



ARS at COSM 2016

May 19-20, 2016

Hyatt Regency Chicago
Chicago, IL





Peter Hwang, MD

Presidential Welcome to the ARS at COSM 2016

On behalf of the leadership of the American Rhinologic Society, it is my great honor and pleasure to welcome you to the American Rhinologic Society meeting at COSM in Chicago. This year's program, developed by Program Chair John DelGaudio, MD and the Program Committee, captures the energy and excitement of our dynamically advancing field. From practical panels on clinical challenges facing us all, to the latest cutting-edge research presentations, this spring's scientific meeting offers new discoveries for all practitioners of rhinology. My thanks and congratulations to Dr. DelGaudio for his leadership in assembling a superb program.

I would also like to extend a warm welcome to non-members of the ARS who are attending our meeting. Thank you very much for engaging with the ARS community. We trust that your meeting experience will be fulfilling, and we encourage you to join the ARS as a regular member, international member, or resident member. Member benefits include a complimentary subscription to the International Forum of Allergy & Rhinology (featuring the recent landmark publication "International Consensus Statement on Allergy and Rhinology: Rhinosinusitis"); free access to online patient and physician educational materials, including educational surgical videos and webcasts of recent meetings; and free registration for our popular Summer Sinus Symposium in Chicago this July. Please see any representative at the ARS information desk for more details.

Finally, we wish to acknowledge the tremendous support of our many corporate partners, without whom this meeting would not be possible. Please join me in thanking our corporate partners by exploring the exhibits and visiting with them.

Welcome to the ARS at COSM—enjoy your time in Chicago!

Peter H. Hwang, MD
President
American Rhinologic Society

Welcome from the Program Chair



John DelGaudio, MD

As the President Elect of the American Rhinologic Society it is my pleasure to serve as the Program Chair for the 2016 meetings. This year the ARS at COSM will be held at the Hyatt Regency Chicago on May 19 and 20th. The program will provide one-and-a-half days of the highest quality educational content in Rhinology and Skull Base Surgery, including clinical and cutting edge research presentations.

I would like to thank the members of the program committee who volunteered their time to review and grade all of the submitted abstracts. This was a very difficult task, as over 150 submissions were received. The highest rated abstract submissions will be presented from the podium, and the poster session will highlight additional excellent clinical and basic science work.

The meeting will feature seven panels on topics that are applicable to everyone that performs nasal and sinus surgery. The panels are guaranteed to be educational and controversial. The scheduled panels are:

- "Ethical Issues in Rhinology"
- "Evidence For systemic and psychosocial symptoms in CRS"
- "How much surgery is appropriate in CRS?"
- "Demystifying CSF leak workup and repair"
- "My favorite new sinus technique and how it can be used in your practice"

Our invited guest speaker will be Alkis Togias, MD, Section Chief of Asthma and Inflammation of the National Institute of Allergy and Infectious Disease of the NIH. Dr. Togias will share his expertise, along with Rob Kern, MD and Wytke Fokkens, MD (Amsterdam) on the panel "Rhinitis, Sinusitis, and the Unified Airway", a topic that crosses disciplines within and outside of Otolaryngology. Dr. Togias will also be featured on a panel with NIH funded ARS researchers whose work has translated into clinical practice. He will provide his insight into the funding process and how ARS members can be more successful in the increasingly difficult arena of federal grant funding.

I am excited and confident that this program will provide excellent practical and scientific content for Otolaryngologists and Rhinologists regardless of the stage of your career. If you are not a member of the ARS I invite you to join and take part in the best educational content available in Rhinology.

Thank you for the privilege of serving the members of the American Rhinologic Society as the Program Chair for the ARS at COSM meeting, and I look forward to seeing you in the great city of Chicago.

SAVE THE DATES:

Summer Sinus Symposium of the ARS,
July 14-16, 2016 at the Westin Michigan Avenue, Chicago

American Rhinologic Society fall meeting at AAO,
Sept. 16-17, 2016 at Manchester Grand Hyatt, San Diego, CA.
The 12th annual Kennedy Lecturer - Ricardo Carrau, MD
"Endoscopic Skull Base Surgery: State of the Art & Future Directions"

John M. DelGaudio, MD, FARS
ARS President Elect & Program Chair

How to obtain your CME certificate:

1. Go to ARS.
CmeCertificateOnline.com
2. Click on the "ARS at COSM 2016" link
3. 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

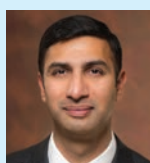
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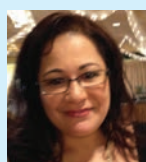
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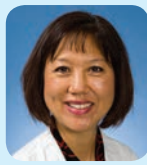


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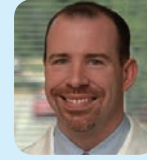
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ARS Mission Statement

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

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

Credit Designation Statement

ARS designates this live activity for a maximum of 10.50 *AMA PRA Category 1 Credits™*. Physicians should claim only the credit commensurate with the extent of their participation in the activity.

Learning Objectives from Practice Gaps

At the conclusion of this meeting participants will be able to:

1. Discuss the medical management of chronic rhinosinusitis (CRS) and appreciate advances in related basic science and translational research.
2. Gain an understanding of the advances in operative and in-office based procedures used in the management of conditions affecting the nose, sinuses and skull base.
3. Discuss the applications of new technologies in the treatment of sinus patients and demonstrate competence in their safe and effective use.

ARS Friends in Research*

Platinum

John Del Gaudio, MD
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William Povah, MD
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Clifford Timothy Chu, MD
Alen N. Cohen, MD
Firas Farhat, MD
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Nedra Joyner, MD
William D. Leight, MD
Sheng-Dean Luo, MD
Jeffrey Manlove, MD
Paul Russell, III, MD
David Sherris, MD

**January 1 - April 18, 2016*

Podium/Oral Presentations *At-A-Glance*

Thursday, May 19, 2016

7:55 am

Welcome

ARS President and President-Elect
Peter Hwang MD &
John DeGaudio MD

**Moderators: Mark Zacharek MD,
Michael Platt MD**

8:00 am

Endoscopic sinus surgery improves
cognitive dysfunction in patients with
chronic rhinosinusitis
Jeremiah Alt, MD, PhD

8:07 am

Improvements of psychological
dysfunction after endoscopic sinus
surgery in patients with chronic
rhinosinusitis
Joshua Levy, MD, MPH

8:14 am

The impact of pain upon neurocognitive
and overall health parameters in
chronic rhinosinusitis
Preeti Kohli, BA

8:21 am

Increased mortality risk linked to
chronic rhinosinusitis
Andrew Thomas, MD

8:28 am

Discussion and award presentation

8:35 am

**Presidential Address
Peter Hwang MD**

**Moderators: Amber Luong MD,
Justin Turner MD**

8:45 am

Nitric oxide production is stimulated by
multiple bitter taste receptors which are
ubiquitously expressed in the sinonasal
cavity
Carol Yan, MD

8:52 am

Type 2 inflammation in chronic
rhinosinusitis with nasal polyps:
Possible role for inhibition of the non-
gastric H⁺/K⁺-ATPase (atp12a)
Jin-Young Min, MD, PhD

8:59 am

Reversal of cigarette smoke extract
induced sinonasal epithelial barrier
dysfunction through Nrf2 activation
Ashleigh Halderman, MD

9:06 am

Increased rhinovirus replication and
type III interferon induction in
differentiated sinonasal epithelial cells
of chronic rhinosinusitis with nasal
polyps patients
Syed Muaz Khalil, PhD

9:13 am

Discussion

9:20 am

**Panel: Rhinitis, Sinusitis, and the
Unified Airway
Moderator: Robert Kern MD
Panelists: Alkis Togias MD,
Wytse Fokkens MD**

10:00 am

Break

**Moderators: Nithin Adappa MD,
Esther Kim MD**

10:20am

Secreted P-glycoprotein is a biomarker
of chronic rhinosinusitis
Angela Nocera, MS

10:27 am

A rapid and cost effective method to
diagnose specific antibody deficiency in
patients with chronic rhinosinusitis
Ashley Kwon, BS

10:34 am

Lack of correlation between patient
reported location and severity of facial
pain and radiographic burden of
disease in chronic rhinosinusitis
Andrew Thomas, MD

10:41

Middle turbinate oedema as a
diagnostic marker of inhalant allergy
Aneeza Hamizan, MD, MS (ORL-HNS)

10:48 am

Discussion

**Moderators: Spencer Payne MD,
Stacey Gray MD**

10:53 am

Balloon dilation of sinus ostia in the
department of defense: Diagnoses,
actual indications, and outcomes
Adrienne Laury, MD

11:00 am

Prospective, multicenter evaluation of
balloon sinus dilation for treatment of
pediatric chronic rhinosinusitis
Zachary Soler, MD, MS

11:07 am

Practice patterns in pediatric chronic
rhinosinusitis: A survey of the American
Rhinology Society
Daniel Beswick, MD

11:14 am

Discussion

11:20 am

**Panel: Ethical issues in rhinology
Moderator: Eric Holbrook MD
Panelists: Doug Reh MD, James
Hadley MD, Robert Miller MD**

12:00 pm

Lunch

**Moderators: Erin O'Brien MD,
Jeremiah Alt MD**

1:00 pm

Longitudinal improvement and stability
of olfaction in the evaluation of surgical
management for chronic rhinosinusitis
Joshua Levy, MD, MPH

1:07 pm

Cost-effective method of olfactory
training in clinical practice: Essential
oils at uncontrolled concentration
Zara Patel, MD

1:14 pm

Nitrogen dioxide pollution exposure
affects olfactory function in older US
adults
Dara Adams, BA

1:21 pm

Role of the type I tumor necrosis factor
receptor in inflammation-associated
olfactory dysfunction and regeneration
Andrew Lane, MD

1:28 pm

Discussion

**Moderators: Elina Toskala MD,
David Poetker MD**

1:33 pm

The endoscopically directed sinus potential difference assay detects acquired Cfr dysfunction in chronic rhinosinusitis.

Do-Yeon Cho, MD

1:40 pm

Prevalence of single nucleotide polymorphisms associated with cystic fibrosis severity in a population of chronic rhinosinusitis patients

Benjamin Hull, MD

1:47 pm

Expression of dermcidin in human sinonasal secretions

Elizabeth Cottrill, MD

1:54

Discussion

2:00 pm

Panel: Rhinologic research that impacts clinical care

Moderator: Timothy Smith MD

**Panelists: Alkis Togias MD,
Vijay Ramakrishnan MD,
Zachary Soler MD**

**Moderators: Adam DeConde MD,
Anne Getz MD**

2:40 pm

Unraveling the complexity of chronic rhinosinusitis: Microbial community insights into the phenotypic heterogeneity of CRS

Michael Hoggard, Mr

2:47 pm

The effect of endoscopic sinus surgery on the bacterial communities

Ravi Jain, MD

2:54 pm

A randomized trial of povidone-iodine and mupirocin versus saline sinus irrigations for surgically recalcitrant gram-positive chronic rhinosinusitis

Victoria Lee, MD

3:01 pm

Discussion

3:06 pm

Break**Moderators: Subinoy Das MD,
Jose Gurrola MD**

3:26 pm

Smell preservation after endoscopic unilateral resection of esthesioneuroblastoma: A multi-institutional experience

Bobby Tajudeen, MD

3:33 pm

Endoscopic resection of sinonasal mucosal melanoma has comparable outcomes to open approaches

Amar Miglani, MD

3:40 pm

Surveillance in sinonasal malignancy: How often should patients receive postoperative endoscopy and imaging?

Douglas Worrall, MD

Presented by Sammy Khalili, MD

3:47 pm

Unintended consequences of proton beam radiation for sinonasal malignancies

Rachel Arffa, MD

3:54 pm

Discussion

**Moderators: Charles Ebert MD,
Henry Barham MD**

3:59 pm

The impact of endoscopic sinus surgery on paranasal physiology in simulated sinus cavities

Ravi Jain, MD

4:06 pm

Prevalence of polyp recurrence after endoscopic sinus surgery for chronic rhinosinusitis with nasal polyposis

Adam DeConde, MD

4:13 pm

Efficacy of a novel self-propelling hemostatic agent in head and neck bleeding using a sheep in vivo model

Amin Javer, MD (Presented by Andres Finkelstein-Kulka, MD)

4:20 pm

Assessment of a lateral nasal wall block technique for endoscopic sinus surgery under local anaesthesia

Grace Scott, MD (Presented by Damien Micomonaco, MD)

4:27 pm

Discussion

4:35 pm

Panel: Evidence for systemic and psychosocial symptoms in CRS

Moderator: Zach Soler MD

**Panelists: Rodney Schlosser MD,
Jeremiah Alt MD,
Adam DeConde MD**

5:15 pm

Closing remarks, Business meeting, and Adjourn

Friday, May 20, 2016

12:55 am

Welcome

ARS President and President-Elect Peter Hwang MD & John DeGaudio MD

1:00 pm

Panel: Demystifying CSF leak diagnosis and repair

Moderator: Sarah Wise MD

**Panelists: Jim Palmer MD,
Stacey Gray MD, Eric Wang MD,
Vijay Ramakrishnan MD**

**Moderators: Justin Antisdell MD,
Leigh Sowerby MD**

1:40 pm

Successful repair of intraoperative Csf leaks improves outcomes in endoscopic skull base surgery

Arash Shahangian, MD, PhD

1:47 pm

Lumbar drain use after endoscopic cerebrospinal fluid leak repair: an evidence based review

Sonya Marcus, MD

Presented by Omar H. Ahmed, MD

1:54 pm

Treatment modalities in sinonasal undifferentiated carcinoma: An analysis from the national cancer database

Mohammed Khan, MD

2:01 pm

Patterns of vascularization and surgical morbidity in juvenile nasopharyngeal angiofibroma: A systematic review and meta-analysis

Jonathan Overdeest, MD, PhD

2:08 pm

Discussion

2:15 pm

Panel: How much surgery is appropriate**Moderator: Zara Patel MD****Panelists: Peter Hwang MD, Richard Harvey MD, Marc Dubin MD****Moderators: Greg Davis MD, Christopher Church MD**

2:50 pm

Immunoglobulin replacement therapy reduces chronic rhinosinusitis in patients with antibody deficiency
Jarrett Walsh, MD, PhD

2:57 pm

Characteristics associated with macrolide therapy response
Gretchen Oakley, MD

3:04 pm

Improved delivery of sinus irrigations after middle turbinate resection during functional endoscopic sinus surgery
Sarah Kidwai, MD

3:11 pm

The relationship of healthcare-acquired pneumonia to sinus opacification in the intensive care unit patient
Phillip Huyett, MD

3:18 pm

Discussion

3:23 pm

Break**Moderators: Luke Rudmik MD, Pablo Stolovitsky MD**

3:45 pm

The pain-depression dyad and the association with sleep dysfunction in chronic rhinosinusitis
Daniel Cox, MD

3:52 pm

Quality of life improvement in patients after endoscopic sinus surgery is dependent on obstructive sleep apnea severity
Carol Yan, MD

3:59 pm

Sleep quality in CRS patients improves with surgery but not medical therapy
Jeremiah Alt, MD, PhD

4:06 pm

The effectiveness of nasal surgery on psychological symptoms in patients with obstructive sleep apnea and nasal obstruction
Yang Xiao, MD

4:13 pm

Discussion

Moderators: Stella Lee MD, Phillip Chen MD

4:18 pm

Health utility scores for patients with recurrent acute rhinosinusitis undergoing endoscopic sinus surgery – A nested case control study
Raj Dedhia, MD

4:25 pm

Evaluating metrics of responsiveness using patient-reported outcome measures in chronic rhinosinusitis
Alcina Lidder, BA

4:32 pm

The Ens6q: A validated 6-item questionnaire as a diagnostic aid for empty nose syndrome
Nathalia Velasquez, MD

4:39 pm

Oral corticosteroid prescribing habits for rhinosinusitis: The ARS membership
John Scott, MD

4:46 pm

Discussion

4:50 pm

Panel: My favorite new sinus technique and how it can be used in your practice**Moderator: Benjamin Bleier MD****Panelists: Brad Woodworth MD, Ray Sacks MD, Jayakar Nayak MD**

5:30 pm

Closing Remarks and Adjourn

Posters-At-A-Glance

Poster# D001

3d reconstruction and printing of skull base anatomy for surgical planning of endoscopic endonasal odontoidectomy. [case Report Of Basilar Invagination With Type 1 Chiari Malformation]
Neeraja Konuthula, BS
New York, NY

Poster# D002

A comparison of the effect of intravenous paracetamol and tenoxicam on postoperative pain following septoplastyAdem Çakmak, MD
Istanbul, Turkey

Poster# D003

A novel technique to promote mucosal graft viability after endoscopic modified lothrop procedureMarissa P. Lafer, MD
New York, NY

Poster# D004

A rare case of middle turbinate nasal schwannomaAnupriya, Gangal, BS
Chicago, IL

Poster# D005

A unique presentation of sinus histiocytosis with massive lymphadenopathyCarolyn A. Coughlan, MD
Orange, CA

Poster# D006

Angioleiomyoma of the nasal septum: Case report and literature reviewVarun V. Varadarajan, MD
Gainesville, FL

Poster# D007

Are industry ties associated with greater scholarly impact among rhinologists?Peter Svider, MD
Detroit, MI

Poster# D008

Assessment Of Compliance Of The Mucosa In Nasal PolyypsLuciano L. Gregorio, MD
São Paulo SP Brazil

Poster # D009

Assessment of sterol o-acyl transferase 1, a key enzyme for cholesteryl ester biosynthesis, and lipid accumulation on sinus tissue of patients with and without chronic rhinosinusitis

Jivianne T. Lee, MD
Irvine, CA

Poster# D010

Bilateral double accessory maxillary sinus ostia

Andrew J. Lerrick, MD
Hoffman Estates, IL

Poster# D011

Can pulmonary function tests measure nasal obstruction and predict the presence of sleep apnea?

Judd H. Fastenberg, MD
Bronx, NY

Poster# D012

Can the cdc's get smart program and use of a decision-tree tool alter clinician guideline adherence for avrs and abrs?

Tracy R. Wilson, DNP, MSN, FNP-BC
Nashville, TN

Poster# D013

Chronic rhinosinusitis at an urban tertiary medical center: Demographics, socioeconomic factors, clinical presentation and surgical outcomes

Christina H. Fang, MD
Bronx, NY

Poster# D014

Chronic rhinosinusitis is associated with hyperpneumatized paranasal sinuses compared to unaffected controls

Michael J. Marino, MD
New Orleans, LA

Poster# D015

Chronic rhinosinusitis patients with gastroesophageal reflux disease have a significantly higher prevalence of atopy and asthma

Mahboobeh Mahdavinia, MD, PhD.
Chicago, IL

Poster# D016

Chronic rhinosinusitis symptoms in crs patients with atopy relates to vitamin D3 levels but does not affect surgical outcome

Erin K. O'Brien, MD
Rochester, MN

Poster# D017

Clinician assessment of paranasal sinus pneumatization is correlated with total sinus volume

Michael J. Marino, MD
New Orleans, LA

Poster# D018

Common medications and negative histamine response in skin prick testing

Nicholas R. Rowan, MD
Pittsburgh, PA

Poster#

Comparative feature analysis of cone-beam computed tomography for the paranasal sinuses and temporal bone: A prospective imaging study

Yanjun J. Xie, BA
Baltimore, MD

Poster# D019

Comparison of inflammatory changes in ethmoid mucosa and nasal turbinate tissue: A histopathological study

Devyani Lal, MD
Phoenix, AZ

Poster# D020

Comparison of nasal airflow simulations in healthy nasal cavity models built from cone beam vs. conventional computed tomography

Azadeh A.T. Borojeni, PhD
Milwaukee, WI

Poster# D021

Concha bullosa mucocele: a rare entity in the radiologic differential diagnosis of nasal mass

Sarah Khalife, Medical Student
Montreal, Quebec, Canada

Poster# D022

Ct scan in pediatric crs: How often is it being used?

Benjamin Addicks, MD
Morgantown, WV

Poster# D023

Development, implementation and validation of an epistaxis simulation model for undergraduate teaching purposes

Claudia Gonzalez, MD
Santiago, Region Metropolitana

Poster# D024

Distinguishing computed tomography findings in patients with empty nose syndrome

Andrew Thamboo, MD, MHSc
Stanford, CA

Poster# D025

Effect of low salicylate diet on clinical and biochemical markers of aspirin exacerbated respiratory disease

Krupal B. Patel, MD
London, ON, Canada

Poster# D026

Effect of nasal endoscopy on operative time for pediatric Crawford tube placement

Mitch Dobberpuhl, MD
Lexington, KY

Poster# D027

Electron microscopy of nasal and tracheobronchial biopsies in the diagnosis of primary ciliary dyskinesia: A systematic review and meta-analysis

Alexandria L. Irace, BA
Boston, MA

Poster# D028

Elimination of pain improves specificity of clinical diagnostic criteria for chronic rhinosinusitis

Scott D. Hirsch, BS
Richmond, VA

Poster# D029

Endoscopic endonasal landmarks to the palatine artery: A radiographic study

Raewyn Campbell, MD
Campberdown NSW Australia

Poster# D030

Endoscopic sinus surgery for paranasal sinus mucoceles with ophthalmologic complications: a meta-analysis of visual outcomes

Leonid Zukin, BS
Aurora, CO

Poster# D031

Endoscopic transnasal, transnasopharyngeal removal of retropharyngeal foreign body (bullet)

David J. Phillips, MD
New York, NY

Poster# D032

Estimates of nasal airflow at the nasal cycle mid-point improve the correlation between objective and subjective measures of nasal patency

Courtney L. Gaberino, Medical Student
Milwaukee, WI

Poster# D033

Evolving role of lumbar drains in contemporary endonasal skull base surgery: meta-analysis and systematic review

Brian D'Anza, MD
Cleveland, OH

Poster# D034

Expanding the limits of endoscopic intraorbital tumor resection using 3-dimensional reconstructionLuciano L. Gregorio, MD
São Paulo, Brazil

Poster# D035

Frontal sinus fibrous dysplasia: A case report and review of the literatureGhassan Alokby, MD
Miami, FL

Poster# D036

Functional nasal surgery utilizing normal anatomic parametersAndrew J. Lerrick, MD
Elk Grove Village, IL

Poster# D037

Gamma scintigraphy to assess delivery of nasal sprays in ct-derived human nasal replicasLandon T. Holbrook, PhD
Chapel Hill, NC

Poster# D038

Genetic loss of arno reduces sinonasal inflammatory cytokine expressionNyall R. London, MD, PhD
Baltimore, MD

Poster# D039

Gustatory signaling in cultured cellsAdam J. Kimple, MD, PhD
Chapel Hill, NC

Poster# D040

Immunohistochemical analysis of human olfactory neuroblastomaYaw Tachie-Baffour, BS
Boston, MA

Poster# D041

Impact of endoscopic dacryocystorhinostomy on sinonasal quality of lifeMarcel M. Miyake, MD
Boston, MA

Poster# D042

Infratemporal fossa meningocele: A case seriesGhassan Alokby, MD
Miami, FL

Poster# D043

Intracranial abscess formation following nasoseptal flap skull base reconstruction: a cautionary taleGeorge S. Tarasidis, MD
Salt Lake City, UT

Poster# D044

Intranasal volume increases with age: CT volumetric analysis in adultsPatricia A. Loftus, MD
Atlanta, GA

Poster# D045

Intra-optic nerve abscess: A rare complication of acute sinusitisAkshay Sanan, MD
Philadelphia, PA

Poster# D046

Investigating the effects of nasal morphology and airflow on chronic rhinosinusitis induced olfactory dysfunctionDavid J. Carpenter, BA
Durham, NC

Poster# D047

Lateral reinforcement to control turbinate bleeding using bioresorbable dressingsAndrew J. Lerrick, MD
Elk Grove Village, IL

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Local invasion of recurrent odontogenic keratocyst (okc) into the maxillary sinus: A collaborative approach between oral surgery and otolaryngologyRyan D. Tabtabai, BS
Farmington, CT

Poster# D049

Low grade papillary schneiderian carcinoma with hepatic metastasis in the setting of nonhereditary isolated polycystic liver disease: A case reportRachel E. Arffa, MD
St. Petersburg, FL

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Management of sinonasal hemangiopericytomas: algorithm and systematic review of the literatureBrittany Barber, MD
Edmonton, Alberta, Canada

Poster# D051

Medial reinforcement to control septal bleeding using bioresorbable dressingsAndrew J. Lerrick, MD
Elk Grove Village, IL

Poster# D052

Meningitis and ent pathology: 4 years of experienceStefano Millarelli, MD
Rome, RM, Italy

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Middle turbinate resection for chronic rhinosinusitis with and without nasal polypsChristopher D. Brook, MD
Boston, MA

Poster# D054

Minimal clinically important difference and correlations with subjective measures in rhinomanometryJenna M. Christensen, PhD
Darlinghurst, NSW, Australia

Poster# D055

Multifocal attachment as an independent risk factor for inverted papilloma of the frontal sinusCarol H. Yan, MD
Philadelphia, PA

Poster# D056

Multifocal inverting papilloma of the sinonasal cavity and temporal boneChristopher H. Le, MD
Tucson, AZ

Poster# D057

Nasal mucosa temperature in healthy individuals and its correlation to subjective nasal patencyRyan S. Bailey, MS
Milwaukee, WI

Poster# D058

Nasocutaneous fistulas after craniofacial resection with orbital exenterationKurren S. Gill, BA
Philadelphia, PA

Poster# D059

Near complete response of skull base inverted papilloma to chemotherapyEdward C. Kuan, MD
Los Angeles, CA

Poster# D060

Neurologic sequelae associated with delayed identification of iatrogenic skull base injury during functional endoscopic sinus surgery (fess)Mark W. Kubik, MD
Pittsburgh, PA

Poster# D061

Obstructive sleep apnea is not associated with cranial base changes based on computed tomography analysisHassan B. Nasser, MD
Los Angeles, CA

Poster# D062

Olfactory neuroblastoma with carcinomatous differentiation: An unusual histologic finding in a rare tumorRodolfo E. Manosalva, MD
Portsmouth, VA

Poster# D063

Outcomes and predictors of mortality in invasive fungal sinusitis: A 10-year retrospective review of invasive fungal sinusitis at a major medical centerHelen Moses, MD
Durham, NC

Poster# D064

Over-pursuit of femininity: Frontocutaneous fistula formation following forehead recontouring surgery in a transgender patientKent Lam, MD
Houston, TX

Poster# D065

Pilot study of intraoperative real-time eye-tracking to assess surgical proficiency in endoscopic sinus surgerySumi Sinha, BS
Boston, MA

Poster# D066

Prevalence of allergic sensitization in patients with rhinitis symptomsHyung Chae Yang, MD
Dong-gu, Gwangju

Poster# D067

Reduction of bilateral anterior frontal sinus fractures using a balloon sinuplasty catheter: A case reportAndrew H. Petersen, DO
Columbus, OH

Poster# D068

Revisiting autologous fat grafts for the reconstruction of skull base defects during the endoscopic eraKent Lam, MD
Houston, TX

Poster# D069

Risk factors associated with olfactory disorders in adults: A U.S. population based analysisZara M. Patel, MD
Stanford, CA

Poster# D070

Risk factors for malignant transformation of sinonasal inverted papillomaJennifer E. Douglas, BA
Philadelphia, PA

Poster# D071

Safe and effective treatment of ethmoid sinusitis utilizing minimally invasive ethmoid punch (ep) sinusotomy in chronic rhinosinusitis without polyposis (crssnp) patientsNathalia Velasquez, MD
Stanford, CA

Poster# D072

Safety and adverse effects of intranasal corticosteroid use: A systematic reviewDaniel Kim, MS
Phoenix, AZ

Poster# D073

Second opinion rhinologic patients: does the amount of surgery approximate the degree of mucosal disease?Patricia A. Loftus, MD
Atlanta, GA

Poster# D074

Simple versus complex sellar repair: Comparison of outcomesTalha Qureshi, MS
Chicago, IL

Poster# D075

Sinonasal Ewing's sarcomaJonathan K. Lin, MD, MBA
Oakland, CA

Poster# D076

Sino-nasal extramedullary plasmacytoma: Case review of a rare otolaryngologic entityNivedita Sahu, MD
Pittsburgh, PA

Poster# D077

Sinonasal metallic foreign body penetration of the anterior cranial fossaMadeleine B. Samuelson, MD, MPH
Nashville, TN

Poster# D078

Sinonasal mucosal healing typically lags SNOT-22 scores after minimally invasive pituitary surgeryShiven Chaudhry, MD, III
Chicago, IL

Poster# D079

Surgical experience does not affect predictors of patency after transnasal endoscopic dacryocystorhinostomy with ultrasonic bone aspiratorDavid Hsu, MD
Philadelphia, PA

Poster# D080

Surgical management of esthesioneuroblastoma: quality metrics and long-term outcomes of endoscopic and open approachesSamuel J. Trosman, MD
Cleveland, OH

Poster# D081

Surgically relevant endoscopic landmarks of the olfactory systemAndrew Thamboo, MD, MHSc
Stanford, CA

Poster# D082

Survival outcomes after anterior skull base invasion due to cutaneous malignanciesRichard B. Cannon, MD
Salt Lake City, UT

Poster# D083

Systematic review of outcomes of endoscopic optic nerve decompression in patients with idiopathic intracranial hypertensionLuisam Tarrats, MD-JD
San Juan, PR

Poster# D084

Taste disability and quality of life in chronic rhinosinusitisPhillip Lee, MD
Salt Lake City, UT

Poster# D085

The correlation between preoperative endoscopic, radiological and operative findings of np (nasal polyps)Mahmoud Atef Youssef, Msch
Giza, Giza

Poster# D086

The effect of allergy and asthma on cell populations in chronic rhinosinusitisGriffin Santarelli, MD
Norfolk, VA

Poster# D087

The effect of ESS on bronchiectasis patients with CRSJesada Kanjanaumporn, MD
Bangkok, Thailand

Poster# D088

The Honrubia technique™ of balloon sinuplasty for the improvement of symptoms in chronic sinusitisVincent Honrubia, MD
Edinburg, TX

Poster# D089

The unified airway: Does asthma impact paranasal sinus pneumatization?

