients with sleep disorder breathing

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Background:
The Starling Resistor Model was first applied to the pathophysiology of obstructive sleep apnea in 1978. Gold and Schwartz then popularized this concept in 1996, and described its mechanism as the root cause of upper airway collapse in OSA. The Starling Resistor model proposes that an increase in nasal resistance will cause a subsequent reduction in pharyngeal airway volume (i.e. airway collapse). If true, improved nasal breathing in patients with OSA should relax the pharyngeal musculature and affect collapse. In this study we used a minimally invasive nasal surgical model and 3-D CT imaging to evaluate changes in the retro-lingual space after nasal airway surgery in patients with sleep disordered breathing (SDB).

Method:
Prospective study of 15 children and 20 adults with nasal obstruction and SDB. Pre and post-operative 3D CT-sinus images were used to calculate retro-lingual space volume, minimal cross-sectional area, hyoid bone position and lateral pharyngeal wall position. Images were obtained at 1 week pre-surgery and 3 months post-surgery. Data was analyzed and compared using paired t-test.

Result:
15 pediatric patients and 20 adults were enrolled. All patients demonstrated significant increase in retro-lingual space volume, retro-lingual minimum cross-sectional area and transverse distance between pharyngeal walls after surgery (P<.00001). Slight forward movement of Hyoid bone position was also observed.

Conclusion:
Children and adults with SDB demonstrated significant increase in retro-lingual space volume and minimum cross-sectional area after nasal airway surgery alone. These results are the first clinical data to support the Starling Resistor model of airway collapse.

Validation of intranasal fluorescein for cerebrospinal fluid detection: An in-vitro analysis

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Background:
Topical intranasal fluorescein color change has been used to confirm cerebrospinal fluid (CSF) and is less invasive than intrathecal fluorescein but has never been objectively evaluated. This work aims to validate topical intranasal fluorescein for CSF detection.

Methods:
100 ul of blood, CSF, saliva, or normal saline were combined with 100 ul of decreasing fluorescein concentrations (10% - 0.1%.) The solutions were photographed in 1.5mL Eppendorf tubes and on nasal pledgets. Color difference (DE) was objectively measured via the International Commission on Illumination (CIE-L*ab) coordinates. Four blinded otolaryngologists also evaluated samples for perceptible color difference. The human eye cannot detect color differences at DE <5.

Results:
When compared to the control (fluorescein only), CSF, saliva, and saline mixtures had a DE <5 at 10% and 5% fluorescein. DE for CSF, saliva, and saline mixtures at fluorescein concentrations of 1%, 0.5%, 0.25% and 0.1% were on average 7.18, 15.96, 17.7, and 6.5 respectively. Blood DE was consistently >50 throughout all fluorescein concentrations. All otolaryngologists agreed there was a color difference with blood across all fluorescein concentrations. Color differences between the control and remaining samples were detectable at fluorescein concentrations <1%. However, a perceptible color difference between experimental samples (excluding blood) was not appreciable.

Conclusion:
Topical fluorescein can detect the presence of CSF, saliva, and saline but not a difference between these fluids by color change alone. Blood, however, is readily identified by this method. Adjunct characteristics such as fluid dynamics may be necessary to properly identify an active CSF leak.

A case of orbital mucocele after endoscopic sinus surgery

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Introduction:
Endoscopic sinus surgery (ESS) is a widely accepted treatment modality successfully used in the treatment of chronic rhinosinusitis. One threatening delayed complication of ESS that may develop many years after initial surgery is mucocele formation. This study describes a novel case of an isolated intraorbital mucocele without inflammatory chronic rhinosinusitis as a delayed complication 20 years after ESS.

Results:
A 71 year old man presented with right orbital pressure and pain with decreased temporal visual field progressive for 3 months after an upper respiratory infection. Computed tomography and magnetic resonance imaging demonstrated a right orbital subperiosteal lesion consistent with an inflammatory vs infectious process. Mucosal thickening within the neo sinus cavity was absent. Medical therapies including intravenous antibiotics and corticosteroids failed to improve patient symptoms. Endoscopic right medial wall orbital decompression revealed an intraorbital mucocele which was marsupialized leaving an intact periorbita. Antibiotic and corticosteroid therapy were stopped post-operative day 1. The patient experienced immediate post-operative relief of orbital pressure and pain along with improvement in the temporal visual field.

Conclusions:
An intraorbital mucocele may present as a remote delayed complication from ESS in which the lamina papraycea is violated and respiratory epithelium is trapped within the orbit. Surgical intervention through endoscopic orbital decompression and mucocele marsupialization is a viable treatment strategy for this delayed ESS complication.

A rare case of basaloid squamous cell carcinoma arising from the anterior nasal septum

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Basaloid squamous cell carcinoma (BSCC) is a highly aggressive subtype of squamous cell carcinoma with features of both basal cell and squamous cell carcinomas. BSCC usually arises from the head and neck region, with a predilection for the oral cavity and larynx. BSCC arising from the nasal cavity is extremely rare. Here, we report a case of a 50-year-old Hispanic male who presented with a two-year history of a slowly enlarging mass protruding from, and obstructing, his left nostril. Computed tomography and endoscopic examination of the nasal cavity revealed a mass at the entrance of the left nasal vestibule with growth arising from the anterior septal wall. The tumor was endoscopically resected, and histopathology confirmed the diagnosis of BSCC.

COSM 2020 POSTERS

Acute frontal sinusitis in a child presenting with acute ischemic stroke

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Objective:
To describe an extremely rare intracranial complication of acute frontal sinusitis

Methods:
Case Report

Results:
Here we present a 9-year-old previously healthy male with three weeks of cough, rhinorrhea, and nasal congestion as well as one week of fevers. One day prior to admission, he began amoxicillin for streptococcal tonsillitis. On the day of admission, he awoke with left hemiparesis and right hemifacial paralysis. MRI demonstrated right frontal lobe ischemia versus encephalitis, and MRA showed no arterial abnormality. CT Sinus showed pansinutis without bony erosion. Elevated neutrophils were identified in the cerebrospinal fluid. Vancomycin and ceftriaxone were started, and the patient underwent urgent endosopic sinus surgery and adenoidectomy. Cultures grew pan sensitive methicillin sensitive staphylococcus aureus and streptococcus pyogenes. Immunodeficiency testing was negative. By post-operative day 6 his motor function was near normal.

Discussion:
Acute sinusitis in children has known but rare neurologic complications such as meningitis, seizures, empyema, and cavernous sinus thrombosis. Acute stroke, however, is exceedingly rare. Literature review reveals six cases of ischemic stroke in patients with acute maxillary, sphenoid or pansinusitis. Patient ages ranged from 6 to 62, and all had evidence of inflammation, stenosis or occlusion of the internal carotid artery. This is the first report to our knowledge of acute sinusitis presenting as stroke with normal arterial anatomy and function, and suspected venous infarct instead.

Conclusion:
We present the first known case of acute sinusitis presenting as stroke in a patient with normal arterial anatomy and function.

African rhinoplasty versus Asian rhinoplasty average patient satisfaction

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Introduction:
Rhinoplasties are a high satisfaction cosmetic procedure performed by two distinct physician pools, ENT trained facial plastic surgeons and plastic surgeons. There are two race-based variants of the rhinoplasty: Asian and African. With the emergence of cosmetic surgery reviews online, the differently trained physicians can be compared in their patient satisfaction rates as well as the makeup of their clinical practice.

Methods:
All reviewed physicians performing African and Asian rhinoplasties in the metropolitan areas of New York (NY) and Los Angeles (LA) were queried from RealSelf cosmetic surgery review website with a radius of 100 miles from city center. The physicians were ranked based on their overall rating surgery, and number of reviews.

Results:
ENT trained facial plastic surgeons have higher average patient satisfaction rates for Asian rhinoplasty (4.85 vs 4.60, p=.488), whereas plastics trained surgeons have higher average patient satisfaction rates for African rhinoplasty (4.60 vs 4.47, p=.803). ENT trained facial plastic surgeons have a larger proportion of their practice made up of African (4.65% vs 1.63%, p=.175) and Asian (8.00% vs 6.37%, p=.845). Asian rhinoplasties have a higher average patient satisfaction compared to African rhinoplasties (4.74 vs 4.53). Lastly, NY had a slightly greater proportion of these race-based rhinoplasties (52% vs 48%) and had a greater average patient satisfaction rating (4.77 vs 4.44) compared to LA.

Conclusions:
There is no significant difference between ENT and plastics surgeons performing these variant rhinoplasty procedures.

Allergic rhinitis in an active duty population
Danielle Anderson, DO

Introduction:
Allergic disease has diverse manifestations and is an underlying factor in several chronic conditions. In a 2012 survey by the United States Department of Health and Human Services, 19.1 million adults were diagnosed with allergic rhinitis. The cost of medications was $3.4 billion, with another $2-3 billion in productivity losses. The United States military is a unique subset in whom the impact of allergic disease has not been fully elucidated. This review of the literature and retrospective analysis of clinic data seeks to identify the impact of allergic rhinitis on an active duty military population and set the groundwork for further study in cost comparison.

Methods:
The Composite Health Care System was queried to pull data on ICD-9 codes 477.0-9 from 2010 – 2015. Data was then filtered using the Medical Expense Performance Recording System code for the Otolaryngology clinic at the Naval Medical Center in Portsmouth. This generated a pool of patients diagnosed with allergic rhinitis that were then cross-referenced for prescription and cost data supplied by the pharmacy.

Results:
4,813 patients were seen for allergic rhinitis over a six year period, representing 6.6% of all encounters. 2,427 were active duty (incidence of 6.8%). Cost analysis of these encounters shows a total of $273,269 was spent on allergy prescriptions. The number of patients and cost spent per patient was roughly equal between active duty and dependents.

Conclusion:
This analysis of one specialty clinic at a military hospital serves as a pilot study to further define the impact that allergic disease has on the military health care system, and the health of the active duty forces.

An elderly patient with bilateral, progressively growing, symptomatic nasolabial cysts
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Marcus Magister

Introduction:
Nasolabial cysts are non-odontogenic, developmental cysts located inferior to the nasal alae in the soft tissues of the upper lip. Representing 0.7% of cysts in the maxillofacial region, nasolabial cysts present as asymptomatic, unilateral swelling in the nasolabial fold that grows slowly and painlessly over years. We present a rare case of an 81-year-old patient with bilateral nasolabial cysts causing symptomatic nasal obstruction.

Case Presentation:
An 81-year-old female presented with bilateral, slowly progressive nasal obstruction. Bilateral cystic lesions of the anterior floor of the nose were suspected based on clinical exam and endoscopy. CT confirmed bilateral cystic lesions anterior to the inferior turbinate extending into the pre-maxillary space, suggestive of nasolabial cysts. Bilateral endoscopic marsupialization of the cysts was performed, and subsequent pathology report confirmed the diagnosis of nasolabial cysts. The patient's symptoms resolved with no signs of recurrence on one-month follow-up.

Discussion/Conclusion:
The decision to surgically treat nasolabial cysts depends on many factors, namely the severity of symptoms. For example, if the patient had an asymptomatic, unilateral cyst, clinical monitoring would likely be the preferred approach. However, in the case of progressive nasal obstruction, as in the patient presented here, endoscopic marsupialization is a simple and effective mode of treatment.

COSM 2020 POSTERS

Assessment of clinical patterns associated with diagnosis of rhinologic disease

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Background:
Clinical presentations of rhinologic diseases are often non-specific, necessitating additional testing for diagnosis. However, patterns within initially available clinical data may provide more diagnostic utility than currently realized. The aim of this study was to patterns of routine clinical information associated with common rhinologic diagnoses.

Methods:
Consecutive patients were enrolled from a tertiary rhinology practice. A total of 22 clinical variables were recorded, including demographics, medical history, patient reported quality of life (PRQOL) measurements, and clinical exam findings. A diagnosis of chronic rhinosinusitis (CRS) without nasal polyposis (CRSsNP), CRS with nasal polyposis (CRSwNP), allergic rhinitis (AR), or recurrent acute rhinosinusitis (RARS) was applied by accepted criteria. Unsupervised non-hierarchical cluster analysis was performed to determine patterns of clinical variables associated with each diagnosis.

Results:
545 patients formed 7 unique clusters, highly dependent on PRQOL scores and demographics. CRSsNP was associated with two clusters having low frequencies of asthma and low eosinophil fractions. CRSwNP was associated with high frequency of asthma, mean (SD) NOSE scores of 66 (19) and SNOT-22 scores of 41 (15), and high eosinophil fractions. AR was present in multiple clusters. RARS was associated with the youngest population with mean (SD) NOSE score of 54 (23) and SNOT-22 score of 41 (19).

Conclusions:
Broader consideration of initially available clinical data may improve diagnostic efficiency for rhinologic conditions without ancillary studies. PRQOL scores and demographic information appeared to be useful adjuncts, with associations to diagnoses in this pilot study.

Atypical meningioma of the sinonasal tract

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Meningiomas are the most commonly reported primary intracranial neoplasms in adults, comprising over one-third of all central nervous system tumors (Ostrom). The WHO 2007 classification criteria divide meningiomas into Grade 1 (benign), Grade II (atypical), and Grade III (malignant); with these new criteria, about 20-35% of meningiomas have now been classified as atypical (Louis). There is still limited data on clinical behavior, outcomes, and optimal management of atypical meningiomas. While the majority of meningiomas fall within the realm of neurosurgical resection, extracranial meningiomas can rarely present in the sinonasal tract and are first evaluated by otorhinolaryngologists; these include primary sinonasal meningomas and olfactory groove meningiomas with extension to the paranasal sinuses. The differential diagnosis of a midline nasal mass involving skull base remains broad, even despite immunohistochemical staining. The prevalence of meningiomas presenting in the head and neck with atypical meningioma on histopathology is unknown, given independent rarity of those two events. This case report describes an unusual presentation of atypical olfactory groove meningioma in patient with baseline intellectual disability, as well as a literature review regarding diagnosis and post-operative management based on final diagnosis.

COSM 2020 POSTERS

Automated skull base segmentation with atlas-based segmentation

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Objective:
Computationally-derived surgical approaches can contribute to the development of novel approaches for the skull base. This defines a need for automated skull base segmentation that can be used for surgical planning. The objective of this work is to report an algorithm for automated segmentation of skull base structures in individual scans.

Methods:
Advanced Normalization Tools software was used to blend six patient scans to create a geometrically fused CT scan to serve as the atlas. Skull base structures were manually segmented using 3D Slicer on the atlas and 10 new patient scans. Multiple registration algorithms were applied to the atlas template to deform it to each of the 10 new patient scans. Dice coefficient (standard > 0.7) and Hausdorrf distance were used to evaluate atlas-based segmentation.

Results:
Deformable registration without rigid registration had the poorest results, followed by rigid registration alone and rigid registration with Plastimatch algorithm. The best results (i.e.: Dice coefficients of 0.8, 0.6, 0.6, 0.7 and average Hausdorrf distances of 1.3, 0.7, 1.2, 1.0mm for globes, optic nerves, bone, and pituitary) were obtained with rigid registration with the Elastix algorithm.

Conclusion:
Currently available open-source algorithms can be used for automated atlas-based segmentation of skull base structures with high clinical accuracy (Dice coefficient 0.6-0.7 and average Hausdorff distance 1-1.3mm). The most accurate results were derived from landmark registration followed by Elastix deformational algorithm. The ability to automatically perform highly accurate skull base registration enables large-scale outcome studies and facilitates automated surgical planning to guide the surgeon.

Career patterns of women in rhinology

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Background:
In the last decade, the field of rhinology has witnessed significant growth and expansion as reflected by the establishment of numerous new fellowship programs. At the same time, an increasing number of women are entering the field of otolaryngology and subspecialty surgery. However, there have been no studies to date investigating the demographic makeup of rhinology fellows over time and the post-fellowship career trajectory of women who complete rhinology fellowships.

Objectives:
Examine the gender distribution in rhinology, including women in leadership, academic, and private practice.

Methods:
Demographics were collected for all current and prior fellows in the field of rhinology. Data was collected from the American Rhinologic Society website, as well as program websites.

Results:
Since 1992, 371 physicians have trained in Rhinology & Skull Base Surgery. Of these, 79 (21.3%) have been women. Of all prior fellows, approximately 45.8% go on to enter into Academic positions, while 35.3% go into private practice. When stratified by gender, no difference was observed between males and females in private vs. academic positions. When stratified by geographic region, women make up approximately 20% of all Rhinologists in the USA, versus 30% in Canada and Australia. When investigating women in leadership roles, 16.9% (22/130) of academic rhinology faculty are women, and 12% (4/33) of rhinology programs were found to have female fellowship directors.

Conclusions:
Women comprised 21.3% of all rhinology fellows trained to date. No gender differences were observed with respect to practice setting. Post-fellowship, 20.5% of female rhinology fellows pursued academic careers with 12.% currently serving as fellowship directors.

COSM 2020 POSTERS

Centralization of care and patient travel for transsphenoidal surgery of the pituitary

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Introduction:
The benefits of care centralization for transsphenoidal surgery (TSS) of the pituitary have been studied. However, the effect of centralization on patient access to care, especially travel to the hospital, has yet to be established.

Methods:
From a statewide database, we identified patients who underwent TSS of the pituitary in New York from 2000-2015. Hospitals were categorized by annual caseload into low (0-25th percentile), medium (26-75th percentile), and high (76-100th percentile) volume centers. Patients and hospitals were assigned to one of the eight health service areas (HSA). Traveling was defined as moving across HSAs.

Results:
6468 patients underwent TSS of the pituitary at low (5%), medium (26%) and high volume (69%) hospitals. A significantly higher portion (28%) of patients who had surgery at high volume centers were traveling compared to low (3%) and medium (9%) volume centers ($p<0.001$). By 2015, the mean travel distances for high, medium and low volume hospitals were 19, 10 and 11 miles, respectively ($p<0.001$). From 2000 to 2015, the number of patients undergoing surgery at high volume hospitals significantly increased from 237 to 383 ($p<0.05$), while the number of high volume hospitals decreased slightly from 15 to 12. In the same period, the mean travel distance to high volume hospitals increased significantly from 15 to 19 miles ($p=0.045$). However, the proportion of patients traveling did not significantly change from 30% to 28% in this time period ($p=0.774$).

Conclusion:
Our results show that centralization of care towards high volume hospitals for TSS of the pituitary is occurring. This trend is associated with increased distance traveled for patients undergoing surgery at high volume hospitals.

CF infection prevention protocol

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Background:
The Cystic Fibrosis Foundation has issued Infection Prevention and Control Guidelines for Cystic Fibrosis (CF) care centers. The guidelines emphasize implementation of contact precautions in ALL healthcare settings for ALL CF patients, regardless of colonization. In rhinology clinics this practice is less universal. The goal of this study was to assess the satisfaction of patients with CF after implementation of an enhanced CF infection prevention protocol.

Methods:
An 11-item survey was completed by CF patients at the conclusion of their routine clinical visit after implementation of our enhanced CF infection protocol. This protocol included flagging CF patients prior to check-in, offering them a mask at check-in, alerting nursing staff of CF patient arrival to expedite rooming, and use of gown and gloves for all clinical interactions. Patients were queried on provider adherence, personal protective equipment (PPE) preference, and patient-perceived effects on care. We also surveyed patients to determine if this improved their visit satisfaction or if they felt singled out in a clinic setting where the majority of patients do not have CF.

Results:
80% of patients preferred their providers to be gloved and gowned for visits. Additionally, 30% of patients preferred providers to wear a mask, at least when the patient is acutely sick.

Conclusion:
The majority of patients preferred clinicians and clinical staff to don gloves and gown. CF patients do not perceive that any PPE impeded patient care, rather, they indicated that it enhanced their clinical experience.

Clinical characteristics and cost of surgically managed nasal polyps patients

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Optum

Introduction:
Nasal polyps (NP) are benign inflammatory growths that may necessitate surgical management. There are minimal data on long-term real-world healthcare utilization for NP patients.

Methods:
US administrative claims analysis using the Optum Research Database identified adults with evidence of NP and surgery from 1/14 to 3/18. Index date was the first surgery date in the identification period. Continuous enrollment 12 months before (pre-surgery) and after surgery (post-surgery) was required. Patients with claims for cystic fibrosis, ciliary dyskinesia, or prior sinus surgery were excluded. All-cause and NP-related health care utilization and cost were assessed pre-/post-surgery. NP-related care utilization included claims for NP visits, sinus surgery, sinus infections, nasal endoscopy, CT scan, steroids, and antibiotics. Variables were summarized descriptively.

Results:
Of 57,044 NP patients identified, 30% had sinus surgery. Of these, 8,116 (47%) met selection criteria: mean age 52 years, 61% male, 41% located in the South, 36% asthma, 93% pre-surgery respiratory infections. Patients averaged 21 ambulatory visits pre-surgery; nearly a quarter were NP-related. Patients averaged 26 ambulatory visits post-surgery; nearly a third were NP-related. Mean total cost was $12,074 pre-surgery (19% NP-related). Mean total cost was $27,072 including index surgery and 1 year post-surgery (48% NP-related). Cost increases were largely driven by surgery-related care.

Conclusions:
NP surgery patients averaged >1 ambulatory visit/month pre-surgery and 2 ambulatory visits/month post-surgery. Further analyses are underway to evaluate costs ≥2 years post-surgery. Interventions to improve NP medical management may help reduce NP-related care.

Clinical factors distinguishing orbital invasive fungal sinusitis from orbital cellulitis

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Introduction:
Distinguishing acute orbital invasive fungal sinusitis (OIFS) from clinical mimics such as orbital cellulitis (OC) is critical to guide early treatment. Here we aim to identify factors to aid in the pre-operative clinical distinction of OIFS from OC.

Methods:
In this retrospective review, we identified patients with suspected OIFS treated at our tertiary care institution between 8/2014 and 11/2019. Data collection included: age, sex, comorbidities, presenting signs and symptoms, and a query of perioperative CT keywords including “fat stranding,” “mucosal thickening,” and “bony erosion.” Primary outcome was the histopathologic or microbiological confirmation of OIFS vs OC.

Results:
Nineteen cases of suspected OIFS were identified. OIFS was diagnosed in 14(74%) and OC in 5(26%). Patient demographics yielded no significant differences ($p>0.05$). Patients with OIFS and OC had similar rates of diabetes (79% vs 60%; $p>0.05$) and malignancy (36% vs 20%; $p>0.05$). Presenting symptoms including ophthalmoplegia, facial swelling, headache, decreased vision, and periorbital edema occurred with near-equal frequency between groups ($p>0.05$). Compared with OC patients, no OIFS patients presented with nasal discharge (60% vs 0%; $p=0.01$) or chemosis (40% vs 0%; $p=0.058$). OC patients trended toward a greater number of total orbital symptoms (5 vs. 3.9, $p=0.15$). Fat stranding, mucosal thickening, and bony erosion were noted on perioperative CT with similar frequencies between groups ($p>0.05$).

Conclusion:
Distinguishing OIFS from OC in the clinical setting remains challenging. While many clinical and imaging features overlap, OC more regularly presents with nasal discharge and chemosis, distinguishing this condition from OIFS.

COSM 2020 POSTERS

Complications after endoscopic sinus surgery in sinonasal cancer patients with mental illness

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Background:
Patients with mental health disorders have been shown to have poorer outcomes across a wide variety of medical conditions. The objective of this study was to investigate the impact of comorbid mental illness on complication rates in patients with sinonasal malignancy undergoing endoscopic sinus surgery (ESS).

Methods:
The Nationwide Inpatient Sample (NIS) was queried from 2003-2014 for diagnoses of sinonasal malignancy using ICD-9 codes. Cases that underwent an ESS procedure were included and stratified by mental illness status into two cohorts. Univariate analysis and multivariate logistic modelling were used to compare patient demographics, comorbidities, and complication rates.

Results:
Of 2,073 patients, 262 (12.6%) had a mental illness and 1,811 (87.4%) did not. The most common mental disorder was mood disorder (5.7%), followed by anxiety disorder (3.6%), substance abuse (1.6%), multiple disorders (1.4%), and schizophrenia (0.3%). There was no significant difference in procedure complexity (neck dissection, orbital involvement, and neurosurgical involvement) between the two groups. Patients with mental illness had a longer mean length of stay (7.4 vs 6.3 days, p=0.010). On univariate analysis patients with mental illness experienced more medical complications (20.2% vs 15%, p=0.030) and surgical complications (25.6% vs 19.9%, p=0.035). After multivariate regression, the mental illness group had a higher risk of medical (OR 1.27, p=0.191) and surgical (OR 1.264, p=0.126) complications, however this did not reach statistical significance.

Conclusions:
The presence of comorbid mental illness may not affect complication rates but may increase the length of stay in patients with sinonasal malignancy undergoing ESS.

Computational analysis of nose-to-brain drug delivery after nasal midvault reconstruction

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Background:
Intranasal administration of neurotherapeutic agents relies on the delivery of drug particles to the olfactory bulb (OB). This study evaluated particle deposition in the OB before and after rhinoplasty.

Methods:
Soft tissue elevation (STE), spreader flap (SF), and spreader graft (SG) procedures were performed in succession on a cadaveric nose with mild right septal deviation. Radiographic images of nasal passages were used to create airway models and inhalation airflow and particle transport simulations were performed at 15 L/min flow rate. Spray speeds of 1, 5, and 10 m/s were simulated with 10 nm – 100 micron particle sizes from 5 release locations at a depth of 15 mm. The OB was defined by the sphenoid sinus posteriorly and middle meatus anteriorly, with inferior boundaries of 1 mm (OB) and 10 mm (olfactory cleft, OC).

Results:
OB deposition was 0% for nanoparticles and < 0.1% for micron particles. OC deposition was < 1% for nanoparticles and < 5% for micron particles bilaterally for all spray speeds, release positions, and surgical procedures evaluated. Right OC deposition was < 0.1% for all conditions tested. Maximal left OC deposition was observed with particles 2 – 20 microns at 1 m/s from the central release point for both STE (4.7%) and SF (4.2%). SG achieved OC deposition only from the anterior release point at 1 m/s with particles from 31- 53 microns (left 0.3%, right 0%).

Conclusions:
Preliminary findings suggest that targeting spray drugs to the OB is not trivial even after rhinoplasty. Micron particles had better penetration to the OB than nanoparticles. Septal deviation may pose additional challenges. Additional studies will evaluate nebulized particles and additional subjects.

Contemporary diagnosis of primary ciliary dyskinesia

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Background:
Primary ciliary dyskinesia (PCD), is a genetically heterogenous disease that results from defective motility of the cilia that cannot propel mucus on the respiratory epithelium. Over the last 10 years, diagnostic evaluations of PCD have dramatically evolved and been standardized at PCD centers across North America.

Methods:
We present a case of a 63 year-old male who was diagnosed with PCD and review modern diagnostic methods and criteria for PCD.

Results:
A 63 year-old male presented for the evaluation of chronic sinusitis after having seen multiple Otolaryngologists for otologic and sinus complaints. He had a life long history of thick nasal drainage, chronic ear effusions, and intermittent cough. He had no children and reports he was infertile secondary to low motility. On physical exam he had dull ear drums with T-tubes in place. On nasal endoscopy he had copious, tenacious clear mucous bilaterally. He had a CT scan that demonstrated bilateral pansinusitis and hypoplastic sphenoid sinuses. He had a normal sweat chloride test and a nasal nitric oxide that was low on two separate occasions. Genetic testing demonstrated 2 pathologic mutations in dynein heavy chain 5 (DNAH5).

Conclusions:
Patients with PCD are frequently seen for their otologic and sinonasal manifestations. Diagnosis of PCD in adolescence or even in adulthood is not uncommon because genetic heterogeneity and diagnostic complexity. Contemporary diagnosis of PCD utilizes a combination of clinical history, sweat chloride testing, nasal nitric oxide, genetics, and electron microscopy. Knowledge of PCDs variable presentation and appropriate workup are critical to providing timely, effective treatment for this disease.

Control of carotid bleed with nasoseptal flap

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Introduction:
Internal carotid artery (ICA) bleed is perhaps the most feared complication of endoscopic skull base surgery, and successful control depends on a coordinated, multidiscliplinary approach. We report a novel technique for acute management of carotid bleed using a pedicled nasoseptal flap in conjunction with hand-over-hand nasal packing.

Methods:
Chart review

Results:
A 30-year-old woman who had undergone prior resection of a prolactinoma was taken to the operating room for a rapidly growing recurrence invading the right cavernous sinus and circumferentially encasing the carotid artery. A right nasoseptal flap was harvested during the approach in anticipation of a CSF leak. During tumor dissection, brisk arterial bleeding was encountered in the cavernous sinus and initially controlled with Gelfoam and thrombin-soaked cottonoids with two large-bore suctions and 4-handed technique. The cottonoid was slowly removed and replaced with the nasoseptal flap to cover the cavernous sinus. Strip gauze was then packed against the flap in hand-over-hand fashion while maintaining pressure against the defect. The patient subsequently underwent placement of intraluminal flow-diverting stents for a pseudoaneurysm and started antiplatelet therapy. She remained completely neurologically intact and was discharged after removal of nasal packing with no recurrent bleeding and good flap healing. Pathologic examination revealed a recurrent lactrotroph tumor with markers suggestive of malignancy.

Conclusion:
The pedicled nasoseptal flap can be utilized in the acute endoscopic management of carotid bleed. It serves as a scaffold for intranasal packing and provides the additional benefit of durable skull base repair.

COSM 2020 POSTERS

CSF leaks due to electric scooter injury

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Background:
There has been a rapid increase in electric motorized scooter (e-scooter) usage after the introduction of dockless, shareable devices in urban environments

Methods:
Case series from two tertiary hospital systems in Los Angeles of all patients with skull base fractures and CSF leaks or pneumocephalus after e-scooter accident between May and September 2019.

Results:
Five patients met criteria, none of whom had been wearing helmets at the time of injury. All five patients were male and the average age was 30.6 (range 15-39) years old. All four adults were intoxicated with the mechanism of injury fall from scooter without specific collision with an object or motor vehicle. One minor patient was hit by a car while on an e-scooter. Two patients with pneumocphalus were treated with observation alone, two patients with clinical CSF leakage were treated with lumbar drain placement or external ventricular drain placement, and one patient died of their injuries prior to definitive management. All patients had facial or temporal bone fractures in addition to the skull base injuries.

Conclusion:
Due to the lack of widespread helmet use and the maximum 15-20 mph speed of e-scooters, there is a risk of anterior cranial injury resulting in CSF rhinorrhea. Without appropriate safety policies in place, the number of such injuries may rise as the use of e-scooters increase.

Demographic predictors of complications in endoscopic sinus surgery in national database

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Background:
Identifying patient-specific risk factors for complications of endoscopic sinus surgery has been investigated in previous studies; however, these studies are institution- or surgeon-specific and lack a population-based analysis. Therefore, such findings may not be generalizable to a larger population. We present an analysis of the American College of Surgeons National Surgical Quality Improvement Program database to identify patient-specific risk factors for complications and readmissions after endoscopic sinus surgery.

Methods:
A retrospective cohort study of patients who underwent endoscopic sinus surgery was conducted using the ACS -NSQIP database from 2011-2017. The primary outcome analyzed was any complication post-operatively. A multivariable logistic regression model evaluating the association between complications and 30-day readmission was regressed on age, sex, race, comorbidities, Hispanic ethnicity, other concurrent procedure and smoking history.

Results:
A total of 1,285 patients who underwent endoscopic sinus surgery were identified. Most patients (81.6 %) had no major comorbidities. 596 (46.3%) patients had a tonsillectomy, adenoidectomy, or both concurrently with endoscopic sinus surgery. 101 (7.8%) patients experienced a complication post-operatively. On logistic regression, sex was the only demographic factor that was associated with post-operative complications (OR = 0.36, 95% CI 0.14, 0.94, p = 0.04). However, sex was not a predictor of readmission (OR = 0.27, 95% CI 0.1, 1.3 p = 0.10).

Conclusions:
Women have a significantly lower risk of complications even after controlling for comorbidities. Further analysis of sex-specific differences in surgery should be evaluated to understand this.

Determining population-wide interest in different sinus procedures using google trends

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Background:
Patients increasingly search for health-related information on the internet. Additionally, new sinus-related interventions are continuously being introduced to the market. Google Trends is a Web search volume tool and source of information on collective health trends. Using Google Trends, we sought to characterize population-wide interest in sinus procedures commonly performed in clinic or in the operating room.

Methods:
We compared the search volume index (SVI) for key search terms, including “sinus surgery,” “endoscopic sinus surgery” (ESS), and “balloon sinuplasty,” using Google Trends. Our search encompassed the entire United States and a period spanning January 2005 thru October 2019. We also investigated available state-level data.

Results:
Our data demonstrates a seven-fold spike in search volume related to balloon sinuplasty shortly following its FDA approval in 2005. Overall, searches for balloon sinuplasty increased from 8.6% to 37.7% of the total search volume for sinus procedures during this peak between March and May 2006. When comparing data from 2006 and 2019, we found a 62.8% decline in search volume related to ESS and a 44.7% increase in search volume related to balloon sinuplasty. There were also seasonal variations in Web searches for “sinus surgery,” with the highest volume of searches in January, February, and March.

Conclusions:
The increase in Google searches related to balloon sinuplasty and the concurrent decrease in searches related to ESS may reflect a shift in patient preferences. There is also a cyclical pattern with regards to patient interest in sinus surgery overall.

Disparities in access to care and outcomes following rhinoplasty

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Introduction:
There is a paucity of data on disparities in care and outcomes for patients undergoing rhinoplasty. This study aims to characterize disparities in access to care based on provider and hospital volume and the subsequent effects on outcomes following rhinoplasty.

Methods:
A New York statewide database was queried for patients undergoing rhinoplasty. Hospital and Surgeons were categorized by annual caseload into low (0-25th percentile), medium (26-75th percentile), and high volume (76-100th percentiles) centers. Outcomes of interest included 30-day all cause hospital admission and 30-day admission due to hemorrhagic/epistaxis complications.

Results:
143,123 patients undergoing rhinoplasty were identified. Patients who were older, female, insured, white, and in the top income quartile were more likely to operated on by a high volume surgeon ($p<0.05$). Patients undergoing rhinoplasty at high volume facility were more likely to be younger, female, insured, non-white, and in the top income quartile ($p<0.05$). Multivariate analysis of outcomes, while controlling for surgeon and hospital volume, demonstrated that patients who had Medicaid and were of Black or Hispanic race were more likely to be admitted to a hospital within 30 days of undergoing rhinoplasty. Furthermore, 30-day admissions due to hemorrhagic/epistaxis complications were associated with older age, male gender, and non-White race. Association between either outcome and hospital and surgeon volume was not significant.

Conclusion:
Our results display marked disparities in access to high volume facilities and surgeons among patients undergoing rhinoplasty. However, after controlling for differences in healthcare access disparities in outcomes continue to persist.

COSM 2020 POSTERS

Distinct histopathologic features of sinusitis complicated by orbital or intracranial extension

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Background:
Complicated sinusitis with orbital or intracranial extension can be a life-threatening condition requiring emergent intervention. Histologic features of complicated sinusitis have yet to be determined and may have important implications on the pathophysiology of the disease process.

Methods:
A structured histopathology report was utilized to analyze sinus tissue extracted during functional endoscopic sinus surgery (FESS). Histopathology variables and Lund-Kennedy (LK) scores were compared between patients with complicated sinusitis (CS), CRS without nasal polyps (CRSsNP), and CRS with nasal polyps (CRSwNP).

Results:
21 CS, 111 CRSsNP, and 112 CRSwNP patients were analyzed. The 21 CS patients included the following diagnoses: 5 orbital abscess, 6 intracranial abscess, 4 cavernous sinus thrombosis, 2 cellulitis, 2 meningitis, and 2 frontal bone osteomyelitis. Compared to CRSsNP, CS was associated with increased inflammation (63.0% vs 38.7%,$p<0.020$), neutrophilia (51.9% vs 17.1%,$p<0.0001$), and squamous metaplasia (40.7% vs 18.0%,$p<0.014$). Compared to CRSwNP, CS demonstrated reduced tissue eosinophil count (33.3% vs 65.2%,$p<0.003$) and fewer eosinophil aggregates (3.7% vs 35.7%,$p<0.0001$). CS was associated with higher mean LK scores (6.33±3.62 vs 4.08±2.28,$p<0.0001$) compared to CRSsNP.

Conclusion:
Patients with sinusitis extending into the orbital or intracranial confines exhibited higher overall inflammation, neutrophilic infiltration, and squamous metaplasia than CRSsNP patients, and decreased tissue eosinophilia and eosinophil aggregates than CRSwNP patients. This study provides insight into histologic features of complicated sinusitis favoring it as an aggressive neutrophilic process associated with tissue remodeling.

Effect of nasal fluticasone exhalation delivery system on eustachian tube dysfunction

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Background:
Intranasal corticosteroids are used for Eustachian tube dysfunction (ETD) despite limited support in the clinical literature. A novel exhalation delivery system for fluticasone (EDS-FLU) is currently FDA-approved for nasal polyps and delivers the drug deeper into the posterior nasal cavity. The purpose of this study was to determine the effect of EDS-FLU on ETD with the hypothesis that its deeper penetration may improve its efficacy.

Methods:
A retrospective chart review of adult patients with ETD treated with EDS-FLU was performed in two surgeons' practices from July to December, 2019. Inclusion criteria included >1 month of symptoms, abnormal ETDQ-7 (>14.5), and >1 month of EDS-FLU treatment. All etiologies of ETD were included in the study. Demographic factors including age, sex, allergy, asthma, and chronic rhinosinusitis status were recorded. Objective outcomes were change in tympanometry and ETDQ-7 scores. Wilcoxon signed rank test was used to compare pre- and post-treatment ETDQ-7 scores.

Results:
A total of 14 patients were included. Pre- and post-treatment ETDQ-7 scores were 23.0+7.7 and 18.2+8.9 ($p=0.0058$). Nine (64%) of the 14 patients had improvement in ETDQ-7 scores by more than the MCID of 1.5. Five patients had abnormal pre-treatment tympanometry, three had normal tympanometry, and six patients had unknown tympanometry status. Of the five abnormal tympanometry patients, 80% (4 out of 5) had normalization of their tympanograms, and 100% had improvements in their ETDQ-7 scores.

Conclusion:
This pilot study demonstrates significant potential of EDS-FLU in ETD and will serve as the basis for an upcoming prospective multi-institutional randomized clinical trial.

Effects of smoking on post-operative outcomes in skull base procedures comparing ENT assisted and unassisted surgeries

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Objectives:
To investigate the association between preoperative serum albumin levels and rates of postoperative complications in patients who underwent anterior skull base procedures.

Study Design:
Retrospective database review

Methods:
The 2005-2015 National Surgical Quality Improvement Program (NSQIP) database was used. Propensity score matching (PSM) was conducted to homogenize the study population. Chi-squared analysis and logistic regression were used to determine the independent effect of covariates on postoperative complication rates.

Results:
4053 individuals with known preoperative serum albumin levels who received anterior skull base surgery by otolaryngologists and neurosurgeons were identified. The median level (4.00 gm/dl) was used to separate patients into two cohorts (albumin <4 gm/dl) and (albumin ≥4 gm/dl). Multivariate regression analysis of this adjusted cohort indicated that lower preoperative serum albumin levels were not independently associated with higher rates of experiencing a complication after procedure (OR 0.139, 95% CI .849–3.230, p=0.016). Of the individual postoperative complications studied, multivariate regression analysis of this cohort revealed that patients who previously had sepsis experienced increased occurrences of pneumonia after procedure (OR 228.33, 95% CI 2.802–18602.798, p=0.016) and systemic sepsis during the postoperative hospitalization (OR 28.501, 95% CI 2.493–325.817, p=0.007).

Conclusions:
This analysis underscores the possible importance of optimizing nutrition prior to anterior skull base procedure. Preoperative serum albumin levels can serve as a nutritional marker, as levels below 4.00 gm/dl are associated with higher risk of postoperative complications.

Empty Nose Syndrome

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Empty Nose Syndrome (ENS) is a rare debilitating complication of functional endoscopic sinus surgery. This syndrome is believed to be caused by surgical removal of the middle and inferior nasal turbinate, which functions to generate turbulent airflow and warms the air within the nasal cavity. Effectively, the loss of adequate turbulent flow and humidification of inhaled air prevents the nasal mucosa from performing its proper physiological functions. Patients with ENS experience symptoms such as severe congestion, anosmia, persistent nasal drip, mucosal dryness, headache, as well as somatic symptoms such as anxiety, depression, frustration, and irritability. Current treatment options for patients with ENS include conservative medical management and turbinate reconstruction surgery. No studies have been conducted on the treatment of ENS with Balloon Sinuplasty (BSP). Here, we discuss two patients who presented to our institution with symptoms of ENS. Both patients elected to undergo BSP after medical management failed to alleviate their symptoms. Both patients noted excellent results with an average of 66% improvement in their SNOT-20 scores after their procedures. These findings suggest a novel endoscopic approach to relieving symptoms in patients suffering from ENS and may form the basis for future studies.

COSM 2020 POSTERS

Endoscopic endonasal resection of a carcinoma ex-pleomorphic adenoma of the skull base

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Background:
Carcinoma ex-pleomorphic adenoma (CXPA) is an aggressive salivary gland tumor, arising from malignant degeneration of a pleomorphic adenoma. To our knowledge, no prior studies have described an expanded endoscopic endonasal approach (EEA) for resection of a skull base CXPA.