Jacqueline E. Weinstein, MD
New Orleans, LA

Poster# D090

Training in endoscopic sinus surgery, experience in a biological model

Julio Lara, MD
Santiago, Providencia

Poster# D091

Training individuals to use an open-source platform for 3d volumetric scoring of sinonasal disease

Pradeep Koripella, BS
Tucson, AZ

Poster# D092

Transorbital management of paranasal sinus mucocoeles

Angelique M. Berens, MD
Seattle, WA

Poster# D093

Unplanned readmissions in pituitary surgery

Andrey Filimonov, PharmD
Newark, NJ

Poster# D094

Utility of imaging in the diagnosis and surgical management of aifs

Suhael Momin, MD
Cleveland, OH

Poster# D095

Viability of lactobacillus probiotic in normal saline for sinus irrigation

Stephen R. Bakos, MD, PhD
Charlottesville, VA

Oral Presentations

Thursday, May 19, 2016

7:55 am

Welcome

ARS President and President-Elect
Peter Hwang MD & John DelGaudio MD

Moderators: Mark Zacharek MD, Michael Platt MD

8:00 am

Endoscopic sinus surgery improves cognitive dysfunction in patients with chronic rhinosinusitis

Jeremiah Alt, MD, PhD
Jess C. Mace, MPH
Timothy L. Smith, MD, MPH
Zachary M. Soler, MD, MSc
Salt Lake City, UT
USA

Introduction:

Patients with chronic rhinosinusitis (CRS) have been found to have cognitive deficits as assessed using the Cognitive Failures Questionnaire (CFQ), however the exact etiology of cognitive decline is unknown. This study aimed to determine if improvement in concomitant inflammation and disease burden in CRS, using endoscopic sinus surgery (ESS), improves cognitive dysfunction and to identify comorbid conditions that effect improvement likelihood.

Methods:

Study participants (n=247) with and without nasal polyposis (CRSwNP, CRSsNP) were prospectively enrolled in a multi-institutional, observational, outcomes study. Preoperative and postoperative cognitive dysfunction was evaluated using the CFQ instrument. Quality-of-life (QOL) and disease burden was also evaluated using the Rhinosinusitis Disability Index (RSDI), 22-item SinoNasal Outcome Test (SNOT-22), nasal endoscopy, computed tomography, and the Patient Health Questionnaire (PHQ-2).

Results:

Average CFQ total scores significantly improved ($p=0.012$) after ESS for patients with follow-up (n=141). Participants with CRSwNP (n=51) reported significant postoperative improvements in mean CFQ total scores ($p=0.002$) and CFQ distractibility and blunders domain scores ($p<=0.006$). No significant postoperative improvement for any average CFQ score was found in CRSsNP ($p>=0.086$). The magnitude of postoperative improvement in CFQ total and domain mean scores was statistically similar between CRSsNP and CRSwNP ($p>=0.115$). Depressive disorders, identified using PHQ-2 screening results, was the only comorbid condition significantly associated with cognitive dysfunction ($p<0.001$).

Conclusions:

Patients with CRS have measurable cognitive decline and ESS modestly improves cognitive dysfunction scores. Future investigations are needed to further elucidate the underlying mechanisms responsible for cognitive dysfunction in patients with CRS and the associations with depression.

8:07 am

Improvements of psychological dysfunction after endoscopic sinus surgery in patients with chronic rhinosinusitis

Joshua Levy, MD, MPH
Jess C. Mace, MPH
Adam S. DeConde, MD
Toby O. Steele, MD
Timothy L. Smith, MD, MPH
Portland, OR
USA

Introduction:

Psychological dysfunction is highly prevalent among patients with chronic rhinosinusitis (CRS). Previous study has identified various measures of anxiety and depression as predictors of quality-of-life outcomes following endoscopic sinus surgery (ESS). Psychological dysfunction scores, as measured by the 22-item SinoNasal Outcome Test (SNOT-22), have been found to influence treatment decision making in CRS. This study aims to further elucidate improvement in discrete psychological related symptoms following ESS for CRS.

Methods:

Adult patients with medically recalcitrant CRS electing to undergo ESS were prospectively enrolled into a multi-institutional, observational cohort. Psychological-related symptom severity and postoperative outcomes were assessed using psychological domain items of the SNOT-22, including subgroup analysis of patients with and without comorbid depression.

Results:

A total of 374 participants met inclusion criteria and were followed postoperatively for an average of 14.6[SD=5.0] months. Total mean psychological domain scores improved from 15.9[8.2] to 8.5[8.4] ($p<0.001$). Significant relative mean improvements were reported in "waking up tired" (23%; $p<0.001$), "fatigue" (25%; $p<0.001$), "reduced productivity" (28%; $p<0.001$), "reduced concentration" (27%; $p<0.001$), "frustrated/restless/irritable" (27%; $p<0.001$), "sad" (15%; $p<0.001$), and "embarrassed" (8%; $p<0.001$) scores. A total of 64-66% of participants reported improvement in "reduced productivity", "waking up tired", "fatigue" and "frustrated/restless/irritable", compared to 46% and 38% reporting improvement in "sad" and "embarrassed", respectively.

Conclusions:

Patients with CRS report significant improvement in common mental health related symptoms following ESS. Despite these improvements, some degree of persistent postoperative psychological dysfunction was reported. Further study is necessary to determine which factors are associated with persistent psychological dysfunction after ESS in order to optimize treatment outcomes.

8:14 am**The impact of pain upon neurocognitive and overall health parameters in chronic rhinosinusitis**

Preeti Kohli, BA
 Zachary M. Soler, MD, MSc
 Kristina Storck, MSPH
 Rodney J. Schlosser, MD
 Charleston, SC
 USA

Introduction:

Pain is a cardinal symptom of chronic rhinosinusitis (CRS) and is associated with cognitive impairment in several chronic diseases. However, the impact of pain upon cognition and related disease parameters in CRS is unknown.

Methods:

Patients with CRS and controls were enrolled from the same clinical population. Facial and ear pain were assessed using a 5-point Likert scale from 0 = No problem to 5 = Problem is as bad as it can be. Subjective and objective cognitive function was assessed using the Cognitive Failures Questionnaire (CFQ) and Simple Reaction Time (SRT), respectively. Overall health metrics assessed included the Pittsburgh Sleep Quality Index (PSQI), Fatigue Severity Scale (FSS), missed productivity, and medication usage.

Results:

The study population consisted of 50 CRS patients and 50 controls. CRS patients had significantly more facial and ear pain than controls after controlling for asthma, allergy, and fibromyalgia. Patients without polyps had significantly higher facial pain. Facial pain correlated to CFQ ($R_s = 0.295$, $p = 0.042$). Ear pain correlated to CFQ ($R_s = 0.293$, $p = 0.043$) and SRT ($R_s = -0.347$, $p = 0.016$). For global metrics, facial and ear pain correlated to FSS ($R_s = 0.363$, $p = 0.011$ and $R_s = 0.452$, $p = 0.001$, respectively) and PSQI ($R_s = 0.427$, $p = 0.002$ and $R_s = 0.353$, $p = 0.014$, respectively). Only ear pain was associated with impaired productivity ($R_s = 0.351$, $p = 0.016$) and greater antibiotic usage ($R_s = 0.448$, $p = 0.001$).

Conclusion:

CRS patients have more severe facial and ear pain than non-CRS controls. Both facial and ear pain are associated with worse measures of neurocognitive dysfunction and poorer global health.

8:21 am**Altered mortality risk linked to chronic rhinosinusitis**

Andrew Thomas, MD
 Karen Curtin, PhD
 Jathine Wong, BSc
 Richard Orlandi, MD
 Jeremiah A. Alt, MD, PhD
 Salt Lake City, UT
 USA

Background:

Chronic rhinosinusitis (CRS) is a highly prevalent inflammatory condition, with significant effects on morbidity and quality of life. Given other chronic inflammatory conditions have been associated with increased mortality risk, we sought to evaluate the relationship between mortality and CRS including the influence of asthma. Our objective was to determine if CRS, with or without asthma, is associated with altered risk of mortality.

Methods:

The study design was a retrospective cohort study. Using a statewide population database, we identified 27,005 adult patients diagnosed with CRS between 1996 and 2012, as well as 134,440 unaffected controls matched 5:1 on birth year and sex. Risk of mortality was determined from Cox models and Kaplan-Meier curves were used to compare survival. We included sex, diagnosis age, and asthma status as covariates.

Results:

CRS patients had a decreased mortality risk (HR=0.80, 95%CI 0.74-0.85) compared to controls. However, in patients diagnosed at or before median age of CRS onset (42y), survival was not improved (HR=0.98, 95%CI 0.81-1.18). Asthma, when present, increased mortality in CRS-negative controls; however in cases, CRS appeared to confer a protective effect (P-interaction<0.0001). Risk of mortality was greater in CRSwNP (n=1643) compared to 25,362 CRSsNP patients (HR=1.38, 95%CI 1.09-1.77).

Conclusions:

CRS was associated with lower risk of mortality compared to controls, and appeared to mitigate increased mortality from asthma. We posit that better survival conferred by CRS may be secondary to treatment. However, the etiology of this relationship and the effect of CRS treatment on mortality are unknown.

8:28 am

Discussion and awards presentation

8:35 am**Presidential Address
Peter Hwang MD**

Moderators: Amber Luong MD, Justin Turner MD

8:45 am**Nitric oxide production is stimulated by multiple bitter taste receptors which are ubiquitously expressed in the sinonasal cavity**

Carol Yan, MD
 Robert J. Lee, PhD
 Samuel Hahn, MD
 Nithin D. Adappa, MD
 James N. Palmer, MD
 Noam A. Cohen, MD, PHD
 Philadelphia, PA
 USA

Introduction:

Bitter taste receptors (T2Rs) play a critical role in sinonasal innate defense. One T2R, T2R38, regulates mucosal defense against gram-negative organisms through nitric oxide (NO) production, which enhances mucociliary clearance and directly kills bacteria. To determine whether additional T2Rs contribute to this innate defense, we evaluated other sinonasal T2Rs for regulation of NO production and expression within the human sinonasal cavity.

Methods:

Primary human sinonasal cultures were stimulated with ligands specific to T2R4 and T2R16 (colchicine and D-salicin, respectively). Cellular NO production was measured by intracellular DAF-FM (4-Amino-5-Methylamino-2',7'-Difluorofluorescein Diacetate) fluorescence. For T2R expression mapping, sinonasal tissue was obtained from patients undergoing sinus surgery from the middle turbinate,

maxillary sinus, ethmoid sinus, or sphenoid sinus. The expression of T2R4, T2R16, and T2R38 was evaluated by immunofluorescence using validated antibodies.

Results:

Similar to T2R38, T2R4 and T2R16 trigger NO production in a dose dependent manner in response to stimulation with their respective ligands. All three receptors are expressed in the cilia of human sinonasal epithelial cells from all regions and independent of chronic rhinosinusitis (CRS) with or without polyposis.

Conclusion:

These 3 T2Rs signal through the same NO-mediated antimicrobial pathway and are ubiquitously expressed in the sinonasal epithelium. Additional T2Rs besides T2R38 may play a role in sinonasal immune defense against different pathogens. Mapping of T2R expression demonstrates the potential widespread role of T2Rs in sinonasal defense while the genetics of these T2Rs may contribute to our understanding of specific endotypes of CRS and may prove to be novel therapeutic targets.

8:52 am

Type 2 inflammation in chronic rhinosinusitis with nasal polyps: Possible role for inhibition of the non-gastric H⁺/K⁺-atpase (atp12a)

Jin-Young Min, MD, PhD
Caroline P. E. Price, BA
Robert C. Kern, MD
David B. Conley, MD
Robert P. Schleimer, PhD
Bruce K. Tan, MD
Chicago, IL
USA

Background:

Recent findings demonstrate that proton pump inhibitors (PPIs) modulate eotaxin-3 production in eosinophilic esophagitis raising the possibility that PPIs may have therapeutic potential in other type-2 inflammatory diseases like CRS. We have previously demonstrated that PPIs significantly inhibit IL-13-induced eotaxin-3 secretion in airway epithelial cells in vitro.

Objective:

To evaluate if PPIs reduce eotaxin-3 expression in CRS patients and explore mechanisms by which PPIs inhibit type-2 responses in airway epithelial cells in vitro.

Methods:

Eotaxin-3 in nasal tissue was measured by Luminex to compare levels in CRS patients taking PPIs with those not taking PPIs. The mechanism by which PPIs inhibited IL-13-induced eotaxin-3 expression was explored in human sinonasal epithelial cells (HNECs) and BEAS-2Bs using ELISA, qRT-PCR, and intracellular pH imaging in vitro.

Results:

CRS patients taking PPIs showed significantly lower levels of eotaxin-3 in nasal tissue compared to those without PPIs (81.53±41.94 vs 291.30±69.26, P<.05). Eotaxin-3 production by IL-13-stimulated HNECs and BEAS-2Bs was significantly inhibited by PPIs and the mechanistically unrelated H⁺/K⁺-ATPase inhibitor SCH-28080. Using intracellular pH imaging and by altering extracellular K⁺ concentrations, we found that IL-13 induced H⁺/K⁺ exchange that profoundly affected eotaxin-3 gene expression and was blocked by PPIs. Specific knockdown

of ATP12A also significantly reduced IL-13 induced eotaxin-3 expression in HNECs (P<.05).

Conclusion:

Eotaxin-3, the dominant type-2 chemokine produced by HNECs in response to IL-13 is significantly reduced by PPIs in vivo and in vitro. ATP12A may be the target of this response, suggesting that inhibiting this non-gastric H⁺/K⁺-ATPase may be of therapeutic potential in CRSwNP.

8:59 am

Reversal of cigarette smoke extract induced sinonasal epithelial barrier dysfunction through Nrf2 activation

Ashleigh Halderman, MD
Anuj Tharakan, BS
Andrew P. Lane, MD
Shyam Biswal, PhD
Murugappan Ramanathan, MD
Baltimore, MD
USA

Background:

Environmental factors such as inhaled pollutants like cigarette smoke may play a significant role in diseases of the upper airway including chronic rhinosinusitis (CRS). Recent studies have shown that cigarette smoke causes impaired airway epithelial cell barrier function likely through environmental oxidative stress related pathways. The purpose of this study is to explore whether enhancing Nrf2, the body's master antioxidant system, can ameliorate cigarette smoke induced sinonasal epithelial cell barrier dysfunction.

Methods:

Human Sinonasal epithelial cells (HSNECs) were grown from control patients at the air:liquid interface. HSNECs were stimulated with cigarette smoke extract (CSE) with and without pharmacologic activation of Nrf2. HSNECs were then stained for the epithelial cell junctional proteins ZO-1 and JAM-A using confocal microscopy. In addition trans-epithelial electrical resistance (TEER) was measured in cultures before and after CSE stimulation with and without Nrf2 activation.

Results:

CSE stimulation caused a global disruption of the epithelial junctional proteins ZO-1 and JAM-A along with an associated decrease in TEER levels. Enhancing Nrf2 levels prior to stimulation with CSE was associated with increased localization of ZO-1 and JAM-A levels at the cell surface and statistically significant increases in TEER levels.

Conclusions:

This is the first study to demonstrate that cigarette smoke induced sinonasal epithelial cell barrier dysfunction is reversible by Nrf2 activation. The Nrf2 antioxidant pathway may represent a potential therapeutic target for cigarette smoke associated sinonasal inflammation.

9:06 am

Increased rhinovirus replication and type iii interferon induction in differentiated sinonasal epithelial cells of chronic rhinosinusitis with nasal polyps patients

Syed Muaz Khalil, PhD
Andrew Pekosz, PhD
Andrew P. Lane, MD, PhD
Baltimore, MD
USA

Introduction:

Sinonasal epithelial cells (SNEC) are the primary line of defense against respiratory virus infections, such as rhinoviruses. Rhinovirus infection is associated with exacerbations of asthma and chronic rhinosinusitis (CRS). In submerged nasal epithelial cells, type I interferon (IFN) - β has been reported to not be induced by rhinovirus in CRS. In this study, we compare viral replication and type III IFN- γ expression in SNEC from patient with CRS with nasal polyps (CRSwNP) patients, to investigate whether altered innate immune responses may underlie susceptibility to rhinovirus infection in inflammatory sinus disease.

Methods:

Differentiated SNEC from CRSwNP patients and healthy control subjects were infected with rhinovirus at a low (0.01) and high (3) multiplicity of infection (MOI). Apical and basolateral supernatants were collected at several timepoints up to 7 days post-infection. Virus titer in the supernatants was assessed by infectious dose analysis, and IFN- γ concentration was quantified by ELISA.

Results:

Rhinovirus replication was greater in CRSwNP SNEC compared to healthy control at low and high MOI infections. Significantly greater IFN- γ was expressed by CRSwNP SNEC at both low and high MOI.

Conclusions:

Rhinovirus replicates to higher titers in SNEC from CRSwNP patients regardless of MOI. In differentiated SNEC, we report significant epithelial cell induction of type III IFN (IFN- γ) in CRSwNP. These results demonstrate differential rhinovirus replication in CRSwNP patients and suggest a role for type III IFN. Future studies are necessary to elucidate innate immune mechanisms underlying rhinovirus-induced exacerbations of CRS.

9:13 am

Discussion

9:20 am**Panel: Rhinitis, Sinusitis, and the Unified Airway**

Moderator: Robert Kern MD

Panelists: Alkis Togias MD, Wytse Fokkens MD

10:00 am**Break with Industry Partners****Moderators: Nithin Adappa MD, Esther Kim MD****10:20 am****Secreted P-glycoprotein is a biomarker of chronic rhinosinusitis**

Angela Nocera, MS

Ana Meurer, BA

Marcel Miyake, MD

Benjamin S. Bleier, MD

Boston, MA

USA

Background:

The discovery of non-invasive biomarkers of Chronic Rhinosinusitis(CRS) endotypes is critical to advance our ability to provide prognostic information and targeted medical therapy. Epithelial P-glycoprotein(P-gp) is overexpressed in CRS and exists in an extracellular, secreted form. The purpose of this study was to determine whether 1) secreted P-gp could be detected in nasal mucus and 2) whether a

threshold value of secreted P-gp could be used to predict CRS endotype and disease severity.

Methods:

IRB approved study examining mucus and tissue concentrations of P-gp in 38 patients(10 Control, 16 CRS, and 12 CRS with Nasal Polyps). P-gp concentrations were determined by enzyme-linked immunosorbent assay and normalized to total protein(TP). Clinical indices of disease severity including the Sino-Nasal Outcomes Test(SNOT-22), tissue eosinophilia, and Lund-Mackay score were collected on all patients.

Results:

Secreted P-gp was present in all patients and a threshold value of 300 pcg/micg TP was used to differentiate low versus high secretors. High P-gp secretion was 100% sensitive for the presence of CRS, was associated with a larger proportion nasal polyp patients, and predicted higher SNOT-22, eosinophil, and Lund-Mackay scores.

Conclusion:

While P-gp is secreted into nasal mucus under physiologic conditions, elevated secretion at values exceeding 300 pcg of P-gp/micg TP is associated with greater disease severity by both objective and subjective indices. The presence of suprathreshold P-gp secretion may therefore represent a novel non-invasive biomarker of CRS and could also be used to predict patients who may benefit from P-gp inhibitory therapeutic strategies.

10:27 am**A rapid and cost effective method to diagnose specific antibody deficiency in patients with chronic rhinosinusitis**

Ashley Kwon, BS

Mark Soltany, MD

Robert Bahadori, MD

Oral Alpan, MD

Fairfax, VA

USA

Introduction:

Specific antibody deficiency (SAD) is the most common immune deficiency in patients with recurrent rhinosinusitis. Diagnosis requires the demonstration of the absence or the loss of IgG response to polysaccharide vaccines in the presence of normal serum IgG levels. Polysaccharide vaccine responses are poorly characterized, subject to inter and intra-lab variability and requires obtaining pre and post vaccination titers at 4 weeks apart.

Method:

Total of 20 subjects (11 adults and 9 children) with chronic rhinosinusitis were included in study. Subjects were divided into control, SAD and common variable immune deficiency (CVID) groups based on their serum immunoglobulin levels and response to pneumococcal vaccines. For biomarker analysis, B cells were stained for surface IgG, IgM, IgD, IgA, IgE, CD21, CD10, CD5 expression and assayed using FACS Canto2.

Results:

To study compartmentalization and how B cell subsets interact with each other we looked at ratios of different B cell compartments. We found that SAD patients had a statistically significant lower ratio of IgG/IgM expression on B cells. This ratio was equally statistically significant in CVID patients. There was no difference in the expression of the memory

arker CD27 or IgG expressing B cell percentages, which are hallmarks of patients with COVID.

Conclusion:

We show that with using the ratio of IgG and IgM expression on B cells, we can diagnose SAD without the need to assess polysaccharide vaccine responses, saving time and cost. This also opens further discussion on interactions between B cell subsets in patients with chronic rhinosinusitis.

10:34 am

Lack of correlation between patient reported location and severity of facial pain and radiographic burden of disease in chronic rhinosinusitis

Andrew Thomas, MD
Jeffrey Falco
Shae Ashby, PhD
Adam Deconde, MD
Richard Orlandi, MD
Jeremiah Alt, MD, PhD
Salt Lake City, UT
USA

Background:

Facial pain is a cardinal symptom of chronic rhinosinusitis (CRS) with significant impacts on patient treatment selection, quality of life, and outcomes. The association between facial pain and CRS disease severity has not been systematically evaluated with validated, facial pain-specific questionnaires. Our objective was to measure pain location, severity, and interference in patients with CRS, and correlate these to the location and severity of radiographic evidence of disease.

Methods:

Patients with CRS were enrolled into a prospective, cross-sectional study. Patients completed the Brief Pain Inventory Short Form, which is a validated and widely used tool that measures pain location, severity, and interference. The Lund-Mackay CT scoring system was used to operationalize the radiographic location and severity of inflammation. Facial pain location, severity, and interference scores were correlated to paranasal sinus opacification scores.

Results:

Patients with CRS with (CRS_wNP; n=37) and without nasal polyps (CRS_sNP; n=46) were enrolled. No significant relationship was found between the location and severity of reported facial pain and radiographic findings of disease for patients with either CRS_wNP or CRS_sNP. There was no difference in pain location between patients with and without radiographic disease in a given sinus.

Conclusions:

Facial pain in CRS is not predicted by the radiographic extent of disease. The location and severity of facial pain reported by the patient is not a reliable marker of the anatomic location and severity of sinonasal inflammation. Pain location should not be relied upon for guiding targeted therapy.

10:41 am

Middle turbinate oedema as a diagnostic marker of inhalant allergy

Aneesa Hamizan, MD, MS (ORL-HNS)
Jenna Christensen, BSc (hons)PhD
Gretchen Oakley, MD
Jessica Tattersall, MD
Raymond Sacks, MBCh, FCS (SA)ORL
Richard Harvey, MD, PhD

Sydney, NSW
Australia

Background:

Middle turbinate oedema is thought to be a characteristic feature of inhalant allergy and has been described by DelGaudio and colleagues. This study sought to determine the diagnostic characteristics of middle turbinate oedema as a marker of inhalant allergy.

Methods:

Case control study of patients who had undergone nasal endoscopy and allergy testing was performed. Allergy status was determined by epicutaneous testing to local allergens or positive serology. Endoscopy was reviewed by two blinded assessors for middle turbinate head oedema. The appearance was graded as either normal, focal, multifocal, diffuse or polypoid oedema. Receiver-operator (ROC) analysis, likelihood ratios (LR), sensitivity, specificity and positive predictive value (PPV) were determined.

Results:

374 nasal cavities were assessed (42% female, age 39.74±14.7yrs, 57% allergic). Diffuse oedema (LR+ 10.9/PPV 93.3%) and polypoid oedema (LR+ 6.6/PPV 88.9%) demonstrated the strongest association with inhalant allergy. Multifocal oedema was used as a cut-off to represent inhalant allergy of ROC analysis which demonstrated 94.7% specificity but only 23.4% sensitivity. The PPV for multifocal was 85.1% and LR+ of 4.4

Conclusion:

Middle turbinate oedema is a useful nasal endoscopic feature to predict presence of inhalant allergy, while not sensitive it has excellent positive predictive value.

10:48 am

Discussion

Moderators: Spencer Payne MD, Stacey Gray MD

10:53 am

Balloon dilation of sinus ostia in the department of defense: Diagnoses, actual indications, and outcomes

Adrienne Laury, MD
Kevin McMains, MD
Joshua Stramiello, BS
Sarah Bowe, MD
JBSA, TX
USA

Introduction:

In the past decade, increasing evidence has supported the use of balloon catheter dilation (BCD) of sinus ostia in the treatment of chronic and recurrent acute rhinosinusitis. However, this technology is often advertised and utilized for off-label indications, which lack evidence-based support. Therefore, we sought to evaluate "actual" indications for BCD in a profit-blind healthcare system – the Department of Defense (DoD).

Methods: A retrospective review was performed on 319 consecutive patients who underwent BCD in the DoD from January 1, 2011 to December 31, 2013. All charts were reviewed for ICD-9 diagnoses, presence of chronic rhinosinusitis (CRS) defined by the European Position Paper on Rhinosinusitis and Nasal Polyps (EPOS 2012), pre-op Lund-Mackay scores, nasal endoscopy findings, sinuses dilated, post-operative outcomes, and complications.

Results: Of 319 patients identified, 217 had sufficient documentation to be included. A CRS ICD-9 code was applied in 182/217 (83.9%) and recurrent acute sinusitis in 12/217 (5.6%). Only 50.5% of CRS patient charts met criteria using EPOS guidelines. In contrast, 40.0% met the ICD-9 criteria for atypical facial pain. Patients with Lund-Mackay scores =4 were reviewed for number of sinuses dilated. Eighty-eight of 123 patients (71.5%) had sinuses dilated that were free from opacification/mucosal edema on pre-operative imaging.

Conclusion: Balloon dilation of sinus ostia has an expanding role in treating sinus disease. In our population, it is often utilized for off-label indications for which there is currently no evidence. Future studies are needed to evaluate the efficacy of this technology in treating these alternate indications.

11:00 am

Prospective, multicenter evaluation of balloon sinus dilation for treatment of pediatric chronic rhinosinusitis

Zachary Soler, MD, MSc
Jeffrey Rosenbloom, MD
Douglas Skarada, MD
Michael Gutman, MD
Mark Hoy, MD
Shaun Nguyen, MD
Charleston, SC
USA

Background:

Although balloon sinus dilation is a treatment option for adults with chronic rhinosinusitis (CRS), there have been few studies performed in pediatric patients.

Methods: This study was designed as a prospective, multicenter, single-arm investigation. Children (2-21 years) with CRS who had failed medical management were treated with balloon sinus dilation and followed to 6 months post procedure. Primary outcomes were technical success and complication rates. Secondary outcomes included mean change in quality of life, percent achieving a minimal clinically important difference (MCID), and revision surgery rate.

Results:

Fifty children were treated at 4 centers; 33 participants were 2-12 years (mean=6.6 ± 2.2 years) and 17 participants were >12-21 years (mean=15.7 ± 2.5 years). A total of 157 sinus dilations were attempted (98 maxillary, 30 frontal, and 29 sphenoid sinuses) and all were successful with no complications. Significant improvement in the Sinus and Nasal Quality of Life Survey [SN-5] was seen for all children between baseline and 6 months (4.7 ± 1.2 vs 1.7 ± 0.8; p<0.0001) and 91.6% improved by the MCID of 1.0 or more. Improvement did not differ on multivariate regression analysis based on presence of allergy, asthma, or concomitant procedures. For adolescents, overall Sino-Nasal Outcome Test-22 [SNOT-22] mean scores were also significantly improved at 6 months (37.0 ± 18.1 vs 9.8 ± 8.9; p<0.001). The revision procedure rate was 0%.

Conclusions:

Balloon sinus dilation is safe and appears effective for children with CRS aged 2 years and older.

11:07 am

Practice patterns in pediatric chronic rhinosinusitis: A survey of the American Rhinology Society

Daniel Beswick, MD
Hassan Ramadan, MD
Fuad Baroodi, MD
Peter Hwang, MD
Stanford, CA
USA

Objective:

To assess current practice patterns of members of the American Rhinologic Society (ARS) in managing pediatric chronic rhinosinusitis (PCRS)

Methods:

A 22-item web-based survey was electronically distributed twice to the ARS membership in January 2015.

Results:

Ninety-one members completed the survey. The most frequently employed medical therapies are topical nasal steroids (96%, 79/82), oral antibiotics (93%, 77/82), and saline irrigations (85%, 70/82), with antibiotics being administered for >= 20 days by 80% (65/81). Forty-five percent (36/80) obtain computed tomography imaging prior to adenoidectomy and 85% obtain imaging (69/80) prior to either endoscopic sinus surgery (ESS), balloon catheter dilation (BCD), or sinus lavage (SL). Ninety-six percent (78/81) include adenoidectomy in first line surgical therapy for medically refractory disease, with 46% (37/81) performing adenoidectomy alone and 50% concomitantly performing SL and culture, BCD, or ESS. The frequency of utilization of BCD and second look procedures when treating PCRS varies significantly.

Conclusions:

The most commonly employed medical therapies include nasal steroids, oral antibiotics for >= 20 days, and saline irrigations, consistent with published guidelines. When surgical management is required, adenoidectomy is almost always included in first line treatment, and imaging is typically obtained prior to ESS or BCD, in accordance with current guidelines. The utilization of BCD for PCRS varies, which aligns with a lack of published consensus on this topic.

11:14 am

Discussion

11:20 am

Panel: Ethical issues in rhinology

Moderator: Eric Holbrook MD
Panelists: Doug Reh, MD, James Hadley, MD,
Robert Miller, MD

12:00 pm

Lunch with Break with Exhibitors

Moderators: Erin O'Brien MD, Jeremiah Alt MD

1:00 pm

Longitudinal improvement and stability of olfaction in the evaluation of surgical management for chronic rhinosinusitis

Joshua Levy, MD, MPH
E. Ritter Sansoni, MD
Jess Mace, MPH
Zachary Soler, MD, MSc
Timothy Smith, MD, MPH
Portland, OR
USA

Introduction:

Abnormal olfaction is common in chronic rhinosinusitis (CRS) and relates to both endoscopic and radiographic measures of sinonasal inflammation. The Brief Smell Identification Test (BSIT) has been used to demonstrate improvements in olfactory dysfunction following endoscopic sinus surgery (ESS). Understanding postoperative durability in olfactory status is critical for patient counseling and future clinical trial design.

Methods:

Adult study participants with medically recalcitrant CRS were prospectively enrolled into a non-randomized, multi-institutional, cohort before ESS and postoperatively observed through the standard of care. Olfactory status was operationalized using BSIT instruments collected at 6-month, 12-month, and 18-month postoperative intervals. Longitudinal trends in olfactory status were compared using repeated measures analysis of variance and matched pairwise comparisons.