Methods:
A 41-year-old woman presented with a large right skull base tumor, involving the pterygopalatine (PPF) and infratemporal fossae (ITF) with extensive erosion into the middle cranial fossa (MCF). She underwent a multidisciplinary EEA transpterygoid and transphenoidal approach, which resulted in gross total resection and minimal 30-day complications.

Results:
The surgical steps are described with intraoperative image guidance. Following harvest of a nasoseptal flap, exposure was obtained with bilateral endoscopic sinus surgery, exposing the tumor from the left sphenoid to the right PPF. Transpterygoid resection of the tumor was achieved, and a posterior septectomy was used to access the ITF laterally. Debulking of the tumor continued via transphenoidal resection until the planum sphenoidale and cavernous sinus were reached. The Neurosurgery team dissected the tumor off dura, from the planum medially along the MCF floor towards the right temporal lobe and Meckel's cave. A low-grade cerebrospinal fluid (CSF) leak was noted, after which the defect was reconstructed with a DuraGen® Plus allograft and nasoseptal flap. The operation lasted 12 hours. The patient developed expected V2 numbness and trismus, but no CSF leak, significant pneumocephalus, or vascular complications.

Conclusions:
Skull base CXPA are rare tumors. We describe a technically challenging resection of a CXPA involving multiple skull base compartments via an EEA.

Endoscopic muscle graft to right carotid artery blowout

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Introduction:
Carotid artery blowout syndrome (CBS) refers to carotid artery rupture, a deadly complication usually linked to head and neck cancer therapy. We present a different etiology of endoscopic CBS, a complication of endovascular coiling of an ICA aneurysm, treated with sternocleidomastoid (SCM) muscle graft packing.

Case Presentation:
An otherwise healthy 55-year-old female presented to the emergency room with right-sided painless vision loss of 23 days. CTA demonstrated right ophthalmic ICA aneurysm eroding into the right sphenoid sinus with optic nerve compression. Attempted endovascular repair of the aneurysm was complicated by ICA rupture into the sphenoid. An endovascular balloon was inflated proximal to the aneurysm to reduce hemorrhage as ENT performed an endoscopic sphenoidotomy after right middle turbinate removal. A hematoma was seen overlying the aneurysm in the superior lateral sphenoid sinus and repaired with SCM muscle, harvested inferior to the spinal accessory nerve branching point. Layers of muscle were morselized and packed serially with Surgicel and Floseal, supported by a Foley balloon. Post-repair angiography showed no further extravasation. Aggressive antiplatelet therapy was initiated. Packing was removed after 14 days. 20 days post-operatively, the patient had profuse left-sided epistaxis requiring a left sphenopalatine artery ligation. Her vision recovered. Right nasolabial fold flattening and left-sided arm weakness is improving with physical therapy.

Discussion:
While CBS is often managed by endovascular coil embolism, in our case CBS was caused by this very treatment itself. This case shows the use of SCM muscle graft as an effective repair modality of ICA rupture due to endovascular coiling.

Endoscopic olfactory anatomy

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Objective:
This study aims to provide a detailed anatomical description of the olfactory filament (OF) distribution in the nasal cavity through endoscopic endonasal dissection.

Methods:
4 specimens (8 sides) were used. Dissection of the nasoseptal (NSM), middle (MTM) and superior turbinate (STM) mucosa was performed to visualize OF at their exit through the cribriform plate (CP). Measurements of OF were taken under endoscopic visualization. Significance was assessed with Student's t-test.

Results:
The NSM contained a mean 11 OF, distributed over a mean surface area (SA) of 173 mm2 with the highest density of OF found at the posterior NSM. The MTM and STM were found to have a mean amount of 6 OF and 9 OF, respectively. Mean surface area was 77 mm2 and 96 mm2 on the MTM and STM, respectively. Mean Overall OF length was 6 mm, with no significant difference found between subsites or sides. While there was no significant difference in SA between the STM and MTM OF ($p=0.13$), the STM OF were found to be significantly greater in number, with a greater width of distribution ($p<0.05$) than the MTM OF, and no significant difference between sides.

Summary:
The STM and MTM combined were found to have a greater density of OF than the NSM. The STM contained a significantly higher amount of OF than the MTM. This suggests that preservation of the STM and MTM, particularly in skull base (SB) defect repair, can be equally - if not more beneficial – for olfactory function as preservation of the NSM; particularly in CP defect repair. Moreover, our findings indicate that nasoseptal flap harvest must be performed at least 6 mm from the SB to preserve OF in the NSM. To our knowledge, this is the first quantitative endoscopic study of the OF.

Environmental exposure and histopathologic findings in WTC relief workers with CRS undergoing FESS

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Introduction:
The World Trade Center (WTC) terrorist attacks on September 11th, 2001 exposed thousands of civilians and relief workers to environmental and industrial inhalable particulate matter. Exposure to WTC site debris has been associated with the development of chronic rhinosinusitis (CRS) in WTC relief workers, many of whom later underwent functional endoscopic sinus surgery (FESS). Local mucosal eosinophilia, in particular, has been linked to increased symptom severity and refractory disease in patients with CRS.

Methods:
Retrospective review of patients enrolled in the World Trade Center Health Program (WTCHP) who underwent FESS by physicians in the Mount Sinai Otolaryngology Rhinology Division. Histopathologic data was collected from surgical pathology reports of biopsy specimens at the time of surgery.

Results:
103 patients with CRS that underwent FESS were included. 38.8% of patients had evidence of eosinophilia on biopsy at time of surgery. Both diesel and non-diesel exhaust exposure were correlated with increased eosinophilia ($p = 0.021$ and $p = 0.037$, respectively). Diesel and non-diesel exhaust exposure were also correlated with higher incidence of nasal polyposis ($p = 0.009$ and $p = 0.007$, respectively). There was no significant correlation between timing of exposure (early vs late), total length of exposure, mask usage, asbestos, dust, mold or chemical fumes exposures on the development of eosinophilia.

Conclusion:
WTC relief workers undergoing FESS exposed to both diesel and non-diesel exhaust may have an increased rate of eosinophilia and nasal polyposis.

COSM 2020 POSTERS

Epithelial remodeling alters PAR-2 polarization

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Protease-activated receptor 2 (PAR-2) is activated by mast cell tryptase, neutrophil elastase, and Alternaria or dust mite proteases and triggers airway epithelial secretion and inflammation. PAR-2 is normally expressed basolaterally in differentiated nasal ciliated cells. We hypothesized that epithelial remodeling during airway diseases, characterized by loss of cilia and squamous metaplasia, may alter PAR-2 polarization. PAR-2 responses were measured by live cell calcium and cilia imaging, measurement of fluid secretion, and quantification of released cytokines. PAR-2 signaling in airway squamous cells activated calcium and inflammatory responses through dual Gi and Gq mechanisms. Squamous cells cultured at air liquid interface (ALI) responded to PAR-2 agonists applied both apically and basolaterally. Primary differentiated nasal epithelial ALI cultures responded only to basolateral PAR-2 stimulation. Primary cultures exposed to IL-13, cigarette smoke condensate, or reduced retinoic acid responded to both apical and basolateral stimulation. Nasal polyp tissue, but not control middle turbinate, exhibited apical calcium responses to PAR-2 stimulation. However, isolated ciliated cells from both polyp and turbinate maintained basolateral PAR-2 polarization, suggesting that squamous metaplasia and/or loss of cilia enhances apical responses. Altered PAR-2 polarization in dedifferentiated or remodeled epithelia may contribute to increased sensitivity to inhaled protease allergens and exacerbate disease.

Eustachian tube balloon dilation

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Background:
Eustachian tube dysfunction (ETD) is a prevalent disorder in the United States. Eustachian tube balloon dilation has emerged as a surgical treatment for the management of ETD. Although its efficacy remains under optimization, factors associated with clinical outcomes are less understood. The identification of predictive variables may have important implications in the selection of appropriate candidates for eustachian tube balloon dilation.

Purpose:
To assess the efficacy of balloon dilation as a treatment modality for ETD in a rhinology practice, and to identify predictors of clinical outcomes.

Methods:
Retrospective cohort study. A preoperative and postoperative seven-item eustachian tube questionnaire (ETDQ7) score was recorded. Univariate and multivariate analyses were performed to assess the correlation of factors to postoperative ETDQ7 scores after 6 months.

Results:
A total of 34 patients underwent eustachian tube balloon dilation for refractory ETD. The average age at surgery was 46 years old (range, 17-77) and the cohort was predominantly male at 53%. The mean preoperative ETDQ7 was 4.6 +/- 1.4. The mean postoperative ETDQ7 was 1.3 +/-1.6. The median follow-up in months was 13 (range, 2-25). Age, sex, history of prior ear surgery were not predictive of differences in postoperative ETDQ7. A higher preoperative ETDQ7 score was an independent predictor of clinical success.

Conclusions:
Higher preoperative ETDQ7 scores independently predicted a reduction in the postoperative ETDQ7. Additional studies are needed to clarify predictive factors of clinical success to optimize patient selection for balloon dilation for ETD.

Exclusively endoscopic surgical resection of esthesioneuroblastoma: A systematic review of outcomes

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Introduction:
Esthesioneuroblastoma is a rare small round blue cell tumor of the olfactory neuroepithelium. Historically, sinonasal malignancies were addressed via open craniofacial surgery for an oncologic resection. Increasingly, esthesioneuroblastomas are excised using an exclusively endoscopic approach. The purpose of this study is to review the outcomes of patients who undergo exclusively endoscopic surgery for esthesioneuroblastoma.

Methods:
A systematic review was performed according to the PRISMA guidelines. Pubmed and Ovid MEDLINE databases were queried using the search term “esthesioneuroblastoma” to find studies publishing outcomes associated with endoscopic management of esthesioneuroblastoma.

Results:
Sixty-three out of 2162 articles met inclusion criteria, totaling 594 patients with esthesioneuroblastoma treated with an exclusively endoscopic approach. 51 patients (8.6%) received adjuvant chemotherapy and 340 patients (57.5%) received postoperative radiation therapy. The average age was 47.8 years old; range 9-83 years. 17.2% were Kadish stage A, 36.8% were Kadish stage B, 42.2% were Kadish stage C, and 3.7% were Kadish stage D. 61.1% of patients had Hyams histologic grade I or II while 38.9% of patients had grade III or IV disease. 86% of patients had negative surgical margins. 54 patients had a recurrence. Of those with 5-year follow-up, reported disease free survival ranged from 60% to 100%.

Conclusion:
Exclusively endoscopic surgery for esthesioneuroblastoma is performed for a wide range of disease stages and grades, and the majority of these patients are also treated with adjuvant chemo or radiation therapy.

Extrasinus recurrence of inverting papilloma following previous Caldwell-Luc

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Sinonasal inverted papillomas (IP) are known for delayed recurrence. Here we present a case of recurrence in the infratemporal fossa after previous Caldwell-Luc resection.

A 79-year-old Chinese male was referred for a mass in the right cheek noticed on a CT scan performed after sustaining a fall with right facial injury. He had undergone excision of a right sided IP 13 years ago, which arose from the antero-medial wall of the maxillary sinus. The intranasal component of the mass was resected endoscopically and the stalk was excised via a Caldwell-Luc approach. Histology revealed IP with no malignant change. He defaulted all follow-up.

At the current presentation, the patient had no nasal symptoms. He had limited right eye abduction, proptosis, and hyperglobus. The CT scan showed a right maxillary mass extending to the infratemporal space and extraconal soft tissues, displacing the right orbit. The MRI showed an expansile mixed solid-cystic lesion with patchy enhancement.

The patient underwent resection of the mass with a modified Denker’s approach. Intraoperatively, a large polypoidal solid-cystic tumour was found arising lateral to the right maxillary sinus, extending into the infratemporal fossa. The cystic component of the mass was decompressed, revealing mucoid content. Complete resection of the mass was performed in piecemeal fashion. No definite stalk was identified. Final histology was IP with no malignancy. The patient was seen 6 months post-op with no recurrence.

To the best of our knowledge this is the first report of an extra-sinus recurrent IP after a Caldwell Luc resection. Possible mechanisms include incomplete resection or weakening of the posterolateral maxillary sinus wall due to trauma, with tumor seeding.

COSM 2020 POSTERS

Gender representation at national rhinology meetings

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Background and Objective:
The number of women in otolaryngology has increased in recent years. In 2018 the Women in Rhinology Section was established by the American Rhinologic Society (ARS) due to the increased interest in rhinology amongst women. In 2019, for the first time, a woman was elected as an officer to the American Rhinologic Society. Currently, 4 of the 6 elected directors are also woman. Our objective was to determine the prevalence of women presenting at a national Rhinology meeting over the last two decades.

Methods:
All poster, oral, moderator, and keynote speeches from the annual meeting of the ARS at the Combined Otolaryngology Sections Meeting (COSM) from 2000-2018 were analyzed for gender of first author, last author, and region.

Results:
In 2000, there were 35 oral research presentations, which grew to 140 in 2018. The percentage of oral research presentations by women first-authors rose from 14.3% to 26.4% over the study period (p=0.18, Fisher's Exact Test). Posters were first presented at the meeting in 2003, and the number of posters increased from 31 to 251 from 2003-2018. The percentage of poster presentations by women first-authors rose from 12.9% to 29.2% from 2003-2018 (p=0.06). The number of female panelists grew from 0% to 24.2% from 2000-2018 (p=0.55). Overall, women held 10.5% of moderator positions, 15.0% of panelist, and no keynote positions over the study period.

Conclusions:
The annual ARS meeting at COSM has grown substantially from 2000 to 2018 with an increase in the total number of oral and poster presentations. The percentage of women presenting their research as a poster or oral podium presentation is increasing, however this change does not reach statistical significance.

Hydraulic dissection technique during endoscopic sinus surgery using a novel balloon sinus dilation

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Introduction:
A decade after its introduction, some surgeons have incorporated the technique of balloon sinus dilation (BSD) technology into "hybrid" endoscopic sinus surgery procedures (ESS). A novel BSD device which can be placed over standard surgical instruments including surgical navigation instruments has recently been introduced. We present a case series in which this device was used as a hydraulic dissection tool to aid in safe efficient surgery in difficult to access locations of the paranasal sinuses during hybrid ESS procedures.

Methods:
Retrospective case series of patients who underwent FESS performed in part with a novel BSD device (Sinusleeve, Dalent Medical, Coral Gables, FL).

Results:
A total of 8 patients who underwent hybrid ESS with this device were reviewed. In all 8 cases, the device was used without complication. The device was used over straight and curved suctions while being tracked with surgical navigation in all cases. Nine posterior ethmoid dissections, 12 sphenoidotomies, and 6 frontal sinusotomies were assisted with the device. In the selected dissections in which the balloon was utilized, the operating surgeon found it to be helpful in creating more space to allow for continued safe surgical dissection.

Conclusions:
This sinus balloon device can be a useful adjunct during FESS. This novel dilation system, which deploys a sinus balloon device over standard surgical instruments with surgical navigation, provides even more opportunity to accurately dissect difficult areas of the paranasal sinuses safely and efficiently. Further studies evaluating the exact role of sinus balloon devices as a hydraulic dissection tool during FESS are warranted.

Hypoalbuminemia in anterior skull base procedures

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Objectives:
To investigate the association between preoperative serum albumin levels and rates of postoperative complications in patients who underwent anterior skull base procedures.

Study Design:
Retrospective database review

Methods:
The 2005-2015 National Surgical Quality Improvement Program (NSQIP) database was used. Chi-squared analysis and logistic regression were used to determine the independent effect of covariates on postoperative complication rates.

Results:
4053 individuals with known preoperative serum albumin levels who received anterior skull base surgery by otolaryngologists and neurosurgeons were identified. The median level (4.00 gm/dl) was used to separate patients into two cohorts (albumin <4 gm/dl) and (albumin ≥4 gm/dl). Multivariate regression analysis of this adjusted cohort indicated that lower preoperative serum albumin levels were not independently associated with higher rates of experiencing a complication after procedure (OR 0.139, 95% CI .849–3.230, p=0.016). Of the individual postoperative complications studied, multivariate regression analysis of this cohort revealed that patients who previously had sepsis experienced increased occurrences of pneumonia after procedure (OR 228.33, 95% CI 2.802–18602.798, p=0.016) and systemic sepsis during the postoperative hospitalization (OR 28.501, 95% CI 2.493–325.817, p=0.007).

Conclusions:
This analysis underscores the importance of optimizing nutrition prior to anterior skull base procedures. Preoperative serum albumin levels can serve as a nutritional marker, as levels below 4.00 gm/dl are associated with higher risk of postoperative complications.

Impact of prophylactic antibiotics on healthcare utilization following endoscopic sinus surgery

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Introduction:
Despite little data that prophylactic antibiotics reduce the rate of infection following endoscopic sinus surgery (ESS), the practice remains common. Some may argue that antibiotics reduce the number of postoperative visits (POVs), debridements, or subsequent prescriptions. This study aims to assess the impact of postoperative antibiotics on these factors and hence healthcare utilization.

Methods:
Retrospective chart review was conducted of patients who underwent ESS for CRS with and without polyps (CRSwNP and CRSsNP) by six surgeons at a tertiary care center between 2014-2018. Patient-specific factors including primary versus revision surgery, extent of surgery, eosinophils on pathology, nasal packing, drug-eluting stent placement, and use of postoperative antibiotics were gathered. Outcomes included number of clinic debridements, incidence of acute infection, and subsequent antibiotic prescriptions during 90 days following surgery.

Results:
Of 1030 cases included, 280 (27.2%) were revision and 445 (43.2%) were for CRSwNP. In 152 cases (14.6%), prophylactic antibiotics were not used. These patients had fewer debridements (M=1.24, SD=0.56 versus M=1.62, SD=0.79), however were also less likely to have had purulence encountered intraoperatively (11.7% versus 26.0%) than those receiving antibiotics. There were similarly low rates of infection at the first POV. There was no association with need for subsequent antibiotic prescriptions over 90 days (23.0% versus 24.8%).

Conclusions:
Patients who received antibiotics were more likely to have had postoperative purulence noted, but the routine use of postoperative antibiotics did not appear to reduce the rate of infection, need for antibiotics, or need for debridements.

COSM 2020 POSTERS

Increased prevalence of sinusitis in Gulf War veterans

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Gulf War Illness is a chronic, multi-systemic disease characterized by fatigue, pain, mood disorder, and respiratory symptoms that affects over 150,000 United States veterans. Approximately 51% of veterans serving during either the Gulf War or Operation Enduring Freedom and Operation Iraqi Freedom (OEF/OIF) have been reported to suffer from respiratory symptoms. However, the prevalence of sinusitis in GWI and OEF/OIF veterans has not been characterized.

Objective:
To determine the physician-diagnosed prevalence of sinusitis in OEF/OIF veterans with the goal of defining veterans with higher risk factors for sinusitis according to periods of service.

Study Design:
Retrospective database analysis

Methods:
We queried the VHA Support Service Center database to identify veterans in the Desert Pacific Healthcare Network with ICD-9&10 diagnoses related to acute and chronic sinusitis, nasal polyps, and anosmia from 2017-2019.

Results:
In 2017, 2.07% of OEF/OIF veterans were diagnosed with sinusitis compared to 1.80% of non-OEF/OIF veterans ($p<0.1E-4$). Similar statistically significant results were demonstrated in 2018 and 2019 (2.11% vs. 1.91%, 2.1% vs. 1.89%). In 2017, the prevalence of nasal polyps and anosmia was 0.03% and 0.11% in OEF/OIF patients and 0.03% and 0.15% in non-OEF/OIF patients. The increased prevalence of overall sinusitis in OEF/OIF veterans is driven primarily by chronic sinusitis; 1.04% of OEF/OIF veterans had chronic sinusitis compared to 0.93% in non-OEF/OIF patients ($p<0.1E-4$).

Conclusion:
OEF/OIF veterans were 15% more likely to be diagnosed with sinusitis than non-OEF/OIF veterans. Further data analysis will focus upon comparing deployed and non-deployed as well as OEF/OIF and Gulf War cohorts.

Inter-pathologist agreement on CRS structured histopathology

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Background:
Structured histopathology reporting is increasingly being utilized in rhinology to characterize pathophysiologic mechanisms in chronic rhinosinusitis and guide management decisions after sinus surgery. The goal of this investigation is to evaluate inter-pathologist agreement in structured histopathology reporting.

Methods:
Two head and neck pathologists independently compiled structured histopathology reports for tissue samples collected during functional endoscopic sinus surgery. Cohen's standard kappa (κ) coefficients were calculated for each histopathologic variable to assess inter-pathologist agreement.

Results:
A total of 92 cases were analyzed. Substantial inter-pathologist agreement was reached on tissue eosinophil count ($\kappa=0.638$, $p<0.001$), the presence of eosinophil aggregates ($\kappa=0.620$, $p<0.001$), and the presence of fungal elements ($\kappa=0.739$, $p<0.001$). There was moderate agreement on the degree of inflammation ($\kappa=0.559$, $p<0.001$) and the presence of squamous metaplasia ($\kappa=0.456$, $p<0.001$). There was fair agreement on the presence of neutrophil infiltrates ($\kappa=0.330$, $p<0.001$), the presence of hyperplastic changes ($\kappa=0.397$, $p<0.001$), and the presence of fibrosis ($\kappa=0.236$, $p=0.022$). There was only slight agreement on the degree of subepithelial edema ($\kappa=0.196$, $p=0.008$). The κ coefficients for basement membrane thickening and mucosal ulceration were not statistically significant.

Conclusion:
High inter-pathologist agreement was demonstrated for several salient histopathologic variables, including tissue eosinophil count and the presence of eosinophilic aggregates. However, refining the definitions of certain histopathologic variables may improve the reproducibility of structured histopathology reporting.

Intranasal drug delivery to the ostiomeatal complex and maxillary sinus in chronic rhinosinusitis

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Background:
Medical management of chronic rhinosinusitis (CRS) with intranasal steroid sprays relies on effective drug delivery to the region of the ostiomeatal complex (OMC), maxillary, and frontal sinuses. Factors influencing intranasal drug deposition patterns include sinonasal anatomy, drug particle size, and administration technique. This project utilized computational fluid dynamics to investigate the intranasal spray release position that maximizes drug particle delivery to the OMC and maxillary sinuses in CRS patients.

Methods:
Anatomically accurate 3D reconstructions of the nasal airspace and maxillary sinuses were constructed from computed tomography scans of two CRS patients. Airflow simulations were performed at 15 pascal inhalation pressure. Aqueous spray particles from 1-100 microns were simulated for release speeds of 1, 5, and 10 m/s from 6 release locations at 15 mm nozzle insertion depth.

Results:
For both subjects, maximal OMC deposition was achieved at a spray speed of 1 m/s from the most lateral release position bilaterally (Subject 1: right 7%, left 9%; Subject 2: right 6%, left 2%), and was greatest with particles of 10-30 micrometers. Maxillary sinus deposition was < 1% for both subjects bilaterally from all release points and spray speeds, with deposition occurring only for particles <20 micrometers.

Conclusions:
Effective delivery of drug particles from intranasal sprays to the OMC and maxillary sinuses is challenging and varies with drug release position and spray speed. Effective medical management of CRS relies on patient education concerning optimal techniques for spray administration. Future work will include nebulized particle deposition patterns and analysis of six additional subjects.

Invasive mucorales infection of the nasopharynx

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Background:
Acute invasive fungal sinusitis (AIFS) is fungal disorder that affects immunocompromised patients. The management includes surgical debridement, antifungals, and correction of immunosuppressed state. Here we present a case of Mucorales invasive fungal infection involving a unique location, the nasopharynx, without paranasal sinus disease in a patient with acute myeloid leukemia (AML).

Methods:
Case report and literature review

Results:
A 69-year-old male patient with AML who underwent induction chemotherapy and on isavuconazole fungal prophylaxis developed symptoms of progressive odynophagia, two days of nasal congestion and headaches. On bedside endoscopy, the choanae were obstructed by a gray edematous mass. This was biopsied and a KOH preparation revealed fungal elements consistent with Rhizopus or Mucorales spp. The patient was started on IV amphotericin and caspofungin. An MRI revealed a nasopharyngeal mass with T2 hypointensity and loss of contrast enhancement consistent with mycetoma with an area of pre-vertebral muscular invasion. The underwent a limited nasophyarngectomy until healthy appearing muscle was seen. On pathologic examination, there was necrotic vascular fibroadipose tissue and skeletal muscle with fungal invasion of blood vessel walls. Additional debridement was performed during a second-look procedure two days later. The patient's neutropenia resolved several days later and he was discharged on posaconazole.

Conclusion:
The prompt assessment of nasal obstruction and pain in an immunocompromised patient resulted prompt initiation of anti-fungal therapy and surgical debridement. Even in the absence of paranasal sinus disease, fungal invasion can involve atypical locations like the nasopharynx.

COSM 2020 POSTERS

Ki-67 as a marker for recurrence in pituitary adenoma

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Introduction:
Ki-67 is a nuclear antigen expressed in the cell cycle and is detected by monoclonal antibody MIB-1. It has been widely accepted as a marker of proliferation and has been studied in many different pathologies. There is increasing evidence that Ki-67 is correlated with an invasive pituitary adenoma but its role in recurrence of non-invasive adenomas has not been established.

Objective:
The objective of this study is to report results on Ki-67 labeling index and its correlation with pituitary adenoma recurrence at our institution.

Methods:
A single institution retrospective chart review was performed for patients who underwent resection of pituitary adenoma. Patients required a follow up of at least 1 year with interval imaging demonstrating recurrence or growth of residual disease postoperatively.

Results:
A total of 224 patients underwent surgery at our institution and 84 patients met inclusion criteria. An index of 3% was used for the cut off value for high versus low Ki-67 based on the WHO criteria. There was an overall recurrence rate of 26% (22/84), with only 7% (6/84) of patients had a high Ki-67 index. Ki-67 was not found to be statistically significant as a predictor of recurrence (p=1.0).

Conclusion:
Ki-67 did not reliably predict the risk of recurrence for pituitary adenoma at our institution.

Long term efficacy of interior turbinate outfracture in CRS patients

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Background:
Inferior turbinate outfracture is a common prelude to endoscopic sinus surgery (ESS). This procedure not only provides increased space for the surgeon to manoeuvre, it is also purported to increase the space for airflow thereby treating the component of nasal obstruction. However, whether or not outfracture during ESS is sustained over the long term is not clear.

Objective:
To evaluate the long term efficacy of inferior turbinate outfracture in patients with CRS.

Methods:
Consecutive cases of revision ESS were reviewed at tertiary care centre between 2017-2019. Inferior turbinate position was assessed by three measurements: 1) distance from the septal line to the medial IT bone 2) distance from the lateral IT line to the lateral nasal line and 3) angle of the IT as it comes off the lateral nasal wall, as previously described1. IT position on the preoperative CT scan was compared to the IT position on the second CT scan prior to revision surgery.

Results:
Data from 87 patients were collected; 62 had complete data for analysis. The mean time (±stdev) to revision ESS was 6.4±4.8 years. Of the three measurements of IT position, the lateral IT bone to lateral nasal line was significantly different from pre and post ESS (4.9±1.6 mm p=0.012). When stratified by time to revision surgery, there was a small but significant correlation with time (Pearson's correlation=0.168, p=0.04). The septal line to medial IT bone and IT angle did not significantly change from pre to post ESS.

Conclusions:
Inferior turbinate outfracture does not retain its position indefinitely. While there may be short term IT position change, over time, the inferior turbinate shifts back to its native position. 1Min et al. Rhinology 2013

Lymph node metastasis in maxillary sinus squamous cell carcinoma

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Background:
Nodal involvement in patients with squamous cell carcinomas (SCC) of the maxillary sinus has not been well defined, especially by risk factors beyond local T-stage. Risk of cervical metastasis and its impact on prognosis has not been well characterized and has been limited to small case series and retrospective studies. Here we present a study with largest cohort of patients with maxillary sinus SCC and the risk of nodal metastasis.

Methods:
Maxillary sinus SCC cases with full staging information were identified in the National Cancer Database (NCDB). Demographic, clinicopathologic, frequency and survival data were compared. Multivariate logistic regression analysis was performed to identify factors associated with increased risk of cervical metastasis.

Results:
Among 1745 patients, 378 (21.7%) had cervical metastasis at the time of diagnosis. T-stage and size > 2cm were associated with higher rates of nodal involvement in maxillary sinus SCC on multivariable analysis. Nodal levels 1, 2, and/or 3 had the highest rates of involvement in T2 or higher maxillary sinus SCC when compared to other nodal levels. Patients with T1-4N0M0 disease that received a neck dissection had a 5-year overall survival of 15.0% compared to 10.0% 5-year overall survival in patients that did not receive a neck dissection ($p < 0.0001$).

Conclusion:
In this population-based study, there are high rates of initial nodal involvement when stratified by local extent determined by T-stage and tumor size in maxillary sinus SCC. Involvement of different nodal levels varies depending on local extent of tumor involvement. These observations may help guide treatment decision making in the inclusion of and extent of elective nodal treatment fields.

Metastasis to the sinuses

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Introduction:
Breast cancer is the second most common cause of cancer-related death in women, however, cancer metastasis to the head and neck is relatively rare, but if found, usually involves the maxilla or mandible. Furthermore, malignant diagnoses of the head and neck are more often squamous cell carcinoma, lymphoma, thyroid and salivary malignancies Diagnosis is often delayed due to nonspecific symptoms, such as facial pain, diplopia, proptosis, or nasal swelling.

Case Description:
A 74 year old female with a prior medical history of breast cancer presented to a tertiary rhinology practice with frontal sinusitis. She reported that she had been feeling a sense of pressure in her forehead along with watery eyes. She also felt that her right eye had been swollen for the past 2 months. After going to see an ophthalmologist, she was referred for allergy and immunotherapy and started on prednisone. After that, she was referred to a tertiary rhinology practice for further management. MRI revealed secondary extension of the tumor through the cribriform plate, paranasal sinus disease, with some involvement of the frontal and maxillary sinuses. Biopsy of the specimens obtained during the surgery revealed poorly differentiated cells consistent with adenocarcinoma of the breast in the right maxillary sinus and the right ethmoid sinus.

Discussion:
This woman had pronounced proptosis for at least 2 months indicating tumor spread before she received the adequate care she needed due to the rarity of breast metastasis to the sinuses. This case highlights the importance of having a high index of suspicion of metastasis when patients present with nonspecific symptoms, but have a history of malignancy.

COSM 2020 POSTERS

Middle turbinate concha bullosa osteoma

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Introduction:
Osteomas are benign slow growing tumours of bone. Up to 3% are found in the paranasal sinuses. However, osteomas of the turbinates are rare. Recently, a number of reports have emerged describing osteomas within the concha bullosa of the middle turbinate (MT) as an important rhinogenic cause of headache. Our objective was to summarize current literature on presentation and treatment approaches to osteoma within MT concha bullosa in order to help guide management.

Data Sources:
Embase, Medline and Scopus databases.

Methods:
All case reports and case series published in the English literature from 1988 through 2019 featuring MT osteomas were reviewed. Case reports with osteoma located within the MT concha bullosa on imaging were included in the review.

Results:
Six documented cases of osteomas localized within MT concha bullosa were identified through the comprehensive literature review. An additional case from our institution was included bringing the total number to seven. Majority of patients were female with a mean age of 45.9. On average, osteomas measured 17.4 mm in the largest dimension at presentation. In previous reports, headaches led to the discovery of the concha bullosa osteoma. However, our patient presented with ipsilateral nasal obstruction. If patients consented for surgery, all osteomas were approached endoscopically leading to resolution of symptoms.

Conclusion:
Osteomas arising in the MT concha bullosa are rare. Our case report adds to the current literature by demonstrating that concha bullosa osteomas can present with ipsilateral nasal obstruction in absence of headaches. Location within concha bullosa presents an opportunity for endoscopic resection with MT preservation.

Modified endoscopic Denker's approach for management of anterior maxillary sinus tumors

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Background:
Tumors involving the anterior portion of the maxillary sinus remain a technically challenging region to access via an endoscopic approach. The Modified Endoscopic Denker's (MED) procedure was recently introduced to address such lesions. We present a multicenter case series of 58 patients with tumors involving the anterior maxillary sinus successfully resected using a MED procedure and present the clinical outcomes and complications.

Methods:
A multi-institution retrospective chart review was performed on patients who underwent the MED approach for management of a tumor involving the anterior maxillary sinus from 2009-2019. The demographic data, pathology, surgical outcomes and complications were reviewed.

Results:
Fifty-eight patients were identified, 34 male and 24 female. The most common pathologies included: inverted papilloma (29), squamous cell carcinoma (9), and adenoid cystic carcinoma (6). Forty-two patients underwent MED alone, while 16 had combined expanded endonasal approaches for more extensive disease. After a mean follow-up of 30 months (range 1-81 months), complications included: facial/palatal numbness (6), epiphora (8), epistaxis (1), synechiae formation (1), facial pain (1) and transient diplopia (1). No patients developed alar notching or vestibular stenosis.

Conclusion:
The MED procedure is highly effective for surgically accessing tumors of the anterior maxillary sinus. The procedure can be performed safely with a low risk of complications, the most common of which include facial numbness and epiphora.

Nasoseptal flap for reconstruction of hard and soft palate defect

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Background:
The pedicled nasoseptal flap has played a significant role in the reconstruction of sinonasal and ventral skull base defects A recent cadaveric study demonstrated the flap's potential use in oropharyngeal reconstruction. Historically, soft and hard palate reconstruction has been performed with fasciocutaneous or osteocutaneous free flaps. In this case report, we present a case in which a defect of the hard and soft palate was reconstructed using a pedicled nasoseptal flap following resection of a palatal carcinoma, the first known case reported in the United States.

Case Report:
A 52-year-old female presented to our institution with a palatal lesion consistent with polymorphous adenocarcinoma based on prior biopsy. The patient underwent left infrastructure maxillectomy with partial hard and soft palate resection. The final palatal defect measured 4x4 cm2. An ipsilateral nasoseptal flap was raised endoscopically and inset into the palatal defect transorally. She had an uneventful post-operative course. At four weeks, examination revealed successful integration of the flap with the surrounding intraoral mucosa, with no necrosis of the flap. The patient was tolerating her pre-operative oral diet without any voice or swallowing deficits. Division of the flap pedicle was performed six weeks post-operatively.

Conclusion:
The nasoseptal flap can be a feasible option for the reconstruction of soft and hard palate defects created during resection of oral cavity neoplasms.

Nasoseptal rescue flap approach for endoscopic surgery of the clivus and upper cervical spine

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Introduction:
Clival lesions are frequently managed with an endoscopic transphenoidal approach (TSA) involving removal of the sphenoid rostrum and sacrifice of at least one nasoseptal flap (NSF) pedicle. However, when the possibility of a cerebrospinal fluid (CSF) leak is uncertain, the NSF pedicles may be preserved. We present a novel technique for preservation of bilateral NSF pedicles for endoscopic resection of clival lesions.

Methods:
Case Report

Results:
A 33-year-old woman with chronic headaches was found to have a 2.2cm enhancing mass within the clivus and underwent endoscopic resection. A standard TSA was first performed. Next, mucosal incisions were made along the arch of the choana and posterior border of the vomer. The overlying mucosa was elevated off of the sphenoid rostrum and vomer while maintaining continuity with the septum anteriorly. With the NSF pedicles preserved, the vomer, sphenoid rostrum, and a cuff of pre-clival nasopharyngeal mucosa were removed. The face of the clivus was drilled until the lesion was widely exposed. An extracapsular resection of the lesion was performed. There was no exposure of dura or a CSF leak, and no skull base reconstruction was required. Histopathology revealed fibroconnective tissue and no malignancy. One month after surgery, the resection bed was healing well with near-complete mucosalization.

Conclusion:
Endoscopic endonasal surgery for clival lesions can be performed with preservation of both pedicles. In properly selected patients, the mucosal strip overlying the arch of the choana can be mobilized without compromising bony resection of the vomer and sphenoid rostrum to afford optimal access to the clivus, with excellent visualization and instrument mobility.

COSM 2020 POSTERS

Nitric oxide nanotherapeutics to combat Candida auris

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Background:
Candida auris (C. auris) is an emerging pathogenic fungal species that has been identified in every continent except Antarctica. C. auris efficiently colonizes patients, notably in the ear, nares, and respiratory tract, and is an increasingly frequent cause of invasive candidiasis. C. auris is especially worrisome due to its high mortality rates and widespread antifungal resistance. Previous studies have demonstrated the efficacy of nitric oxide (NO) nanoparticles on Candida species, and this is the first study to investigate the antifungal effects of a NO nanoparticle on C. auris.

Methods:
Six C. auris strains were used in this study, including two clinical strains isolated from fungemic patients and four strains representing each of the major clades obtained from the Centers for Disease Control. Planktonic and biofilm susceptibility to a nanoparticle (NAC-SNO-np), which releases 1.2 µmol/mg of n-acetylcysteine s-nitrosothiol (NAC-SNO), was assessed with fungal cell growth curves, colony forming unit (CFU) assays, and confocal microscopy. Comparisons were made to a nanoparticle lacking NAC-SNO and to medium alone.

Results:
NAC-SNO-np effectively eradicated planktonic and biofilm C. auris. NAC-SNO-np at a concentration of 10 mg/mL successfully halted planktonic growth in the two clinical strains. Across all 6 strains, 10 mg/mL NAC-SNO-np significantly reduced the number of CFUs ($p<0.05$), and confocal microscopy showed a 60-85% decrease in biofilm viability ($p<0.0001$).

Conclusion:
NAC-SNO-np effectively eradicates planktonic C. auris. It also significantly reduces C. auris survival in biofilms and disrupts fungal biofilm integrity. This novel NO-releasing nanoparticle shows promise as a future therapeutic.

Non-opioid vs. opioid analgesics for pain control after endoscopic sinus surgery for CRS

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Background:
A recent survey of the American Rhinologic Society indicates that most providers give opiates for pain after endoscopic sinus surgery (ESS). The effectiveness of non-opiate medication after ESS is not well known and most studies do not assess medication failure. This study compares opiate and non-opiate pain control after ESS and uses patient call backs as a proxy for assessing pain medication failure.

Methods:
The study compares three medication regimens after ESS for adult chronic sinusitis at an academic medical center between 9/2017 and 12/2018. Patients were prescribed nasal saline irrigations and 2 weeks of an as needed pain medication regimen: oxycodone-acetaminophen (5mg/6 hours), oxycodone-acetaminophen (5mg/6 hours) and twice daily budesonide irrigation additive, or meloxicam (7.5mg/12 hours). Patients were instructed to call if pain was not controlled with the treatment. Descriptive statistics compared cohorts. Chi-square tests compared number of patient calls between cohorts. Logistic regression adjusted for baseline differences in covariates, comorbidities, and operative sites.

Results:
182 subjects were included. Cohorts had similar demographics, polyp phenotype, preoperative opiate use, and ESS extent. Differences were seen in the rate of septum and turbinate surgery, diabetes, and pain disorders. After adjusting and using oxycodone-acetaminophen as the reference group (n=50) the odds-ratio for call backs was 0.18 (95% CI: 0.04-0.6) in the meloxicam cohort (n=46) and 0.19 (95% CI: 0.07-0.5) in the oxycodone-acetaminophen/budesonide cohort (n=86).

Conclusion:
Both meloxicam and oxycodone-acetaminophen/budesonide are more effective at controlling pain after ESS than oxycodone-acetaminophen alone.

Opioids after endoscopic skull base surgery

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Introduction:
Endoscopic skull base surgery has become an increasingly common approach to access and treat anterior skull base pathologies. However, pain requirements after endoscopic skull base surgery and optimal pain management has not been well described. Additionally, pain management options such non-steroidal anti-inflammatories are frequently avoided due to the risk of hemorrhage and treatment is often limited to acetaminophen and opioids.

Methods:
Retrospective review of patients who underwent endoscopic skull base surgery between July 2018 and November 2019. Patient pain scores as assessed by nursing and opioid pain requirements in morphine equivalent dose (MED) were recorded.

Results:
There were a total of 54 cases. The most common approach was transnasal transphenoidal (N=43). The mean MEDs for their hospital course was 98.8 ± 16.6 mg. Average length of inpatient stay was 6.7 ± 1.0 days. 5 patients (9%) did not require any opioid medication. There was no significant difference in pain requirements between patients who had intraoperative CSF leak (126.1 vs 87.6 mg, p=0.40), type of reconstruction (nasoseptal flap vs free graft, 102.7 vs 79.2 mg, p=0.70), use of nonabsorbable packing (139.7 vs 98.8 mg, p=0.58), or whether an extended approach to the skull base was utilized (104.6 vs 66.4 mg, p=0.17).

Conclusion:
For patients who underwent endoscopic anterior skull base surgery, no statistically significant association was identified between patients undergoing extent of skull base approach, presence of intraoperative CSF leak, type of packing, or type of skull base reconstruction. Nevertheless, judicious opioid prescription is important for preventing postoperative complications.

Ostial patency measurement analysis after endoscopic sphenoidotomies and frontal sinusotomies

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Background:
Sphenoid and frontal sinuses have narrow ostia and are prone to stenosis; however, the extent of the stenosis is not well described. The objective of this study is to measure the patency of the sphenoid and frontal sinus ostia postoperatively.

Methods:
A multi-institutional cohort study was performed utilizing prospectively-collected clinical data on consecutive ESS involving the sphenoid and/or frontal sinuses from March to August 2019. After a few optimization trials to determine the best method of measurement, standardized assessments of ostial patency were made at surgery along with 3 and 6 months postoperatively using a 4-mm OD (12F) straight suction with 0-degree endoscope for the sphenoid sinus and a 4-mm OD curved suction with 70-degree endoscope for the frontal sinus. The areas were calculated using the narrowest and widest cross-sectional diameters. The Wilcoxon signed ranked test was used to compare measurements.