Results:

122 participants were recruited between March 2011 and February 2014 and completed all study requisites. Significant longitudinal differences in average BSIT scores were reported for the total cohort ($F=3.63(3)$; $p=0.018$) with the greatest significant improvements found in participants with nasal polyposis ($n=38$; $F=5.98(3)$; $p=0.005$). Overall, the prevalence of abnormal olfaction significantly decreased from 28% preoperatively to 17% (6-months; $p=0.015$), and remained statistically similar at 12-months (19%; $p=0.791$) and 18-months (21%; $p=0.581$) postoperatively. Comparable trends in olfactory improvement were found for participants with nasal polyposis.

Conclusions:

Patients demonstrated improved olfaction following ESS with greatest improvement among patients undergoing polypectomy. Longitudinal stability was detected 18-months following surgery. Despite overall improvement in olfaction, dysosmia persisted in 17-21% of patients, demonstrating the need for further understanding of prognostic factors related to olfactory dysfunction in CRS.

1:07 pm

Cost-effective method of olfactory training in clinical practice: Essential oils at uncontrolled concentration

Zara Patel, MD
Sarah Wise, MD, MSCR
John DelGaudio, MD
Stanford, CA
USA

Introduction:

Published data examining the efficacy of olfactory training (OT) has used standardized concentrations of odorants and the Sniffin' Sticks testing method. Although well-validated, these methods are costly and time-intensive for the average otolaryngology practice. The purpose of our study was to evaluate the efficacy of using essential oils at random concentrations and the University of Pennsylvania Smell Test (UPSIT) for training and testing, and compare this with the existing data on OT.

Methods:

Randomized Clinical Trial. Patients presenting to a tertiary care rhinology center with subjective loss of smell and olfactory loss measured by UPSIT were randomized to OT or control for 6 months. Only patients with loss of smell greater than one year duration, and loss associated with post-infectious and idiopathic etiologies were included. Baseline UPSIT was compared to 6 month UPSIT. An accepted 10% change or better (4 points or more) was used to establish a significant improvement on UPSIT.

Results:

43 patients were enrolled. 8 patients were lost to follow-up, with a total of 35 completing the study. Age ranged from 39-71 with an average of 56. Of 19 patients in the OT group, 6 showed significant improvement (32%), while only 2 out of 16 patients (13%) in the control group improved. Increasing age and duration of loss were significantly correlated to lack of improvement.

Conclusion:

Allowing patients to use random concentrations of essential oils to perform OT is as effective as published data using controlled concentrations of odorants for post-infectious and idiopathic olfactory loss.

1:14 pm

Nitrogen dioxide pollution exposure affects olfactory function in older US adults

Dara Adams, BA
Gaurav Ajmani, MPH
Kristen Wroblewski, MS
Martha McClintock, PhD
Helen Suh, ScD
Jayant Pinto, MD
Chicago, IL
USA

Introduction:

Nitrogen dioxide (NO₂) is a key air pollutant that is associated with respiratory diseases. Given the olfactory nerve's anatomic susceptibility to air pollution, we investigated the impact of NO₂ exposure on olfactory dysfunction.

Methods:

Odor identification ability was evaluated using a validated olfactory test in respondents from the National Social Life,

Health, and Aging Project (NSHAP), a representative probability sample of home-dwelling, older US adults ages 57-85 (n=1,832). Exposure to NO₂ pollution was assessed using data from EPA monitoring stations nearest to each respondent's home. We tested the association between NO₂ exposure and olfactory function using multivariate logistic regression.

Results:

Among older adults in the US, 22.6% had impaired olfactory function, defined as = 3 correct (out of 5) on the odor identification test. Median NO₂ exposure during the 364 days prior to the interview date was 14.7 ppb (interquartile range [IQR] 10.8-19.7 ppb). Greater levels of NO₂ exposure were associated with an increased odds of olfactory impairment (OR 1.35 per 1-IQR increase in NO₂, 95% CI: 1.07-1.72), adjusting for age, gender, race/ethnicity, education, cognition, comorbidity, smoking, and season of the home interview.

Conclusions:

We show for the first time that NO₂ exposure may have a deleterious impact on olfactory function in older US adults. Given the profound biopsychosocial effects of olfactory dysfunction on quality of life, physical and social function, and mortality itself, understanding the mechanism of this association is likely to have a major public health impact, with implications for nasal disease more broadly.

1:21 pm

Role of the type I tumor necrosis factor receptor in inflammation-associated olfactory dysfunction and regeneration

Andrew Lane, MD
Mengfei Chen, PhD
Baltimore, MD
USA

Introduction:

To understand mechanisms of human olfactory dysfunction in chronic rhinosinusitis, an inducible olfactory inflammation (IOI) model has been utilized to chronically express inflammatory cytokines locally, resulting in neuronal loss, diminished odorant responses, and repressed olfactory regeneration. Knockout of the minor TNF- α receptor 2 (TNFR2) was previously shown to partially rescue these olfactory changes. The purpose of current study is to investigate the role of the major TNF receptor, TNFR1, in acute and chronic olfactory inflammation and regeneration.

Methods:

3 experimental groups of mice were studied: 1) IOI mice lacking the TNFR1 receptor; 2) TNFR1 knockout mice with allergen-induced inflammation; and 3) TNFR1 knockout mice injected with methimazole (50 μ g/g body weight). Olfactory function was assayed by electroolfactogram (EOG), and olfactory tissue was processed for histology and immunohistochemical staining.

Results:

TNF- α was dramatically induced in IOI-TNFR1 knockout mice, but the olfactory epithelium did not show inflammation, and olfactory sensory neurons and basal stem cells were histologically normal. EOG responses were normal at 2 weeks, but diminished at 6 weeks. Ovalbumin-sensitized TNFR1 knockout mice developed markedly diminished eosinophilic inflammatory infiltration. After acute olfactory mucosal injury with methimazole, proliferation of olfactory progenitor cells was decreased 50% in

TNFR1knockout versus wild type.

Conclusions:

Genetic deletion of TNFR1 completely blocks TNF- α -induced inflammation as well as allergen-induced inflammation. However, diminished EOG responses suggest a TNFR1-independent mechanism of TNF- α -induced olfactory neuron dysfunction. Impaired regeneration in TNFR1 knockouts after acute injury supports a role for TNFR1 signaling in regulating normal olfactory repair.

1:28 pm

Discussion

Moderators: Elina Toskala MD, David Poetker MD

1:33 pm

The endoscopically directed sinus potential difference assay detects acquired Cftr dysfunction in chronic rhinosinusitis

Do-Yeon Cho, MD
Elisa Illing, MD
Daniel Skinner, BS
Steven Rowe, MD
George Solomon, MD
Bradford Woodworth, MD
Birmingham, AL
USA

Objectives:

The human nasal potential difference assay is a widely accepted method for measuring CFTR activity in vivo. Because the nasal epithelium may not reflect CFTR activity or dysfunction within the sinus cavities, we recently developed the endoscopically directed sinus potential difference (EDSPD) assay. Our objective is to establish the validity of the EDSPD assay for detecting diminished anion transport at the site of inflammation in the maxillary, ethmoid, or sphenoid sinuses.

Methods:

Subjects with and without CRS and endoscopic evidence of sinus inflammation were prospectively enrolled. A potential difference catheter was inserted under endoscopic visualization into the maxillary, ethmoid, or sphenoid sinuses. The abbreviated protocol for detecting CFTR-mediated chloride (Cl⁻) transport was as follows: Ringer's solution (baseline potential difference), Ringer's + 100 μ M amiloride (blockade of epithelial sodium channels), and Low Cl⁻ Ringer's + 10 μ M isoproterenol (activation of Cl⁻ transport).

Results:

A total of 10 patients were included in this prospective study. The EDSPD assay revealed significantly diminished response to low Cl⁻ Ringers + isoproterenol in individuals with CRS vs. controls (-1.4 \pm 0.5 mV vs. -9.5 \pm 0.9 mV, p<0.001, n=5 per condition). Robust baseline potential difference indicated the presence of epithelial integrity and preserved tight junctions.

Conclusions:

Chloride secretion across in vivo sinus epithelium in human subjects with CRS is markedly diminished as measured by the EDSPD assay and suggests acquired CFTR dysfunction at the site of inflammation in CRS. These patients may derive therapeutic benefit from Cl⁻ secretagogues.

1:40 pm**Prevalence of single nucleotide polymorphisms associated with cystic fibrosis severity in a population of chronic rhinosinusitis patients**

Benjamin Hull, MD
Justin Turner, MD, PhD
Lana Olson, PhD
Rakesh Chandra, MD
Nashville, TN
USA

Background:

The clinical association between cystic fibrosis (CF) and chronic rhinosinusitis (CRS) is well known. Previous studies identified several nonCFTR single nucleotide polymorphisms (SNPs) associated with lower airway disease severity in CF patients. We hypothesized that expression of these SNPs would be different between CRS patients and age/gender matched nonCRS controls.

Methods:

This is a genome wide association study of 1231 CRS patients identified through a university hospital database who were compared to 8796 age- and gender-matched controls without a history of rhinitis, sinusitis, allergies, or asthma. Prevalence of 5 relevant SNPs (Nat Genet. 2011 June; 43(6): 539–546. doi:10.1038/ng.838) was compared between groups via chi-square, with $p < 0.05$ considered significant. Stratification by race and gender was performed among groups when statistically appropriate.

Results:

CRS patients exhibited a significant ($p=0.031$) decrease in expression of rs12883884 (chromosome 14; associated with an ion transporter) compared to controls. This association disappeared when patients were stratified by race. CRS patients manifested a greater tendency to express rs1403543 (sex chromosome 23) in both the Caucasian and African American subgroups ($p=0.036$, $p=0.026$, respectively). Statistical significance disappeared among Caucasians when stratified by gender, but persisted among African American women ($p=0.047$). rs12188164 (chromosome 5) and rs12793173 (chromosome 11) were both more prevalent in African Americans with CRS than controls ($p=0.042$ and $p=0.020$, respectively).

Conclusions:

The identified SNPs were differentially expressed in CRS compared to control, with some variability as a function of race and gender. Further research is required to confirm these initial findings and elucidate clinical significance.

1:47 pm**Expression of dermcidin in human sinonasal secretions**

Elizabeth Cottrill, MD
Bei Chen, MD, MPH
Robert Lee, PhD
Noam Cohen, MD, PhD
Philadelphia, PA
USA

Introduction:

Antimicrobial peptides (AMPs) produced by the epithelium are important for innate immune defense. In 2001 a novel AMP Dermcidin (DCD) was described with no homology to other AMPs and an expression pattern restricted to eccrine sweat glands. In contrast to other AMPs, DCD expression has not been shown to be induced under inflammatory conditions in the skin. After identifying DCD by mass

spectrometry in a protein sample isolated from human nasal secretions, we sought to determine the role of DCD in innate defense of the sinonasal airway.

Methods:

After IRB approval, sinonasal mucosal tissue specimens were acquired from residual clinical material obtained during sinonasal surgery and used to grow cultures in air-liquid-interface (ALI). After stimulation of the cultures with various bitter compounds and PBS, airway surface liquid was collected and a DCD-specific ELISA was used to quantify DCD in each sample. To localize DCD expression ALI cultures were fixed and immunofluorescence performed against DCD, β -tubulin IV, and Muc-5A.

Results:

ELISA showed DCD in air-surface liquid and in clinical nasal secretion samples at concentrations comparable to eccrine sweat. There was no evidence of inducible expression with any of the tested stimulants. Confocal microscopy revealed DCD expression in sinonasal mucosal goblet cells.

Conclusion:

This is the first report of the presence of DCD in nasal mucosa and demonstration of DCD in clinical samples of human nasal secretions at clinically relevant concentrations which may represent a novel arm of sinonasal airway innate defense.

1:54 pm**Discussion****2:00 pm****Panel: Rhinologic research that impacts clinical care**

Moderator: Timothy Smith MD
Panelists: Alkis Togias MD, Vijay Ramakrishnan MD, Zachary Soler MD

Moderators: Adam DeConde MD, Anne Getz MD

2:40 pm**Unraveling the complexity of chronic rhinosinusitis: Microbial community insights into the phenotypic heterogeneity of CRS**

Michael Hoggard, Mr.
Richard Douglas, MD
Mike Taylor, PhD
Kristi Biswas, PhD
Waldvogel-Thurlow S, Mrs.
Fiona Radcliff, PhD
Auckland
New Zealand

Introduction:

Despite considerable research, the aetiology of chronic rhinosinusitis (CRS) remains poorly understood. Recent work has begun to investigate associations between patterns in resident microbial communities and distinct immunological profiles, exploring potential aetiological roles in driving different clinical phenotypes of CRS.

Methods:

Bacterial communities and local inflammatory response were assessed in 106 patients with extensive bilateral CRS undergoing endoscopic sinus surgery (ESS) and 29 controls undergoing ESS for indications other than CRS. Patient groups were delineated on the basis of phenotypic variants (with/without polyps) as per EPOS guidelines for CRS, and clinical parameters including asthma and cystic fibrosis.

Bacterial communities were characterised via 16S rRNA amplicon gene sequencing, and quantified by qPCR. Mucosal inflammatory profiles were analyzed using the BDTM Cytometric Bead Array and immunohistochemistry.

Results:

Controls and idiopathic CRS subjects tended to be dominated by members of the genera *Corynebacterium* and *Staphylococcus*, together with lower abundances of several other genera, including *Streptococcus*, *Moraxella* and *Haemophilus*. Aberrant (dysbiotic) bacterial assemblages and increased inter- and intra-patient variability were more common in subjects with comorbidities such as asthma and cystic fibrosis, together with distinct associated immune profiles. Dysbiotic communities were variably dominated by the genera *Staphylococcus*, *Streptococcus*, *Haemophilus*, *Pseudomonas*, *Moraxella*, or *Fusobacterium*.

Conclusions:

Microbial community dysbiosis may play a role in the pathogenesis and severity of CRS, particularly in some variants. Improved understanding of interactions between resident microbes and the host tissues and immune system in this spectrum of inflammatory disease will have significant implications for improving treatment of this morbid condition.

2:47 pm

The effect of endoscopic sinus surgery on the bacterial communities

Ravi Jain, MD
Michael Hoggard, BSc(hons)
Kristi Biswas, PhD
Melissa Zoing, BNurs
Richard Douglas, MD
Grafton, Auckland
New Zealand

Introduction:

Endoscopic sinus surgery (ESS) improves symptoms for a majority of chronic rhinosinusitis (CRS) patients by enlarging the size of sinus ostia, improving mucociliary clearance and access for topical therapies. However, the effect of surgery on the sinonasal microbiota is largely unknown. This study examined changes in bacterial communities in the middle meatus before and after surgery.

Methods:

Swabs were taken from the middle meatus of 23 patients undergoing endoscopic sinus surgery for CRS. Repeat swabs were taken following surgery in clinic (mean 120 days). Five patients were also followed to a third time point (mean 277 days). Symptom scores and antibiotic use were recorded. Bacterial communities were characterized using amplicon sequencing and bacterial abundance was measured using quantitative PCR.

Results:

Significant, but unpredictable shifts in bacterial community composition were seen before and after surgery. Specific bacterial genera were not associated with these changes. ESS also had an impact on bacterial abundance. However, there were no significant changes in the bacterial diversity or richness before and after surgery. PERMANOVA tests indicated that changes in bacterial communities were driven more by intersubject variability ($p = 0.005$) than timepoint, antibiotic use, presence of polyps or changes in symptom scores.

Conclusions:

This study demonstrates changes in bacterial composition and abundance in the middle meatus following ESS. The complexity of these changes mirrors the variability between patients. Modern molecular techniques highlight our limited understanding of the impact of current therapies on the microbiology of CRS.

2:54 pm

A randomized trial of povidone-iodine and mupirocin versus saline sinus irrigations for surgically recalcitrant gram-positive chronic rhinosinusitis

Victoria Lee, MD
Paul Pottinger, MD, DTM&H
Greg Davis, MD, MPH
Seattle, WA
USA

Introduction:

Patients with surgically recalcitrant chronic rhinosinusitis (CRS) are therapeutically challenging. Mupirocin sinus irrigations have shown promise but are costly, often not covered by insurance, and prone to long-term failure. The purpose of this study was to compare the effectiveness of povidone-iodine and mupirocin versus saline sinus irrigations for surgically recalcitrant gram-positive CRS.

Methods:

Our study was designed as a prospective single-blinded (clinician only) randomized controlled trial. Sixty-three surgically recalcitrant gram-positive CRS patients were randomized to receive povidone-iodine (PI), mupirocin (MUP), or saline (SAL) sinus irrigations, twice daily for 1 month. The primary outcome was post-treatment culture positivity; secondary outcomes were Sinonasal Outcome Test-20 (SNOT-20) and Lund-Kennedy (LK) endoscopic score changes from baseline.

Results:

Of the 60 patients that completed follow-up (PI $n=20$, MUP $n=21$, SAL $n=19$), 53% had nasal polyposis, 53% had asthma, 15% had aspirin sensitivity, and 72% had environmental allergies. Post-treatment culture positivity was higher on PI (14/20, 70%) and lower on MUP (6/19, 32%) compared to SAL (10/19, 53%), but these differences were not significant ($p=0.06$). One-way ANOVA found no significant differences in SNOT-20 score change from baseline (PI -0.3 ± 0.9 vs. MUP -0.3 ± 0.8 vs. SAL -0.4 ± 0.7 , $p=0.79$) or LK endoscopic score change from baseline (PI -3.7 ± 4.1 vs. MUP -1.7 ± 3.5 vs. SAL -2.3 ± 4.7 , $p=0.32$). No serious adverse effects were reported.

Conclusions:

In surgically recalcitrant CRS, post-treatment culture positivity was substantially lower on mupirocin compared to saline sinus irrigations. Povidone-iodine and mupirocin, however, did not show significant improvements in outcome measures compared to saline sinus irrigations.

3:01 pm

Discussion

3:06 pm

Break with Industry Partners

Moderators: Subinoy Das MD, Jose Gurrola MD

3:26 pm

Smell preservation after endoscopic unilateral resection of esthesioneuroblastoma: A multi-institutional experience

Bobby Tajudeen, MD
Nithin Adappa, MD
Edward Kuan, MD
Jeffrey Suh, MD
Marilene Wang, MD
James Palmer, MD
Philadelphia, PA
USA

Introduction:

Gold standard treatment of esthesioneuroblastoma consists of en bloc craniofacial resection with postoperative therapy dictated by histology and extent. Numerous studies have shown fully endoscopic approaches to provide comparable survival and recurrence rates with decreased patient morbidity. Here we report the first multi-institutional series assessing smell outcomes of patients who underwent unilateral endoscopic resection of esthesioneuroblastoma with preservation of the contralateral olfactory bulb.

Methods:

A multi-institutional retrospective review was performed identifying patients who underwent endoscopic unilateral resection of esthesioneuroblastoma with preservation of one olfactory bulb between 2003-2015. Patients were administered the University of Pennsylvania Smell Identification Test (UPSIT) after completion of all adjuvant therapy.

Results:

Fourteen patients (six males, eight females) were identified and tested for post-treatment olfactory function. All fourteen patients received postoperative radiotherapy and four patients received additional chemotherapy. Mean follow up was 53 months. 5-year recurrence-free survival was 100%. Six patients (43%) were found to have residual smell function with three patients (21%) having normal or mildly reduced smell function.

Conclusions:

Here we report the first multi-institutional series demonstrating smell preservation after unilateral endoscopic resection of esthesioneuroblastoma. In carefully selected patients, this approach can yield comparable survival with decreased patient morbidity.

3:33 pm

Endoscopic resection of sinonasal mucosal melanoma has comparable outcomes to open approaches

Amar Miglani, MD
Heidi Kosiorek, MS
Richard Hayden, MD
Michael Hinni, MD
Devyani Lal, MD
Phoenix, AZ
USA

Background:

Endoscopic endonasal resection (EER) of sinonasal mucosal melanoma (SMM) is a newer alternative to traditional external/open resection (OR). Long-term local control and survival data for EER are needed.

Aims: Compare outcomes of EER versus OR in SMM.

Methods:

A case series of patients who underwent surgical resection of SMM at a tertiary-care institution (2000-2015) was studied retrospectively. Patients were divided into those undergoing EER and OR. Tumor site, stage, surgical margins, local control and survival were studied.

Results:

Twenty-two patients met inclusion criteria. Nine underwent EER and 13 underwent OR. Mean age in EER and OR groups was 78.7 years (range 58.9-92.4) and 72.3 years (range 47.8-92.5), respectively. Two-thirds of patients were female (EER:66.7%; OR:61.5%). The nasal cavity was the most common primary site (EER:77.8%; OR:84.6%). Negative margins were achieved in all EER and 69.2% of OR. Local tumor stage in both groups was similar with the majority of cases being T4 (EER:55.6%; OR:61.5%; p=0.99). Median follow-up overall was 25.0 months (range 1.7-172.9). Median follow-up for EER and OR cohorts was 32.6 months (range 3.4-58.7) and 14.1 months (range 1.7-172.9) respectively. Five-year overall survival was similar in both groups (EER: 53.3%; OR:22.7%; p=0.214) as was disease-free survival (EER:55.6%; OR:22.8%; p=0.178). Local control was significantly higher in EER cohort (EER: 85.7%; OR:37.6%; p=0.026).

Conclusions:

Endoscopic resection of SMM offers oncologic outcomes comparable to open resection for appropriately selected patients, even in locally advanced tumors. Endoscopic resection may achieve superior local control rates. Longer follow-up is needed to further validate results.

3:40 pm

Surveillance in sinonasal malignancy: How often should patients receive postoperative endoscopy and imaging?

Douglas Worrall, MD
Sammy Khalili, MD (Presenter)
Steven Brooks, MPH
James Palmer, MD
David Kennedy, MD
Nithin Adappa, MD
Philadelphia, PA
USA

Introduction:

Postoperative surveillance of sinonasal tumors remains poorly established with a wide range of clinical practices. Studies have identified clinical markers associated with worse outcomes but these have not been translated into an alteration in the frequency of surveillance. In this study, we attempt to substantiate independent predictors of disease free survival and evaluate the timing of post-treatment endoscopy and imaging on overall survival and recurrence surgical outcome in sinonasal malignancy.

Methods:

Retrospective cohort study of primary sinonasal malignancies from 2000-2014. Subjects were analyzed based on endoscopic and imaging surveillance frequency in terms of recurrence surgical outcome and survival.

Results:

Ninety-eight sinonasal malignancies were identified with 28 recurrences. In addition to well established prognostic markers, preoperative American Society of Anesthesiologists (ASA) physical status score was found to be a novel independent marker of disease free survival (p <

0.01). Alterations in the timing of postoperative endoscopy or imaging did not impact the margin status of the recurrence resection. However, those who received surveillance imaging more frequently: every three months for the first post-treatment year, every six months for the second year, and every six to twelve months thereafter, had a significant improvement in overall survival when controlling for other prognostic factors ($p < 0.05$).

Conclusions:

Preoperative ASA scores of three or higher had a significant impact on disease free survival. In those at high risk for recurrence, more frequent postoperative imaging appears to provide a significant cancer survival benefit.

3:47 pm

Unintended consequences of proton beam radiation for sinonasal malignancies

Rachel Arffa, MD
Donald Lanza, MD
Glenn Call, MD
Alla Solyar, MD
Nadieska Caballero, MD
Jeb Justice, MD
St. Petersburg, FL
USA

Introduction:

Proton beam radiation (PBR) carries a theoretical advantage of a narrow Bragg peak and improved relative biological effectiveness (RBE) for treatment of sinonasal cancer. The goals of this retrospective review are to report local control rates and to describe unintended but common biological tissue effects.

Methods:

This is a retrospective case series report of all 29 patients from a single rhinology practice that received PBR for sinonasal malignancy from 2003 to 2015. Adverse tissue effects associated with PBR were sought: including skin/brow changes, epiphora, blindness, frontal lobe damage, osteoradionecrosis, and radiation induced secondary cancer. The post-PBR magnetic resonance imaging (MRI) frontal lobe changes were graded as described in the literature.

Results:

Adjuvant PBR was associated with a local control rate of 89.3% for a mean follow-up of 47.2 months, 96.4% nasal crusting, 77.8% epiphora, 53.6% intranasal synechia requiring lysis, 48% with radiation-induced frontal lobe changes, 22.2% eyebrow loss, 6.9% blindness, 3.4% with radiation-induced malignancy. The average time to initial MRI brain findings was 31.0 months. 58.3% of those subjects had worsening over time, with an average time to final change of 58.6 months from PBR. The average final MRI grade for those subjects with changes was 2.9 out of 4. 13.8% had osteoradionecrosis an average of 46.3 months after PBR completion.

Conclusions:

PBR appears to be an important tool in adjuvant treatment of sinonasal malignancy with a high local control rate. However, the possible tissue complications are relevant for patient education, patient management, and to prevent unnecessary brain biopsies.

3:54 pm

Discussion

Moderators: Charles Ebert MD, Henry Barham MD

3:59 pm

The impact of endoscopic sinus surgery on paranasal physiology in simulated sinus cavities

Ravi Jain, MD
Haribalan Kumar, PhD
Merryn Tawhai, PhD
Richard Douglas, MD
Grafton, Auckland
New Zealand

Introduction:

Surgery improves symptoms for a majority of CRS patients, however physiological changes in the sinus cavities remain poorly characterized. Direct measurement of changes in airflow velocity, pressure, temperature, water vapor and intranasal spray distribution following surgery is technically challenging. Accordingly we have used computational fluid dynamic modeling to quantify how these parameters change.

Methods:

CT images from a normal control, a patient with CRS before and after surgery and a patient following an endoscopic Lothrop procedure (ELP) were used to create four three-dimensional models of the sinus cavities. Changes in physiologic parameters and topical drug distribution were modeled (inhaled air at 15°C and 10% humidity) at the maxillary ostium, frontal recess and sphenoid ostium.

Results:

Large differences were seen in the models. Following surgery, the maxillary ostia were found on average to be cooler (2.35°C), with an increased flow velocity (0.26ms⁻¹ (from 0ms⁻¹)), and a 9% reduction in water vapor. Sphenoid ostia parameters followed a similar trend. Significant changes in frontal recess physiology were seen following ELP in which the recess was 3.7°C cooler, had increased flow velocity (0.5ms⁻¹) and a 10% reduction in humidity. Topical drug distribution increased with escalating surgery.

Conclusions:

Surgery has an effect on the geometry and physiology of the paranasal sinuses. These changes are likely to have an impact on wound healing, mucociliary function and microbial ecology in postoperative cavities. Application of this model and a clearer understanding of the effects of surgery may help to optimize surgical techniques and improve topical drug delivery.

4:06 pm

Prevalence of polyp recurrence after endoscopic sinus surgery for chronic rhinosinusitis with nasal polyposis

Adam DeConde, MD
Jess Mace, MPH
Joshua Levy, MD, MPH
Luke Rudmik, MD, MSc
Jeremiah Alt, MD, PhD
Timothy Smith, MD, MPH
San Diego, CA
USA

Introduction:

Chronic rhinosinusitis with nasal polyposis (CRSwNP) is a disease process that is driven, in part, by intrinsic mucosal inflammation. Surgery plus continued medical therapy is commonly elected by medically recalcitrant, symptomatic

patients. Our objective was to evaluate the prevalence of nasal polyp recurrence up to 18 months after functional endoscopic sinus surgery (FESS) with congruent continuing medical management.

Methods:

A prospective, multi-center cohort of adult patients undergoing FESS for medically recalcitrant CRSwNP was observed. All patients received baseline nasal endoscopy quantified using Lund-Kennedy grading. All patients included for final analysis provided at least 6 month postoperative endoscopy examinations. Multivariate analysis was used to identify risk factors for polyp recurrence.

Results:

Patients with CRSwNP were recruited between August 2004 and February, 2015 with 363 patients having undergone FESS involving polypectomy. A total of 244 (67%) participants had graded postoperative endoscopies with average of follow-up of 14.3[7.0] months. Surgery plus postoperative medical management significantly improved endoscopy total scores at 6 months ($p < 0.001$). The recurrence of nasal polyposis 6 months after FESS was 35% (68/197), compared to 38% (48/125) after 12 months, and 40% (52/129) after 18 months. Multivariate analysis identified both prior FESS (OR: 2.6, 95% CI: 1.5-4.6; $p = 0.001$) and worse preoperative polyposis severity (OR: 1.4, 95% CI: 1.1-1.8; $p = 0.016$) as risk factors for recurrent polyposis.

Conclusions:

Polyp recurrence is common after FESS with control of polyps only found in approximately 60-70% of patients. Investigation into both surgical and medical management strategies is warranted to improve upon the observed rate of recurrence.

4:13 pm

Efficacy of a novel self-propelling hemostatic agent in head and neck bleeding using a sheep in vivo model

Amin Javer, MD
Jamil Manji, MSc
Luis Macias-Valle, MD
Andres Finkelstein-Kulka, MD
Christopher Okpaleke, MD, MPH
Salahaldin Alsalihi, MD
Vancouver, BC
Canada

Introduction:

Functional endoscopic sinus surgery (FESS) involves operating within a confined space bordered by vital structures such as the eyes and brain. One main obstacle in FESS is intraoperative bleeding which when magnified poses a potentially significant hindrance in the operating field. Propelled-thrombin, a self-propelling hemostatic agent, has been demonstrated to effectively halt arterial bleeding in mice. This study aims to evaluate the efficacy and safety of propelled-thrombin in stopping bleeding in a sheep model of epistaxis and carotid injury.

Methods:

Eleven sheep underwent minor endonasal and subsequent carotid surgery. The nasal mucosa of both sides was punched using a 45-degree Trucut forceps and the bleeding time measured after applying propelled-thrombin and plain gauze for 2 minutes. Propelled-thrombin, plain and Floseal gauzes were then applied to a carotid bleed under

standardized pressure and assessed after 10 minutes for bleeding. Students' t-test was used to compare the means of bleeding time. The lungs, brain and heart were assessed for evidence of thromboembolism.

Results:

There was a statistically significant difference in the mean bleeding times of propelled thrombin vs plain gauze (mean difference: 3.83-minutes, p -value=0.002). All of the carotid bleeds (100%) controlled with propelled-thrombin stopped after 10 minutes of application under pressure, compared to 33% of Floseal and 0% of plain gauze. There was a 1.5cm mean migration of propelled-thrombin from the carotid puncture site. There was no evidence of thromboembolism in the organs.