Results:
40 patients, including 67 sphenoidotomies and 41 frontal sinusotomies, were included in the analysis. The median sphenoid sinus ostial area decreased 32% in size from baseline to 3 months postoperatively (T0 55.0 ± 24.5 mm vs. T3m 37.7 ± 33.8 mm, $p < 0.001$). The median frontal sinus ostial area decreased 38% in size from baseline to 3 months postoperatively (T0 34.8 ± 20.1 mm vs. T3m 21.5 ± 16.8 mm, $p < 0.001$). Neither the sphenoid nor the frontal sinus ostial patency demonstrated a statistically significant change from 3 to 6 months postoperatively.

Conclusion:
Both sphenoid and frontal sinus ostia routinely narrow postoperatively, predominately from baseline to 3 months. These findings can serve as a reference for both clinical outcomes and future studies of these surgeries.

COSM 2020 POSTERS

Outcomes in ENT assisted and unassisted anterior skull base surgeries for high risk patients

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Objectives:
To investigate the association between patients who had developed prior deep incisional surgical site infections and rates of postoperative complications in patients who underwent a subsequent anterior skull base procedure with either otolaryngology - assistance or neurosurgery alone.

Study Design:
Retrospective database review

Methods:
The 2005-2015 National Surgical Quality Improvement Program (NSQIP) database was used. Chi-squared analysis and logistic regression were used to determine the independent effect of covariates on postoperative complication rates.

Results:
4053 individuals who underwent an anterior skull base surgery by either neurosurgeons alone or with otolaryngologist assistance were identified. Univariate analysis revealed that patients who had experienced prior deep incisional surgical site infections were more likely to receive an anterior skull base procedure with ENT assistance (p=0.001). Multivariate regression analysis of this cohort indicated that patients were independently associated with higher rates of experiencing a complication following free-flap surgery if neurosurgeons were not assisted by otolaryngologists (OR 5.694, 95% CI 1.431–22.662, p=0.014). Analysis of individual complication rates revealed that these patients that had higher risks of postoperative bleeding in neurosurgery-alone procedures (OR 8.739, 95% CI 1.428–53.490, p=0.019).

Conclusions:
This analysis underscores the importance of a cooperative approach to anterior skull base procedures between neurosurgeons and otolaryngologists. In patients who had previous surgical site infection, otolaryngologist-assisted approach was associated with lower risk of postoperative complications.

Outcomes of anti-hypertensive therapy in skull base procedures

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Objectives:
To investigate the association between patients on anti-hypertensive therapy and rates of postoperative complications in patients undergoing anterior skull base procedure with either otolaryngology (ENT) assistance or neurosurgery alone.

Study Design:
Retrospective database review

Methods:
The 2005-2015 National Surgical Quality Improvement Program (NSQIP) database was used. Independent t-tests, chi-squared analysis and logistic regression were used to determine the independent effect of covariates on postoperative complication rates.

Results:
Patient cohort of 4053 individuals were identified who underwent an anterior skull base surgery by either neurosurgeons alone or with otolaryngologist assistance. Independent t-test revealed that total operation time (p=.001) and anesthesia duration (p<.001) were longer when neurosurgery operated alone in patients on anti-hypertensive medication. Univariate analysis revealed that patients on anti-hypertensive medication were more likely to receive ENT assistance (p= .012) compared to patients without this comorbidity, but neurosurgery alone performed the majority of the procedure in patients on anti-hypertensives (52.9%). Multivariate regression analysis revealed no significantly elevated risk of postoperative complications following anterior skull base surgery with ENT assistance (OR 1.411, CI 95% .828-2.406, p=.205).

Conclusions:
This analysis demonstrates no significant difference in postoperative outcomes in patients on anti-hypertensive medication undergoing anterior skull base procedures between ENT assistance and neurosurgery alone. However, ENT assistance was found to make the procedure more time efficient, underscoring the importance of a cooper

Patient satisfaction after septoplasty

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Introduction:
Septoplasties are a high satisfaction cosmetic procedure performed by two distinct physician pools, ENT trained facial plastic surgeons and plastic surgeons. With the emergence of cosmetic surgery reviews online, the differently trained physicians can be compared in their patient satisfaction rates as well as the makeup of their clinical practice.

Methods:
All reviewed physicians performing septoplasties in the metropolitan areas of New York (NY) and Los Angeles (LA) were queried from RealSelf cosmetic surgery review website with a radius of 50 miles from city center. The physicians were ranked based on their overall rating, surgery, and number of reviews.

Results:
ENT surgeons were the most reviewed practitioners of septoplasty in both NY (82.4% vs 17.6%) and LA (82.4% vs 17.6%). The average patient satisfaction rates for ENT trained facial plastic surgeon performing septoplasty was significantly higher in NY (5.0 vs 3.67, p=.025). This trend was reversed in LA where plastic surgeons had higher average patient satisfaction rates compared to ENT surgeons (5.0 vs 4.75, p= .505). The overall patient satisfaction was slightly higher in LA then in NY for septoplasties (4.79 vs 4.76). Lastly, ENT surgeons had septoplasties make up a larger percentage of their overall practice in both LA (11.51% vs 1.32%, p=.403) and NY (6.12% vs 2.39%, p=.453).

Conclusions:
In NY, ENT surgeons had statistically significant higher average patient satisfaction rates. There were no other statistically significant variables in the study. While there was no significant difference between the proportion of septoplasty making up either specialty practice, ENT surgeons were found to be equal to or better than their plastic surg.

Patient satisfaction after surgical or nonsurgical rhinoplasty

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Introduction:
Rhinoplasties also known as nose jobs can be surgical or nonsurgical. Rhinoplasties are a high satisfaction cosmetic procedure performed by two distinct physician pools, ENT trained facial plastic surgeons and plastic surgeons. With the emergence of cosmetic surgery reviews online, the differently trained physicians can be compared in their patient satisfaction rates as well as the makeup of their clinical practice.

Methods:
All reviewed physicians performing African and Asian rhinoplasties in the metropolitan areas of New York (NY) and Los Angeles (LA) were queried from RealSelf cosmetic surgery review website with a radius of 100 miles from city center. The physicians were ranked based on their overall rating surgery, and number of reviews.

Results:
ENT trained facial plastic surgeons have higher average patient satisfaction rates performing both surgical rhinoplasties (4.87 vs 4.14, p=.047) and nonsurgical rhinoplasty (4.93 vs 4.02, p=.089). ENT trained facial plastic surgeons have a greater proportion of their total practices made up of both surgical rhinoplasties (36.23% vs 14.72%, p=.012) and nonsurgical rhinoplasties (6.37% vs 5.53%, p=.841). The average patient satisfaction rates between surgical and nonsurgical rhinoplasties are highly similar (4.63 vs 4.62)

Conclusions:
ENT trained facial plastic surgeons have statistically higher average patient satisfaction and perform a greater relative proportion of surgical rhinoplasties compared to plastic surgeon. While there is no significance within nonsurgical rhinoplasties, perhaps if the study were expanded a significant difference would be found.

COSM 2020 POSTERS

Perioperative management of spontaneous CSF leak repair

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Introduction:
Spontaneous CSF leaks represent a unique subset of skull base pathology and require distinctive management. Perioperative evaluation and management of intracranial hypertension is essential in preventing further erosion of the skull base and development of recurrent leak. The objective of this study is to evaluate the safety and utility of an expedited protocol for recording and managing intracranial hypertension following endoscopic repair of spontaneous CSF leaks.

Methods:
Patients undergoing endoscopic repair of spontaneous CSF leaks and a standard lumbar pressure monitoring protocol (SP) or expedited protocol (EP) with shortened duration of CSF diversion from 2017 to 2019 were included in the study. Prospectively collected data regarding the two groups was compared for leak location, short-term success of skull base repair, complications, and cost based analysis.

Results:
Forty-eight patients (SP, n=28 v EP, n=20) were included in the study. Leak location was similar between cohorts, with the lateral recess being the most common locations in both groups (37.9% v 44.0%;p=0.93). Postoperative complications (3.6% v 5.0%;p=0.81) and VP shunt rate (32.1% v 20.0%;p=0.35) were similar among cohorts. There was no difference in lumbar drain complications (0% v 5%;p-0.23) or recurrent leak (3.6% v 0%;p0.43). Length of stay was shorter in the EP group, [median(IQR): 3(1)v2.5(1);p<0.01]. Total hospital charges were less in the EP cohort, though not significant (99,614.71+/-33,043.97 v 90,306.71+/-24,545.29;p=0.29).

Conclusions:
An expedited monitoring protocol shortened hospital stay without increased risk of complications.

Post-op outcomes in ENT assisted and unassisted surgeries for patients with steroid use

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Objectives:
To investigate the association between patients on steroids and rates of postoperative complications in patients who underwent a subsequent anterior skull base procedure with either otolaryngology (ENT) assistance or neurosurgery alone.

Study Design:
Retrospective database review

Methods:
The 2005-2015 National Surgical Quality Improvement Program (NSQIP) database was used. Chi-squared analysis and logistic regression were used to determine the independent effect of covariates on postoperative complication rates.

Results:
4053 individuals who underwent an anterior skull base surgery by either neurosurgeons alone or with otolaryngologist assistance were identified. Univariate analysis revealed that patients with steroid use were more likely to receive an anterior skull base procedure with ENT assistance ($p<0.001$). Multivariate regression analysis of this cohort demonstrated that patients with this comorbidity were not more likely to experience complications following anterior skull base surgery if neurosurgeons were not assisted by otolaryngologists (OR 1.567, 95% CI .732-3.355, p=0.248). However, analysis of individual complication rates revealed that these patients had higher risks of postoperative cerebrovascular accident in neurosurgery alone (OR 4.927, 95% CI 1.364-17.803, p=.015).

Conclusions:
This analysis underscores the importance of a cooperative approach to anterior skull base procedures between neurosurgeons and otolaryngologists. In patients with chronic steroid use, otolaryngologist-assisted approach was specifically associated with lower risk of postoperative cerebrovascular accident.

Potential costs of dental treatment and endoscopic sinus surgery for odontogenic sinusitis

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Background:
Successful management of odontogenic sinusitis (ODS) may require dental treatments and endoscopic sinus surgery (ESS). Significant variation exists in the literature with regard to recommended dental procedures and extent of ESS for ODS. No study has discussed the costs of these different treatment options. This study determined the costs of different combinations of dental treatments and ESS for ODS.

Methods:
Using Medicare and Fair Health databases, cost data were obtained for dental and sinus surgical treatments across the United States. Costs for the following treatments were analyzed: root canal therapy (RCT), revision RCT, apicoectomy, dental extraction, oroantral fistula (OAF) closure, dental implant, bone graft, and ESS (maxillary, anterior ethmoid, frontal sinus surgery). Cost ranges were determined for primary dental extraction, RCT, OAF closure, and ESS treatment pathways, accounting for the costs of potentially necessary revision or additional dental procedures.

Results:
Depending on the need for revision or additional dental procedures, mean primary dental extraction cost was $231 (max: $5,643), mean RCT cost was $1,909 (max: $13,610), and mean OAF closure cost was $1,132. ESS cost ranged from $1,792-3,583 depending on extent of surgery. Total costs varied based on the combinations of dental procedures and extents of ESS.

Conclusion:
While dental extraction alone is the least expensive treatment option for ODS, patient costs will vary based on the need for subsequent dental procedures, ESS, and medical and dental insurance coverage. Treatment costs increase significantly if revision dental procedures are required, or if dental implants are considered.

Practice patterns in the medical and surgical management of traumatic optic neuropathy

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Objective:
There is little consensus on the optimal treatment of traumatic optic neuropathy (TON). The purpose of this study is to determine current management strategies for TON across multiple surgical disciplines.

Design:
A prospective 20-question survey was distributed to members of the AO Craniomaxillofacial Surgery, American Society of Ophthalmic Plastic and Reconstructive Surgery, and North American Ophthalmologic Society. Data collected included participant demographics, diagnostic evaluation strategies, and management paradigms. Clinical scenarios were presented at worsening levels of visual acuity (VA) and treatment options were queried based on TON injury and VA.

Results:
A total of 189 responses were recorded. The majority of respondents were ophthalmology-trained (n=159) and 59.3% were in academic practices. In TON patients presenting with declining VA, the majority (n=115, 64%) of respondents treat with steroids. For patients with evidence of a bony spicule in the optic canal or optic sheath hematoma, the majority (n=110-130, 60-72%) would choose surgical decompression. In patients with good VA, the majority would observe or treat with steroids (n =137, 77%). Most respondents would consider treating TON with systemic steroids (n=121, 64%) starting with a loading dose of 500-1999 mg (n=82, 69%). The latest that most respondents would consider offering intervention is within the first 1-3 days after injury (58%).

Conclusion:
Surgical decompression in patients with radiologic evidence of a bony spicule or optic sheath hematoma and poor initial VA is the treatment of choice for most respondents. Medical management was selected in patients with both stable and declining VA without evidence of direct nerve injury.

COSM 2020 POSTERS

Prelacrimal approach in managing sinonasal diseases

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Background:
The aim of the study was to evaluate the treatment outcomes of endoscopic prelacrimal recess approaches (EPLAs) in managing different sinus pathologies, analyzing associated adverse events and post-treatment quality-of-life.

Methods:
We enrolled 21 consecutive patients (22 lesions) who received endoscopic sinus surgical procedures with EPLAs in two tertiary medical institutes between 2015 and 2018. Quality-of-life and self-rated symptom severity data were collected using the 22-item Sino-Nasal Outcomes Test (SNOT-22) and 10-point visual analogue scales (VAS), respectively.

Results:
Twenty-one patients (mean age [standard deviation] 51.7 [14.5] years; 16 (76.2%) male) were followed up for 12.7 months. The most common symptoms were nasal discharge and nasal airway obstructions. Nine lesions (40.9%) were sinonasal papilloma's, 7 lesions were other types of neoplasms (31.8%; 5 benign and 2 malignant), 2 were trauma-related (9.1%), and 4 inflammatory diseases (18.2%). Patients with non-papilloma lesions had higher presurgical SNOT-22 than those with papillomas (p-value=0.021). After EPLAs, non-papilloma patients had significant improvements in SNOT-22 and VAS (p-values=0.012&0.012, respectively), while those with papillomas had only marginally significant improvements in VAS (p-value=0.061). The most common adverse events were temporary cheek/tooth numbness (n=11). Patients with sinonasal papillomas were more likely to have post-treatment complications than those with other disease entities.

Conclusions:
Endoscopic PLAs were found to effectively manage various sinus diseases. Short-term life-quality improvements have been promising. However, future large-scale studies with longer follow-up periods are

Quality of life outcomes 10 years after endoscopic sinus surgery

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Introduction:
Chronic rhinosinusitis (CRS) significantly affects patients' quality of life (QOL) and complaints range from nasal congestion, post nasal drip, hyposmia, facial pressure, and headache. Multiple studies have found that functional endoscopic sinus surgery (FESS) improves these QOL measures in the short term. However, few have investigated the effect on long term QOL.

Objective:
The objective of this study is to assess the quality of life for patients 10 years after endoscopic sinus surgery for CRS.

Methods:
A retrospective chart review was performed on patients who had undergone surgery for CRS 10 years prior to the date of study. Questionnaires including symptomatology on a 10-point scale and chronic sinusitis survey (CSS), were sent out to assess current quality of life.

Results:
A total of 618 surveys were sent out to patients that had FESS between 2004 and 2006. Surveys were returned by 71 patients but only 41 had initial questionnaires for comparison. Overall average symptom score improved from 7.6 to 5.9 ($p<0.05$). Other improved symptoms included nasal congestion, post nasal drip, bad breath, sleep difficulties, hyposmia, and facial pressure ($p<0.05$). Chronic sinusitis survey score improved from 43.06 to 61.70 with a significant improvement of 34.40 to 59.93 in the symptom component of the survey.

Conclusion:
Both individual symptom score and CSS showed maintained improvement in QOL 10 years after FESS.

Race, insurance, and facility affect treatment modality in SNSCC

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Background:
Sinonasal squamous cell carcinoma (SNSCC) often presents at advanced stages in which disease extent informs treatment planning. The impact of socioeconomic (SE) factors, however, on the selection of therapy is less understood. We investigated the role of socioeconomic factors in the selection of primary treatment for SNSCC.

Methods:
Using the NCDB (2011-16), patients with advanced SNSCC (AJCC 7th Stage III-IV) were identified by site and histology codes. Patients who did not receive treatment or without staging information were excluded. Univariate and multivariate analysis of SE variables associated with treatment type was performed. Parametric survival regression with subgroup analysis was used to analyze the impact of patient variables on overall survival.

Results:
2894 advanced stage patients were included. 58.3% received surgery with or without adjuvant treatment (AT), while 41.7% received non-surgical treatment only. On multivariate analysis controlling for stage, patients were less likely to receive surgery if they were Black (OR: 0.58 95%CI:0.45-0.74 p<0.001) or treated at community hospitals (OR 0.66 95% CI: 0.56-0.78 p<0.001), but more likely with private insurance (OR 1.72 95% CI: 1.40-2.12 p<0.001). Cox Proportional-Hazards model demonstrated that utilizing surgery with or without AT improved survival (HR: 1.31 95%CI:1.21-1.52 p<0.001) compared to non-surgical treatment.

Conclusion:
Among patients with advanced stage SNSCC, Black race and public insurance are associated with decreased likelihood of receiving surgical treatment despite similarly staged disease. Given the significant impact of treatment modality on survival, further investigation into the causal inference of these factors is necessary.

Radioanatomic characteristics of the posteromedial intraconal space

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Introduction:
The Cavernous Hemangioma Exclusively Endonasal Resection (CHEER) staging system was developed to standardize orbital tumor reporting. The inferomedial muscular trunk (IMT) of the ophthalmic artery (OA) defines the surgical landmark for the anterior (CHEER II/III) and posterior (CHEER IVA) intraconal compartments. As the IMT may not always be identified on preoperative imaging, this study seeks to define a reliable radiologic landmark for the IMT to assist in pre-operative assessment, staging, and outcomes reporting for orbital tumors.

Methods:
The medial intersection of the optic nerve (ON) and OA was identified as a potential radiologic landmark for the IMT and positively identified on 100% of 28 CT scans of patients with orbital lesions. Dissection was then performed on 15 fresh-frozen cadaver orbits to correlate the relationship between the IMT and medial OA/ON intersection.
Results:
The overall mean distance between the medial OA/ON intersection and the IMT was 1.20+/- 0.68mm SD(range: 0-2.5mm). In all specimens, the OA crossed above the ON and the IMT branch point occurred at or anterior to the medial OA/ON intersection. Furthermore, all posterior (CHEER IVA) tumors demonstrated near-complete (2/9) or complete (7/9) obliteration of the optico-annular fat triangle (OAT) formed between the medial rectus and optic nerve on axial imaging.

Conclusion:
The medial OA/ON intersection is a robust and reliable radiologic landmark which closely approximates the IMT and can be used to accurately stage orbital tumors based on pre-operative CT imaging alone. Obliteration of the OAT can be used as a consistent confirmatory radiologic finding for CHEER IVA lesions.

COSM 2020 POSTERS

Radiologic algorithm for identification of maxillary and sphenoid sinus natural ostia

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Objective:
The purpose was to investigate radiologic landmarks for identifying the sphenoid sinus natural ostium (SSNO) and maxillary sinus natural ostium (MSNO). In a previous cadaveric study, we identified the transverse turbinate line (TTL), defined as the transition point of the vertical and horizontal portion of the middle turbinate, as a reliable landmark for the vertical height of the MSNO. We aimed to confirm this landmark and correlate other preserved sinonasal landmarks radiologically.

Methods:
High quality noncontrast CT images of the head were reviewed with multiplanar reconstruction. The left and right sinonasal anatomy of 48 patients were reviewed (total of 96 sphenoid sinuses and 96 maxillary sinuses). Patients with prior history of sinonasal surgery, facial trauma and sinonasal malignancy were excluded. The average distance between the TTL and MSNO, and the distance between the superior turbinate (ST) and SSNO, among other anatomic relationships, were measured. Anatomical variants, such as concha bullosa and accessory ostia, were included in our analysis.

Results:
Concha bullosa were present in 13 sides (13%). The vertical alignment of the TTL was equal with MSNO in 58 sinuses (60.4%). Average distance from TTL to lower aspect of MSNO was 1.0 +/- 2.9 mm, while TTL to highest aspect of MSNO was 0.8 +/- 2.4 mm. Average diameter of MSNO was 3.7 +/- 1.7 mm. Average distance from ST to highest aspect and lowest of SSNO was 0.7 +/- 8.7 mm and 2.1 +/- 4.1 mm. Average distance from maxillary sinus roof to highest aspect of and lowest aspect of SSNO was 0.5 +/- 6.8 mm and 1.1 +/- 3.1 mm.