Conclusion:

Propelling thrombin can potentially enhance its performance and efficacy in controlling hemorrhage in epistaxis and FESS.

4:20 pm

Assessment of a lateral nasal wall block technique for endoscopic sinus surgery under local anaesthesia

Grace Scott, MD
Chris Diamond, MD
Damian Micomonaco, MD
Sault Ste. Marie, ON
Canada

Introduction:

With increasingly limited operative resources and patient desires for minimally invasive procedures, there is a trend toward local endoscopic procedures being performed in the outpatient clinic setting. However, there remains limited data supporting a technique to adequately anaesthetize the lateral nasal wall and provide patient comfort during these procedures. The objective of the current study is to assess the efficacy of a novel lateral nasal wall block for use in office-based endoscopic sinus surgery.

Methods:

A prospective cohort study assessing consecutive patients undergoing office-based endoscopic sinus surgery using our described lateral nasal wall block anaesthesia technique. Procedural patient comfort was assessed using the Iowa Satisfaction with Anesthesia Scale (ISAS), completed by patients immediately following an office-based endoscopic procedure and prior to discharge from clinic. Post-operative analgesic use was assessed at the first post-operative visit.

Results:

Thirty-five consecutive patients undergoing office-based outpatient endoscopic sinus surgery for chronic rhinosinusitis (with and without polyps) were assessed. The mean ISAS score was a 2.83 with a 95% confidence interval ranging from 2.69 to 2.97. All patients (100%) agree or strongly agree they were satisfied with their anaesthesia care and would want the same anaesthetic again. No patient required narcotic analgesia and 80% used no oral analgesia at all following the procedure.

Conclusions:

Recent advances in office based endonasal surgical procedures must be accompanied by assessment and validation of local anaesthetic techniques. The described novel lateral nasal wall block is well tolerated, provides patient satisfaction and allows for limited use of post-procedure oral analgesics.

4:27 pm

Discussion

4:35 pm**Panel: Evidence for systemic and psychosocial symptoms in CRS**

Moderator: Zach Soler MD

Panelists: Rodney Schlosser MD, Jeremiah Alt MD, Adam DeConde MD

5nn:15 pm

Closing remarks, Business meeting, and Adjourn

Friday, May 20, 2016

12:55 am**Welcome**

ARS President and President-Elect

Peter Hwang, MD & John DelGaudio, MD

1:00 pm**Panel: Demystifying CSF leak diagnosis and repair**

Moderator: Sarah Wise, MD

Panelists: Jim Palmer MD, Stacey Gray MD, Eric Wang MD, Vijay Ramakrishnan MD

Moderators: Justin Antisdell MD, Leigh Sowerby MD**1:40 pm****Successful repair of intraoperative Csf leaks improves outcomes in endoscopic skull base surgery**

Arash Shahangian, MD, PhD

Zachary Soler, MD

Andrew Baker, MS IV

Caitlin Boling, MD

W. Alexander Vandergrift, MD

Rodney Schlosser, MD

Charleston, SC

USA

Background:

The impact of failed intraoperative CSF leak repair in endoscopic skull base surgery is not known.

Methods:

A retrospective review of patients undergoing any type of endoscopic skull base surgery between 2002 and 2014 at 7 international centers was performed. Demographic, comorbidity, tumor characteristics and repair technique were evaluated to determine association with successful repair of intraoperative leak. Postoperative complications and length of stay were compared among groups.

Results:

Data was collected on 2101 patients. Patients were divided into 3 groups: 1) Those with no intraoperative leak (73.7%); 2) those with successful repair of intraoperative leak (20.7%) and 3) those with failed repair (5.6%). Failed repair was associated with increased risk of intracranial infections (OR=5.5, P<0.0001), pneumocephalus (OR=5.3, P<0.0001), reoperation (OR= 115.4, P<0.0001) and increased hospital stay (p <0.01) compared to successful repair. Outcomes in patients who had successful repairs of intraoperative leaks

were similar to patients who never leaked. Intraoperative use of pedicled septal flaps was associated with successful repair (OR=0.53, p=0.009).

Conclusions:

Intra-operative CSF leaks are a frequent and expected occurrence during endoscopic skull base surgery. Failed CSF leak repair has a significant impact upon patient outcomes with increased rates of postoperative pneumocephalus, intracranial infections, reoperation and increased length of hospital stay. Recognition and repair of intraoperative CSF leaks reduces postoperative complications. Pedicled septal flaps may be useful in improving outcomes.

1:47 pm**Lumbar drain use after endoscopic cerebrospinal fluid leak repair: an evidence based review**

Omar Ahmed, MD

Sonya Marcus, MD

Jenna Tauber, MS

Seth Lieberman, MD

Richard Lebowitz, MD

New York, NY

USA

Introduction:

Lumbar drain (LD) placement after endoscopic cerebrospinal fluid (CSF) leak repair is a well-established practice. However, prior literature suggests that adjunct lumbar drain use may not improve outcomes but rather may introduce significant risk. This study examines the existing body of literature to determine if lumbar drain placement is beneficial in the prevention of CSF leak after endoscopic surgical repair.

Methods:

A comprehensive search was performed using Ovid MEDLINE (1947-November 2015), EMBASE (1974-November 2015), Cochrane Review, and PubMed (1990-November 2015) databases. Articles that investigated postoperative lumbar drain use in the management of CSF rhinorrhea were included and were located using the following search criteria: CSF rhinorrhea, CSF leak and use of postoperative lumbar drain. Studies citing pre-operative lumbar drain use and non-rhinologic leak were excluded.

Results:

Twenty-one studies met inclusion criteria with an aggregate C-grade of evidence (Level 1: 1 study, Level 2: 1 study, Level 3: 6 studies, Level 4: 11 studies, Level 5: 2 studies). Overall success rate of primary CSF leak repair without LD ranged from 86.5 to 100 %. When a lumbar drain was utilized as an adjunct, success ranged from 77.9 to 100 %. Complication rates from LD use ranged from 1.3 to 22.7 %.

Conclusions:

LD placement after endoscopic CSF leak repair has not been shown to provide superior outcomes and may be associated with increased adverse effects. Further prospective studies are necessary to investigate postoperative LD use in patients who are at high-risk for CSF leak.

1:54 pm**Treatment modalities in sinonasal undifferentiated carcinoma: An analysis from the national cancer database**

Mohammed Khan, MD
 Neeraja Konuthula, BS
 Arjun Parasher, MD
 Alfred Marc Iloreto Jr, MD
 New York, NY
 USA

Background:

Sinonasal undifferentiated carcinoma (SNUC) is a rare malignancy of unknown etiology.

Objective:

To analyze associations between treatment variables and survival in SNUC.

Population:

Retrospective study of cases in the National Cancer Data Base. Patients diagnosed as having SNUC between January 1, 2004, and December 31, 2013.

Results:

460 patients were found to have SNUC with a 5-year survival rate of 42.2%. AJCC clinical staging was available for 241 of the patients. 50.2% patients were diagnosed with late stage tumors of staging of 3 or greater. Surgery with adjuvant radiotherapy and chemotherapy was found to greater survival than definitive radiotherapy with adjuvant chemotherapy (57.6% vs 44.4%, $p = 0.0043$) in the total population. However, in late stage tumors, there was no difference in survival between the two treatment groups ($p = 0.1248$). Further analysis of late stage tumors revealed that in the surgery with adjuvant therapy group, time to initiation of adjuvant therapy was 53.0 ± 6.2 days as compared to 27.4 ± 2.5 days in the definitive radiotherapy with chemotherapy group ($p = 0.0014$). No differences in age, gender, race, Charlson-Deyo Score, facility type (academic vs nonacademic), or radiation dose were found between the two treatment groups ($p > 0.05$).

Conclusions:

Survival for late stage SNUC tumors does not seem to differ with surgery. In fact, surgery extends time to initiation of radiotherapy with chemotherapy and likely increases morbidity without improving mortality. Definitive radiotherapy with chemotherapy should be considered for initial therapy in late stage SNUC tumors.

2:01 pm**Patterns of vascularization and surgical morbidity in juvenile nasopharyngeal angiofibroma: A systematic review and meta-analysis**

Jonathan Overdeest, MD, PhD
 Matthew Amans, MD, MSc
 Peter Zaki, MD
 Chris Dowd, MD
 Ivan El-Sayed, MD
 San Francisco, CA
 USA

Background:

Juvenile nasopharyngeal angiofibromas (JNA) are benign, locally aggressive tumors that are increasingly recognized to have complex vascular contributions, as noted during preoperative angiographic embolization. Indeed, vascularity from the internal carotid system is a key criterion in a recent

staging system. This systematic review and meta-analysis evaluates the prevalence of vascular supply from the internal carotid system and its impact on surgical management.

Methods:

We reviewed twenty-six consecutive JNA cases from our academic medical center, in addition to performing a systematic review & meta-analysis of all juvenile nasopharyngeal angiofibroma cases undergoing angiographic embolization with explicitly reported angiographic vascular patterns. Studies were published between January 1995 and November 2015 in PubMed, Cochrane Review, and Web of Science databases, and inclusion was evaluated in accordance with PRISMA guidelines based on defined criteria.

Results:

Seventy-one studies were identified, involving 944 patients. The internal carotid system was noted to provide collateral blood supply in 311 cases (32.9%). The mandibulovidian artery was the most commonly involved named vessel, however, branches of the internal carotid artery system were not specifically named in 279 cases. The majority of relevant studies were found to provide insufficient data to perform further analyses. However, evaluation of our eighteen cases (69.2%) with internal carotid artery supply demonstrated association with residual disease ($P < 0.05$) and increased operative blood loss ($P < 0.01$).

Conclusion:

Internal carotid contributions are frequent in JNA and portend worse clinical stage and course. Transparent reporting of internal carotid and collateral contributions in clinical publications will enhance prognostic accuracy when counseling patients.

2:08 pm**Discussion****2:15 pm****Panel: How much surgery is appropriate**

Moderator: Zara Patel MD
 Panelists: Peter Hwang MD, Richard Harvey MD,
 Marc Dubin MD

Moderators: Greg Davis MD, Christopher Church MD**2:50 pm****Immunoglobulin replacement therapy reduces chronic rhinosinusitis in patients with antibody deficiency**

Jarrett Walsh, MD, PhD
 Jose Gurrola II, MD
 Scott Graham, MD
 Zuhair Ballas, MD
 Iowa City, IA
 USA

Introduction:

Patients with primary antibody deficiencies have an increased frequency of sinonasal and pulmonary infections. Immunoglobulin (Ig) replacement is a standard therapy for common variable immunodeficiency (CVID) and specific antibody deficiency (SAD). While there is convincing evidence that Ig replacement reduces pulmonary infections, there is little evidence that it reduces sinus infections or abates chronic rhinosinusitis (CRS).

Methods:

A single-center, retrospective chart review from 1991 to 2014 was performed. Inclusion criteria included diagnosis of CVID or SAD, history of CRS requiring medical and/or surgical management within the last year, treatment with immunoglobulin replacement therapy, and follow-up interval of at least 1 year after initiating Ig replacement. Patients with secondary immune deficiencies were excluded. 31 patients met criteria. Collected data includes pre- and post-treatment Lund-Mackay scores as well as rates of sinusitis and pulmonary infections. Statistical analysis was performed using Wilcoxon signed-rank tests.

Results:

A significant decline in the Lund-Mackay score was evidenced from pre- to post-treatment ($p < 0.01$). Treatment also conferred significantly lower rates of sinusitis ($p < 0.01$) and pulmonary infections ($p < 0.01$). Additionally, 62% of patients who were on prophylactic antibiotics prior to Ig replacement were able to discontinue their use.

Conclusions:

We present objective evidence showing that Ig replacement therapy has a positive impact on the frequency of sinusitis and confirm its positive impact on pulmonary infections in patients with CVID and SAD. These results suggest immunoglobulin replacement therapy may improve quality of life associated with CRS in patients with humoral immunodeficiencies.

2:57 pm**Characteristics associated with macrolide therapy response**

Gretchen Oakley, MD
Richard Harvey, MD, PhD
Darlinghurst, NSW
Australia

Introduction:

Long term low dose macrolide therapy has shown benefit in the management of diffuse panbronchiolitis. However, our understanding of patient characteristics in Chronic Rhinosinusitis (CRS) that predispose to macrolide response is limited.

Methods:

A case control study was performed of consecutive chronic rhinosinusitis patients with low dose macrolide therapy, who were failing after endoscopic sinus surgery the corticosteroid irrigation therapy in a tertiary level rhinology practice. Patients were categorized as either responders based on near normal endoscopy at 6 months or greater following endoscopic sinus surgery and commencement of clarithromycin treatment. History of asthma or reflux, allergy status, and intraoperative serum and tissue histopathology results were assessed in both groups.

Results:

Twenty-seven patients met inclusion criteria (44.4% female, 54.4 +/- 15.5 years), of which 18 were macrolide responders (66.7%) and 9 were nonresponders (33.3%). Of these patients, 29.6% had a history of asthma, 22.2% a history of reflux, and all were nonsmokers. Macrolide responders had low tissue eosinophilia compared to nonresponders (defined as eosinophil count < 10 per high power field) [84.6% vs 33.3%, $p < 0.02$]. Tissue neutrophilia was similar between the groups (38.5% vs 50%, $p = 0.64$). Presence of tissue squamous metaplasia was associated with lack of response (15.8% vs 84.2%, $p < 0.21$). Serum eosinophilia was lower

in macrolide responders (median 0.13 [0.11] vs 0.25 [0.13]), whereas serum neutrophilia was similar ($p = 0.84$). Allergy status did not predict response.

Conclusion:

Low tissue and serum eosinophilia, and absence of tissue squamous metaplasia may predict effective treatment response in patients.

3:04 pm**Improved delivery of sinus irrigations after middle turbinate resection during functional endoscopic sinus surgery**

Sarah Kidwai, MD
Arjun Parasher, MD
Mohammed Khan, MD
Anthony Del Signore, MD, PhD
Alfred Iloreta, MD
Satish Govindaraj, MD
New York, NY
USA

Introduction:

Improvement in the delivery of topical medications to nasal mucosa is a fundamental goal of functional endoscopic sinus surgery (FESS). Here, we compare the penetration of sinus irrigation before and after middle turbinate resection (MTR) during FESS to assess the efficacy of topical medication delivery.

Methods:

FESS was performed bilaterally on four cadaver heads, followed by MTR. Each head was irrigated with Fluorescein-dyed water using a NeilMed squeeze bottle both before and after MTR. Videos were recorded by rigid nasal endoscopy to assess penetration of the maxillary, ethmoid, frontal, sphenoid sinuses and olfactory clefts. Four blinded raters reviewed videos and scored the extent of staining (0 – 3) for each site.

Results:

The mean score for the extent of staining of all anatomical sites before and after MTR was 1.30 and 1.92, respectively ($p = 0.035$). The mean score for extent of staining before and after MTR was 2.56 and 2.81, respectively ($p = 0.134$), for the maxillary sinus, 1.66 and 2.25, respectively ($p = 0.022$), for the ethmoid sinus, 1.03 and 1.94, respectively ($p = 0.263$), for the sphenoid sinus, 0.16 and 0.94, respectively ($p = 0.055$), for the frontal sinus, and 1.09 and 1.66, respectively ($p = 0.340$), for the olfactory cleft.

Conclusions:

Overall, MTR results in a significant improvement in the penetration of nasal irrigations. Each individual sinus displays a trend toward improvement; however, only the ethmoid sinus displays a statistically significant improvement. Further in-vivo studies are needed to elucidate the role of MTR in FESS.

3:11 pm**The relationship of healthcare-acquired pneumonia to sinus opacification in the intensive care unit patient**

Phillip Huyett, MD
 Nicholas Rowan, MD
 Berrylin Ferguson, MD
 Stella Lee, MD
 Eric Wang, MD
 Pittsburgh, PA
 USA

Objectives:

The association between ICU sinusitis and other healthcare-acquired infections remains unclear. Our objective was to determine the correlation between the development of radiographic sinus opacification and pneumonia in the ICU setting.

Methods:

We performed a retrospective study of head CT or MRI imaging of 612 patients admitted to the neurologic ICU at a tertiary care center from April 2013 through April 2014. Sinus opacification was measured by the Lund-Mackay system (LMS). A diagnosis of pneumonia was determined by the ICU team from radiographic, laboratory and ventilatory data. Exclusion criteria included a history of endonasal surgery or sinonasal malignancy, facial fractures, ICU admission less than 3 days or inadequate imaging.

Results:

Worsening sinus opacification occurred in 42.6% of patients and pneumonia in 18.5% of patients during their ICU stay. Of the patients who developed pneumonia, 71.7% also developed worsening sinus opacification ($p < .001$). In 80.2% of cases, the sinus opacification developed prior to the diagnosis of pneumonia. The mean highest LMS for patients who developed pneumonia was 4.24 compared to 1.99 in patients who did not develop pneumonia ($p < .001$). Sinus air-fluid levels or complete opacification occurred in a larger proportion of patients who developed pneumonia (46.9% vs. 19.4%, $p < .001$). Mortality rates for patients with no pneumonia or sinusitis, pneumonia only, sinusitis only and sinusitis with pneumonia were 7.6%, 15.6%, 18.3% and 25.9%, respectively ($p < .001$).

Conclusions:

This study finds a strong relationship between worsening sinus opacification in the ICU patient to the development of healthcare-acquired pneumonia and increased mortality.

3:18 pm

Discussion

3:23 pm

Break with Industry Partners

Moderators: Luke Rudmik MD, Pablo Stolovitsky MD

3:45 pm**The pain-depression dyad and the association with sleep dysfunction in chronic rhinosinusitis**

Daniel Cox, MD
 Shaelene Ashby, PhD
 Richard Orlandi, MD
 Timothy Smith, MD, MPH
 John DelGaudio, MD
 Jeremiah Alt, MD, PhD
 Salt Lake City, UT
 USA

Introduction:

Depression, pain, and sleep disturbance is a symptom cluster often found in patients suffering from chronic illness, exerting a large impact on quality of life (QOL). A wealth of literature exists demonstrating a significant association between depression, pain, and sleep dysfunction in other chronic diseases. This relationship has not been described in patients with chronic rhinosinusitis (CRS).

Methods:

Sixty-eight adult patients with CRS were prospectively enrolled. Patients at risk for depression were identified using the Patient Health Questionnaire -2 (PHQ-2). Pain experience was measured using the Brief Pain Inventory Short Form (BPI-SF) and the Short Form McGill Pain Questionnaire (SF-MPQ). Sleep quality was assessed using the Pittsburgh Sleep Quality Index (PSQI).

Results:

Forty-seven patients were at risk for depression. Significant positive correlations were found between total PSQI scores and all pain measures ($R = 0.38-0.61$, $p = 0.05$) and between total PSQI scores and PHQ-2 scores ($R = 0.46$, $p < 0.05$). For patients at risk for depression, positive correlations were found between pain measures, the total PSQI score, and the three PSQI subdomains (sleep latency, sleep quality, and daytime dysfunction; $R = 0.305-0.610$, $p < 0.05$). The relationship between pain and sleep dysfunction was not seen in the absence of depression.

Conclusions:

Depression, pain, and sleep dysfunction are interrelated in patients with CRS. In the absence of depression, significant correlations between pain and sleep are not observed, suggesting that depression plays a key role in this interaction. Further research investigating the complex relationship between depression, pain, and sleep dysfunction in CRS is needed.

3:52 pm**Quality of life improvement in patients after endoscopic sinus surgery is dependent on obstructive sleep apnea severity**

Carol Yan, MD
 Bobby Tajudeen, MD
 Steven Brooks, MPH
 Edward Kuan, MD, MBA
 James Palmer, MD
 Nithin Adappa, MD
 Philadelphia, PA
 USA

Introduction:

Patients with chronic rhinosinusitis (CRS) and comorbid obstructive sleep apnea (OSA) have reduced quality of life (QOL) improvements after functional endoscopic sinus surgery (FESS) compared to patients without OSA. We aim to determine whether this difference in QOL improvement is dependent on OSA severity.

Methods:

This multi-institution retrospective cohort study evaluated adult CRS patients who underwent FESS between 2007 and 2015. Patient demographics and clinical factors were collected prior to FESS. Pre-operative, 1-month, 3-month, 6-month, and 1-year post-operative 22-item Sino-Nasal Outcome Test (SNOT-22) scores were used to evaluate QOL. We compared non-OSA with stratified OSA patients with mild (apnea-hypopnea index [AHI] 5 to <15), moderate (AHI = 15 to < 30), or severe (AHI = 30) disease based on pre-operative polysomnography. A multilevel mixed-effects linear regression model was used for the analysis.????

Results:

Of 480 participants, 83 (17%) had self-reported OSA and 47 had PSG-confirmed mild (n=12), moderate (n=16) or severe (n=19) OSA. Both OSA and non-OSA patients reported significant QOL improvement post-operatively ($p < 0.05$). After adjusting for all covariates, non-OSA patients reported greater improvement in overall SNOT-22 scores compared to OSA patients (-2.6, $p = 0.015$). Stratifying for OSA severity, non-OSA patients demonstrated the most QOL improvement followed by OSA patients with severe (-1.55, $p = 0.432$), moderate (-5.89, $p = 0.014$) and mild (-6.16, $p = 0.019$) disease (model $p = 0.009$).

Conclusions:

CRS patients with OSA experienced a smaller QOL benefit compared to those without OSA. When disease stratified, patients with severe OSA received greater QOL benefit after FESS compared to those with moderate and mild OSA.

3:59 pm**Sleep quality in CRS patients improves with surgery but not medical therapy**

Jeremiah Alt, MD, PhD
 Vijay Ramakrishnan, MD
 Michael Platt, MD
 Preeti Kohli, BA
 Rodney Schlosser, MD
 Zachary Soler, MD, MSc
 Salt Lake City, UT
 USA

Introduction:

Endoscopic sinus surgery (ESS) has been shown to improve sleep quality in patients with chronic rhinosinusitis (CRS). However, it is unknown how this improvement compares to non-CRS controls and medically treated patients.

Methods:

Patients meeting criteria for CRS and controls from the same reference population were recruited from 4 academic centers. Patients elected medical or surgical treatment. The Pittsburgh Sleep Quality Index (PSQI) was administered to patients prior to treatment and after 6 months while controls received the PSQI at enrollment.

Results:

The study population consisted of 187 cases (64 medical; 123 surgical) and 101 controls. Baseline PSQI scores for CRS patients (9.27 ± 4.76) were worse than controls (5.78 ± 3.25), even after controlling for potential confounding factors including asthma and allergy ($p < 0.001$). There was no significant difference in baseline PSQI between patients choosing medical vs surgical treatment. PSQI in surgical patients improved from 8.36 ± 5.05 to 7.44 ± 5.09 ($p = 0.020$). PSQI in medical patients actually demonstrated a non-significant increase with treatment, going from 8.71 ± 4.48 to 9.06 ± 4.80 ($p = 0.640$). After controlling for allergy and asthma, six month PSQI scores in medical patients remained significantly higher than controls ($p = 0.001$), whereas a significant difference could not be demonstrated between surgical patients and controls ($p > 0.05$). PSQI subdomain analysis mirrored the overall findings.

Conclusion:

Patients with CRS report worse sleep quality compared to controls. Surgically treated CRS patients show significant improvement in PSQI scores, whereas those continuing with medical management fail to improve and remain worse than controls.

4:06 pm**The effectiveness of nasal surgery on psychological symptoms in patients with obstructive sleep apnea and nasal obstruction**

Yang Xiao, MD
 Demin Han, MD
 Hongrui Zang, MD
 Beijing
 China

Background:

The aim of this study was to investigate the psychological status of OSA patients with nasal obstruction and the effects of nasal surgery on the psychological symptoms and polysomnographic (PSG) parameters of these patients.

Methods:

We compared 30 patients with nasal obstruction and 30 matched patients without nasal obstruction using PSQI and SCL-90. All of the patients had been previously diagnosed with OSA. Nasal obstruction was assessed using a VAS. The patients with nasal obstruction underwent nasal surgery, and their weight, VAS, nocturnal PSG characteristics and psychological symptoms at baseline and 3 months after surgery were compared.

Results:

The OSA patients with nasal obstruction suffered from significantly longer sleep latency on the PSQI and higher somatization and anxiety scores on the SCL-90 than the subjects without nasal obstruction. The nasal obstruction symptoms significantly improved after surgery (VAS decreased from 6.18 ± 1.85 to 1.87 ± 1.76 , $P < 0.01$). The assessments also showed a significant reduction in weight (from 84.60 ± 11.30 kg to 82.27 ± 9.87 kg, $P < 0.05$) between the preoperative and postoperative values. Although there was significant reduction in the AHI (from 49.67 ± 19.49 /hr to 43.07 ± 21.86 /hr, $P < 0.01$) and a significant improvement in LSpO₂ (from $73.83 \pm 8.49\%$ to $75.97 \pm 9.86\%$, $P < 0.05$), only 23.3% of patients achieved a response of nasal surgery that met Sher's criteria. Remarkable reductions were observed in the sleep latency scores, daytime dysfunction scores on the PSQI, anxiety and hostility scores, and the number of positive symptoms on the SCL-90.

Conclusion:

Nasal obstruction can aggravate the psychological status of OSA patients, and nasal surgery should reduce this aggravation.

4:13 pm**Discussion****Moderators: Stella Lee, Phillip Chen****4:18 pm****Health utility scores for patients with recurrent acute rhinosinusitis undergoing endoscopic sinus surgery – A nested case control study**

Raj Dedhia, MD
 Toby Steele, MD
 Jess Mace, MPH
 Luke Rudmik, MD, MSc
 Timothy Smith, MD, MPH
 Jeremiah Alt, MD, PhD
 Sacramento, CA
 USA

Introduction:

Health utility scores quantify an individual's valuation of particular health states and are vital components of health economic studies and cost-effectiveness research. We sought to characterize health utility values for patients with recurrent acute rhinosinusitis (RARS) both before and after endoscopic sinus surgery (ESS), as well as compare health utility to chronic rhinosinusitis without nasal polyposis (CRSsNP).

Methods:

Patients with RARS (n=20) and CRSsNP (n=20) undergoing ESS were enrolled as part of a longitudinal, observational, prospective cohort. Case patients diagnosed with RARS were age and gender matched to controls with CRSsNP using a nested case-control design at a 1:1 ratio. Health utility was measured using the Medical Outcomes Study Short Form-6D (SF-6D).

Results:

Patients with RARS were followed for an average of 14.0[6.1] months compared to an average of 14.4[5.3] months for CRSsNP controls (p=0.779). Mean preoperative SF-6D health utility scores were statistically comparable between RARS (0.71[0.14]) and CRSsNP (0.66[0.12]; p=0.341). Both patients with RARS and CRSsNP reported significant postoperative improvement in SF-6D scores from 0.71[0.14] to 0.79[0.13] (p=0.031) and from 0.66[0.12] to 0.77[0.13] (p=0.004), respectively. No difference in last postoperative SF-6D scores were found between RARS and CRSsNP (p=0.583) or in the average magnitude of postoperative improvement (0.08[0.16] vs 0.11[0.13]; p=0.620).

Conclusion:

Patients with RARS and CRSsNP report significant impairment in health utility as measured by the SF-6D. Endoscopic sinus surgery significantly improves health utility in patients with RARS and CRSsNP to near normative values. These data will help inform future economic analysis and cost-effectiveness research.

4:25 pm**Evaluating metrics of responsiveness using patient-reported outcome measures in chronic rhinosinusitis**

Alcina K. Lidder, BA
 Caroline P.E. Price, BA
 Robert C. Kern, MD
 David B. Conley, MD
 Robert P. Schleimer, PhD
 Stephanie Shintani-Smith, MD
 Rakesh K. Chandra, MD
 Anju T. Peters, MD
 Leslie C. Grammer, MD
 Li-Xing Man: MD, MPA
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 USA

Introduction:

Responsiveness, or sensitivity to clinical change, is important when selecting patient-reported outcome measures (PROMs) for research and clinical applications. We compared responsiveness of PROMs used in chronic rhinosinusitis (CRS).

Methods:

Adult CRS patients initiating medical therapy (MT: n=143) or undergoing endoscopic sinus surgery (ESS: n=123) completed a visual analog scale (VAS), SNOT-22, and PROMIS-29 at baseline and 3 months following treatment. The PROMIS-29 is a validated general health PROM. Statistical tests included Cohen's d (responsiveness metric) and paired t-tests.

Results:

Respectively, 55 (38.5%) subjects and 44 (35.8%) subjects in the MT and ESS groups completed baseline and 3-month questionnaires. Subjects with and without 3-month data were similar with respect to baseline demographics, VAS scores, and SNOT-22 scores ($p>0.05$). In the MT group, CRS-specific measures like VAS ($d=-0.58$, $p<0.01$) and SNOT-22 scores ($d=-0.70$, $p<0.01$) were more responsive than PROMIS-29 domains ($p>0.05$). In the ESS group, VAS ($d=-1.97$, $p<0.01$) and SNOT-22 scores ($d=-1.56$, $p<0.01$) were similarly more responsive although changes in PROMIS-29 Fatigue ($d=-0.82$, $p=.01$); Sleep Disturbance ($d=-0.83$, $p<0.01$); and Pain Intensity ($d=-1.0$, $p<0.01$) domains became significant. For MT subjects, 13 SNOT-22 items differed significantly following treatment whereas all 22 items differed significantly for ESS subjects.

Conclusions:

In both MT and ESS groups, SNOT-22 and VAS scores were more responsive than PROMIS-29 domains, suggesting that CRS-specific PROMs are more sensitive to post-treatment clinical changes than general health measures. Furthermore, the findings suggest that surgical response is greater than response to initial medical therapy for both disease-specific and general health PROMs.

4:32 pm**The Ens6q: A validated 6-item questionnaire as a diagnostic aid for empty nose syndrome**

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 Andrew Thamboo, MD
 Al-Rahim Habib, MSc
 Zhenxiao Huang, MD, PhD
 Jayakar Nayak, MD, PhD
 Palo Alto, CA
 USA

Introduction:

Because empty nose syndrome (ENS) is difficult to objectively diagnose, specific symptoms are essential to identifying possible ENS patients. We sought to validate an ENS-specific, 6-item questionnaire (ENS6Q) as an adjunct to the standard SNOT-22 questionnaire to reliably discriminate patients with suspicion of ENS.