Conclusion:
TTL is a consistent landmark for identification MSNO. The roof of the maxillary sinus is a consistent landmark for SSNO.

Real world attributes of patients on anti-asthma biologic therapy that have concurrent CRS

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Background:
Many anti-asthma biologic therapies are being evaluated for chronic rhinosinusitis (CRS) therapy. We studied characteristics of patients on anti-asthma biologic therapy that had concurrent CRS in a real-world scenario.

Methods:
Natural language processing was used to search the universal electronic health record to identify asthma patients treated with biologic therapy (2016-2018). Individual records were reviewed to identify concurrent CRS diagnosis. Patient characteristics and post-biologic intervention changes in sinus CT Lund Mackay scores, SNOT-22 scores, serum assays and performance of subsequent sinus surgery were studied.

Results:
We identified 846 patients placed on biologics for asthma control of which 307 (36%) were noted to have concurrent CRS. A subset of 247 patients with formal Otolaryngology evaluation records was further analyzed: 181 (73.3%) had CRSwNP and 66 (26.7%) had CRSsNP. The most common biologic agents used were omalizumab (126 subjects; 51.0%) and mepolizumab (115 subjects, 46.6%). Benralizumab (26 subjects; 10.5%), reslizumab (4 patients; 1.6%) and dupilumab (6 patients; 2.4%) were less frequently used. Thirty-one patients (12.6%) were treated with more than one biologic agent. Matched pair analyses for dupilumab could not be performed due to low numbers, but patients on all other biologics showed significant improvement in post-intervention CT and SNOT-22 scores. Sinonasal surgery had been performed in 206 (84.1%) patients; 189 (76.5%) had surgery prior to biologic intervention and 55 (22.3%) post-biologic intervention. Twenty-three (16.5%) required surgery after starting the anti-IL5 biologics.

Conclusions:
We present a real-world series illustrating characteristics of patients on a

Recurrent nasal hamartoma in DICER1

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Objectives:
Describe a unique case of nasal tumor in pediatric patient with genetic tumor predisposition.

Methods:
Case report

Results:
We discuss an 11-year-old female with DICER1 mutation and history of pelvic primitive neuronal tumor, rhabdomyosarcoma of the pelvis, renal spindle cell sarcoma, and papillary thyroid carcinoma. In 2016, she was seen by the ENT team for nasal obstruction and found to have a left nasal mass. On CT and MRI there was a 6cm soft tissue mass extending from the left nasal vestibule to the nasopharynx. She underwent FESS with left maxillary antrostomy, ethmoidectomy, and sphenoidotomy given concern for malignancy with nasal mass causing obstruction. The final pathology revealed benign nasal chondromesenchymal hamartoma (NCMH). The patient was followed at increasing intervals without symptoms or signs of recurrence. Between interval exams, 3 years after initial surgery, the patient noted the sensation of nasal obstruction worrisome for recurrence. On exam and imaging, she was found to have a right (contralateral) lesion. She underwent operative resection, with the pathology showing NCMH.

Conclusions:
While most cases of NCMH occur in infancy, there are case series describing the disease in DICER1 mutation. There are no formal NCMH screening recommendations for patients with DICER1 mutation. Surgical removal of NCMH is considered curative. We describe a unique case of NCMH in a patient with DICER1 mutation with a newly developed contralateral lesion several years later. These patients should be queried on nasal symptoms and assessed by an otolaryngologist as needed.

Responsiveness and convergent validity of the CRS-PRO in CRS patients undergoing sinus surgery

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Background:
The CRS-PRO is a rigorously developed and responsive 12-item patient-reported outcome measure, with previously demonstrated validity in chronic rhinosinusitis (CRS) patients receiving standard of care medical therapy. This study establishes responsiveness and convergent validity of the CRS-PRO following standard of care endoscopic sinus surgery (ESS).

Methods:
This was a retrospective study of 69 patients (39 CRSsNP, 30 CRSwNP) from the Northwestern CRS subject registry who underwent ESS. At baseline, each patient had completed the CRS-PRO, SNOT-22, and four PROMIS health-related quality-of-life questionnaires, as well as objective testing (endoscopic and radiographic assessment). At three-month follow-up, each subject had completed the same questionnaires.

Results:
The 12-item CRS-PRO was responsive with a large effect size (Cohen's d of 1.53) comparable to the longer SNOT-22 (Cohen's d 1.58). The CRS-PRO physical subdomain was the most responsive subdomain (Cohen's d 1.48). The instrument was equivalently responsive to the CRSsNP patients and CRSwNP patients (Cohen's d 1.50 vs 1.55, respectively). PROMIS measures were less responsive in comparison (effect sizes of 0.30 - 0.83). The change in CRS-PRO total score had a strong correlation with change in the SNOT-22 ($r=0.81$, $p<0.0001$), and moderate correlations with change in PROMIS Fatigue ($r=0.54$, $p<0.0001$), Sleep ($r=0.40$, $p=0.0007$) and Pain ($r=0.30$, $p=0.01$).

Conclusions:
This study demonstrates the validity and responsiveness of the CRS-PRO in subjects receiving ESS, over a longer follow-up time period than previously described. The CRS-PRO can be used for clinical assessment of symptom changes and potentially as a measure of post-ESS outcomes.

COSM 2020 POSTERS

Revision frontal sinus surgery
Mohamed Elsayed, MSc

Aim:
The aim of the current study was to detect possible causes of persistent or recurrent frontal sinus disease radiologically and intra-operatively at the frontal recess and /or frontal sinus at the time of the revision surgery.

Methods:
The Study was performed on 20 patients who were attending Otorhinolaryngology clinic (at the Main hospital of university of Alexandria) who had a history of previous frontal sinus surgery and still had persistent or recurrent symptoms refractory to medical treatment postoperatively. All patients had a preoperative non contrast multi-plannar CT nose and paranasal sinuses with axial ,coronal and sagittal reconstruction before the time of the revision surgery. At the time
of the revision surgery, intra-operative common causes of frontal recess and/or frontal sinus persistent obstruction were evaluated.

Results:
Analysis of CT scans of the patients and intra-operative identifying of factors causing obstruction of the frontal recess and/or frontal sinus were reviewed and evaluated.

Conclusion:
Multiple factors were identified as causes of persistent or recurrent frontal sinus obstruction requiring revision surgery . it can be categorized into patients factors , disease factors and surgical factors.

Sinonasal angiomatous polyp: Case report and review of imaging features
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Sinonasal angiomatous polyps (SAPs) are rare benign lesions that classically arise from the maxillary sinus. They present with typical symptoms of sinonasal malignancy. Initial imaging findings reveal a mass arising from the maxillary sinus, and the preliminary differential frequently leans towards neoplasm including juvenile angiofibroma, inverted papilloma, hemangioma, and malignant sinonasal tumors.
We report the case of a 61-year-old male with no significant past medical history who presented for evaluation of six years of nasal obstruction and recurrent left sided epistaxis. CT sinus without contrast revealed a bulky soft tissue mass obstructing the bilateral nasal cavities, ethmoids, and left maxillary sinus. There was erosion of the cartilaginous septum and inferior turbinate along with thinning of both the lamina paparycea and hard palate. MRI identified a contrast enhancing lesion that was hypointense on T1, and heterogeneously hyperintense on T2 and confirmed the absence of intra-orbital and intra-cranial extension. The differential diagnosis favored an odontogenic tumor at that point. A CT angiogram revealed several areas of patchy and linear hyperdensities along the periphery of the mass in the arterial phase. Feeding vessels were identified as the left sphenopalatine, left infraorbital artery, and a distal antral branch from the internal maxillary artery. These were embolized prior to resection. Final pathology reported necrotic tissue suspicious for angiomatous sinonasal polyp. Repeat MRI performed 8 months after surgery revealed no residual tumor or interval recurrence of disease. Imaging techniques for identification of SAP are not well known, but when obtained may raise suspicion for this highly vascular mass.

Sinonasal small cell neuroendocrine carcinoma – Case series of a rare malignancy

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Objectives:
Small cell neuroendocrine carcinoma (SNEC) is an extremely rare and aggressive neoplasm that can arise in the sinonasal region. These tumors are associated with high morbidity and mortality, and are particularly difficult to pathologically classify and treat. We aim to describe two cases of this poorly characterized malignancy, review imaging, pathology and treatment decisions.

Methods:
Case review of 41 y/o male and 64 y/o female that presented to a tertiary center in 2019 after developing nasal obstruction and were found to have a sinonasal mass on imaging. Consensus pathology review of obtained biopsies showed strong pancytokeratin, chromogranin, synaptophysin staining and cellular morphology consistent with SNEC.

Results:
Staging PET/CT and brain MRI were performed, and patients were discussed at a multi-disciplinary tumor board. There was no distant metastatic disease. One patient had no intracranial or orbital disease, and underwent a subtotal endoscopic resection with intraoperative margins prior to adjuvant chemoradiation. The other patient demonstrated anterior cranial fossa, dural, and orbital involvement as well as cranial nerve 5 palsy. This patient was treated with induction chemotherapy, followed by concurrent chemoradiation given the locoregional extent and rapid growth of the tumor. Both patients are presently alive and continue to undergo treatment with intent to cure.

Conclusion:
Sinonasal small cell neuroendocrine carcinoma is a rare and poorly understood malignancy with an aggressive clinical course. Continued careful review of pathology and cases is needed for improved understanding of SNEC, to establish a staging system, and to formulate treatment protocols.

Sinonasal symptoms in hospitalized patients

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David Yim

Background:
Sinonasal symptoms in the inpatient hospital setting may be disregarded in the setting of more dire medical conditions. The purpose of this study is to identify the incidence and risk factors for sinonasal symptoms in hospitalized patients.

Methods:
A cross-sectional study was conducted in which hospitalized adult patients were randomly selected for a 4-question survey regarding their current sinonasal symptoms. The patients' medical records were reviewed to identify potential risk factors for development of these symptoms. Patients were excluded if they were unable to consent for themselves or medically unable to answer questions.

Results:
One-hundred and one patients were included in the study. Forty-two (41.6%) patients reported at least one sinonasal symptom. Of these patients, twenty-six (61.9%) patients reported only one symptom, 10 (23.8%) patients had two symptoms, 4 (9.5%) patients had three symptoms, and 2 (4.8%) patients reported all four symptoms. The most common symptom was rhinorrhea/post-nasal drip (29.7%). No patients had a history of chronic rhinosinusitis. There was no statistically significant association between sinonasal symptoms and sex, age, race, number of days in the hospital, hospital location, immune status, diabetes, use of nasal steroids, nasogastric tube use, or prior sinonasal surgery. Only one patient was treated for acute sinusitis during admission.

Conclusions:
Sinonasal symptoms are common in the inpatient setting and can afftect patients' quality of life. No identifiable risk factors for sinonasal symptoms were identified. Given the high incidence of these symptoms, clinicians should be cognizant and consider starting medical therapy or providing appropriate referral.

COSM 2020 POSTERS

Sinus irrigation penetration after a Draf IIA vs modified Draf IIA in a cadaveric model

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Background:
Functional endoscopic sinus surgery (FESS) is an effective intervention at improving quality of life for patients with medically refractory chronic rhinosinusitis. Frontal sinusotomy is one of the most challenging parts of this surgery and one of the key outcomes is to increase penetration of topical irrigation. The purpose of this study is to compare irrigation penetration in frontal sinuses following Draf IIA and a modified Draf IIA frontal sinusotomy.

Methods:
4 cadaver heads were used in this experiment. Draf IIA was performed on one side of each head and a modified Draf IIA on the contralateral side. Modified Draf IIA consists of a Draf IIa combined with an agger nasi “punch out” procedure and trimming the vertical lamella of the middle turbinate back to the posterior table of the frontal sinus without drilling the beak. Using a high-volume, high-flow bottle, each head was irrigated with methylene blue dyed water and recorded by rigid endoscopy through an endonasal view (EV) of the frontal sinus and frontal trephinations view (TV). Two blinded fellowship-trained rhinologists reviewed videos and scored the extent of staining (using a scale of 0 to 3) for each side.

Results:
Following Draf IIA the mean score for the TV was 0.625 and EV was 0.875. After modified Draf IIA the mean score for the TV was 2 and for the EV was 2.125. There was a statically significant increase for both TV ($p=0.018$) and EV ($p=0.019$) after the modified Draf IIA. Interrater reliability was good, with intraclass correlation of 0.86.

Conclusion:
A simple procedural modification improved penetration of irrigations into the frontal sinus. Prospective studies with postoperative outcomes should be considered.

Skull base COREAH: Case report and literature review

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Background:
Chondro-osseous respiratory epithelial adenomatoid hamartoma (COREAH) is an extremely rare lesion of the nasal cavity with only 13 reported cases in the literature. While benign, it can imitate malignant diseases which require significantly different management.

Case Report:
We report the case of a 57-year-old female who was incidentally found to have a sinus mass on imaging obtained after a motor vehicle accident. Appearance on imaging and endoscopy was concerning for malignancy. During complete endoscopic resection, the mass appeared to emanate from the left skull base/sphenoethmoidal recess and was noted to have an atypical bony consistency. Histology and immunohistochemical analysis were consistent with respiratory epithelial adenomatoid hamartoma with prominent bone metaplasia.

Literature Review:
13 publications were identified reporting on 13 individual cases of COREAH. We compared these reports with our own patient’s presentation to identify similarities in tumor location; patient age, sex, and race; associated symptoms with duration; and follow up and rates of recurrence.

Results:
At the time of this writing, our patient has no evidence of recurrence 4 months after surgery. Our literature review resulted in new conclusions about the presentation of COREAH. While prior publications noted no significant gender preponderance, only 3 of 12 patients with COREAH whose sex was documented were male.

Conclusion:
COREAH is extremely rare. Our patient represents the 14th case in the literature, and our literature review identifies a female predilection for COREAH. Other conclusions regarding tumor location and patient race are limited by incomplete reporting, but represent areas for further investigation.

Sleep outcomes lack association with mucosal eosinophilia or neutrophilia in patients with CRS

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Introduction:
Chronic rhinosinusitis (CRS) is associated with sleep dysfunction, but the underlying pathophysiology is not well understood. The purpose of this study was to determine if mucosal eosinophilia or neutrophilia associated with preoperative severity of sleep dysfunction or postoperative changes in sleep dysfunction following functional endoscopic sinus surgery (FESS).

Methods:
Patients with medically refractory CRS, with nasal polyposis (CRSwNP) and without (CRSsNP), completed the Pittsburgh Sleep Quality Index (PSQI) before and after FESS. Ethmoid mucosa was collected during FESS and densest infiltrates of eosinophilia and neutrophilia per high powered field (HPF) were determined by microscopy. Eosinophilic (>=10 eosinophils/HPF], and neutrophilic (>4 neutrophils/HPF] CRS was then compared with preoperative and postoperative PSQI measures.

Results:
97/115 (84%) of study participants reported preoperative PSQI total scores consistent with “poor sleep,” (PSQI total>5) with significant improvement in poor sleep prevalence to 65% ($\chi 2=13.78$; $p<0.001$) an average of 16.8±5.0 months after FESS, with variation within CRSwNP and CRSsNP. Higher density of eosinophils/HPF moderately correlated with worse PSQI total scores ($R=0.415$; $p=0.006$) in CRSwNP, however eosinophilic CRS and neutrophilic CRS were not associated with differences in preoperative PSQI sleep measures or postoperative improvements in PSQI measures, regardless of nasal polyposis (all $p>0.152$).

Conclusion:
This study suggests that in patients with medically refractory CRS, evidence of mucosal eosinophilia and neutrophilia likely lack strong associations with patient-reported sleep dysfunction or improvements in sleep quality after FESS.

Sociodemographic factors impact adjuvant treatment and survival in sinonasal mucosal melanoma

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Introduction:
Sinonasal mucosal melanoma (SNM) has a poor prognosis and is typically treated surgically with/without adjuvant therapy (AT). The presumed benefit of AT is largely based upon data from other anatomic sites. We used a population-based cohort to investigate the impact of sociodemographic factors on receipt of AT and survival in SNM to identify factors affecting outcomes in this rare disease.

Methods:
Patients with SNM were identified from the National Cancer Database (2011-2016). Sociodemographic (including sex, race/ethnicity, income, education, and treatment facility), treatment, and survival data were collected. AT was defined as radiation or chemotherapy initiated within 30 days of surgery. Multivariable analyses and survival regression were performed to determine the impact of variables on AT and OS.

Results:
539 patients met inclusion criteria: 52.1% (n=281) were stage III and 47.9% (n=258) were stage IV. The rate of AT (47.0%, n=328) did not differ by stage ($\chi 2=1.76$ $p=0.42$). On multivariable analysis, age <60 years (OR: 2.86 [1.98-3.15], $p=0.02$) and private insurance (OR: 1.98, $p=0.04$) increased the likelihood of AT. In survival analysis, AT improved OS in stage IV only (HR: 0.74 [0.52-0.97], $p=0.04$). Controlling for AT, younger patients demonstrated worse survival within stage III disease (HR: 1.44 [1.38-1.72], $p=0.007$). Insurance status did not predict OS in either stage (HR: 0.86 [0.65-1.13], $p=0.28$).

Conclusion:
Younger patients and patients with private insurance are more likely to receive AT independent of disease stage. In stage III disease, AT was not found to improve survival, and younger patients had worse OS. These factors must be considered when determining the benefit of AT.

COSM 2020 POSTERS

Squamous cell carcinoma and pituitary adenoma, a collision tumor of the cavernous sinus

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Objective:
We describe the first reported case of a rare collision tumor of squamous cell carcinoma (SCCa) and pituitary adenoma within the pituitary sella

Methods:
Case Report

Results:
An 85-year-old male was referred with a previously resected sinonasal SCCa of the left maxillary sinus and a new contralateral oculomotor palsy. CT and MRI demonstrated residual disease in the maxillary sinus with orbital floor invasion, extension to the orbital apex, and perineural spread to Meckel's cave. An isolated focus of hyperintensity was noted in the sella with possible extension to the right cavernous sinus, possibly explaining the contralateral oculomotor palsy. The patient underwent a transphenoidal approach to biopsy this distinct lesion. Final pathology demonstrated pituitary adenoma, with additional specimen notable for SCCa abutting this hyperplastic pituitary tissue. After surgical debulking the patient noted subjective improvement in his right eyelid ptosis and visual acuity; however, extraocular movement remained impaired. Planned treatment for his T4b sinonasal SCCa will consist of 45 to 54Gy palliative radiation with concurrent chemotherapy. PD1 staining is pending.

Conclusion:
Here we describe a unique case of sinonasal SCCa presenting with a contralateral oculomotor palsy. Interestingly, both a pituitary adenoma and SCCa were found in the cavernous sinus and sella, representing the first documented collision tumor of this type. This highlights the importance of recognizing atypical routes of metastasis for a contralateral sinonasal SCCa, as well as the importance of critically evaluating new cranial nerve palsies that do not quite fit the expected presentation.

Subacute IFS, a distinct entity from acute fulminant and chronic IFS

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Background:
Acute invasive fungal sinusitis (aIFS) is a rapidly progressive sinonasal disease most frequently in immunosuppressed patients. A much rarer form of IFS, chronic IFS (cIFS), presents with an indolent onset over at least 3 months. In our practice we have noted multiple cases of IFS with a course between these diagnoses. Here, we propose a modified classification system for IFS.

Methods:
Retrospective review of patients with pathologic diagnosis of IFS (2010-2019). Patients with symptoms for ≥ 90 days were classified as cIFS. Patients with endoscopic evidence of mucosal necrosis or fungal angioinvasion on pathology were classified as aIFS. Patients that did not satisfy these criteria were classified as subacute IFS (saIFS).

Results:
Twenty-two patients were classified as aIFS, 13 as saIFS, and 8 as cIFS. Compared to patients with aIFS, those with saIFS were more likely to have a fungal ball (46.2% vs. 0%, p=0.001), vision loss at presentation (92.3% vs. 45.5%, p=0.010), and have lived outside the US (23.1% vs. 0%, p=0.044). Patients with aIFS were more likely to be severely immunocompromised (A1c ≥ 8.0% or ANC < 500) (90.9% vs. 53.8%, p=0.032).

Conclusion:
Similar to the current literature regarding pulmonary invasive fungal infections, we propose a modified classification system of IFS including aIFS, saIFS, and cIFS. saIFS should include those who do not meet the temporal criteria of acute (<4 weeks) or chronic (>12 weeks) infections and without fungal angioinvasion or gross necrosis. saIFS patients are less immunocompromised, more likely to have lived outside of the US and to have a fungal ball found at surgery, suggesting potential environmental risk factors or progression from non-invasive disease.

Surgical extent increases risk of post-operative epistaxis in outpatient sinus surgery in Florida

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Introduction:
Postoperative epistaxis (POE) represents a significant complication of endoscopic sinus surgery (ESS). Patient and surgical characteristics influencing risk of POE remain poorly understood.