Methods:

The ENS6Q paired 6 common ENS symptoms - nasal suffocation, burning, openness, crusting, dryness, impaired air sensation through nasal cavities – with testing on three patient cohorts: 15 patients with suspected ENS, 30 with chronic rhinosinusitis without polyposis (CRSsNP) and 29 healthy controls devoid of past sinonasal surgery. Participants answered 2 rounds of both the SNOT-22 and ENS6Q questionnaires within 48 hours of each other. No changes in treatments occurred in the test interval between questionnaires. Internal consistency, test-retest reliability, validity, and area under the curve (AUC) were assessed to differentiate between patient cohorts using the SNOT-22 and ENS6Q.

Results:

Internal consistency between SNOT-22 and ENS6Q was 0.943 and 0.946 for the first, and 0.915 and 0.932 for the second time point, respectively. The test-retest reliability between time points for ENS6Q testing was 0.969. The ENS6Q was able to statistically significantly discriminate between ENS vs. control patients ($p<0.001$) and ENS vs. CRSsNP patients ($p<0.001$), without significant differences between CRSsNP vs. controls ($p=0.127$). The AUC threshold score comparison further supported the ability of the ENS6Q to differentiate ENS from CRSsNP patients (AUC = 0.975).

Conclusion:

The ENS6Q is the first validated, specific, adjunct questionnaire to the SNOT-22 to better identify patients suspected of developing ENS

4:39 pm**Oral corticosteroid prescribing habits for rhinosinusitis: The ARS membership**

John Scott, MD
 Luke Rudmik, MD, BSc, FRCSC
 Brian Rotenberg, MD, MPH, FRCSC
 Leigh Sowerby, MD, MHM, FRCSC
 London, Ontario
 Canada

Introduction:

Oral corticosteroids (OCSs) are widely prescribed by Otolaryngologists for rhinosinusitis. While there is evidence in the literature regarding specific OCS dosing regimens, it is not known to what extent these recommendations are being followed.

Objective:

To examine the current state of OCS prescribing habits for rhinosinusitis in American Rhinologic Society (ARS) members.

Methods:

An anonymous online survey was sent to all ARS members. Dosing, frequency, tapering and overall prescribing habits for OCSs were assessed in chronic rhinosinusitis with (CRSwP) and without polyposis (CRSsP) and acute bacterial rhinosinusitis (ABRS). The CRSwP was subdivided into aspirin exacerbated respiratory disease (CRSwP-AERD), not otherwise specified (CRSwP-NOS) and allergic fungal sinusitis (CRSwP-AFS). Results were compared with current guidelines. Descriptive statistics were used to analyze data.

Results:

93 surveys were completed. In CRSwP-AERD (n=86) the median starting dose was 60mg (Range was 4-80mg) and the average duration was 8 days (Range 2-28 days). In CRSwP-NOS (n=84) the median starting dose was 50mg (Range 20-80mg) and the average duration was 5 days (Range 1-21 days). In CRSwP-AFS (n=81) the median starting dose was 50mg (Range 20-60mg) and the average duration was 6 days (Range 2-35 days). OCSs were administered in 66.0% and 62.4% of CRSsP and ABRS patients, respectively. Several discrepancies were observed when survey results and evidence-based recommendations were compared.

Conclusion:

Significant heterogeneity exists in OCS prescribing habits for rhinosinusitis. Improvements in standardization should be made to enhance outcomes and reduce complications.

4:46 pm

Discussion

4:50 pm**Panel: My favorite new sinus technique and how it can be used in your practice**

Moderator: Benjamin Bleier MD

Panelists: Brad Woodworth MD, Ray Sacks MD, Jayakar Nayak MD

5:30 pm

Closing Remarks and Adjourn

Posters

Poster ID# D001

3d reconstruction and printing of skull base anatomy for surgical planning of endoscopic endonasal odontoidectomy. [case Report Of Basilar Invagination With Type 1 Chiari Malformation]

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Katelyn Stepan, MD
Alok Saini, MD
Anthony Costa, PhD
Raj Shrivastava, MD
Alfred Illoreta, MD
New York, NY
USA

Introduction:

Pathologies at the craniovertebral junction occasionally require surgical interventions such as odontoidectomy. Transnasal approaches are becoming more common and offer some advantages over transoral approaches; however, certain anatomic constraints limit our ability to obtain adequate exposure and operate safely in such a narrow field. Careful preoperative planning with imaging is critical for defining appropriate surgical candidates and allowing surgeons to operate confidently in a difficult to visualize space. We present the use of two 3D reconstruction methods to plan an endonasal odontoidectomy for surgical decompression of basilar invagination.

Methods:

A 48-year-old female with type one Chiari malformation status-post suboccipital decompression and C1 laminectomy presented to clinic with basilar invagination, which necessitated endoscopic odontoidectomy and occipitocervical fusion. 3D images were reconstructed with Surgical Theater, LLC's "Surgical Navigation Advanced Platform" (SNAP) and open-source software based models. These were coupled to BrainLab navigation for operative interactivity. Structural models were printed at 1:1 scale.

Results:

Preoperatively, using the 3D models, we determined that we would be able to adequately expose the target region despite being at the limit of our endoscopic instruments. The models also highlighted an aberrant midline left carotid artery at C1/C2, which helped avoid injury to the carotid intraoperatively.

Conclusion:

Effective surgical planning with 3D models can aid in appropriate patient selection by defining the limitations of surgical instrumentation and has the potential to decrease time under general anesthesia while decreasing morbidity and mortality by allowing surgeons to better understand complex spatial anatomy and operate with greater confidence.

Poster # D002

A comparison of the effect of intravenous paracetamol and tenoxicam on postoperative pain following septoplasty

Adem Çakmak, MD
Murat Salihoglu, MD
Atila Gungor, MD
Istanbul, Turkey

Objectives:

This study aims to compare the efficacy of intravenous paracetamol and tenoxicam in the management of postoperative pain following septoplasty.

Patients and Methods:

Between May 2008 and January 2009, 40 male adults (mean age 21.7 years; range 19 to 24 years) who underwent septoplasty in our clinic were included in this randomized controlled study. Patients were randomly divided into two groups, including 20 in each group. Analgesia was achieved through intravenous paracetamol 1 g every six hours in the first group (paracetamol group) and intravenous tenoxicam 20 mg at a single dose within the first 24 hours in the second group (tenoxicam group). Visual analog scale (VAS) was used to assess the pain severity preoperatively and at 30 minutes, 1, 2, 6, 12 and 24 hours postoperatively. Postoperative complications for both groups were also recorded.

Results:

There was no significant difference in intraoperative pain scores between the groups ($p=0.47$). The VAS scores at 30 minutes ($p=0.018$), 1, 2 and 6 hours were significantly lower in paracetamol group, compared to tenoxicam group ($p=0.0001$; $p=0.001$; $p=0.04$, respectively).

Conclusion:

Early postoperative moderate pain is accompanied following septoplasty. This can be prevented by using analgesics.

Poster# D003

A novel technique to promote mucosal graft viability after endoscopic modified lothrop procedure

Marissa P. Lafer, MD
Mark Fritz, MD
Kenneth Yan, PhD
Seth Lieberman, MD
New York, NY
USA

Introduction:

The Endoscopic Modified Lothrop Procedure (EMLP), or Draf III, maximizes the dimensions of the frontal outflow tract. This procedure has a variety of indications, including the management of frontal mucocoeles, in which a larger outflow tract correlates with a decrease in mucocoele recurrence. Stenosis of the neo-ostium is cited as a major reason for surgical failure. Recurrence rates secondary to stenosis ranges from 14% to 32%. One theory is that the exposed bone of the neo-ostium is pro-inflammatory resulting in formation of granulation tissue and osteoneogenesis, ultimately causing stenosis. Mucosal grafts in the neo-ostium have been shown to decrease the rate of stenosis. The use of a mucosal graft with a steroid-eluting stent as a bolster has yet to be described.

Methods:

Case Series: Two male patients with frontal mucocoeles were identified. Both patients underwent frontal drillout procedures with a mucosal graft from the septum to cover the exposed bone of the neo-ostium with the Propel steroid-eluting stent acting as a bolster.

Results:

At the most recent follow up, the mucosal grafts in both patients were intact and viable and the neo-ostia were patent without stenosis.

Conclusions:

While more numbers will be needed to further support our idea, we propose the use of a steroid-eluting stent bolster as a novel and effective technique in promoting mucosal graft viability after EMLP.

Poster# D004

A rare case of middle turbinate nasal schwannoma

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Chicago, IL
USA

Background:

Schwannomas are benign lesions of peripheral nerve sheaths, 25-45% of which occur in the head and neck region, commonly in association with the eighth cranial nerve. Nasal schwannomas represent 4% of these, and only one report of middle turbinate schwannoma exists in the literature.

Methods:

Case report, literature review

Results:

A 69-year-old woman presented for evaluation of left pulsatile tinnitus, nasal congestion, and intermittent epistaxis. A nasal mass (15mm X 23 mm X 27mm) was identified on magnetic resonance imaging performed for asymmetric hearing loss, on which she was also found to have an internal carotid aneurysm. After recovering from neurosurgical clipping of the aneurysm, a sinus computed tomography showed the nasal mass without sinus involvement or bony destruction. She then underwent endoscopic treatment of the left nasal mass, which was identified to be emanating from the middle turbinate intraoperatively. Frozen section revealed low-grade spindle cells, which carry a differential diagnosis of both benign and malignant pathologies such as sinonasal polyp with stromal atypia, nodular fasciitis, solitary fibrous tumor, glomangiopericytoma, schwannoma, spindle cell carcinoma, and melanoma. The lesion was completely excised with the aim to achieve a negative margin. Final histopathology was consistent with a schwannoma, and no further treatment was indicated.

Conclusion:

This is the second report of a nasal schwannoma arising from the middle turbinate. In contrast to the previous report, this nasal schwannoma did not invade into adjacent sinuses and produced no orbital/visual symptoms. Biopsying the lesion in the clinic would not have altered management.

Poster# D005

A unique presentation of sinus histiocytosis with massive lymphadenopathy

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Orange, CA
USA

Introduction:

Sinus histiocytosis with massive lymphadenopathy (SHML) is a rare condition that typically presents with painless lymphadenopathy, fever, and polyclonal hypergammaglobulinemia. Extranodal involvement of the nasal cavity and paranasal sinuses has been reported in 11% of cases. We report of a case with two distinct foci of sinonasal SHML in the sinonasal cavities, requiring complex surgical treatment.

Methods:

Case report with literature review; IRB exempt.

Results:

61-year-old male with 6-year history of progressive nasal obstruction refractory to medical treatment following polypectomy. He was found to have bilateral sinonasal masses and was taken to surgery for excision. Intraoperative examination revealed bilateral, distinct anterior fleshy but polypoid masses with submucosal involvement of the nasal floor and septum, extending to the lateral nasal wall, inferior turbinate, and maxillary cavity, with complete obstruction of the nasopharynx. Staged surgical resection was performed for the left-sided mass to minimize the risk of septal perforation given involvement of the anterior septal perichondrium bilaterally. Pathology was consistent with SHML. On complete physical examination there were no other obvious foci of SHML and he remains disease-free.

Conclusion:

SHML is a rare condition that has been known to involve the sinonasal cavity. Discussed is a unique case with multiple infiltrating foci of the sinonasal mucosal causing obstruction and chronic pansinusitis. There is currently no consensus on the optimal treatment of SHML, however complete surgical resection at the time of presentation has been recommended and suggested to be sufficient. Co-treatment with steroids, radiation, or chemotherapy has also been proposed.

Poster# D006

Angioleiomyoma of the nasal septum: Case report and literature review

Varun V. Varadarajan, MD
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Jeb Justice, MD
Gainesville, FL
USA

Introduction:

Angioleiomyoma is a benign soft tissue tumor of smooth muscle origin with a vascular component and is an uncommon form of leiomyoma. Angioleiomyoma presenting in the nasal cavity is exceedingly rare and there are 57 reported cases in the literature worldwide. We present a new case of angioleiomyoma of the nasal septum and review its diagnosis and treatment.

Study Design:

Case report and Literature Review.

Methods:

The medical records of a 69-year-old patient with an angioleiomyoma of the nasal septum were reviewed. The PubMed database was searched for literature describing angioleiomyoma of the nasal cavity using the key words "angioleiomyoma" with "nasal cavity," "nasal septum," "nose," or "sinus."

Results:

A 69-year-old female patient presented with progressive right-sided nasal obstruction and epistaxis for one year in duration. Office examination revealed stigmata of recent bleeding and nasal endoscopy revealed a smooth, pink, vascular appearing mass arising from the right nasal septum. Computerized tomography with intravenous contrast revealed a 1.3 x 1.1 cm heterogeneously enhancing vascular lesion arising from the right nasal septum. The patient was taken to the operating room for endoscopic resection.

Conclusion:

Angioleiomyoma of the nasal septum is a rare and challenging clinical diagnosis that requires detailed histopathologic examination. The differential diagnosis includes a variety of epithelial and mesenchymal derived tumors. Literature review suggests a female predilection with possible hormonal influence. Definitive treatment includes endoscopic resection and laser ablation. Clinical reports are accumulating and may provide further information regarding risk factors, immunoreactivity, recurrence rates, and anatomic sites of presentation.

Poster# D007

Are industry ties associated with greater scholarly impact among rhinologists?

Peter Svider, MD
 Houmehr Hojjat, MD
 Jean Anderson Eloy, MD
 Vibhav Sekhsaria, MD
 Michael Setzen, MD
 Adam Folbe, MD
 Detroit, MI
 USA

Objectives:

To evaluate payments/funding by industry to rhinologists and determine whether there is a relationship with scholarly impact as well as demographic factors such as practice setting and gender.

Methods:

Fellowship directors/co-directors and past fellows practicing in the U.S. were obtained from the ARS fellowship listing, and the Open Payments database offered by CMS was searched for industry payments/funding. The Scopus database was used to calculate scholarly impact, as determined by the h-index. Practitioners were additionally categorized by gender and practice setting.

Results:

Of 199 rhinologists, 84.9% received industry payments/funding in 2014, involving 2,711 transactions totaling \$856,478. 89.7% were general payments, although industry contributed \$35,284 and \$53,048 in research payments and associated research funding, respectively. Academic practitioners received significantly higher median payments than those in private practice (\$1,019 vs. \$399, $p < 0.05$). Individuals receiving support had greater scholarly impact ($p = 0.0002$) and more publications than those who did not. Median h-indices were significantly higher among those receiving greater funding. Although a similar proportion of men and women received support (85.9% vs. 80.6%), men received significantly higher median payments/funding (\$862 vs. \$287) and 96.5% of all industry contributions.

Conclusion:

Both for research activities and other pursuits, industry support has a strong association with scholarly impact. In a nascent field such as rhinology where sources of support are highly sought, indirect support through educational and consulting activities as well as other expenses may play an invaluable role in facilitating scholarly discourse among practitioners. Additionally, a significant gender disparity was noted.

Poster# D008

Assessment Of Compliance Of The Mucosa In Nasal Polyps

Luciano L. Gregorio, MD
 Rogerio Pezato, MD
 Rafael Souza, MD
 Eduardo Kosugi, MD PhD
 São Paulo SP
 Brazil

Objective: Evaluate the compliance of the nasal polyps

Study Design: Cross-Sectional Study

Methods:

IRB approved Protocol. To assess the compliance of the nasal mucosa and nasal polyps (NP) a controlled volume was injected on tissue samples and pressure data measurements were registered. These samples were acquired from healthy patients and with Chronic Sinusitis (with (CRSwN) and without Nasal Polyps (CRSnNP). Diagnosis criteria were based on EPOS. Multiple subsites measures were taken from different samples and comparison between groups. In addition, SNOT-22 and Lund-Kennedy scores were registered to correlate compliance of the mucosa and severity of the clinical presentation.

Results:

A lowest Pressure/Volume mean was found in the polypoid tissue.

Conclusion:

Different behavior during liquid infusion was reported between CRSnNP and CRSwNP when compared to patients with healthy mucosa. A new pathophysiological mechanism for polyps can be cogitated.

Poster # D009

Assessment of sterol o-acyl transferase 1, a key enzyme for cholesteryl ester biosynthesis, and lipid accumulation on sinus tissue of patients with and without chronic rhinosinusitis

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Nicholette Pollock, BS
David Keschner, MD
Rohit Garg, MD
Edith Porter, MD
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USA

Background:

Airway secretions contain endogenous antimicrobial factors which contribute to the innate host defense of the respiratory tract. Antibacterial host-derived lipids including cholesteryl esters have been detected in maxillary lavage fluid. Increased gene expression of sterol O-acyltransferase 1(SOAT1), a key enzyme for cholesteryl ester production, has been observed in the sinus mucosa of patients with chronic rhinosinusitis(CRS) versus controls. The purpose of this study is to determine if SOAT1 is present within sinus epithelial cells and to localize lipid accumulation in patients with and without CRS.

Methods:

Sinus mucosa was obtained from subjects with(3) and without(3) a history of CRS. Formalin-fixed specimens were processed for immunohistochemistry for SOAT1 or; for lipid assessment, pretreated with linoleic acid(to amplify the signal of native lipids) and chromic acid (to fix the lipids prior to Oil-Red-O staining).

Results:

Immunohistochemistry revealed the presence of SOAT1 in all epithelial cells with a stronger staining at the cell base. In contrast, lipid staining appeared to be more prominent at the apical surface. In 2 of 3 controls, the pseudostratified respiratory epithelium was more prominently stained with Oil-Red-O than the submucosal tissue. In 2 of 3 CRS samples, submucosal tissue was more prominently stained, and numerous cells with a granular lipid accumulation were present.

Conclusions:

Lipids as well as SOAT1 are present in sinonasal epithelial cells; and additional sources for lipids may be recruited in CRS specimens. This further supports the novel concept of lipid-mediated innate mucosal defense and its potential role in CRS.

Poster# D010

Bilateral double accessory maxillary sinus ostia

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USA

Introduction:

Accessory ostium of the maxillary sinus (AMO) are anatomic variants identified in approximately 30% of the population. When AMO are present, the highest reported incidence of double ostia was 44.4%. Despite the prevalence of AMOs a medical literature search did not identify a patient with bilateral double AMO. We present a patient who underwent trans-sphenoidal hypophysectomy in whom this entity was identified.

History & Surgical Findings:

A 78 year-old male diagnosed with a pituitary adenoma five years previously presented to the ER with temporary LOC. An MRI identified a 2.1 cm pituitary mass. AMO were visualized but not reported on a pre-operative maxillo-facial CT. Access to the tumor was facilitated by bilateral partial middle turbinectomy and sphenoidotomy. The anterior maxillary fontanelles were found to have two unequal-sized, oval accessory ostia. Each anterior ostium was larger. The left-sided ostia were more closely situated. The intervening tissue was membranous. The inferior aspect of each ostium were at essentially the same level. In the absence of maxillary sinusitis the ostia were not modified.

Discussion:

AMO are not readily visualized radiologically or under-reported. AMO are typically an incidental intra-operative finding. Patients with AMO are more prone to sinusitis due to a re-circulation phenomenon, which explains why patients with sinusitis are more likely to have accessory ostium than controls. This was not the situation in the current case.

Conclusion:

We believe this is the first reported case of a patient with bilateral double accessory maxillary sinus ostia."

Poster# D011

Can pulmonary function tests measure nasal obstruction and predict the presence of sleep apnea?

Judd H. Fastenberg, MD
Howard Stupak, MD
Bronx, NY
USA

Objective:

The contribution of the oropharyngeal airway to obstructive sleep apnea (OSA) has garnered far more attention than that of the nasal airway throughout the otolaryngology literature. Recent studies suggest that the nasal airway may play a more significant role in OSA than previously thought. The introduction of handheld spirometers now allows otolaryngologists an easy, objective tool for measurement of nasal airflow. While most studies have focused on peak nasal inspiratory flow, there is evidence to suggest that expiratory nasal flow may correlate more closely to nasal patency. We describe the correlation between results of office-based nasal spirometry with polysomnograms in 35 patients to illustrate the potential for this tool to help identify those patients with a nasal contribution to OSA.

Methods:

35 patients who presented to the otolaryngology clinic and who had undergone a polysomnogram in the previous 6 months underwent nasal spirometry in the office with a hand-held FDA-approved spirometry device. All polysomnograms were performed at the same sleep center. Patients also completed NOSE and SNOT questionnaires. Polysomnogram, spirometry, and questionnaire results were then statistically analyzed and compared.

Results:

There was a strong correlation between reduced nasal expiratory flow and AHI on polysomnogram. Nasal inspiratory flow did not correlate as well. Reduced expiratory flow also correlated well with subjective complaints of OSA as demonstrated by validated questionnaire.

Conclusion:

Handheld spirometry may offer otolaryngologists a relatively easy way to identify patients with nasal contribution to OSA, with reduced nasal expiratory flow closely correlated to elevated AHI on polysomnogram.

Poster# D012

Can the CDC's Get Smart program and use of a decision-tree tool alter clinician guideline adherence for AVRS and ABRs?

Tracy R. Wilson, DNP, MSN, FNP-BC
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USA

Purpose:

This project will evaluate the impact of three bundled small-scale interventions and a decision tree tool on clinician adherence to treatment guidelines for acute viral and bacterial rhinosinusitis (AVRS and ABRs). The measured outcomes are 1) clinician knowledge and 2) treatment choices for acute viral and bacterial rhinosinusitis (AVRS/ABRS).

Review of Literature:

Previous studies demonstrated inconsistent adherence to guidelines for AVRS and ABRs. Despite documented value of clinical practice guidelines, AVRS and ABRs treatment continues to differ from evidence-based guidelines. Challenges include knowledge of clinicians and patients, conflicting guidelines, and peer pressure.

Methods:

This project was a quasi-experimental one-group, pre-post without randomization design. Clinicians completed questionnaires before and after an educational session to evaluate changes in knowledge. Each clinician received a decision tree tool with diagnostic criteria and guideline recommended treatments for AVRS and ABRs. The clinicians were also taught about the CDC's Get Smart program and how to implement its components within the clinics. Chart audits were performed to identify length of symptoms and treatment plans for AVRS and ABRs.

Results:

Data collection will be completed by December 31st, 2015.

Implications:

The study program offers easy to use tools [CDC Get Smart materials and AVRS/ABRS decision tree tool] to improve 1) clinician adherence to evidence-based guidelines, 2) patient knowledge and clinical outcomes, and 3) antibiotic use for ABRs only.

Poster# D013

Chronic rhinosinusitis at an urban tertiary medical center: Demographics, socioeconomic factors, clinical presentation and surgical outcomes

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USA

Objective:

The presentation and outcomes of patients with chronic rhinosinusitis (CRS) is thought to vary among different socioeconomic groups. We aim to characterize these relationships in this study.

Methods:

A retrospective chart review of adult patients who presented to our otorhinolaryngology clinic with a diagnosis of CRS and underwent surgery from 2012-2015 was performed. Data were collected from inpatient, outpatient and operative records.

Results:

A total of 276 patients were identified. Of these, 65.8% of patients were females; 34.2% were males. The average age of patients was 43.7. Common medical comorbidities included asthma (31.6%) and aspirin intolerance (15.8%). The median income of this population was \$43,179. Half of patients had nasal polyps on initial examination. Almost all patients (92.1%) had bilateral disease. The average Lund-MacKay Score was 10.0 (range, 1-24; SD, 7.0). Higher median income was found to be associated with lower Lund-MacKay Scores ($R^2 = 0.0159$). The majority of patients were treated with oral steroids (78.9%), steroid nasal sprays (89.4%) and antibiotics (86.8%) pre-operatively. Surgical management included functional endoscopy sinus surgery in all patients as well as inferior turbinate reduction in 60.5% and septoplasty in 44.7% of patients. 0.5% of patients required unplanned readmission for postoperative bleeding. Mean follow-up time of 265 patients was 8.4 days, ranging from 3 to 19 days. The average Lund-Kennedy Score was 3.3 at time of follow-up.

Conclusion:

Chronic rhinosinusitis is a prevalent disease in the urban setting. Severity of disease appears to be correlated with socioeconomic status.

Poster# D014

Chronic rhinosinusitis is associated with hyperpneumatized paranasal sinuses compared to unaffected controls

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Jacqueline Weinstein, MD
Edward McCoul, MD, MPH
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USA

Background:

Paranasal sinus pneumatization of chronic rhinosinusitis patients without cystic fibrosis (CRSsCF) has not been studied using a validated instrument. Previous investigations have confirmed sinus hypoplasia in cystic fibrosis (CF) patients. This study compares paranasal sinus pneumatization of CRSsCF patients to unaffected controls to determine if there is an analogous effect to CF.

Methods: 591 sinus computed tomography (CT) scans, comprised of 303 adolescents (age 13-18) and 288 adults (age >18), were analyzed for Lund-MacKay and Assessment of Pneumatization of the Paranasal Sinuses (APPS) scores. The APPS score is validated for measuring sinus pneumatization variation. A diagnosis of CRSsCF was determined from the medical record for each scored CT scan.

Results: The mean APPS score for patients with a diagnosis of CRSsCF was 10.61 (n=111) compared to 9.62 (n=448) for unaffected controls (p=0.001). This was significant in the adult (p=0.02) and adolescent subgroups (p=0.03). For patients with both a diagnosis of CRSsCF and a Lund-MacKay score ≥ 3 , (the reported incidental value) the mean APPS score was 10.79 (n=84). Comparatively, control patients with a Lund-MacKay score <3 had a mean APPS score of 9.23 (n=304, p<0.001). This reached significance in the adult (p<0.001) and adolescent subgroups (p=0.02). The mean APPS score was lower (3.5) in CF patients (p<0.001).

Conclusion: CRSsCF is associated with hyperpneumatized paranasal sinus variation compared to unaffected controls. This suggests that sinus hypoplasia is not a consistent factor in the development of sinusitis, and that mucosal disease is not a generalizable etiology of arrested sinus pneumatization."

Poster# D015

Chronic rhinosinusitis patients with gastroesophageal reflux disease have a significantly higher prevalence of atopy and asthma

Mahboobeh Mahdavinia, MD, PhD.
 Christopher Codispoti, MD, PhD
 Philip LoSavio, MD
 Jill Jeffe, MD
 Mary Tobin, MD
 Pete Batra, MD, FACS
 Chicago, IL
 USA

Background:

An association between chronic rhinosinusitis (CRS) and gastroesophageal reflux disease (GERD) has been previously reported; however, the underlying mechanisms linking CRS and GERD remain to be elucidated.

Methods:

The current study was structured to include both prospective and retrospective arms. The retrospective arm comprised a large cohort of CRS cases, while the prospective arm consisted of a series of CRS cases and controls.

Results:

Retrospective arm: Of 1006 CRS patients, 112 (10.5%) had GERD. GERD was associated with higher BMI, higher age, and female gender. Odds ratio (OR) (95%CI) for asthma and atopy in the GERD+CRS group compared to non-GERD CRS group was 2.89 (1.905-4.389) and 2.021 (1.035-3.947). Furthermore, GERD was associated with a greater duration of CRS.

Prospective Arm:

90 CRS cases and 81 controls were enrolled in the study. CRS cases showed a trend towards increased GERD (15.6% vs 7.4%, p=0.071). In the CRS group, GERD was associated with asthma with OR of 4.77 (1.27-18.01). Furthermore, CRS cases with GERD had a trend towards a higher prevalence of atopy with OR of 3.19 (0.84-12.13). In controls, there was no association between GERD and asthma 0.67 (0.09-5.19) or atopy 0.35 (0.05-2.59). CRS cases with GERD had a longer duration and a lower age of onset of CRS.

Conclusions:

CRS patients with GERD are more likely to have atopic conditions in contrast to non-CRS patients with GERD. This suggests that co-morbid GERD and atopic disease are potential risk factors for development of CRS.

Poster# D016

Chronic rhinosinusitis symptoms in crs patients with atropy relates to vitamin D3 levels but does not affect surgical outcome

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Introduction:

The prevalence of allergic rhinitis (AR) in patients with chronic rhinosinusitis (CRS) is estimated at 50-84% but it is unclear how AR contributes causally or symptomatically in CRS.

Methods:

We analyzed the pre- and post-operative SNOT-22 symptom scores and IgE, blood eosinophil count and vitamin D3 levels in CRS patients who had sinus surgery and allergy testing for 43 allergens. Statistical analysis was performed using JMP 10 (SAS software) on data using Wilcoxon-Rank sums for non-normal distribution with two-sided P<0.05 considered as significant. Network graphs were generated using Gephi 0.8.2.

Results:

Ninety-six subjects were included; 53 (55.2%) had positive skin testing. The atopic subjects were younger, more likely to have a history of asthma and had higher total IgE (P <= 0.05), but blood eosinophil count, Lund-Mackay score and total pre- and post-SNOT-22 scores were not significantly different between the atopic and non-atopic groups. There was no difference in individual SNOT-22 scores between the two groups. Of the 53 atopic subjects, 37 (70%) were polysensitized. Network analysis showed that allergen sensitivities co-cluster in specific patterns. A significant negative correlation was noted between SNOT-22 total score and vitamin D3 levels amongst atopic subjects . .

Conclusion:

Atopy overall was not associated with worse pre- or post-operative total SNOT-22 scores or individual symptoms. Allergen clustering in CRS followed intuitive patterns of polysensitization. Atopic subjects with low vitamin D3 had higher SNOT-22 scores. AR may be associated with younger age for those who have surgery for CRS.

Poster# D017

Clinician assessment of paranasal sinus pneumatization is correlated with total sinus volume

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Background:

The Assessment of Pneumatization of the Paranasal Sinuses (APPS) score is a novel and validated instrument for comprehensively evaluating the pneumatization pattern of the sinuses. Previous studies of the relationship of sinus pneumatization with clinical parameters have been hindered by cumbersome volume analysis. The purpose of this study was to determine if the APPS score correlates with total sinus volume.

Methods:

Semi-automated three dimensional (3D) volume analysis of 20 consecutive sinus computed tomography (CT) scans was performed. Total paranasal sinus volume for each scan was then calculated. Relative total paranasal sinus volume was calculated by dividing total sinus volume by the volume of the right globe. An independent reviewer then scored each CT scan using the APPS instrument. The elapsed time to perform 3D analysis and APPS scoring was recorded for each CT scan.

Results:

The APPS score was strongly correlated with total sinus volume by Pearson correlation coefficient ($r=0.893$). The coefficient of determination (R-squared) was 0.797. The APPS score was also strongly correlated with relative total sinus volume ($r=0.851$, R-squared=0.724). The mean elapsed time of 3D volume analysis for each CT scan (1187 seconds) was significantly more than APPS scoring (36.7 seconds, $p<0.001$).

Conclusion:

The APPS score strongly correlates with both total sinus volume and relative total sinus volume. Evaluation of paranasal sinus pneumatization by APPS score is also significantly faster than a semi-automated method for 3D volumes. The APPS instrument can be used to study large populations for relationships between clinical parameters and total sinus volume.

Poster# D018

Common medications and negative histamine response in skin prick testing

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Introduction:

A negative response to a histamine control yields uninterpretable allergy skin prick testing. While some medications are known to inhibit a histamine response (e.g. antihistamines), the clinical impact of other everyday medications and dietary supplements on the histamine response in skin prick testing is not clear. The goal of this study was to identify if certain common medications and supplements put patients at risk for a negative histamine control in patients with suspected allergic rhinitis.

Methods:

This prospective study enrolled patients undergoing allergy skin prick testing at a tertiary care academic center. Prior to undergoing allergy skin prick testing, patients completed a survey regarding dietary supplements and 28 different commonplace medications that included antidepressants, antihypertensives and reflux medications, among others. Medication and supplement usage was compared between patients with a positive and negative response to the histamine control.

Results:

149 patients were enrolled, 124 with a positive response to the histamine control and 25 patients with a negative response to the control. While the response to the histamine control in the setting of proton pump inhibitors trended towards a significant difference ($p = 0.09$), all other medications and supplements failed to reveal a statistically significant difference.

Conclusions:

A negative histamine response in skin prick testing may be secondary to factors other than medications and dietary supplements. The common medications and supplements examined in this study did not interfere with histamine control results.

Poster# D0

Comparative feature analysis of cone-beam computed tomography for the paranasal sinuses and temporal bone: A prospective imaging study

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Introduction:

Cone-beam CT (CBCT) provides high-resolution images at low radiation doses and is an alternative to the multi-detector CT (MDCT). Prior studies in paranasal sinuses and temporal bone were inconclusive on image quality. This study's objective was to compare these modalities for sinus and temporal bone indications.

Methods:

A comparative feature analysis (CFA) was performed to assess provider preference on CBCT vs. MDCT. Patients with sinus and temporal bone disorders underwent both CBCT and MDCT. Five physicians including neuroradiologists and otolaryngologists with sinus and temporal bone expertise performed a post-hoc, blinded review. Each reviewer rated images from -2 (strong MDCT preference) to +2 (strong CBCT preference) on the ability to view clinical features, confirm a diagnosis, and overall quality.

Results:

78 adults underwent double imaging, providing 17 sinus and 61 temporal bone studies. Overall, 84% reviewers had neutral to slight MDCT preference. There was moderate inter-rater agreement (kappa variability coefficient, $\kappa=0.55$). Most reviewers had no preference over either technique to view clinical features (61%) or confirm a diagnosis (65%). The average rating for sinus and temporal bone images were similar (CFA: -0.36 vs. -0.47, $p=0.29$). In contrast, reviewers indicated slight MDCT preference for images that were aimed to identify bony defects vs. those for soft tissue pathology (CFA: -0.71 vs. -0.35, $p<0.01$).

Conclusions:

No significant differences were observed for provider preference on using CBCT vs. MDCT. Future research is needed to establish informed recommendation on using CBCT as a comparable alternative in patients with paranasal sinuses and temporal bone disorders.

Poster# D019

Comparison of inflammatory changes in ethmoid mucosa and nasal turbinate tissue: A histopathological study

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Background:

"Rhinosinusitis" has been adopted as a terminology in preference to "sinusitis" to reflect the continuum of inflammation between the nose and the paranasal sinuses. A previous study found regional differences in innate host defense molecules between the inferior turbinate (IT) and uncinata tissue. However, there are no histopathological studies that investigate nasal and sinus tissue for agreement in degree or type of inflammation.

Objectives:

Study agreement in select histopathological measures by comparing ethmoid mucosa and nasal turbinate tissue.

Methods:

Patients undergoing sinonasal surgery were prospectively enrolled. Mucosa was collected from the ethmoid cells \pm uncinata process (EC) in all patients. In addition, mucosa was also sampled from either the inferior turbinate (IT) or middle turbinate (MT). Each sample underwent structured histopathology reporting using standardized criteria. EC and IT/MT histopathology were compared using the Kappa coefficient as a measure of agreement.

Results:

Fifty-five patients underwent surgery; all had EC tissue collected. Forty-six patients had tissue collected from the IT and 9 from the MT. The agreement between EC and IT mucosa was weak in terms of "overall degree of inflammation", eosinophils numbers per high power field (EHPF), degree of neutrophilic infiltration, and type of inflammatory predominance (eosinophilic/lymphocytic/lymphoplasmacytic/neutrophilic). MT and EC samples however showed fair agreement with "overall degree of inflammation", EHPF and inflammatory predominance.

Conclusions:

IT and ethmoid inflammation showed weak agreement. The MT had fair agreement with ethmoid mucosa, likely because MT is part of the ethmoid complex. Further study of regional differences in sinonasal mucosal inflammation is warranted.

Poster# D020

Comparison of nasal airflow simulations in healthy nasal cavity models built from cone beam vs. conventional computed tomography

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Background:

Computational fluid dynamics (CFD) simulations of nasal airflow in patient-specific three-dimensional (3D) models of the nasal anatomy provide quantitative measures of nasal function that may be used in future virtual surgery planning. While computed tomography (CT) scans have been the primary imaging modality to build nasal cavity models so far, cone beam computed tomography (CBCT) represents an attractive option due to much lower radiation doses. However, the Hounsfield unit values are less consistent in CBCT scans than in conventional CT scans, raising the question whether equivalent airflow measures are obtained in CBCT and CT-based models.

Method:

Anatomically-accurate models of the human nasal cavity were created based on 11 CBCT and 9 CT scans of healthy individuals. The same range of -1024 to -300 Hounsfield units was used to segment the nasal airspace in both cohorts. CFD simulations were performed to quantify biophysical measures of nasal airflow, including nasal resistance and heat flux.

Results:

Bilateral nasal resistance was 0.043 ± 0.01 Pa.s/ml in the CBCT cohort and 0.045 ± 0.03 Pa.s/ml in the CT cohort. Unilateral heat flux was 196 ± 32 W/m² in the CBCT cohort and 193 ± 36 W/m² in the CT cohort.

Conclusions:

A good agreement was observed between the average CFD variables calculated in the two cohorts. Furthermore, the results agreed well with previous computational studies in the literature. We conclude that CBCT is a reliable imaging modality to create 3D models of nasal airflow, providing results that are consistent with models based on conventional CT scans.

Poster# D021

Concha bullosa mucocoele: a rare entity in the radiologic differential diagnosis of nasal mass

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Introduction:

Concha bullosa mucocoele is a rare diagnosis that presents as a nasal mass. It impinges on surrounding structures, and can easily be mistaken for a neoplasm. The objective of this study was to shed light over this rare entity and report its diagnostic features and treatment outcomes.

Methods:

Case series conducted in a tertiary healthcare centre. Demographic data, clinical presentation, imaging, cultures and treatments were recorded. Operative video illustration and key pictures were obtained. A review of the literature was also performed.

Results:

A total of six cases were reviewed, five of which were concha bullosa mucocoeles and one was a mucopyocoele. Three cases were in pediatric patients. Half of the patients had some form of prior nasal trauma, including nasal fracture, foreign body, or previous endoscopic sinus surgery. Headache and nasal obstruction were the most common symptoms. Nasal mass was a frequent finding on physical exam. CT scan was used in all patients and MRI in 4/6 patients. Four of our patients had co-existent chronic rhinosinusitis. Three patients had positive cultures, including *Staphylococcus aureus*, *Corynebacterium*, *Escherichia coli* and *Haemophilus influenzae*. *Staphylococcus aureus* was the most common organism isolated. No fungi were cultured from any of our patients. All these patients were treated endoscopically either with middle turbinate marsupialization or subtotal resection. No recurrence has been noted thus far.

Conclusion:

Concha bullosa mucocoele is a rare diagnosis. Imaging characteristics are helpful in suggesting the diagnosis, though surgical intervention is often necessary to confirm the diagnosis and treat it.

Poster# D022

Ct scan in pediatric crs: How often is it being used?

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Introduction:

Chronic rhinosinusitis(CRS) is a significant problem among children. CT imaging of the sinuses can play an important role in treatment decision, especially when surgical intervention is considered. However, there is often reluctance in scanning children due to potential radiation exposure.

Objectives:

To study the trend of obtaining CT imaging in children with CRS among primary care physicians and otolaryngologists, and its role in treatment decisions.

Methods:

Retrospective observational study of consecutive children diagnosed with CRS referred to a tertiary care center from 2009 to 2014. Charts were reviewed and the age at imaging, provider obtaining scan, number of scans, Lund-Mackay scores, treatment decisions, and co-morbid factors were recorded.

Results:

The study included 146 children. Most participants (71%) had =1 CT scans during treatment, for a total of 182 scans. More specifically, 60 children had one scan, 29 had 2, 7 had 3, and 9 had =4 scans. Most children (64%) were referred with scans ordered by general pediatricians, pediatric specialists, or general otolaryngologists. Patients getting CT scans were older (6.6 years) than those who did not (3.9 years). Most (70%) patients who had CT scans had surgical intervention: adenoidectomy (16%) or adenoidectomy/ESS (74%). Mean CT scores varied between groups: no surgery (1.1), adenoidectomy (1.5), and adenoidectomy (1.2). Asthma was present in 45% and 11.5% of those with and without CT scans, respectively.

Conclusions:

The majority of children with CRS will have CT imaging during the course of treatment. Imaging appears to aid in treatment decision-making across providers."

Poster# D023

Development, implementation and validation of an epistaxis simulation model for undergraduate teaching purposes

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Introduction:

Simulation can be an effective teaching tool. Epistaxis is a common condition, and clinical inexperience can lead to uncontrollable bleeding events.

Objective:

To validate an innovative simulation model for the management of epistaxis by medical students.
Methods: Fiber resin and silicone models were designed and manufactured. Eight otolaryngologists and forty-four medical students participated in the study. All participants were video recorded performing management of epistaxis on the models. Recordings were repeated after the teaching sessions. The medical students were divided into two teaching groups. In group 1, students were given a traditional classroom approach for epistaxis management. In group 2, students were given a hands-on approach using the simulation model. The otolaryngologists' (experts) videos were used for the validation process. The medical student recordings were analyzed by otolaryngologists in a blinded fashion. A student satisfaction survey was applied at the end of the session.

Results:

There was no statistically significant difference in the diagnostic evaluation between the two groups ($p > 0.05$). Following the teaching sessions, group 2 achieved an 85% success rate which was significantly greater than the control group which achieved 67% ($p < 0.01$). When comparing group 2 with the experts, no significant difference was observed ($p > 0.05$). Assessing survey results, students referred a high degree of satisfaction with the acquired skills.

Conclusion:

Simulation is a useful tool in acquiring skills needed for professional development. Epistaxis is a common clinical situation that requires an appropriate management, which can be taught and improved with simulation models.

Poster# D024

Distinguishing computed tomography findings in patients with empty nose syndrome

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Introduction:

Given the lack of basic diagnostic criteria for Empty Nose Syndrome (ENS), we sought to define whether consistent radiographic characteristics could be identified to aid in the development of such criteria.

Methods:

Computed tomography (CT) scans were collected from 65 patients diagnosed with ENS, patients with a history of submucosal inferior turbinate (IT) reduction without ENS, and patients without a history of sinonasal procedures. Measurements were taken at the level of the nasolacrimal duct, including the IT mucosal thickness, and the widest distances between septum-IT, nasal floor-IT, lateral nasal wall-IT and septum-lateral nasal wall. The thickest sites of soft tissue density of the nasal cavity floor, septum, and lateral wall were also measured in the anterior, central, and posterior segments of the nasal cavity.

Results:

The mucosal thickness of both the central and posterior segments of the septum in ENS subjects was significant when compared to ITR without ENS ($p < 0.01$) and control subjects ($p < 0.01$). Constant landmarks such as the agger nasi, the presence of middle turbinate and the nasolacrimal duct defined a simple set of landmarks that can serve as the start of the central-nasal region. A cut-off of $>2.64\text{mm}$ and $>1.32\text{mm}$ in the central nasal and posterior nasal regions, respectively, provided the highest likelihood of differentiating ENS patients from ITR without ENS patients.

Conclusions:

These findings provide evidence there are two objective radiographic changes (central and posterior septal mucosa) that suggest ENS patients can be discriminated based on mucosal CT findings.

Poster# D025

Effect of low salicylate diet on clinical and biochemical markers of aspirin exacerbated respiratory disease

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Objective:

Aspirin Exacerbated Respiratory Disease (AERD) has classic triad of chronic rhinosinusitis due to nasal polyposis, asthma and intolerance to aspirin and other NSAIDs. Our objective was to assess if low salicylate diet would result in symptomatic improvement and decrease in inflammatory markers.

Study Design:

Study design included randomization to either a high or low salicylate diet for the first week, followed by cross-over to the other arm. Patient's were asked to record their dietary salicylate for each week of the study. SNOT-22 questionnaire was filled out at baseline, end of week one and end of week 2. Urine was collected and urinary creatinine, leukotrienes and salicylate levels were measured at the time of recruitment, end of week one and end of week two.

Results:

Total of seven patient were recruited. Patients reported improved symptoms on low salicylate diet on the SNOT-22 scales for the following symptoms (all $p < 0.05$): "need to blow nose", "sneezing", "thick nasal discharge", "ear fullness", "facial pain/pressure", "wake up tired", "reduced productivity", and "nasal blockage". There was no statistical difference observed between urinary leukotrienes levels between two diets.

Conclusion:

Patients with AERD should be counseled on low salicylate diet to provide symptomatic relief. No difference was observed in urinary leukotriene levels.

Poster# D026

Effect of nasal endoscopy on operative time for pediatric Crawford tube placement

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Introduction:

Crawford tube placement commonly is used to achieve patency of lacrimal ducts for recurrent dacryocystitis. The nasal passages of pediatric patients are narrower than adults, with internal structures taking up relatively more space, resulting in a relatively higher risk of intranasal complications (e.g. synechiae, bleeding) with Crawford tube placement. Evidence suggests that general anesthesia may negatively affect the neurocognitive function and development of children, prompting efforts to decrease operation times for potential health benefits and also potentially to reduce healthcare costs. Research supports the use of nasal endoscopy to reduce intranasal complications with Crawford tube placement; however, no publications currently address the effect of nasal endoscopy concurrent with Crawford tube placement on operative times on pediatric patients or the resulting effects on healthcare costs.

Methods:

A chart review was performed from August 2011 to current for cases of Crawford tube placement (CPT# 68815). Operative times were noted, and T-test was performed to examine for any statistically significant difference in operative times. Estimates of anesthesia cost savings were made.

Results:

To date, there have been 16 cases of Crawford tube placement without nasal endoscopy (average operative time was 32.8 minutes) and 4 cases of tube placement with nasal endoscopy (average operative time 20.5 minutes), with a trend towards a statistically significant difference ($p=0.2$). The cost savings to the healthcare system by decreased operative time is statistically significant.

Conclusions:

Nasal endoscopy during Crawford tube placement may result in a significant decrease in costs and reduce general anesthesia duration for pediatric patients.

Poster# D027

Electron microscopy of nasal and tracheobronchial biopsies in the diagnosis of primary ciliary dyskinesia: A systematic review and meta-analysis

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Primary ciliary dyskinesia (PCD) is a rare hereditary disorder of motile cilia. The purpose of this study is to systematically review the literature regarding the efficacy of different biopsy sites and methods to obtain an adequate ciliary sample for ultrastructural examination with electron microscopy (EM) for the diagnosis of PCD.

A comprehensive literature search for the diagnosis of PCD was conducted. Studies written in English with five or more subjects were included. Successful biopsy was defined as an adequate ciliary sample to make or exclude the diagnosis of PCD. Two independent reviewers screened studies for relevance and quality and extracted data for meta-analysis.

Eight studies met inclusion criteria with level 3 or 4 evidence. These studies included 1,993 patients (age range: 6 months – 76 years) who underwent 2,299 ciliary biopsies. The weighted pooled proportion of obtaining an adequate specimen from a nasal biopsy was 76% (95% CI, 64-86%) versus 66% (95% CI, 62-69%) for a tracheobronchial site ($p=0.10$). The pooled proportion of obtaining an adequate sample was 68% for both brush and forceps biopsy groups (95% CI, 58-77% and 54-81%, respectively); nasal scraping was reported in two studies and yielded a higher proportion of adequate specimens (pooled proportion of 92%; 95% CI, 82-99%) than studies using brush or forceps techniques ($p=0.002$).

Biopsy sites are not significantly different in terms of obtaining an adequate sample for EM evaluation. Nasal biopsy is therefore preferred in adult and age-appropriate pediatric patients in whom office biopsies can be obtained without general anesthesia.

Poster# D028

Elimination of pain improves specificity of clinical diagnostic criteria for chronic rhinosinusitis

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Introduction:

Clinical criteria for diagnosis of rhinosinusitis remain elusive. Prior studies suggest facial and head pain confound differentiation of sinusitis from headache syndromes.

Methods:

Retrospective cohort study of 700 adults referred to an academic otolaryngology clinic with presumptive diagnosis of chronic sinusitis without prior sinonasal imaging or endoscopy. Presenting symptoms, endoscopic findings, and CT results were analyzed. Clinical diagnosis of sinusitis was rendered using both the Lanza-Kennedy system and a modified version eliminating facial pain and headache.

Results:

367 subjects (52%) met inclusion criteria. Among patients positive by Lanza-Kennedy criteria, 21% failed to show objective evidence of sinonasal inflammation by CT scan ($p=0.009$), 46% by endoscopy ($p = 0.000$), and 63% by both imaging and endoscopy ($p = 0.000$). Applying modified diagnostic criteria to the same cohort, 18% lacked sinonasal inflammation by CT ($p = 0.000$), 40% by endoscopy ($p = 0.000$), and 58% by both modalities ($p = 0.000$). Using combined CT and endoscopy as the gold standard, modified diagnostic criteria yielded a substantial increase in specificity (41.4% to 56.3%) yet comparatively minor loss of sensitivity (95.5% to 92.8%).

Conclusion:

Current clinical diagnostic criteria using facial pain or headache may overestimate the prevalence of sinusitis. Use of modified diagnostic criteria resulted in increased specificity with only a minor loss in sensitivity. Given the high prevalence of sinusitis, improved clinical diagnostic criteria may assist primary care providers in more accurately predicting the presence of inflammation, thereby reducing inappropriate antibiotic use or delayed referral for evaluation of primary headache syndromes.

Poster# D029

Endoscopic endonasal landmarks to the palatine artery: A radiographic study

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Background:

The palatine neurovascular bundle is at risk during endoscopic surgery. Injury may result in significant blood loss and anesthesia of the ipsilateral hard palate. Nonetheless, its endoscopic anatomy has not been described previously. This paper strives to establish landmarks to identify the greater palatine canal; thus, avoiding injury to its contents.

Methods:

This study comprised 25 de-identified computed tomographic angiograms (CTA) using landmarks that are immediately visible during endoscopic medial maxillectomy to calculate: the angle of the greater palatine canal to the vertical, the distance from the anteroinferior aspect of the greater palatine canal to the orifice of the nasolacrimal duct, the distance from the anteroinferior aspect of the greater palatine canal to the posterolateral free edge of the hard palate, and the distance from the anterior aspect of the greater palatine canal as it enters the hard palate to the posterior wall of the maxillary sinus.

Results:

The mean angle of the greater palatine canal to the vertical was 22.50. The mean distance from the anteroinferior aspect of the greater palatine canal to the nasolacrimal duct was 31.5mm. The mean distance from the anterior aspect of the greater palatine canal to the posterolateral free edge of the hard palate was 7.64mm and the mean distance from the anterior aspect of the greater palatine canal to the posterior wall of the maxillary sinus was 7.59mm.

Conclusions:

Accessible anatomical landmarks may be used to ascertain the location of the descending palatine canal; thus, avoiding injury to its contents.

Poster# D030

Endoscopic sinus surgery for paranasal sinus mucocoeles with ophthalmologic complications: a meta-analysis of visual outcomes

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Background:

Mucocoeles are epithelial-lined, mucus-filled, cystic lesions of the paranasal sinuses. Most often caused by obstruction of mucus drainage from prior sinus surgery or trauma, these cysts can expand and impinge on local structures, causing ophthalmologic complications such as proptosis, vision loss, and optic neuropathy. Mucocoeles may be successfully treated with endoscopic sinus surgery. However, it is unclear to what degree visual acuity improves after treatment, or if there are clinical factors that may predict potential for return of function.

Methods:

Systematic review and meta-analysis of clinical research data describing postoperative vision outcomes in adults presenting with vision loss caused by paranasal sinus mucocoeles.

Results:

321 articles were identified from the medical literature, 90 of which were included in the final analysis (230 subjects), consisting largely of individual case reports and several case series. The average preoperative visual acuity in these patients was 1.45 logMAR units, and the average postoperative visual acuity was 0.73 logMAR units. An average of 86 days elapsed from symptom onset to time of surgery. Better preoperative visual acuity and shorter time to surgery were associated with improved outcomes.

Conclusions:

Time from symptom onset to surgery and degree of preoperative visual impairment are important factors in the outcomes of patients suffering from vision loss due to paranasal sinus mucocoeles. These factors may be used in decision-making and to counsel patients regarding expectations for visual recovery.

Poster# D031

Endoscopic transnasal, transnasopharyngeal removal of retropharyngeal foreign body (bullet)

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Objectives:

To describe our four-handed technique for removal of two bullet fragments from the retropharyngeal space following complex penetrating maxillofacial trauma

Study Design:

Case report

Methods:

Review of the medical record

Results:

A 20 year-old woman, 11 weeks pregnant at the time, presented following gunshot wounds to the left neck, left face, and abdomen. Imaging revealed a severely comminuted fracture of the left mandibular body and ramus. There were two metallic projectile fragments measuring 10mm and 6mm noted in the retropharyngeal soft tissues at the level of C1/C2. There was no evidence of cervical spine fracture. The patient subsequently underwent external fixation of the left hemimandible with mandibulomaxillary fixation by the oral and maxillofacial surgery service. Our service was later consulted for management of the retropharyngeal foreign bodies. In order to prevent future infection, migration, or aspiration of the bullet fragments, the decision was made to take the patient to the operating room for removal. The instability of the mandible and status post mandibulomaxillary fixation precluded a transoral approach. Using a four-handed endoscopic, transnasal, transnasopharyngeal approach, we successfully extracted two large bullet fragments from the retropharyngeal space. This required simultaneous retraction of the retropharyngeal tissues superiorly, inferior displacement of the soft palate, endoscopic visualization, and a grasping instrument for extraction. The patient recovered without any permanent neurologic deficits and the fetus remained viable.

Conclusion:

An endoscopic, transnasal approach to the retropharyngeal space for diagnostic or therapeutic purposes is possible in situations where transoral access is not an option.

Poster# D032

Estimates of nasal airflow at the nasal cycle mid-point improve the correlation between objective and subjective measures of nasal patency

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Introduction:

The nasal cycle represents a significant challenge when comparing pre- and post-surgery objective measures of airflow. The ability to correct for the confounding effect of the nasal cycle is a key element that future virtual surgery planning software for nasal airway obstruction (NAO) will need to account for when using anatomic models based on single instantaneous imaging.

Methods:

In this retrospective study, computational fluid dynamics (CFD) models were constructed for 12 NAO patients showing evidence of nasal cycling between pre- and post-surgery computed tomography scans. Biophysical variables (nasal resistance, airflow, and heat flux) were estimated at mid-cycle either by creating a single mid-cycle model (Method 1), or by creating multiple models spanning the range of turbinate thicknesses during the cycle and fitting a curve to the relationship between each variable and inferior turbinate size (Method 2). Subjective scores of nasal patency were obtained pre- and post-surgery via the Nasal Obstruction Symptom Evaluation (NOSE) and visual analog scale (VAS).

Results:

Methods 1 and 2 provided similar estimates of how nasal aerodynamics changed after NAO surgery. After correcting for the nasal cycle, the correlation between objective variables and the NOSE and VAS scores increased. In contrast to biophysical variables in individual patients, cohort averages were not significantly affected by the nasal cycle correction.

Conclusions:

The correlation between objective variables and patients' subjective feelings of nasal patency improves after correcting for the nasal cycle. The nasal cycle correction is required to evaluate individual patients, but not cohort averages.

Poster# D033

Evolving role of lumbar drains in contemporary endonasal skull base surgery: meta-analysis and systematic review

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USA

Introduction:

Historically, lumbar drains (LDs) have played a prominent role in endonasal skull base reconstruction. Over the last decade, vascularized pedicled flaps have become the reconstructive workhorse in repairs, often obviating the need for CSF diversion. Given these evolving factors, we aimed to perform a meta-analysis of the literature to evaluate the need for LDs in contemporary skull base surgery.

Methods:

A systematic search was performed of English language articles using PubMed and Ovid. Search terms included "lumbar drain," "CSF leak," and "endoscopic skull base reconstruction." Articles were incorporated when they used current methods for reconstruction and addressed CSF leak rates secondary to endoscopic anterior skull base resection in adults. A random effects model was used to estimate an average odds ratio of post-operative CSF leak. PRISMA guidelines were followed.

Results:

Eight articles met inclusion criteria, totaling 586 patients and overall CSF leak rate of 6.31%. A meta-analysis was conducted incorporating 4 studies which met criteria based on testing for heterogeneity. The average odds ratio for post-op CSF leak for non-drained patients relative to drained patients was 0.445, with a 95% Confidence Interval (CI) 0.169 - 1.160. Based on 95% CI of less than 1.25, results demonstrated non-inferiority of non-drained patients relative to drained patients with respect to post-operative CSF leak rate.

Conclusions:

Our results demonstrated lumbar drains offer no advantage in the rate of post-operative CSF leaks. Given this equivalency, LDs should be considered only in high risk cases, especially in the era of vascularized and multilayer tissue reconstruction.

Poster# D034

Expanding the limits of endoscopic intraorbital tumor resection using 3-dimensional reconstruction

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Objective:

To utilize 3-dimensional(3D) radiographic reconstruction to define the theoretical lateral limit of endoscopic resectability of primary orbital tumors and to apply these boundary conditions to surgical cases.

Study Design: Retrospective case series

Methods:

A 3D orbital model was rendered in 4 representative patients presenting with primary orbital tumors using OsiriX open source imaging software. A two dimensional plane was propagated between the contralateral nare and a line tangential to the long axis of the optic nerve(ON) reflecting the trajectory of a trans-septal approach. Any tumor volume falling medial to the ON and/or within the space inferior to this plane of resectability(POR) was considered theoretically resectable regardless of how far it extended lateral to the ON as nerve retraction would be unnecessary. Actual tumor volumes were then superimposed over this plan and correlated with surgical outcomes.

Results:

Among the 4 lesions analyzed, two were fully medial to the ON, one extended lateral to the optic nerve but remained inferior to the POR, and one extended both lateral to the ON and superior to the POR. As predicted by the 3D modeling, a complete resection was achieved in all lesions except one that transgressed the POR. No new diplopia or vision loss was observed in any patient.

Conclusion:

3D reconstruction enhances preoperative planning for endoscopic orbital surgery. Tumors that extend lateral to the ON may still be candidates for a purely endoscopic resection as long as they do not extend above the plane of resectability described herein.

Poster# D035

Frontal sinus fibrous dysplasia: A case report and review of the literature

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Objectives:

To present a case of frontal sinus fibrous dysplasia with atypical radiological features and to perform a literature review.

Case Report:

A 63 years gentleman presented to our clinic with one year history of right eye proptosis. CT and MRI were done and showed a mass filling the frontal sinus and eroding the orbital wall. The patient had a combined endoscopic and open approach to the right frontal sinus with the final diagnosis being fibrous dysplasia.

Study Design: Case report and literature review.

Methods:

Systematic literature review was conducted with the review being focused in the radiological features of Fibrous dysplasia in the head and neck.

Results:

Fibrous dysplasia can present in variety of ways in the head and neck. There are certain features in the radiological appearance that aids in early identification of the disease and hence better management plan. In CT scan, the ground glass appearance is the most persistent presentation. In MRI, the amount of mineralization of the lesion would dictate its signal intensity.

Poster# D036

Functional nasal surgery utilizing normal anatomic parameters

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Introduction:

Surgeons intuitively correct the nasal airway where it appears most constricted, de-emphasizing wider areas. Illogically, areas that appear wide may, in fact, be proportionally narrower than the normal nose than areas that appear narrow, which are proportionally closer to normal. The paradoxical thinking is that the narrowest part of the airway should be enlarged and that the widest part need not be treated. CT images and acoustic rhinometry data identify where the airway is actually compromised to the greatest degree relative to normative values and where turbinate reduction would be most beneficial.

Dimensions:

Acoustic rhinometry quantifies the cross-sectional nasal airway, providing a topographic display of the septal-turbinate relationship the length of the entire nose. The normal nasal airway has three cross-sectional narrow areas:

- 1) 1.90-2.00 cm - anterior: 4.5 mm
- 2) 4.25-4.35 cm - mid-nasal: 10.2 mm
- 3) 6.20-6.25 cm - posterior: 12.5 mm

Methods:

Using CT images pre-operative cross-sectional measurements are obtained from the midline to the inferior and middle turbinates at each internal distance. The twelve dimensions determine the percentage by which each turbinate affects the airway and the amount at each distance each turbinate needs to be reduced. The mid and posterior regions, while visually appearing wider, might require correction, being potential areas of even greater obstruction by comparative norms. Logically, each paired turbinate should end-up being symmetric.

Conclusions:

Following the paradigm of correcting "proportional obstruction" one can avoid patient dissatisfaction at not having established an airway "at least the size of a normal nose".

Poster# D037

Gamma scintigraphy to assess delivery of nasal sprays in ct-derived human nasal replicas

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USA

Introduction:

Nasal sprays are typically used to manage chronic rhinosinusitis (CRS) before and after functional endoscopic sinus surgery (FESS). The objective of this study is to determine the fate of a nasal spray in an individualized, nasal model using a new method for comparison of drug administration in the nasal cavity.

Methods:

De-identified sinus CT scans were used to digitally reconstruct the nasal cavity of a patient before and after FESS. Hollow models of the nasal cavity including external nares were 3D-printed in two parts, divided at the region of the internal nasal valve, using a flexible material for the anterior, external nares piece and acrylic for the remaining posterior part. Steady inspiratory airflow was drawn through the model at 15 L/min during administration of a nasal spray (one spray/nostril, other side blocked) spiked with technetium-99m. Radio-aerosol deposition was assessed using a 2D gamma camera and image processing software.