Methods:
Patients from 2006-2010 in the Florida HCUP SASD database who underwent ESS were identified and cross-referenced to patients presenting to an emergency department (ED) for epistaxis control within one month post-operatively. Variables analyzed included demographics, insurance, surgical indication, and surgical extent including septoplasty and inferior turbinectomy. Univariate and multivariate logistic regression determined risk factors for POE.

Results:
From 2006-2010, 49,061 patients underwent ambulatory ESS in Florida. Of these, 186 (0.38%) presented to ED for epistaxis control. On univariate analysis, age ≥50 (OR 1.45, 95%CI 1.09-1.94, p=0.01), presence of inferior turbinectomy (OR 4.05, 95%CI 1-10.77, p=0.02) and septoplasty (OR 1.42, 95%CI 1-1.97, p=0.04) were associated with POE. Protective factors included female sex (OR 0.75, 95%CI 0.56-1, p=0.05) and private insurance (OR 0.68, 95%CI 0.49-0.95, p=0.02). Race, income, polypoid disease, acute rhinosinusitis, and malignancy were not associated with POE. Under multivariate analysis, only surgical extent was significantly associated with post-op epistaxis: inferior turbinectomy (OR 4.49, 95%CI 1.1-12.03, p=0.01) and septoplasty (OR 1.42, 95%CI 1-1.99, p=0.05).

Conclusion:
Age ≥50, presence of septoplasty, and inferior turbinectomy were independently associated with increased risk for POE. Our data confirm prior findings identifying age as a risk factor for POE. This is the first study to demonstrate association between surgical extent and POE in outpatient ESS.

Surgical management of World Trade Center relief workers with chronic rhinosinusitis

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Introduction:
Many workers involved in recovery efforts after the 2001 World Trade Center (WTC) attacks have developed chronic rhinosinusitis (CRS) often refractory to maximal medical therapy and requiring multiple functional endoscopic sinus surgery (FESS) procedures. Our study aims to analyze the impact of environmental exposures on symptom recurrence and revision surgery rates in this population.

Methods:
Retrospective review of patients enrolled in the World Trade Center Health Program who received FESS at Mount Sinai's Otolaryngology department was conducted. Sinonasal comorbidities, surgical course, and postoperative symptoms were recorded. Details on WTC-related environmental exposure were obtained from questionnaires.

Results:
104 patients underwent FESS for CRS. Of these, 54.8% experienced symptom recurrence and 36.5% required revision surgeries, while revision rates for standard CRS patients in the literature range from 3-20%. Symptom recurrence was higher among those who arrived within four days of the attacks (OR 3.02, 95% CI 1.20 to 7.64). Patients who did not require multiple surgeries were more likely to have worn a mask (OR 0.303, 95% CI 0.113 to 0.816). Duration of exposure did not significantly impact the need for multiple surgeries or symptom recurrence.

Conclusion:
Early exposure to environmental toxins onsite was associated with a higher rate of symptom recurrence. Additionally, mask usage was associated with decreased need for multiple surgeries. These findings suggest that exposure intensity may play a role in the development of refractory disease.

COSM 2020 POSTERS

Surgical versus endovascular ligation for epistaxis in the anticoagulated patient population

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Background:
Epistaxis is a common problem afflicting patients taking anticoagulant medications, often prompting intervention. We investigated the incidence of recurrent epistaxis after surgical ligation compared to endovascular embolization using a large population database.

Methods:
Patients with ICD-9 codes indicative of active anticoagulant use were identified in the Healthcare Cost and Utilization Project (HCUP) Florida Statewide Inpatient Database (SID) between 2006-2010. Clinicodemographic and procedural data were collected. Multivariable regression analysis was performed to identify predictors of epistaxis recurrence within one year of the procedure.

Results:
882 anticoagulated patients with epistaxis requiring intervention were identified. 79.0% (n=697) underwent surgical ligation and 21.0% (n=185) underwent endovascular embolization. Mean age was 54.2 years. 46.0% of patients were female and 82.9% were Caucasian. 30 patients (3.4%) had a subsequent encounter for recurrent epistaxis. Of these, 16 were admitted as an inpatient (median days after intervention: 48). 12 patients were seen in an emergency department (median: 136.5 days) and 2 patients underwent an ambulatory procedure for epistaxis (median: 234.5 days). On multivariable analysis, advanced age (OR=1.08; 95% CI 1.02-1.25 p=0.02) was the only clinicodemographic predictor of recurrent epistaxis. Method of intervention was not predictive of failure (OR=1.21; 95% CI 0.84-1.71, p=0.49).

Conclusion:
Surgical or endovascular arterial ligation can be considered in patients with recalcitrant epistaxis even if they are medically anticoagulated. There was no difference in recurrence rates of epistaxis following surgical ligation compared to endovascular embolization.

Survival outcomes by treatment modality in HPV+ sinonasal squamous cell carcinoma

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Objective:
To compare overall survival rates across treatment modalities in patients with human papillomavirus-positive (HPV+) sinonasal squamous cell carcinoma (SN-SCC).

Methods:
The 2010-2015 National Cancer Database (NCDB) was queried for cases of HPV+ SN-SCC. Kaplan Meier and Cox multivariate regression analysis was used to compare survival across treatment modalities including surgery with adjuvant radio- or chemotherapy, surgical treatment alone, and radiation and/or chemotherapy alone.

Results:
Four hundred and twenty-one cases of HPV+ SN-SCC were identified. The most common primary site was nasal cavity (61.8%) followed by maxillary sinus (19.9%) and ethmoid sinus (10.4%). 47.9% of patients received surgery with adjuvant therapy, 23.5% received surgery alone, 20.6% received radiation and/or chemotherapy alone, and 3.8% of patients received no treatment. Improved 1-, 3-, and 5-year overall survival was observed in patients who underwent surgery with adjuvant therapy (1-year OSS: 91.2%, 3-year OSS: 73.5%, 5-year OSS: 61.9%) and surgery alone (1-year OSS: 91.1%, 3-year OSS: 71.4%, and 5-year OSS: 60.6%) when compared to radiation and/or chemotherapy (1-year OSS: 78.5%, 3-year OSS: 49.6%, 5-year OSS: 31.1%). Multivariant analysis accounting for demographic and clinicopathologic factors reaffirmed this significant survival benefit with radiation/ chemotherapy exhibiting increased hazards ratio (HR: 2.31; 95% CI: 1.31-4.09) when compared to surgery and adjuvant therapy. No difference in overall survival was observed between surgery alone (HR: 0.93; 95% CI: 0.42-2.04) and surgery with adjuvant on multivariant regression.

Conclusions:
Overall survival is improved in patients who undergo surgical resection for HPV+ SN-SCC.

Survival outcomes in patients with acute invasive sinusitis with intracranial extension

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Introduction:
Acute invasive fungal rhinosinusitis(AIFS) is a subset of sinonasal fungal disease that affects immunocompromised patients and is associated with a high mortality rate. We aim to characterize our outcomes in patients with AIFS with intracranial extension of their disease (IC AIFS).

Methods:
We performed a retrospective review of patients with AIFS at UCSF from 2007–19. Chart review was completed to obtain patient demographics and key clinical data. Intracranial site of involvement was determined by review of MRI.

Results:
We reviewed 67 patients with AIFS. 24 patients (35.8%) had IC AIFS. Overall survival in patients with IC AIFS at 1 month, 3 months and 6 months were 15/24 (63%), 11/24 (46%), and 10/24 (42%) respectively. IC AIFS patients had significantly worse survival when compared to AIFS patients (HR 2.9, $p<0.05$). The majority of IC AFS patients were infected with Mucorales(15/24, 61%), followed by Aspergillus (4/24, 16.7%) similar to the distribution in all AIFS patients. Intracranial involvement was most commonly seen in the cavernous sinus (18/24, 75%) followed by the dura (14/24, 58%), internal carotid artery (9/24, 38%), Meckel's cave (9/24, 38%), brain parenchyma (8/24, 33%). 3 patients had an intracranial abscess and 6 patients had infarction. At 3 months, patients with carotid involvement and infarction were less likely to survive. All patients who survived past 3 months were on posaconazole (10 pts) or isavuconazole (1 pt).

Conclusion:
While intracranial extension of disease is associated with a high mortality, there are a significant subset of patients who survive and stabilize on new generation antifungal therapies.

Survival outcomes in sinonasal neuroendocrine carcinoma: An NCDB analysis

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Background:
Sinonasal neuroendocrine carcinoma (SNEC) is a rare tumor with poor prognosis. Treatment and sequence of therapy are still unclear. The goal of this study is to analyze treatment outcomes in SNEC using a large national database.

Methods:
The National Cancer Database was queried for SNEC from 2004 to 2014. Patient demographics, tumor and treatment characteristics were tabulated. Multivariable Cox proportional hazards regression was performed for statistical analysis of treatment regimen on overall survival (OS).

Results:
A total of 415 patients were identified. Most patients were male (61.2%) and the most common primary site of the tumor was the nasal cavity (52.5%). 67.7% were T4 tumors and 56% were treated in top tier volume facilities. Unimodality (41.9%) and bimodality (43.9%) were the most common treatment modalities while only 14.2% received trimodality therapy. Radiation therapy was the only treatment administered for 30% of the patients, while 27.2% received definitive chemoradiation (CRT) and 11.6% had surgery with definitive CRT. In our Cox-PH model, T4 (HR=2.6, p=0.004) and N2/N3 (HR=2.18, p=0.001) were associated with worse survival. Trimodality (HR=0.49, p=0.005) and bimodality (HR=0.65, p=0.009) therapies had a better OS. Patients who received definitive CRT or surgery with definitive CRT had a significant increase in OS (p=0.01 and 0.002 respectively).

Conclusion:
SNEC appears to be best treated with definitive CRT in combination with surgery if possible. Neoadjuvant chemotherapy could be promising however this group in the study was too low to yield a significant difference. A prospective, multi-center randomized controlled trial is necessary to confirm these findings.

COSM 2020 POSTERS

Symptom scores and CT findings in CF sinusitis

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Introduction:
Chronic Rhinosinusitis (CRS) is ubiquitous in patients with Cystic Fibrosis (CF). Endoscopic sinus surgery (ESS) is generally performed in this population with the goal of improving quality of life and sinonasal symptom scores. Imaging with computed tomography (CT) scans are performed for surgical planning purposes rather than determining candidacy for surgery. Current data on the relationship between SNOT-22 symptom scores and Lund-Mackay (LMK) scores is controversial. The aim of this study is to better define and characterize these correlations with the goal of providing more selective and effective patient care.

Methods:
Data was collected from the University of South Florida Health EMR (EPIC) from January 1, 2012 to March 1, 2019. ICD-10 diagnosis codes identified patients with CF and CRS. Patients over the age of 18 who met these criteria were included. Patients without SNOT-22 scores or CT scans were excluded. Age, transplant status, SNOT-22 scores, LMK scores, and the interval between CT scan and SNOT-22 were collected. Correlation analysis was applied to assess the relationship between SNOT-22 and LMK scores.

Results:
Data from 128 patients with CRS and CF was extracted. 101 of these patients had both a CT scan and SNOT-22 score. A total of 111 scans were analyzed. The SNOT-22 scores ranged from 0 to 4.36 (mean= 1.36). LMK scores ranged from 4 to 24 (mean=17.1). Correlation analysis revealed no relationship between SNOT-22 and LMK scores ($r= 0.052$, $p=0.59$).

Conclusion:
CT scan findings do not correlate with sinonasal symptom scores in CF patients. The goal of ESS in the CF population is to relieve symptoms and improve quality of life, thus, LMK scores are not an ideal indicator for surgery.

The case of a solitary fibrous tumor of the nasal cavity with expansion into the intracranial fossa

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Introduction:
Solitary Fibrous Tumors (SFTs) typically arise from the pleura and other thoracic locations, but can also affect the nasal cavity and paranasal sinuses. This report describes the presentation and workup of a sinonasal SFT with expansion into the anterior cranial fossa and highlights the surgical management through the endoscopic endonasal approach.

Methods:
Case report.

Results:
A 78-year-old male presented with approximately 1 year of worsening nasal obstruction and difficulty sleeping as well as a 4-month history of progressive loss of olfaction and gustation. Fiberoptic nasal examination, CT, and MRI all demonstrated a mass in the right nasal cavity extending into the cranial vault, paranasal sinuses, medial orbital extraconal space, and nasopharynx. Histologic examination of a sample taken from an in-office biopsy revealed a non-malignant tumor consistent with a SFT. Definitive treatment of the SFT involved an endoscopic endonasal resection of the nasal and intracranial components of the tumor with subsequent reconstruction of the ethmoid skull base.

Conclusions:
Although SFT are rare tumors that present in the sinonasal cavities, awareness of this pathologic entity and its histopathologic features enhances the workup for diagnosis and treatment of nasal masses.

The diagnostic utility of sinonasal pathology in systemic vasculitides

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Introduction:
The systemic vasculitides granulomatosis with polyangitis (GPA, formerly Wegner's) and eosinophilic GPA (EGPA, formerly Churg-Strauss) frequently demonstrate sinonasal manifestations. Although sinonasal tissue is often sought to confirm a diagnosis, little evidence exists to support the diagnostic utility of sinonasal tissue biopsy. Here, we investigate the diagnostic utility of sinonasal pathology for these vasculitides.

Methods:
Patients seen at our tertiary-care institution (2007-2019) with diagnoses of GPA (n=31) or EGPA (n=7) and available sinonasal pathology reports were identified. Medical records were reviewed for diagnostic/treatment histories, sinonasal findings, and pathology reports. Descriptive and inferential statistics were used to determine factors associated with diagnostic utility.

Results:
Of 38 patients with systemic vasculitis, 5 (13%) had pathology reports confirming vasculitis (GPA 13%, EGPA 14%), and 12 (32%) had pathology features suggestive of a vasculitic/granulomatous disease (GPA 35%, EGPA 14%). Septal perforation was associated with increased likelihood of sinonasal pathology suggestive of a vasculitic/granulomatous disease (p=0.03), and septal tissue was the most likely sinonasal source to reveal vasculitis on pathology (p=0.09). Patients undergoing current or recent treatment with systemic steroids at the time of biopsy were more likely to show vasculitis on pathology (p=0.016).

Conclusion:
Although sinonasal tissue biopsy is often requested to confirm suspected diagnoses of GPA or EGPA, the utility of routine sinonasal biopsy has limited diagnostic value. Diagnostic yield may be modestly improved in patients with septal perforations and when septal biopsies are performed.

The effects of sinus surgery and aspirin desensitization on sleep in AERD

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Introduction:
Aspirin-exacerbated respiratory disease (AERD) is an inflammatory disorder of the upper and lower respiratory tract. Current treatments include corticosteroids, endoscopic sinus surgery (ESS), aspirin (ASA) desensitization, and biological immunomodulators.

Objective:
The objective of this study was to investigate the effects of ESS and ASA desensitization on sleep in AERD patients.

Methods:
All patients underwent ESS and were divided into two cohorts based on ASA desensitization status. Total SNOT-22 and sleep domain sub-scores were collected and analyzed at pre-operative, 1-, 3-, 6-, and 12-month intervals after surgery.

Results:
184 AERD patients underwent ESS from November 2009 to November 2018. From this group, 130 patients underwent ASA desensitization (AD) and 54 patients remained non-desensitized (ND). While overall SNOT-22 sleep domain scores did not significantly differ between groups, AD patients reported a relative improvement in perceived sleep quality compared to ND patients over the study period (p=0.0531). Furthermore, a sub-group analysis accounting for subject attrition showed significantly greater improvements in overall sleep (p=0.0311) and perceived sleep quality (p=0.0270) in AD patients compared to ND patients over the study period.

Conclusions:
ESS followed by ASA desensitization decreases the overall sleep burden in AERD patients with a significant improvement in perceived quality of sleep. This has important implications given the impact of sleep on quality of life and overall health.

COSM 2020 POSTERS

The effects of site-specific metastases on nasopharyngeal squamous cell carcinoma survival

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Objectives:
To investigate the impact of site-specific metastases on survival and identify predictors of metastasis in patients with nasopharyngeal squamous cell carcinoma (SCC).

Study Design:
Retrospective database review.

Methods:
The National Cancer Database (NCDB) was queried for all cases of nasopharyngeal SCC between 2010-2016 which had metastasized to distant sites (460 cases). This was then further classified as metastases to bone, liver, lung, brain, and multiple sites. Univariate and multivariate analyses were used to compare patient demographics between sites. Kaplan-Meier analysis was used to compare overall survival.

Results:
A total of 145 distant metastases to bone, 112 to lung, 55 to liver, 15 to brain, and 133 to multiple sites were identified. One-year overall survival for the entire cohort was 50.4% with a median survival of 12.4 weeks. One-year overall survival was 58.3% for liver metastasis, 53.2% for bone, 48.9% for multiple sites, 44.2% for brain, and 42.7% for lung (log-rank=0.321). Patient age (p=0.009) and treatment facility type (p=0.019) were found to predict the site of distant metastasis. Being younger than 60 had lower odds of metastasis to liver compared to bone (OR 0.527, p=0.017).

Conclusion:
There was no significant difference found in survival between metastases to different sites. The patient's treatment facility type and age were significantly associated with lower odds of nasopharyngeal SCC metastasis to certain distant sites.

The impact of head position on sinonasal drug delivery via actuated nasal sprays

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Background:
Medical therapy for chronic rhinosinusitis (CRS) frequently includes intranasal corticosteroids, commonly in the form of nasal sprays. Following nasal spray package insert instructions leads to suboptimal medication deposition in the sinuses and ostiomeatal complex (SOMC). Previous work has shown that penetration of spray past the nasal valve can be improved with modification of nozzle position. However, potential effects of head position during spray actuation on SOMC deposition are unknown.

Methods:
Pre- and post-surgery (FESS) 3D anatomical reconstructions were constructed in 5 subjects with CRS using CT scans and MIMICS™. Computational fluid dynamics (CFD) simulations of gentle inspiration were accomplished using FLUENT™. Seven head positions were analyzed via CFD for each model (n=20). Spray deposition of fluticasone propionate was calculated (% of shot weight) in the SOMC with the sprayer positioned upright and tilted with head. Non-parametric permutation tests were used to test for differences in deposition.

Results:
The difference in deposition across head positions was significant in pre- and post-FESS models (p=<0.001, 0.037, respectively). Lying on the side of sprayer insertion (lateral) or placing the top of the head to the floor yielded the largest average deposition (0.89%, 0.87%, respectively). There was no statistically significant difference in SOMC deposition between pre and post-surgery models (p=0.375).

Conclusions:
Lateral or top of the head to the floor positions showed improved deposition to the SOMC compared to package insert instructions in pre- and post-surgery models. The difference in SOMC deposition between pre- and post-surgery models was found to be non-significant.

The impact of inspiration on sinonasal drug delivery via actuated nasal sprays

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Background:
Intranasal corticosteroid sprays are commonly prescribed for management of chronic rhinosinusitis (CRS). Nasal spray deposition at the sinuses and ostiomeatal complex (SOMC) is influenced by the interaction of numerous variables including spray angle, particle size distribution, and nasal airflow. Previous experimental models demonstrate improvements in spray penetration past the nasal valve with nasal airflow during spray actuation; effects on SOMC deposition are unknown.

Methods:
Five subjects with CRS underwent pre and post-surgery (FESS) CT scans which were used to create 3D reconstructions of the nasal cavity and sinuses (MIMICS™). FLUENT™ was then used to conduct computational fluid dynamics (CFD) simulations of spray actuation during gentle, steady inspiration (~20L/min) and breath holding (0 L/min) in each model (n=20). Spray deposition of fluticasone propionate (% of shot weight) was measured in the SOMC with sprayer and head positioned according to package instructions. Non-parametric permutation tests were used to test for differences in deposition.

Results:
Inspiration during spray actuation significantly increased SOMC deposition compared to breath holding across all models (average 0.83%, 0.0027%, respectively, p=0.03). Breath holding during spray actuation yielded zero (%) deposition at the SOMC in 19/20 models. Differences between pre- and post-FESS models were non-significant (0.92%, 0.73%, respectively, p=0.375).

Conclusions:
Gentle inspiration during nasal spray actuation significantly increases medication delivery to the SOMC when compared to breath holding conditions in CFD models. There was no significant difference in deposition with inspiration between pre- and post-surgery models.

The impact of nasal steroid irrigations on the management of chronic rhinosinusitis

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Introduction:
Chronic rhinosinusitis (CRS) treatment options include systemic therapies, topical therapies, and functional endoscopic sinus surgery (FESS). Additionally, nasal steroid irrigations (NSI) with mometasone and budesonide have been incorporated into the medical management of recalcitrant CRS, but the importance of wide access for irrigation has been stressed.

Objective:
To evaluate the role and efficacy of topical steroid nasal irrigations in patients prior to surgical intervention, and the potential for surgery avoidance.

Methods:
Patients presenting with CRS initially underwent a trial of NSI for at least six weeks. Pre-irrigation and post-irrigation outcomes that were measured included Lund-Mackay scores (LMS), SNOT-22 scores, and whether or not the patient underwent FESS.