Results:

Preliminary results showed that the fraction of sprayed drug depositing posterior to the nasal valve was greater in the post-FESS model than in the pre-FESS model (37.3% and 1.4%, respectively), possibly due in part to the reduction in swelling observed in the post-FESS model.

Conclusions:

Our methods may be further used to (1) validate numerically simulated predictions of deposition within the nose and sinuses, (2) compare alternative and generic nasal sprays, and (3) test optimal delivery conditions for nasal sprays in general and within specific individuals.

Poster# D038

Genetic loss of arno reduces sinonasal inflammatory cytokine expression

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Introduction:

Chronic rhinosinusitis (CRS) is characterized by elevated cytokine levels, inflammation, and vascular permeability in the sinus mucosa. Dysfunction of epithelial cell-cell adhesions is postulated to play a role in CRS pathogenesis. The ARNO-Arf6 pathway regulates endocytosis and removal of adhesion molecules from the cell surface. Our previous data in a mouse model of allergen-induced CRS showed that small molecule inhibition of cytohesins such as ARNO decreased histologic parameters of inflammation and eotaxin-1 levels to a degree comparable to dexamethasone. In this study, we investigated whether genetic deletion of ARNO resulted in increased expression of cell-cell adhesion molecules or decreased expression of inflammatory cytokines.

Methods:

ARNO knockout mice sensitized to ovalbumin were challenged intranasally to generate inflammation. Murine sinonasal tissue was obtained and qPCR performed to assess expression of inflammatory cytokine and chemokine genes, including IL-8 and eotaxin-1, in addition to the cell-cell adhesion molecule ZO-1.

Results:

A significant reduction in inflammatory cytokine levels and a significant increase in cell-cell adhesion molecule expression in ARNO knockout sinonasal tissue was observed.

Conclusions:

Inhibition of the ARNO-Arf6 pathway reduces cytokine expression and increases cell-cell adhesion molecule expression in a mouse model of chronic sinonasal inflammation, consistent with previous preliminary data with small molecule inhibition of the ARNO-Arf6 pathway. These data suggest that inhibition of the ARNO-Arf6 pathway reduces inflammation and stabilizes the cell-cell junction stability in murine sinonasal tissue. Further studies are necessary to assess for decreased parameters of inflammation through histologic analysis of ARNO knockout sinonasal tissue.

Poster# D039

Gustatory signaling in cultured cells

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Introduction:

Mucociliary clearance (MCC) maintains the respiratory epithelium by propelling debris laden mucus over a ciliated epithelial monolayer for removal. Impairment of MCC promotes disease states such as chronic rhinosinusitis (CRS). Mutations in taste receptors have been shown to impair MCC and serve as an independent predictor of outcomes after sinus surgery. Standard assays for gustatory signaling are highly artificial, involving chimeric G-proteins heterologously expressed in immortalized kidney cells. Identification of cell lines that endogenously express gustatory signaling components will provide a more physiologic system to study gustation and allow for the development of high-throughput screens to identify modulators of gustation and MCC.

Methods:

Twenty immortalized cell lines from the aerodigestive tract were obtained and cultured according to standard protocols. Ribonucleic acid was extracted and quantitative real-time polymerase chain reaction was used to detect transcription of taste receptors and downstream components. Selected cell lines, which demonstrated endogenous expression of the gustatory signaling cascade, were assayed using tastant induced changes in intracellular calcium and cAMP.

Results:

Gustatory components are variably expressed in the immortalized aerodigestive cell lines. Application of tastants elicited a calcium and cAMP response in cell lines identified to express components of the gustatory cascade.

Conclusions:

We have identified multiple cell lines that endogenously express gustatory signaling components and respond with the anticipated intracellular calcium and cAMP changes upon stimulation with tastants. These cell lines can be readily used for studying the gustatory cascade or identifying small molecules that modulate MCC through the gustatory signaling cascade.

Poster# D040

Immunohistochemical analysis of human olfactory neuroblastoma

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Introduction:

Olfactory neuroblastoma (ONB) is a rare malignant tumor of neuroectodermal origin that typically arises from the superior nasal cavity at the level of the cribriform niche. It may mimic the histopathologic presentation of other undifferentiated sinonasal tumors resulting in diagnostic and management challenges. Here, we investigate the molecular profile of ONB with an attempt to improve the diagnostic precision of this tumor.

Method:

Using a library of biopsy-verified and cryosectioned ONB tissue from five patients, we performed immunohistochemical analysis with a cohort of antibodies with proven fidelity against cell signaling proteins, and transcription factors implicated in the neurogenesis and reconstitution of the olfactory epithelium (OE).

Results:

ONB consists mainly of nests of cells that co-express neuron-specific class III beta tubulin (Tuj1), Sox9, and NeuroD1—a transcription factor expressed in cells derived from globose basal stem cells (GBCs) fated to give rise to olfactory sensory neurons (OSNs). NeuroD1 expression suggests that GBCs might be potential candidates for ONB tumorigenicity, however Sox9 is typically expressed in gland/duct cells and normally not co-expressed with NeuroD1. These nests of cells constitute the most mitotically active region of the tumor based on Ki67 immunopositivity. All five specimens express Golf—an olfactory receptor-specific G-protein—providing definitive evidence that ONB is an olfactory neuroepithelium-derived neoplasm. Olfactory marker protein (OMP)—a marker for matured OSNs—was absent in all five specimens.

Conclusion:

These findings present avenues for improving the diagnostic precision of ONB and ultimately advancing our understanding of the cell of origin of the disease.

Poster# D041

Impact of endoscopic dacryocystorhinostomy on sinonasal quality of life

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Introduction:

Endoscopic dacryocystorhinostomy (eDCR) has several advantages over the traditional open approach. However, it requires instrumentation of the nasal mucosa and its impact on sinonasal quality of life remains unknown. The purpose of this study was to determine whether patients undergoing eDCR suffered any long term decrement in sinonasal quality of life and whether the performance of adjunctive septoplasty for surgical access in otherwise asymptomatic patients resulted in a change in nasal symptom scores.

Methods:

Retrospective chart review of 44 patients who underwent eDCR between June 2012 and May 2015. The primary outcome was the total and nasal specific domain 1 scores of the disease specific validated Sino-Nasal Outcomes Test (SNOT)-22. Pre-operative scores were compared with the post-operative scores on days 0-30, 30-90, and 90-180 visits.

Results:

A statistically significant increase in both total (7.5 (0-44) to 24 (0-51), median (interquartile range)) and domain 1 (2.5 (0-11) to 9 (0-18)) scores was observed between the pre-operative score and the first post-operative score (days 0-30) ($p=0.0066$ and $p=0.0001$; respectively). In contrast, there was no statistically significant difference between the pre and post-operative scores on days 30-90 or 90-180. When asymptomatic patients who underwent adjunctive septoplasty were examined, similar results were observed.

Conclusion:

Our findings indicate that, in general, eDCR is well tolerated by patients and nasal symptom scores return to baseline values within 30-90 days of surgery. The concomitant performance of septoplasty in the setting of asymptomatic septal deviation does not confer any long term improvement in symptoms of nasal obstruction.

Poster# D042

Infratemporal fossa meningocele: A case series

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Introduction:

Anterior skull base meningocele are a common cause of CSF rhinorrhea. The infratemporal fossa is a rare location that meningocele may present in. Endoscopic surgical management of meningocele at this location may be challenging. We present 3 cases of transpterygoid infratemporal fossa meningoceles. The cases are discussed with regard to radiological findings, operative technique, and surgical morbidity.

Study Design:

Case series and literature review.

Results:

The 3 cases presented with infratemporal fossa meningocele. Two cases were on the right side and one on the left. Two of the cases presented with CSF rhinorrhea and were successfully treated surgically by trans nasal endoscopic approach. Intrathecal fluorescein was injected to help identify the leak. The 3rd case was treated conservatively.

Conclusion:

Meningoceles can present in the infratemporal fossa and may cause CSF rhinorrhea. Surgical management is the treatment of choice in that case. We conclude that endoscopic trans nasal approach is a valid and safe alternative option to the traditional techniques for treatment of these lesions.

Poster# D043

Intracranial abscess formation following nasoseptal flap skull base reconstruction: a cautionary tale

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Introduction:

Formation of an intracranial abscess following nasoseptal flap skull base reconstruction has not been previously described.

Methods:

A single case at our institution involving formation of an intracranial abscess following nasoseptal flap reconstruction of a cerebrospinal fluid leak is presented.

Results:

It was determined that occlusion of the sphenoid sinus outflow played a role in this complication. The patient was treated with a combined surgical and medical approach utilizing a burr hole craniotomy and endoscopic debridement followed by intravenous antibiotics and recovered without long-term deficit.

Conclusions:

In closing defects of the posterior ethmoid and sphenoid skull base, especially with a pedicled graft, care must be taken to reduce the potential for retention of secretions and blood as this may lead to an intracranial complication.

Poster# D044

Intranasal volume increases with age: CT volumetric analysis in adults

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Introduction:

It is theorized that intranasal cavity volumes change throughout the aging process, possibly secondary to hormonal changes and/or atrophy of the sinonasal mucosa. Our objective is to compare intranasal volumes from different age groups in order to test the hypothesis that intranasal cavity volume increases with age.

Methods:

An analysis of computed tomography (CT) scans of 1.25mm or less slice thickness performed for reasons other than sinonasal complaints. Intranasal volumes of 3 groups (age 20-30y, 40-50y, and 70y and above) were calculated using Vitrea software. The total intranasal volume was measured from the nasal vestibule anteriorly, the nasopharynx posteriorly, the olfactory cleft superiorly, and the nasal floor inferiorly. The total volume included the sum of the right and left sides.

Results:

Sixty-two CT scans were analyzed. There was a progressive, relatively linear, increase in intranasal volume with increasing age: 20-30y = 15.73mL, 40-50y = 17.30mL, and 70y and above = 18.38mL. Mean intranasal volume for males was 19.07mL, and for females was 15.23mL. Analysis of variance demonstrated significant group differences in mean intranasal volume for age ($p=0.003$) and gender ($p<0.001$), with moderate-to-large effect size of 0.206 and 0.289 (partial eta squared), respectively. Post hoc testing revealed a significant difference between the 20-30 year and >70 year age groups ($p=0.006$). There was no significant difference in intranasal volume dependent upon body mass index.

Conclusion:

As theorized, intranasal volume increases with age and is larger in males. Specific etiologies responsible for increased intranasal cavity volume with age are actively being evaluated.

Poster# D045

Intra-optic nerve abscess: A rare complication of acute sinusitis

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Introduction:

Intracranial complications from acute sinusitis are rare. In particular, intra-optic nerve abscess has not been described. A case report and literature review is presented here to emphasize the extreme rarity of this clinical entity.

Methods:

Case report and literature review. The patient's pertinent history, clinical findings and radiologic studies are examined.

Results:

The case of a 33 year old male who was transferred to a tertiary care academic medical center with acute vision loss after developing signs and symptoms consistent with acute sinusitis is presented and reviewed. A computed tomography scan demonstrated pansinusitis with worse severity on the left side. Magnetic resonance imaging revealed a right-sided epidural abscess along the roof of the right sphenoid sinus and the right optic nerve into the optic chiasm. The patient's clinical exam was consistent with right sided optic neuropathy. He underwent an emergent functional endoscopic sinus surgery and subsequent right-sided craniotomy for drainage of epidural and intracranial abscess involving the right optic nerve, chiasm, and optic tract. Subsequently, the patient was treated for six weeks of IV ceftriaxone, penicillin and metronidazole and transitioned to five months of PO amoxicillin. At 3 month follow-up the patient had no evidence of sinusitis and stable ophthalmologic findings.

Conclusions:

The occurrence of an intra-optic nerve abscess is a rare but possible sequela of acute sinusitis. A multidisciplinary approach involving otolaryngology, neurosurgery, ophthalmology, neuroradiology and infectious diseases is paramount. Surgery and antibiotic therapy is the standard of care.

Poster# D046

Investigating the effects of nasal morphology and airflow on chronic rhinosinusitis induced olfactory dysfunction

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Introduction:

An estimated 8 million to 24 million Americans with chronic rhinosinusitis (CRS) suffer from varying degrees of olfactory dysfunction (OD). The mechanism of OD secondary to CRS consists of sensorineural and conductive components. The latter is less understood, particularly in cases of CRS without nasal polyps (CRSsNP). This pilot study aims to identify variations in nasal vestibule morphology (NVM) and olfactory airflow between CRSsNP patients with and without corresponding subjective OD.

Methods:

Based on 3D reconstructions of computed tomography scans of the nasal passage, the unilateral NVM of 15 CRSsNP subjects (7 with OD and 8 without OD) were classified as "notched", if there was a prominent notched indentation at the junction of the nasal ala and sidewall, or "standard" otherwise. Furthermore, olfactory airflow was quantified using computational fluid dynamics (CFD) modeling techniques to simulate airflow into the nasal cavity.

Results:

For CRSsNP subjects with and without OD, 9 out of 14 (64%) and 10 out of 16 (63%) unilateral NVM demonstrated notches, respectively. Notches occupied an expected occluded surface area of $52.59 \pm 52.0 \text{ mm}^2$ in OD and $18.93 \pm 13.78 \text{ mm}^2$ in the absence of OD. In subjects without OD, average olfactory anterior to posterior airflow increased by 251.1% while in those with OD, it decreased by 45.6%.

Conclusions:

Our preliminary results show that CRSsNP subjects with OD have greater expected occluded surface area from notched indentation around the nasal vestibule, as well as different olfactory airflow transport behavior. This may explain their poor olfactory function compared to subjects without olfactory loss.

Poster# D047

Lateral reinforcement to control turbinate bleeding using bioresorbable dressings

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USA

Introduction:

Turbinate bleeding is typically iatrogenic, most commonly occurring following surgery to modify their size, shape, or surface. Bioresorbable dressings have a number of advantages over other methods, in particular the ease of insertion of reinforcing material selectively placed lateral to the primary dressing in the event of persistent or recurrent bleeding.

Properties:

Bioresorbable dressings possess expansile properties that allow the material to contour around the turbinate. Its sponge-like qualities permit thrombin to be injected directly into the polymer. Oil can be applied to preserve its integrity. It does not require removal, reducing the risk of re-bleeding associated with gauze packing, balloons, and sponges.

Technique:

Primary hemostasis is intended to be a non-specific maneuver in order to apply mechanical compression against the turbinate in the absence of visualization of the bleeding site. Typically, an 8x1x1 cm dressing is coated with an antibiotic ointment and inserted using a bayonet forceps. Thrombin is injected into the dressing to facilitate clot formation. If bleeding persists or recurs, a second dressing is cut longitudinally, creating a narrower 8x1 cm segment. Positioning the nasal speculum lateral to the primary dressing the supplemental packing is inserted along the length of the turbinate. Additional dressings can be inserted in the same manner.

Results:

In instances when the primary biologic dressing fails to achieve adequate control of turbinate bleeding a secondary, reinforcing dressing may be effective.

Conclusion:

Laterally-positioned supplemental packing with a biodegradable dressing enhances the diffuse mechanical compression required to control persistent turbinate bleeding.

Poster# D048

Local invasion of recurrent odontogenic keratocyst (OKC) into the maxillary sinus: A collaborative approach between oral surgery and otolaryngology

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Introduction:

Odontogenic keratocysts (OKCs) are epithelial odontogenic cysts known for their aggressive behavior and high recurrence rate that originate from the dental lamina.

Methods:

We present a case of a 50-year-old male with a recurrent OKC in the maxillary sinus. Characteristic histological and radiographical features of OKC will also be discussed.

Results:

The patient presented with an infected maxillary third molar associated with an OKC, which was treated with transoral enucleation, aggressive curettage, and removal of the second and third molars. The patient was then lost to follow up for 18 months. A repeat CT showed extensive osteitic changes extending along the floor and lateral wall of the maxillary sinus, consistent with either a recurrent OKC or infection. The first molar, which had extensive periodontal disease, was then removed and a subsequent biopsy revealed recurrent OKC. Collaboration between the oral/maxillofacial and otolaryngology surgical services led to definitive management consisting of wide local excision through a combined endoscopic-assisted Caldwell-Luc and endoscopic maxillary antrostomy approach. Negative margins were confirmed with the aid of frozen sections.

Conclusions:

OKCs have a high rate of recurrence (2.5-62.5%) and maxillary sinus OKCs are often difficult to access and remove under direct visualization. This case demonstrates a unique radiographic presentation of a recurrent OKC as well as the benefit of a collaborative approach between oral/maxillofacial surgery and otolaryngology to treat an aggressive recurrent lesion. Furthermore, use of intraoperative extradural sinus navigation may aid in complete excision and enucleation of maxillary sinus OKCs.

Poster# D049

Low grade papillary schneiderian carcinoma with hepatic metastasis in the setting of nonhereditary isolated polycystic liver disease: A case report

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Introduction:

Schneiderian papillomas, including oncocytic, fungiform, and inverted papilloma, comprise 0.4-4.7% of all sinonasal tumors. The risk of malignant transformation is about 10% for inverted papilloma. Recently, a new description of "low-grade papillary schneiderian carcinoma" was reported in the literature. This tumor was reported in the setting of multiple previous diagnoses of inverted papilloma. Nonhereditary isolated polycystic liver disease (PCLD) is a rare disorder where the normal hepatic architecture is replaced with clusters of cysts. Multiple cystic hepatic malignancies and metastases have been reported, including cystadenocarcinoma, pancreatic carcinoma, ovarian carcinoma, and head and neck squamous cell carcinoma. The objective of this case report is share the newly described low-grade papillary schneiderian carcinoma with a cystic hepatic metastasis in the setting of PCLD.

Methods:

This study is a case report of a newly reported subtype of schneiderian carcinoma with a delay in the diagnosis of polycystic hepatic metastasis due to a recent diagnosis of PCLD.

Results:

A 57 year-old male with a 10-year history of inverted papilloma presented with a frontal sinus mass. A biopsy showed low-grade papillary schneiderian carcinoma. He also had an 8-month history of PCLD. A subsequent liver biopsy showed metastatic disease.

Conclusion:

Inverted papilloma has a 10% risk of malignant transformation and low-grade carcinoma can be difficult to distinguish from benign disease. However, even this low-grade carcinoma can cause a cystic metastasis to the liver. Therefore, any clinician treating a patient for schneiderian papilloma or carcinomas should be suspicious of any polycystic liver disease.

Poster# D050

Management of sinonasal hemangiopericytomas: algorithm and systematic review of the literature

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Introduction:

Sinonasal hemangiopericytomas (SNHs) account for approximately 2.5% of all vascular sinonasal tumors. Treatment consists of open or endoscopic surgical resection. As the literature on SNH is limited primarily to small case series, there is limited data available regarding the utility of postoperative adjuvant radiotherapy (RT). In addition, the optimal timing and length of surveillance has not been established.

Methods:

A retrospective review of all SNH patients treated in the province of Alberta from 1990-2015 was conducted using data from the Alberta Cancer Board database. Data regarding patient and tumor characteristics, treatment, length of follow-up, and disease-specific (DSS) and overall survival (OS) was collected. A systematic review of the literature regarding treatment and survival data was also performed to allow for construction of an optimized management algorithm for treatment of SNH patients.

Results:

Open or endoscopic surgical resection was performed in 96.8% of patients and 13.6% patient received adjuvant RT. Overall 5-year survival was 80.8%. Treatment with adjuvant RT demonstrated a significant difference in recurrence only in patients with incomplete resections ($p=0.041$). Mean follow-up time was 33.1 months, and 6 patients (4.8%) recurred after this time. A management algorithm is presented and discussed.

Conclusions:

SNH is a rare, yet intricate disease. Complete resection is integral to avoid tumor recurrence. Adjuvant RT may decrease recurrence in cases of incomplete resection. A management algorithm is discussed.

Poster# D051

Medial reinforcement to control septal bleeding using bioresorbable dressings

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USA

Introduction:

Current methods to control septal bleeding include layered petroleum-coated packing, balloons, non-resorbable sponges, and bioresorbable dressings. Hemostasis is achieved by applying pressure directly against the bleeding site. Sponges and dressings permit application of thrombin, enhancing clot formation. Only biologic dressings dissolve, avoiding clot disruption the other methods cause when removed. If bleeding persists or recurs following placement of the primary dressing, insertion of additional resorbable material against the septum is effective.

Method:

The standard white-colored, intra-nasal bioresorbable dressing measures 8x1x1 cm. Antibiotic ointment is applied to its surfaces, which, along with a long nasal speculum, permits resistance-free insertion, avoiding intra-nasal trauma inherent to other methods. The dressing is advanced using a bayonet forceps, which enables re-grasping and re-positioning. If reinforcement is necessary a second dressing is cut longitudinally, creating a narrower 8 cm segment. The speculum is insinuated between the septum and the primary dressing, permitting the reinforcement dressing to be inserted its full length, stabilizing the entire primary dressing. Increased compression is applied against the bleeding source. This maneuver can be repeated if bleeding recurs. Thrombin is injected directly into the dressing.

Results:

Hemostasis is readily observed as the "reddened" dressing becomes pink. Control of re-bleeding with other methods would require more packing, increased balloon inflation, or additional sponge material, causing far greater pain. Combining removable and resorbable modalities defeats the purpose of avoiding clot disruption.

Conclusions:

Medially-positioned supplemental packing with a bioresorbable dressing provides an accurate gauge of bleeding while avoiding the morbidity of other first-line methods.

Poster# D052

Meningitis and ent pathology: 4 years of experience

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We studied 36 cases of meningitis with ENT pathology admitted to a division of infectious diseases that is located in proximity of our ENT unit; 30 cases were treated for complications of ear infections; 6 cases were the consequence of nasal pathology (1 CSF Leak due to previous nasal surgery; 2 ethmoid sinus disease who including 1 post traumatic fistula for aggression that the patient has voluntarily not mentioned; 3 from sphenoid sinus disease). Surgical therapy early, and the massive antibiotic therapy, have proved amelioration in the great majority of cases: they have allowed a great reduction in the time of hospitalization in the ICU and a decrease in the percentage of complications. We had two deaths: they were patients admitted with severe disease that were underwent late surgery. From our experience it follows that, once the diagnosis is also hypothetical ENT pathology during bacterial meningitis, the rapidity of surgical therapy is directly proportional to the percentage of resolution.

Poster# D053

Middle turbinate resection for chronic rhinosinusitis with and without nasal polyps

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 USA

Background:

Studies have shown that middle turbinate resection prolongs the time to revision surgery in CRSwNP patients. The purpose of this study was to determine if a similar impact is observed in CRSsNP patients.

Methods:

Details of middle turbinate resection were reviewed for 480 patients who had undergone two or more endoscopic sinus surgeries for CRS. The interval between surgeries was analyzed based on two disease populations -- CRSwNP (n=337) and CRSsNP (n=143).

Results:

For CRSwNP patients, the interval between surgeries was significantly different at 4.85 years in those who had a MT resection, and 4.60 years in those who had MT preservation (p=0.05). For CRSsNP patients, the interval between surgeries was 4.08 years in those with MT resection, and 4.18 years in those who had MT preservation (p=0.87). There was an increased likelihood of MT resection being performed at time of the last surgery in patients with CRSsNP compared to those with CRSwNP (39.2% vs. 21.1%, respectively, p>0.001).

Conclusions:

MT resection increases the interval between surgeries performed for CRSwNP, but not CRSsNP. MT resection may, however, reduce the need for subsequent sinus surgery in CRSsNP patients.

Poster# D054

Minimal clinically important difference and correlations with subjective measures in rhinomanometry

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Introduction:

Rhinomanometry as a functional method to measure nasal airway resistance (NAR) is well described. However, rhinomanometry values are thought to have poor correlation with patient subjective measures and a minimal clinically important difference (MCID) has not been defined. Thus the impact of clinical interventions is currently difficult to interpret. The use of rhinomanometry pre- and post-intervention was used to define the effect of surgery and determine a MCID.

Methods:

A case-control study of patients from two tertiary clinics undergoing any turbinate, septal and/or rhinoplasty surgery for nasal obstruction was performed. Rhinomanometry was performed at 150 Pa pre- and post-surgery. NAR was recorded for total, obstructed and unobstructed sides. Three patient derived tools were used to define clinical benefit: a 5-point nasal obstruction score, 13-point score of overall nasal function and Nasal Obstruction Symptom Evaluation (NOSE) score. Patient anchored techniques were used to define MCID.

Results:

131 patients (38.02±14.33 years, 58.8% female) were recruited, with 46.9% having had prior surgery. Post-surgery assessment was >6mths after intervention (7.4[IQR6] months). Total NAR decreased following surgery (0.47±0.28Pa/cm3/s v 0.38±0.38Pa/cm3/s, p=0.014). ?NasalObstruction score correlated with both ?TotalNAR (rs0.288, p=0.001), ?ObstructedNAR (rs0.340, p<0.001) and ?UnobstructedNAR (rs0.191, p=0.035). Similar correlations were observed for ?NasalFunction score and ?TotalNAR (rs0.321, p<0.001), ?ObstructedNAR (rs0.403, p<0.001) and ?UnobstructedNAR (rs0.209, p=0.022). Variability was observed with NOSE scores. The patient anchored MCID was defined as -0.10Pa/cm3/s total NAR.

Conclusion:

Rhinomanometry was a robust tool in demonstrating the clinical impact of surgical interventions. An MCID of -0.10Pa/cm3/s is recommended when assessing clinical outcomes.

Poster# D055

Multifocal attachment as an independent risk factor for inverted papilloma of the frontal sinus

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Introduction:

Inverted papillomas (IP) of the frontal sinus have a propensity to recur and pose a surgical challenge. This study aims to evaluate risk factors for tumor recurrence of frontal IPs and evaluate surgical approaches.

Methods:

A single-center, retrospective review of frontal sinus IPs resected from 1999 to 2015 (n=49). Demographic and tumor data, surgical approach, recurrence, and outcomes were analyzed.

Results:

Frontal IP recurrence rate was 34.7% with a mean recurrence time of 26 months of those who recurred. Mean follow-up time was 57 months. On multivariate analysis, tumors with multifocal attachments showed increased odds of recurrence (odds ratio [OR]: 9.02, 95% confidence interval [CI]: 1.59-96.7, p=0.008) compared to tumors with a single attachment. Tumors attached to the posterior frontal wall were associated with recurrence when compared to tumors attached to other regions of the frontal sinus (p=0.026). Additionally, tumors resected with an open approach, as compared to an endoscopic approach, were also associated with a lower recurrence, although this finding did not reach statistical significance (14% vs. 43%, p=0.096). There was no difference in recurrence rates in revision vs. primary cases (p=0.539).

Conclusion:

Frontal sinus IPs are associated with a high rate of recurrence after surgery. Our data demonstrate evidence that tumors with multifocal and posterior wall attachments are at an increased risk for recurrence. Open surgical approaches may provide better outcomes for frontal IPs with multifocal attachments or suspected posterior table attachment. Long-term post-operative follow-up is critical to monitor for tumor recurrence.

Poster# D056

Multifocal inverting papilloma of the sinonasal cavity and temporal bone

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Introduction:

Inverting papillomas (IPs) represent the most common benign neoplasm of the sinonasal cavity and are known for local invasion, proclivity for recurrence, and risk of malignant transformation. IP of the temporal bone (TBIP) is exceptionally rare, with approximately 30 reported cases. We present a new case of multifocal IP of the sinonasal cavity and temporal bone.

Methods:

Case report and review of the literature.

Results:

A 45-year-old man presented with a left sided biopsy proven IP and associated left sided hearing loss. Imaging demonstrated a left sided nasal mass and a separate non-contiguous soft tissue mass filling the left middle ear without involvement of the eustachian tube. He underwent an endonasal endoscopic gross total resection of the sinonasal lesion and biopsy of the middle ear mass with pathology showing IP. He subsequently underwent a left sided transtemporal resection of the TBIP. Review of the literature, revealed 33 TBIP cases (including this case), with 61% having history of associated sinonasal IP and 39% with isolated temporal bone disease. Over half of the patients demonstrated recurrence. In comparison with patients with history of sinonasal IP, isolated TBIP occurred in younger patients, was more common in females, and had less association with HPV and malignant transformation.

Conclusion:

TBIP is extraordinarily rare and usually presents with a history of sinonasal IP. Isolated TBIP may be a distinctly different disease process. Disease recurrence is common and risk of malignant transformation is present, so aggressive initial surgical treatment with gross total resection is advocated.

Poster# D057

Nasal mucosa temperature in healthy individuals and its correlation to subjective nasal patency

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Introduction:

Historically, otolaryngologists have focused on nasal resistance to airflow and minimum airspace cross-sectional area as objective measures of nasal obstruction using methods such as rhinomanometry and acoustic rhinometry. However, there is some data suggesting that perception of nasal patency may be associated with activation of cold receptors by inspired air. Nasal mucosa temperature has not been measured extensively in humans. Our study aimed to investigate whether subjective nasal patency correlates with mucosa temperature in healthy subjects without history of nasal obstruction.

Methods:

Sixteen healthy adults were recruited for this study. Subjects first completed the Nasal Obstruction Symptom Evaluation (NOSE) and a visual analog scale (VAS) to quantify perception of nasal patency. A miniaturized thermocouple sensor was then used to record nasal mucosa temperature bilaterally in two locations along the nasal septum: anterior nasal vestibule and across from the head of the inferior turbinate.

Results:

Inspiratory nasal mucosa temperature measured at the vestibule correlated with the VAS score in the right cavity only (Pearson $r = 0.41$). No other correlations were found between mucosa temperature and subjective scores. Expiratory temperature was higher in the left cavity as compared to the right cavity in both anatomic locations.

Conclusions:

To our knowledge, this is the first study to demonstrate possible correlation between subjective nasal patency and nasal mucosa temperature. However, our results were inconsistent and suggest that the sensor irritated the nasal mucosa because the right vestibule was the first location measured. Future studies should consider non-contact methods to prevent mucosa irritation.

Poster# D058

Nasocutaneous fistulas after craniofacial resection with orbital exenteration

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Introduction:

Nasocutaneous fistula formation is a recognized complication of craniofacial resection with orbital exenteration (CFOE), often requiring subsequent surgical repair. The purpose of this study is to identify the incidence of and risk factors for nasocutaneous fistulas after CFOE with microvascular free tissue transfer.