Results:
Of the 90 patients who underwent NSI, 32 patients ultimately underwent FESS, while 58 patients had a significant enough improvement in symptoms to avoid FESS. The likelihood of decision for surgery did not differ between the mometasone and budesonide groups (p=0.3094), comorbid asthma status (p=0.3585), smoking status (p=0.2256), polyp status (p=0.7288), or history of prior FESS (p=0.5803). SNOT scores showed a significant improvement following NSI in the group of patients that did not go on to FESS (p<0.0001) and in the group that did (p<0.0001). LMS also improved following NSI, but this was only statistically significant in the patients that ultimately went on to FESS (p=0.0102).

Conclusions:
After a trial of NSI, 64.4% of patients no longer met candidacy for FESS and had a significant improvement in SNOT-22 scores. This supports the continued use of nasal steroid irrigations in the management of CRS with and without nasal polyps.

COSM 2020 POSTERS

The impact of sinus surgery and aspirin desensitization on psychological burden in AERD

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Introduction:
Aspirin-exacerbated respiratory disease (AERD) is an aggressive inflammatory disorder of the upper and lower respiratory tract. Corticosteroids, leukotriene modifiers, endoscopic sinus surgery (ESS), aspirin (ASA) desensitization, and biological immunomodulators are currently used to treat the disorder.

Objective:
The objective of this study was to determine the psychosocial impact of ESS and ASA desensitization on AERD patients.

Methods:
All AERD patients who underwent ESS were divided into two cohorts based on ASA desensitization status. The psychosocial metrics of the SNOT-22 were collected and analyzed at the following time points: pre-operative, 1-month, 3-month, 6-month, and 12-month after ESS.

Results:
184 AERD patients underwent ESS from November 2009 to November 2018. From this group, 130 patients underwent ASA desensitization (AD) and 54 patients remained non-desensitized (ND). AD patients showed a significantly greater reduction in total SNOT-22 scores over the study period compared to ND patients (p=0.0446). Analysis of SNOT-22 psychosocial metrics showed a significantly greater improvement in patient productivity in the AD cohort when compared to the ND cohort (p=0.0214). Further, a sub-group analysis accounting for subject attrition showed a significantly greater improvement in both productivity and concentration in AD patients when compared to the ND cohort (productivity: p=0.0068; concentration: p=0.0428).

Conclusions:
ESS followed by ASA desensitization decreases the overall psychosocial burden in AERD patients with a significant improvement in perceived productivity and concentration. This has significant implications given the psychosocial impact of chronic diseases.

The influence of population density on survival in sinonasal cancer

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Introduction:
Sinonasal cancers are a relatively uncommon form of head and neck malignancy. Socioeconomic disparities are increasingly being shown to affect survival in cancer patients. The goal of this study is to compare survival among patients with SC in urban, suburban, and rural communities.

Methods:
The National Cancer Database (NCDB) was queried for cases of sinonasal cancer from 2004 to 2016. All cases were stratified into urban, suburban, and rural population groups using Rural-Urban Continuum (RUC) codes. Patient demographics, clinicopathologic features, and treatment types were compared using univariate analysis. Kaplan-Meier analysis and Cox regressions were used to examine survival.

Results:
22,120 cases were included: 18,357 (80.9%) urban, 3299 (14.5%) suburban, and 464 (2.0%) rural. There was no difference in primary site, T-stage, N-stage, time to first treatment, and treatment modality between the three groups. However, race, age, sex, insurance, Charleson-Deyo score, grade at diagnosis, and histology did differ significantly. Five-year overall survival (OS) was 49.0% in the urban group, 45.4% in suburban, and 39.3% in rural (log-rank p<.001). Cox regression modelling accounting for demographic, histopathologic and treatment differences in populations showed decreased survival in suburban (OR=1.08; p=0.027) and rural patients (OR=1.24; p=0.014) as compared to urban patients.

Conclusions:
There are geographic disparities in 5-year OS in patients with sinonasal cancer. Suburban and rural populations have lower OS than urban populations. Further study is warranted to address this disparity and optimize care for those in suburban and rural locations.

The role of CT and endoscopy in the evaluation of patients referred for intranasal cryoablation

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Introduction:
Cryoablation (CA) of the posterior nasal nerves has garnered increasing interest as an office-based procedure for chronic rhinitis (CR). Standardized preoperative evaluation, specifically the role of computed tomography (CT) and endoscopy, has yet to be defined. We report a series of patients who underwent CT and endoscopy as part of CR work-up in patients referred for CA.

Methods:
A retrospective review of all patients referred to a single tertiary rhinology practice for CA was performed.

Results:
Fifteen patients were sent for CA by medical allergists. Five patients were deemed CA candidates, and 1 patient received only medical CR treatment. Four patients had evidence of incomplete prior sinus surgery and/or continued chronic rhinosinusitis (CRS) on endoscopic exam. These 4 patients received a combination of medical and surgical management with either complete resolution or improvement in CR symptoms. In 3 patients, CT confirmed CRS that was not apparent endoscopy, and received a combination of medical and surgical management with symptom improvement. In the last two patients, final diagnoses were nasal valve collapse and recurrent acute rhinosinusitis.

Conclusions:
Referrals for CA are becoming more common and the optimal preoperative work up remains unclear. In this limited retrospective review, 67% of patient had diagnoses other than CR and thus were not deemed candidates for CA. Both CT and endoscopy are complementary to a detailed history and physical examination and can aid in CA candidate selection.

Topical anesthesia for scope exams

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Introduction:
Topical medications are routinely used for nasal and laryngeal endoscopy. Little is known about how patient preferences affect satisfaction and efficacy. Herein, we use a decision aid to study patient preferences for topical nasal anesthesia in patients undergoing nasal and laryngeal scope exams.

Methods:
New patients in rhinology and laryngology clinics were enrolled over two months. A decision aid was developed with expert and patient input. A pre-procedure survey about priorities was administered. Patients then chose between topical oxymetazoline/lidocaine spray or none. A post-procedure outcome survey followed and was analyzed.

Results:
90.1% of patients chose to have topical anesthesia. Top patient priorities were “I want the scope to be easy for the doctor” and “I want to be as comfortable as possible”. Low priorities were “I want to avoid medications” and “I don’t want to feel numb.” Past experience with scope examination did not predict choice. Patients who strongly wanted to avoid medication ($p=0.002$) and bad taste ($p=0.003$) were more likely to choose no spray, whereas those who wanted to avoid pain received anesthetic ($p=0.011$). 95.4% of patients were satisfied with their choice, regardless of use of anesthetic. Ratings of comfort during scope were not different between groups.

Conclusion:
Patient preferences are easily elicited and correlate with treatment choices. Most patients chose to have topical anesthetic. The population was willing to tolerate spray side effects to mitigate discomfort, but both patients with and without topical anesthetic were satisfied with their choices. This decision aid can be used to optimize shared decision-making in otolaryngology clinics.

COSM 2020 POSTERS

Transorbital sinonasal trauma due to impalement with a felt tip marker

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Background:
The objective of this clinical case report is to highlight, using surgical video and operative imaging, the unusual presentation of an impalement injury to the orbit with intrusion into the contralateral nasal sinuses.

Patient Findings:
A 45-year-old Caucasian male with a history of psychiatric illness presented acutely overnight to the Emergency Room following traumatic orbital impalement with a felt-tip marker following an altercation with his roommate. Patient was alert and at mental baseline, complaining of double vision and obvious pain to his left eye. Computed tomography sinonasal imaging discovered globe-displacing retroorbital penetration through the paranasal sinuses terminating within the contralateral ethmoidal air cells adjacent to the lateral lamella of the cribriform plate. Due to the complicated trajectory of the marker, there was concern for combined retroorbital and intracranial involvement with significant morbidity. The patient was urgently taken to the operating room orbital decompression and functional endoscopic sinus surgery with preparation for skull base reconstruction following removal of the foreign body. Following the procedure, the patient's vision was restored with no residual deficits and was asymptomatic on subsequent visits.

Discussion/Conclusion:
Penetrating ocular trauma is estimated to be about 30-50% of orbital trauma, but involvement of the sinonasal cavities without permanent globe injury is a rare but well-written phenomenon with no clear incidence. Involvement of the nasal cavity and cribriform plate from the foreign body is a complicated situation that requires immediate evaluation with multiple surgical services to prevent chronic sequela.

Treatment and clinical outcomes in acute orbital invasive fungal sinusitis

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Introduction:
Treatment of invasive fungal sinusitis with orbital involvement (OIFS) is controversial, specifically the need for exenteration. Here we examine visual acuity and survival outcomes with regard to treatment in patients with OIFS.

Methods:
Using a retrospective review, we identified patients with histopathologically confirmed OIFS treated at our tertiary care center from 8/2014-11/2019. We recorded treatments, visual acuity at presentation and most recent follow-up, and mortality (IFS-related and all-cause), and performed a descriptive statistical analysis.

Results:
Thirteen patients were identified with OIFS. All were treated with IV antifungal agents and endoscopic debridement as well as retro-bulbar antifungal injection in 6(46%), hyperbaric oxygen in 5(38%), and exenteration in 1(8%). All were evaluated by ophthalmology with median follow-up of 33.5 days. Visual acuity of the involved eye at presentation was near-normal (≤20/30 with correction) in 7(54%); impaired in 3(23%), and ≥20/200 in 3(23%). Of those with near-normal visual acuity, one developed impairment and one lost light perception. Of those with impaired vision, all improved to near-normal vision. Of those with ≥20/200, none improved and one was exenterated. Median follow-up for survival data was 362 days. The exenterated patient survived. Of the remaining 12, 7(58%) survived, 2(17%) died of IFS complications and 3(25%) died of other conditions.

Conclusion:
In OIFS, aggressive treatment with IV antifungals and debridement coupled with consideration of retro-bulbar antifungal injection and hyperbaric oxygen may help preserve visual acuity in those presenting with impaired vision, without the need for exenteration and without an increase in mortality.

Understanding nasopharyngeal lymphoepithelial carcinoma: A national analysis

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Background:
Nasopharyngeal lymphoepithelial carcinoma (NPLEC) is a rare malignancy that lacks comprehensive review. The objective of this study is to investigate the impact of patient, disease, and treatment factors on the survival of patients with NPLEC.

Study Design:
Retrospective database review.

Methods:
The National Cancer Database (NCDB) was queried for all patients with nasopharyngeal lymphoepithelial carcinoma between 2004-2016 (845 cases). Univariate and multivariate analyses were used to examine patient demographics, tumor characteristics and survival.

Results:
The majority of patients were under 60 years old (76.7%), male (69.1%), and white (54.4%). The most common treatment modality was radiation and/or chemotherapy (84.0%). Five-year overall survival (OS) was 75.2% and median survival was 12.8 years. Surgery plus radiation and/or chemotherapy had the highest 5-year OS (83.4%) among treatment modalities. Accounting for other patient demographics and tumor characteristics, the following groups had reduced OS: older than 60 (HR 2.20, $p<0.001$), uninsured (HR 1.95, $p=0.03$), government insurance (HR 1.54, $p=0.02$), and stage IV cancer (HR 3.33, $p<0.001$). Female patients had higher OS (HR 0.60, $p=0.007$). Patient undergoing surgery alone was also associated with higher mortality compared to surgery with radiation and/or chemotherapy (HR 10.57, $p=0.001$).

Conclusion:
Factors associated with decreased survival for patients with nasopharyngeal lymphoepithelial carcinoma include age older than 60, being male, having government or no insurance and stage IV cancer. In addition, receiving surgery alone rather than surgery with radiation and/or chemotherapy is associated with higher mortality.

Utility of an ultrasonic aspirator in performing a frontal sinus osteoplastic flap

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Introduction:
The osteoplastic flap remains an integral surgical technique to achieve unrestrained access to the frontal sinus. The approach is employed for a variety of scenarios including recalcitrant inflammatory disease, mucoceles, tumors, trauma, and facial feminization. Complications such as mucocele formation, cerebrospinal fluid leak, outflow tract obstruction, flap failure, and frontal bossing are described, and may be reduced by avoiding injury to the bone flap and adjacent tissues. Sonopet Ultrasonic Aspirator (UA) has been used in diverse surgical settings for precise bone work while minimizing injury to soft tissues. We present the first reported use of an UA in an osteoplastic flap.

Methods:
Case report

Results:
A 78-year-old male underwent endoscopic resection of a left frontal sinus mass. DrafIIb was performed but due to atypical pneumatization of the crista galli total resection could not safely be achieved. Pathology returned as sinonasal oncocytic papilloma and the patient elected to proceed with open surgery via coronal incision. Osteotomies were mapped under image navigation, and using an UA fine bone cuts were made while preserving the underlying mucosa. The mucosa was sharply incised and the bone flap removed providing full access to the tumor which was resected in its entirety. The bone flap was replaced with minimal bone loss noted. There were no intraoperative or postoperative complications, and at 6 month follow-up there was no evidence of recurrence or frontal sinus disease.

Conclusion:
The Sonopet UA is a novel instrument in performing frontal sinus osteoplastic flap that minimizes bone loss, thermal injury, and soft tissue trauma, which may reduce intraoperative and delayed complications.

COSM 2020 POSTERS

Utility of preoperative phone calls for endoscopic sinus surgery

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Objective:
Perioperative patient education improves patient satisfaction, surgical outcomes, and can reduce postoperative call volume (Chern, 2019). Here, we investigate whether the use of standardized preoperative phone calls elicits similar results in patients undergoing endoscopic sinus surgery (ESS).

Methods:
Patients undergoing ESS at a tertiary rhinology center were identified prospectively through the electronic medical record (EMR). In the intervention cohort, a standardized pre-operative educational phone call was performed. A postoperative survey was utilized to collect self-assessment of satisfaction and understanding in all patients. Post-operative call rates were obtained from the EMR. Wilcoxon rank sum and chi-squared analyses were conducted to compare results.

Results:
Data from 52 cases and 53 controls were collected. Those undergoing call intervention were similar to controls with regard to patient-reported understanding (9.2±1.4 vs 8.8±1.1, p=0.999) and satisfaction (9.4±1.1 vs 9.1±1.4, p=0.997). Both cases and controls called the clinic regarding surgical outcomes (65% and 56%) more often than about post-operative medications (35% and 43%). Independent of receiving the intervention, patients that did not call clinic post-operatively had significantly better understanding of their procedures (9.5±0.7 vs 8.6±1.5, p<0.001).

Conclusion:
Though shown in other settings, a significant impact of educational phone calls prior to surgery was not observed in this sample. This finding may be indicative of adequate baseline preoperative patient education. Patients with lower pre-operative understanding were more likely to call the clinic with questions or concerns. Future studies may target such patients prior to ESS.

Value of inferior meatal flap as an adjuvant approach in managing maxillary sinus lesions

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Purpose:
Several approaches for the maxillary sinus were described. Currently, endoscopic Middle Meatal Antrostomy (MMA) is the gold standard for managing maxillary sinus lesions. Unfortunately, there are some limitations especially in hidden areas. This research elucidates the advantages and disadvantages of adding IMF to the MMA for managing maxillary sinus lesions.

Methods:
This study was a randomized controlled trial, conducted on sixty patients, divided into 2 groups: Group (A) included 30 patients underwent IMF after MMA, while group (B) involved 30 patients subjected to MMA only for managing the maxillary sinus. Patients were assessed for the accessibility of the antero-inferior area of the maxillary sinus, residual lesion after performing IMF and evidence of recurrence.

Results:
The antero-inferior area accessibility in group (A) was difficult in 10 patients (33%) compared to 20 patients (66%) of group (B) (P =0.004). Residual was detected after performing the IMF in 12 patients (40%). Postoperative 1 year Lund Mackay score comparison between both groups was statistically insignificant (P=0.6). Recurrence was noted in 4 cases of group (A) and 2 cases of group (B), (P=0.7).

Conclusion:
Inferior meatal flap is helpful approach to maxillary sinus hidden areas when added to standard MMA. It is best suited for complete removal of small hidden lesions (e.g. foreign bodies, fungal ball and odontogenic cysts) which could be hardly handled through MMA.
Keywords: Maxillary sinus; MMA; Inferior meatal flap.

Vitamin D level is inversely associated with Lund-Mackay score in AERD

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Aspirin-exacerbated respiratory disease (AERD) is a subtype of chronic rhinosinusitis with nasal polyps (CRSwNP) that presents many challenges in management. Low serum 25(OH) vitamin D3 (25VD3) is associated with CRSwNP incidence overall, while 25VD3 level is inversely correlated with disease severity among CRSwNP patients. However, in subtype analysis, no associations have been established between AERD and vitamin D. We examined vitamin D screening as a means of forecasting disease severity in AERD.

Methods:
A retrospective review of University of Pennsylvania Health System records was performed, identifying patients with AERD receiving aspirin desensitization following functional endoscopic sinus surgery. Of 198 records assessed, 54 patients had vitamin D levels measured before therapy. Pre-operative CT-scans were evaluated using Lund-Mackay Score (LMS), while SNOT-22 questionnaires measured subjective disease burden before surgery. Statistical analysis was performed using multiple-variable linear regression.

Results:
Mean serum 25VD3 in the cohort was 32.7 ± 14.1 ng/mL. Ten patients were vitamin D deficient (<20 ng/mL), while an additional 17 patients had vitamin D insufficiency (20-30 ng/mL). Serum 25VD3 was inversely correlated with LMS ($p=0.05$) in multiple-variable analysis. However, there was no correlation between 25VD3 level and SNOT-22 ($p=0.47$).

Conclusion:
Among patients with AERD, disease severity as measured by LMS correlates inversely with 25VD3. In addition, vitamin D deficiency or insufficiency was present in half of the cohort, suggesting a role for hypovitaminosis D in disease development. Assessing vitamin D level in patients diagnosed with AERD may aid in prognosis and management of this condition.

Woakes' syndrome: A case series

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Background:
Woakes' syndrome is a constellation of chronic rhinosinusitis with nasal polyposis leading to thinning and expansion of the ethmoid sinus and broadening of the nasal pyramid. Their sinus disease treatment, while extensive, is standard practice, however the management of their nasal deformities varies in the literature. We describe our experiences in Woakes' syndrome management, and advocate for simultaneous closed rhinoplasty in these patients.

Methods:
Four patients with Woakes' syndrome presented with notable nasal pyramid expansion resulting from severe chronic rhinosinusitis with nasal polyposis. All patients had eosinophilic disease, with three exhibiting aspirin-exacerbated respiratory disease. They underwent extensive functional endoscopic sinus surgery from May 2018 to September 2019, while three underwent simultaneous rhinoplasty. Their nasal bones were adequately rarefied, such that only external digital compression was required for reduction.

Results:
Post-operatively, all patients had excellent nasal airway symptom improvement, and the cosmetic results of rhinoplasty demonstrated normalization of strength, symmetry, profile, and contour of the nose with high patient satisfaction. One patient with low compliance for medical therapy has developed significant polyp recurrence, while the rest are being managed effectively with intranasal corticosteroids and ASA desensitization where tolerated.

Conclusion:
Based on our experiences, simultaneous rhinoplasty on the rarefied nasal bones of a Woakes' syndrome patient is not only easy to perform, but provides excellent cosmetic and functional results by allowing bone to remodel in the appropriate position, thus avoiding re-operation.

COSM 2020 POSTERS

YouTube as a surgical instructional tool for endoscopic transsphenoidal pituitary tumor removal

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Introduction:
YouTube is a popular educational audiovisual resource for surgical trainees. The purpose of this study was to evaluate YouTube videos as a surgical instructional tool for endoscopic transsphenoidal pituitary tumor removal.

Methods:
YouTube videos on endoscopic transsphenoidal pituitary tumor removal were searched for using a set of five keywords. The top 20 most viewed and relevant videos for each keyword were screened. Video characteristics, including upload date, duration, viewership, comments, likes, and dislikes, were recorded. Videos were evaluated based on conformity to an 18-item list of criteria, adapted from the 2018 LAP-VEGaS Practice Guidelines for reporting educational videos in laparoscopic surgery.

Results:
The search produced 94 eligible videos, with 43 unique, unduplicated videos for analysis, uploaded between 2009 and 2019. Mean video length was 7 minutes (SD=13) with a mean viewership of 16,017 (SD=29,415). The videos received a mean of 10 comments (SD=30) and more “likes” (mean 40; SD=54) than “dislikes” (mean 3; SD=4). The mean percent conformity to the 18-item list of criteria was 39% (SD=16). A majority of videos (69%) presented the surgery in a standardized step-by-step fashion. A minority of videos included presentation of the case (37%), patient or medical staff positioning (9%), or outcomes of the procedure (31%).

Conclusions:
There is substantial variation in the quality of uploaded surgical instructional videos on endoscopic transsphenoidal pituitary removal. Overall, there is a need to improve the educational value of uploaded surgical instructional videos, beginning with a consensus on a standardized set of guidelines, which should be tailored to each surgical discipline.

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