Methods:

Retrospective chart review of 70 patients who underwent free tissue transfer for reconstruction of craniofacial defects between September 2006 and December 2014 performed at a tertiary care facility. The main outcome measure was incidence of post-operative fistulas that were subsequently repaired according to univariate analysis of risk factors.

Results:

Nine of 70 (12.9%) patients developed post-operative fistulas requiring surgical repair. The most common fistulas were orbital (66%), followed by open wounds of the face or nasal skin (33%). Mean time to diagnosis of fistula after CFOE was 17.6 months (range 1 to 42.6). Majority of the fistula patients (5/9) were reconstructed with an ALT flap during initial CFOE. Six of 70 patients (8.6%) experienced a minor wound breakdown after CFOE, and all 6 went on to develop fistulas ($p=0.0001$). Eight of 9 fistula patients had undergone post-operative radiation therapy prior to developing a fistula ($p=0.0038$). Five fistulas healed after surgical repair (56% success rate) and 4 persisted despite reoperation.

Conclusion:

Wound breakdown after CFOE and irradiation increase the risk for post-operative fistula formation.

Poster# D059

Near complete response of skull base inverted papilloma to chemotherapy

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Introduction:

Inverted papilloma (IP) is the most common benign sinonasal neoplasm. Endoscopic techniques, improved understanding of pathophysiology, and novel surgical approaches have allowed rhinologists to treat IPs more effectively, with surgery being the mainstay of therapy. We report a unique case of a massive frontal sinus IP presenting with intracranial and orbital extension, with near resolution following chemotherapy.

Methods:

Retrospective case review of a patient with a frontal sinus IP treated at a tertiary academic medical center.

Results:

A 75-year-old male patient presented with nasal obstruction, purulent nasal discharge, and a growing left supraorbital mass. Endoscopy demonstrated a mass filling both frontal and ethmoid sinuses, with orbital invasion. There was also substantial erosion of the posterior table measuring 1.73x1.40 cm. A biopsy demonstrated IP with carcinoma in situ (CIS). The patient was deemed unresectable on initial evaluation, and subsequently underwent chemotherapy (carboplatin/paclitaxel). The tumor had a dramatic response to the chemotherapy, and the patient elected for a definitive surgical procedure to remove any residual disease. Intraoperatively, only a small focus of IP was found along the superior wall of the frontal sinus. No tumor was found elsewhere, including at the site of skull base erosion. The final pathology was IP without CIS or dysplasia.

Conclusions:

This is the first reported case of chemotherapeutic "debulking" of IP, which facilitated surgical resection despite substantial intracranial and orbital involvement. Though nearly all IPs can be treated surgically, rare cases, such as unresectable tumors or those with malignant transformation, may benefit from systemic chemotherapy.

Poster# D060

Neurologic sequelae associated with delayed identification of iatrogenic skull base injury during functional endoscopic sinus surgery (fess)

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Introduction:

Violation of the skull base is a rare complication during FESS. When recognized, the management of this complication is well described and generally successful. However, delays in recognizing this complication may result in increased morbidity. We hypothesize that late recognition and repair of CSF fistula during FESS is associated with increased neurologic consequences.

Methods:

An IRB approved retrospective review of the medical record was performed to study patients with early (<72 hrs) and late (>72 hrs) diagnosis of iatrogenic skull base injury after FESS. Parameters studied included patient demographics, time to diagnosis, clinical course, imaging, site of injury, type of repair, clinical outcomes, and neurologic complications. Neurologic complications included postoperative meningitis, pneumocephalus, subarachnoid hemorrhage, and frontal lobe injury.

Results:

Seventeen patients were included for study. Etiologies included FESS (n=15) and balloon sinuplasty (n=2). Mean latency from primary surgery to presentation to our facility was 11 days. The most common site of iatrogenic injury was the cribriform plate (n=10) and the mean defect size was 4.5 mm. Late diagnosis of CSF fistula (n = 11) was associated with increased total neurologic complications (p<0.04) and increased rates of postoperative meningitis (72.7% vs 0%, p<0.01). No neurologic complications occurred in those patients diagnosed intraoperatively. All patients underwent successful endoscopic repair.

Conclusion

Skull base injury is a rare but major complication following both balloon sinuplasty and traditional primary FESS. Early diagnosis and endoscopic repair may prevent neurologic morbidity in these patients.

Poster# D061

Obstructive sleep apnea is not associated with cranial base changes based on computed tomography analysis

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Introduction:

The pathogenesis of spontaneous skull base defects is obscure and may be driven by conditions that affect the pressure differential across the bony skull base, such as obstructive sleep apnea (OSA). The purpose of this retrospective study was to assess possible remodeling of the anterior and middle cranial fossa on computed tomography (CT) studies in patients with and without OSA.

Methods:

130 subjects with and without a diagnosis of OSA and normal maxillofacial CT imaging were identified over a 10-year period. Individual CT images were reviewed and measurements at 10 anatomic sub-sites were performed. One-way ANOVA and chi-square testing were used to compare all continuous and ordinal outcomes, respectively.

Results:

The average duration of OSA was 4.82 years and average apnea hypopnea index (AHI) was 31.94. Statistical analysis revealed no difference between OSA and non-OSA subjects for all variables except for ratio of height of fovea ethmoidalis-to-crista galli (p=0.004). Multilinear regression analysis of continuous variables revealed no statistical difference between groups when stratified for duration of OSA, AHI, or oxygen nadir (p>0.05). Binary logistic regression analysis of ordinal variables revealed no positive relationship when stratified by duration of OSA, AHI, or oxygen nadir (p>0.05).

Conclusions:

Results suggest there may not be a causal relationship between OSA and spontaneous skull base defects. A more empiric approach to analysis of the anterior and middle cranial base is limited by natural variation of anatomy. Further studies may indicate if these observations bear out on the population level.

Poster# D062

Olfactory neuroblastoma with carcinomatous differentiation: An unusual histologic finding in a rare tumor

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Introduction:

Olfactory Neuroblastoma (ONB) is a rare malignant neoplasm of the sinonasal tract that arises from olfactory epithelium. There have been reports, mainly in tumors that have undergone chemoradiation or distant metastasis, describing focal histologic changes of divergent cell populations with distinct characteristics within archetypal ONB. Only three cases have been reported of ONB coexisting with non-neuroendocrine tumors

Methods:

We report the case of a 35-year-old male with a nasal cavity mass extending into the anterior cranial fossa. Pathology revealed this to be a high grade malignant neoplasm with features of olfactory neuroblastoma and poorly differentiated carcinoma.

Results :

The patient underwent combined endoscopic and open craniofacial resection followed by adjuvant chemotherapy and radiation. The patient is now eight months status post completion of treatment with no evidence of recurrence. Surgical pathology clearly demonstrated two cell populations evenly distributed and displaying the classic histologic and immunochemical markers of ONB, as well as of poorly differentiated carcinoma.

Conclusion:

Our patient's presentation is unique and unusual in that the tumor demonstrated a high grade olfactory neuroblastoma and a high grade carcinoma cell population in the same tumor mass. This combined appearance is quite rare and has been termed "olfactory carcinoma" in the literature. Only one previous case has been reported of carcinomatous involvement of an ONB. There is insufficient information in the literature to draw conclusions on the impact these divergent cell populations have on prognosis or treatment.

Poster# D063

Outcomes and predictors of mortality in invasive fungal sinusitis: A 10-year retrospective review of invasive fungal sinusitis at a major medical center

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Introduction:

Acute invasive fungal sinusitis (IFS) represents a specific type of invasive fungal infection with reported mortality rate of 50-80%. Mortality aside, if survived, morbidity is extensive and lifelong. The purpose of this study is to provide a comprehensive analysis of outcomes related to IFS by focusing on predictors of mortality.

Methods:

Retrospective review was performed of all IFS cases from 2004-2015 in a tertiary referral center (n=34). Patient demographics and potential risk factors such as immunosuppression, malignancy, absolute neutrophil count (ANC), and chemotherapy use were analyzed. Multivariate backward elimination variable selection using logistic regression model was used to identify potential predictors of mortality.

Results:

Cohort was 58% male (20/34) with 59% (24) patients reported as Caucasian. Overall mean age at diagnosis was 49, including 4 pediatric patients. 77% of patients were receiving chemotherapy and 29% had a bone marrow transplant. Mortality from IFS was 50% (17/34). Of patients that died of IFS, 47.1% had ANC=0, while for those that did not, only 17.7% had ANC=0 at time of diagnosis (chi-square p=0.0668). With mortality as outcome variable, backward selection method failed to identify demographic and other risk factors of immunosuppression for inclusion in the model.

Conclusion:

Over the last decade IFS overall mortality remains high at 50% despite medical and surgical advances. Non-detectable ANC at time of diagnosis may be linked to mortality, although it was not statistically significant (p=0.0668). Diagnosis of IFS alone portends a poor prognosis and once diagnosed, individual patient factors do not appear to impact survival.

Poster# D064

Over-pursuit of femininity: Frontocutaneous fistula formation following forehead recontouring surgery in a transgender patient

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Objectives:

Facial feminization surgery incorporates various cosmetic and reconstructive procedures to create more classically feminine facial features. Forehead recontouring is a common part of facial feminization surgery that alters the shape and structure of the frontal bone. We present a case involving the development of a frontocutaneous fistula as a delayed complication of forehead recontouring surgery.

Methods:

Case report and literature review.

Results:

A 65-year-old female underwent gender reassignment surgery, which include forehead recontouring, at an outside facility. Seven years following facial feminization surgery, the patient developed a draining frontocutaneous fistula over her left eyebrow positive for methicillin-resistant *Staphylococcus aureus*. The frontocutaneous fistula persisted despite prolonged intravenous antibiotics and intranasal steroids. CT sinus revealed a large defect in the anterior table of the frontal sinus and stenosis of the left frontal outflow tract. The patient underwent a modified Lothrop procedure in order to open the obstruction. At subsequent post-operative visits, the patient's frontal sinus neo-ostia have remained patent, although the frontocutaneous fistula persists.

Conclusions:

This is the first reported case of frontocutaneous fistula formation after forehead recontouring surgery. As facial feminization surgery continues to expand as a reconstructive option for a specific population, practitioners should recognize the potential risk of sinonasal complications following forehead recontouring surgery.

Poster# D065

Pilot study of intraoperative real-time eye-tracking to assess surgical proficiency in endoscopic sinus surgery

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Introduction:

Eye-tracking hardware and software allow real-time quantitative analysis of eye movements. Applied to surgery, eye-tracking technology enables the comparison of visual cues used by surgical trainees and expert surgeons, which may provide insight into proficiency and open avenues for surgical assessment. Herein, we compare the gaze of trainees and experts on endoscopic and surgical navigation imaging, as well as surgical and non-surgical fields.

Methods:

The portable eye-tracking device consisted of lightweight glasses connected to a mobile phone that recorded eye movements overlaid on real-time video of the user's visual field. Recordings included one attending and one fellow performing endoscopic sinus surgery (ESS). Videos were analyzed using defined time stamps and gaze time was classified as one of the four aforementioned fields.

Results:

Total operative time studied for attending and fellow were 18 minutes and 21 minutes, respectively. While the attending and fellow had similar endoscopic imaging use (72.9% vs 78.8% of operative time, respectively), the number of times each referenced the surgical field for camera positioning differed substantially (31 vs 65 instances). OR communication or passing of instruments was also lower for the attending (31 vs 43 instances). Additionally, the average length of fixation per endoscope view was longer for the attending (25 vs 14 seconds).

Discussion:

This pilot study demonstrates the potential utility of intraoperative eye-tracking in assessing surgeon gaze during ESS. Future studies will validate whether eye-tracking technology can be utilized to measure surgical proficiency and track educational progress over time.

Poster# D066

Prevalence of allergic sensitization in patients with rhinitis symptoms

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Objective:

In this study, we enrolled patients with characteristic chronic rhinitis symptoms and attempted to identify the clinical clue for differentiating AR from NAR among patients who present with similar rhinitis symptoms.

Methods:

A total number of 2002 patients with AR symptoms underwent the multiple allergen simultaneous test (MAST). Nasal symptoms (rhinorrhea, nasal obstruction, itching and sneezing) and serum total IgE were evaluated. Univariate and multivariate regression tests were performed to identify factors which had correlation with allergic sensitization.

Results:

We observed that 1236 patients (61.7%) showed allergic sensitization and 766 patients (38.3%) showed a negative test result. Among the 4 nasal symptoms, only itching showed a significant correlation with allergic sensitization in the multiple logistic regression test ($p=0.000$, $aOR=2.090$, $95\%CI: 1.560-2.800$). The proportion of male patients was significantly higher in the AR group ($p=0.000$, $aOR=1.744$, $95\%CI: 1.441-2.112$). Younger age was a significant factor for allergic sensitization ($p=0.001$, $aOR=1.621$, $95\%CI: 1.227-2.140$). All four nasal symptoms peaked in patients who were in their 10s and 20s. However, relative ratio for each symptom showed that itching decreased with age and rhinorrhea increased with age.

Conclusions:

The prevalence of AR decreased with age. The AR group showed a higher TNS than the NAR group. NAR was relatively common in females than males and it was also common at an older age. Multiple regression test showed that itching, age under 60 years, and male gender had a significant correlation with allergic sensitization.

Poster# D067

Reduction of bilateral anterior frontal sinus fractures using a balloon sinuplasty catheter: A case report

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Introduction:

Frontal sinus fractures contribute to 5-15% of all facial fractures and their management deserves special attention due to the risk of short and long-term complications. The management algorithm for frontal sinus fractures is one that has been long debated with no clear consensus. More recently, there has been a trend towards restoration of normal sinus anatomy in place of the previous gold standard of frontal sinus obliteration. The evaluation, classification, and management of such injuries continue to be studied. As new technologies are developed it is important to apply them to the evolving treatment paradigms that exist. We report the use of a balloon sinuplasty catheter in the correction of bilateral anterior table frontal sinus fractures in a 13-year-old male following sports injury.

Methods:

Details of the case are reported as well as a review of the recent literature surrounding this topic.

Results:

This is a case report about the use of balloon sinuplasty catheters in the reduction of bilateral anterior frontal sinus fractures. We were able to safely reduce the bilateral fractures with multiple balloon sinuplasty catheters, thus avoiding the need for frontal sinus obliteration. In addition, we were able to preserve the frontal sinus mucosa as well as patency of the frontal sinus outflow tract. He was followed for over one year postoperatively without signs of sinus obstruction or other complication.

Conclusion:

In carefully selected patients, balloon sinuplasty catheters may be considered in the management of frontal sinus fractures with the aim of sinus preservation.

Poster# D068

Revisiting autologous fat grafts for the reconstruction of skull base defects during the endoscopic era

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Background:

The use of abdominal free fat is a traditional surgical method for the repair and reconstruction of the skull base. Abdominal free fat is regarded as a grafting material that obliterates dead space and restores the boundaries between the intracranial compartment and sinonasal cavity. Few studies, however, have evaluated the success rates and complications associated with the abdominal fat graft during the endoscopic era.

Methods:

All patients, who underwent endoscopic skull base reconstruction or repair with autologous abdominal fat from September 2009 to August 2015, were included for retrospective chart review. Outcome measurements included the success of skull base reconstruction, as determined by occurrence of post-operative cerebrospinal fluid (CSF) leaks.

Results:

A total of 24 patients, consisting of 13 men and 11 women, were identified for inclusion. Indications for intervention included idiopathic meningoencephaloceles (n=8), traumatic injuries (n=6), pituitary adenomas (n=3), and other malignant (n=3) and benign (n=4) neoplasms. All cases involved intraoperative CSF leaks. One patient did not return for follow-up visits. Of the remaining 23 patients, 22 (95.7%) demonstrated successful repair of the CSF leak; the shortest duration of follow-up was 2 months. The one unsuccessful case occurred 1 week after initial repair with fat graft, but the recurrent CSF leak resolved following revision surgery of the fat graft.

Conclusions:

The use of autologous fat remains a viable option as a grafting material for endoscopic anterior skull base reconstructions. Despite the wide variety of closure techniques, autologous fat provides safe and easily accessible material to repair CSF leaks.

Poster# D069

Risk factors associated with olfactory disorders in adults: A U.S. population based analysis

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Introduction:

Olfactory dysfunction is increasingly recognized as having significant social, psychological, and safety implications. Knowledge regarding potential risk factors has been arbitrarily documented and is limited in scale. We present a contemporary population based study of olfactory disorders in the United States and identify correlative demographic and exposure variables.

Methods:

Analysis was performed with data from the 2011-2012 edition of the National Health Examination and Nutrition Survey (NHANES). Respondents were identified based on responses to a subjective assessment of olfaction within the previous 12 months. The frequency of olfactory disturbance was determined in relation to demographic factors, occupational or environmental exposures, and urinary levels of environmental and industrial compounds.

Results:

3,594 respondents were included in the analysis. Smell disorders were significantly more common with increasing age (OR 1.061, 95% CI 1.003-1.123) and among the non-Hispanic Black and non-Hispanic Asian populations (OR 0.570, 95% CI 0.384-0.847; OR 0.441, 95% CI 0.253-0.770). Those reporting exposure to vapors were more likely to experience olfactory dysfunction (OR 1.480, 95% CI 1.092-2.007). Urinary levels of manganese (OR 0.949, 95% CI 0.921-0.977), 2-Thioxothiazolidine-4-carboxylic acid (2T4CA) (OR 0.663, 95% CI 0.484-0.907), and 2-Aminothiazoline-4-carboxylic acid (2A4CA) (OR 0.710, 95% CI 0.547-0.922) were lower among respondents with smell disturbance. Remaining demographic and exposure variables were not significantly associated.

Conclusions:

This study provides the only current, population-based data identifying demographic and exposure elements related to smell disturbances in U.S. adults. Age, race, exposure to vapors, and lower urinary levels of manganese, 2T4CA and 2A4CA were significantly associated with decreased olfaction.

Poster# D070

Risk factors for malignant transformation of sinonasal inverted papilloma

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Introduction:

Inverted papillomas (IP) are benign tumors of the sinonasal cavity that possess the potential to be locally aggressive and carry a 5-10% risk of malignant transformation to squamous cell carcinoma (SCCa). Prior studies have found smoking history and tumors arising from the frontal sinus or frontoethmoidal recess to be associated with malignant transformation. This study aims to explore risk factors for malignant transformation of sinonasal IPs.

Methods:

A single-center, retrospective review of IP resections from 1999 to 2015 identified 39 patients with malignant transformation. Demographic data, pre-operative radiographic imaging, operative notes, pathology details, and transformation rates were analyzed and compared to non-transformed IP cases to identify risk factors for malignant tumor transformation.

Results:

Of 39 cases with IP malignant transformation, 62% were male with a median age of 59 years (range 36-79). There was no association between SCCa and gender, smoking history, alcohol consumption, or prior sinus surgery. Age (= 70 yrs, 45-70 yrs, = 45 yrs) was associated with increased transformation rate (17.1%, 8.3%, and 4.4%, respectively), which approached statistical significance ($p=0.14$). There was no association between tumor origin location and transformation rate.

Conclusion:

Age, gender, smoking status, alcohol consumption, and prior sinus surgery show no association with malignant transformation of IP. History of smoking and tumor location were not risk factors for transformation in our series. It is thus important to closely monitor all patients with a history of sinonasal IP to assess for interval malignant degeneration.

Poster# D071

Safe and effective treatment of ethmoid sinusitis utilizing minimally invasive ethmoid punch (ep) sinusotomy in chronic rhinosinusitis without polyposis (crssnp) patients

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Introduction:

Current rhinologic practice is devoid of minimally invasive procedures dedicated to the treatment of ethmoid sinusitis to improve ventilation and topical drug delivery. We have recently described a handheld spiral punch to create minimally invasive ethmoid punch (EP) sinusotomies into the ethmoid bulla and basal lamella, which significantly increased irrigant access to the ethmoid sinuses in cadaver models. Here we determined the safety profile and efficacy associated with EP sinusotomy in CRSsNP patients with active ethmoid disease.

Methods:

Single arm, IRB-approved observational study performed in CRSsNP patients who failed medical management and were originally candidates for standard FESS. Thirty of 40 possible ethmoid compartments (17/20 anterior, 13/20 posterior) underwent EP sinusotomy. EP site characteristics (patency, remucosalization), complications (closure, recirculation) were collected. Efficacy of EP sinusotomy was determined by SNOT-22 and Lund-Mackay (LM) scoring collected at 6 months.

Results:

29/30 EP sites remained patent ($n=29$, 96.6%), with a minority displaying evidence of stenosis ($n=9$, 30%) or closure ($n=1$, 0.03%). All patent EP sites had complete remucosalization ($n=29$, 100%) with no evidence of mucus recirculation ($n=0$, 0%) or other complication secondary to healing or device use. SNOT-22 scores significantly improved with a mean reduction of 32.3 (49.6 ± 7.5 pre-EP vs 17.3 ± 8.1 post-EP, $p=0.0001$). Ethmoid sinus cavities with a pre-procedure LM score of 1 or 2 universally improved to LM score of 0 following EP sinusotomy ($n=26$, 100%).

Conclusion:

EP sinusotomy appears to be a safe and highly effective minimally invasive procedure to treat ethmoid sinusitis in CRSsNP patients unresponsive to medical therapy.

Poster# D072

Safety and adverse effects of intranasal corticosteroid use: A systematic review

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USA

Background:

Intranasal corticosteroids (INCS) are used long-term for many rhinologic conditions. Newer formulations and methods of delivery are now available. A systematic review of the literature provides comprehensive understanding of safety and adverse effects.

Objectives:

Conduct a systematic literature review for adverse effects from INCS use in adults and children.

Methods: Systematic review of MEDLINE, PubMed, EMBASE databases using comprehensive search strategy including all INCS formulations was conducted.

Results:

Eighty-nine manuscripts, including case reports, underwent full review after screening 214 Posters. These included INCS use as metered nasal sprays, drops, injections, aerosols and irrigations (adults: 38; pediatric: 14 studies). The most commonly reported side effects in both adults and children included nasal discomfort, dryness, burning, rhinitis, septal erosion, epistaxis, headache and nasopharyngitis.

A meta-analysis of 8 studies with 755 children using INCS nasal spray reported significant growth velocity disturbance (2015). In the year 2013, a 16 year-old was reported to have retinal emboli and vision loss from intranasal triamcinolone acetonide injection. In adults, temporary serum cortisol level suppression with high dose dexamethasone nasal spray (2015) and intranasal betamethasone nasal drops (1993) was found. Cushing's syndrome from dexamethasone phosphate nasal drops was reported (1984). A 2015 case series reported transient vision loss with intra-polyp triamcinolone acetonide injection. Nasal steroids were not reported to cause infections, cataracts or glaucoma.

Conclusions:

INCS appear to be generally safe to use. However, serious adverse effects can result in children, and with certain formulations and methods of use. The rhinologist must have detailed knowledge of these.

Poster# D073

Second opinion rhinologic patients: does the amount of surgery approximate the degree of mucosal disease?

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Introduction:

Recent literature demonstrates an increase in endoscopic sinus surgery (ESS), but no change in the rates of chronic rhinosinusitis (CRS). The objective of this study was to determine if patients with presumed CRS are undergoing appropriate preoperative treatment and surgical management.

Methods:

Prospective evaluation was undertaken for patients seeking care at our tertiary rhinology practice after sinus surgery was performed or recommended by an outside otolaryngologist. Inclusion required preoperative records with specific surgical recommendations or operative report, and preoperative computed tomography (CT) images. Images were graded with the Lund-McKay (LM) scale and compared to the amount of surgery performed/recommended, graded with a newly-developed 24-point sinus surgery scoring system. The ideal LM-to-surgery score ratio was 1.

Results:

Sixteen study patients and 48 control patients (3 controls per study patient; matched for age, gender, and surgery date) were included. The absolute value of the difference between the actual and ideal LM-to-surgery ratios was calculated for each patient. The mean difference +/- SEM was 1.076 +/- 0.2737 for the study patients and 0.223 +/- 0.04581 for controls ($p = >0.0001$). In addition, 5/16 patients did not receive adequate medical management preoperatively.

Conclusions:

The trend for second opinion rhinology patients evaluated in our practice is that they are undergoing an inappropriate degree of ESS versus what is indicated by CT scan. This most commonly involves more surgery than indicated, but at times less surgery than indicated. The degree of surgery should closely approximate the LM score, aiming for an ideal ratio of 1.

Poster# D074

Simple versus complex sellar repair: Comparison of outcomes

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Background:

The transphenoidal endoscopic (TE) approach to pituitary adenoma resection became the standard approach in 2006 at our institution. Adequate closure of the sella can vary across surgeons and institutions. Complex repairs involve reconstructing the sella while simple closures can involve surgical and fibrin glue. The purpose of this study is to show the benefit of the simple repair in minimizing OR times but maintaining similar post-op outcomes.

Methods:

A retrospective analysis of 62 patients who underwent TE surgery was performed. Patients were identified as having either a simple sellar repair (n=56) or complex repair (n=6). All gross intra-operative CSF leaks required complex repairs. Discrete variables and continuous variables were compared with Fischer's exact test and T-test, respectively.

Results:

There was a reduction in mean OR time between simple and complex repairs with 212.0 minutes and 240.5 minutes, respectively (p=0.0663). There was no significant change in vision improvement (p=0.6037), length of stay (p=0.9087), or stay in the intensive care unit (p=0.1102). Post-op complications included no significant difference in post-op CSF leaks (p=0.7245), placement of lumbar drains (p=0.7245), worsened vision (p=0.1000), pan-hypopituitarism (p=0.6826), transient (p=0.2594) or permanent (p=0.1000) DI, or the need for re-operation (p=0.3416). Among the simple repairs, there were a total of 3/56 (5.4%) cases that required re-operation.

Conclusion:

The retrospective analysis exhibited reduced OR times and no difference in post-op outcomes or complications between the simple and complex repair groups indicating adequate benefit of using fibrin glue and surgical for simple closures.

Poster# D075

Sinonasal Ewing's sarcoma

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Introduction:

Sinonasal Ewing's sarcoma (SES) and associated primitive neuroectodermal (PNET) tumors are exceedingly rare entities. To our knowledge, only ten case reports of SES of the nose or paranasal sinuses have been reported. There has only been one case of SES arising from the middle turbinate, first reported over three decades ago. The management of SES has stemmed from the management of its osseous counterpart, but overall treatment of surgery, radiotherapy, and chemotherapy is varied. Five-year survival rates for SES vary from 21-70% with the lower range representing those presenting with metastatic disease.

Methods:

Case report and review of literature.

Results:

A 26 year-old man presented with persistent left-sided nasal obstruction. Endoscopy demonstrated a friable mass in the left nasal cavity originating from the middle turbinate with extension into the nasopharynx, confirmed with CT and MRI. There was no evidence of metastatic disease on PET-CT. Histopathology was consistent with SES. FISH was positive for EWS gene translocation. A multidisciplinary tumor board evaluated the patient. The patient underwent neoadjuvant chemotherapy, followed by definitive endoscopic surgical resection and post-operative radiotherapy. A literature review found more involvement of the maxillary and ethmoid sinuses compared to the nasal cavity and that although chemotherapy was constant, the role of radiation and surgical approach was more varied.

Conclusion:

SES is a rare entity that has a high mortality but for which few standardized treatment protocols exist. This study outlines the role of relevant imaging, a multidisciplinary team, and the timing of surgery, chemotherapy, and radiation.

Poster# D076

Sino-nasal extramedullary plasmacytoma: Case review of a rare otolaryngologic entity

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A 76-year-old male presented with unilateral, left sided nasal obstruction, recurrent epistaxis and chronic nasal drainage of unknown duration. Nasal endoscopy revealed a mass involving the medial aspect of the middle turbinate and abutting the nasal septum. Computed tomography revealed a well-circumscribed mass stemming from the left middle turbinate, abutting the left septum as well as left nasal sidewall, extending posteriorly to the choanal arch. Differential diagnosis included nasal polyp, inverted papilloma, hemangiopericytoma, esthesioneuroblastoma, mucocele, encephalocele, malignant melanoma, and lymphoma. Final pathology revealed an extramedullary plasmacytoma. The presentation, pathology as well as implications and treatment of this relatively rare sino-nasal tumor are reviewed.

Poster# D077

Sinonasal metallic foreign body penetration of the anterior cranial fossa

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Introduction:

Intracranial foreign bodies have the potential to cause several devastating complications including CSF leak, meningitis, hydrocephalus, nerve or vessel injury, and even death. These risks must be weighed against the risks associated with potential management options and techniques for removal. With the advent of endonasal anterior skull base techniques, safe and efficient options for surgical retrieval and skull base repair have become available.

Methods:

In the present report, we present three cases involving metallic foreign bodies penetrating anterior cranial fossa via the sinonasal tract, and the management approaches employed.

Results:

The three cases involved (1) a migrated K-wire from nasal reconstruction in the remote past, (2) an acute nail-gun injury, and (3) an impaled car antenna. A combined endoscopic and transcranial approach was performed in the first case, an endoscopic approach was used in the second, and, in the third, an EVD was placed due to elevated ICP after the foreign body had been withdrawn.

Conclusions:

Intracranial metallic foreign bodies may have significant potential morbidity. Recent advances in endonasal techniques for anterior skull base access may enhance outcomes through reduced morbidity and mortality, improved speed and precision, shorter hospital stays, and lower post-operative pain. Technical nuances of these approaches and medical decision-making in the context of various neurosurgical considerations are discussed.

Poster# D078

Sinonasal mucosal healing typically lags SNOT-22 scores after minimally invasive pituitary surgery

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Background:

Minimally invasive pituitary surgery (MIPS) has become widely accepted as the surgical treatment of choice for sellar pathology. The objective of the current study was to analyze evolution of symptom scores and mucosal healing after MIPS.

Methods:

SNOT-22 scores and objective endoscopic data were reviewed on 52 patients in a longitudinal manner. Scaled averages of the SNOT-22 and endoscopic data from different time points were compared with baseline scores using non-parametric testing. Time to baseline for endoscopic exams was also analyzed using Kaplan-Meier curves.

Results:

The rhinologic subdomain of the SNOT-22 scores showed statistical significant worsening differences between baseline and 2 weeks postoperatively ($p = .03$). Follow up SNOT-22 scores after 2 weeks showed no significant differences compared to baseline with overall trend towards improvement in patient symptoms during the subsequent period. Similar analysis for the endoscopic data illustrated statistically significant differences between the baseline scores up to 16 weeks postoperatively. Overall trend showed a worsened endoscopic exam initially with a spike around 8-10 weeks (1.38, $p=.03$) with subsequent return to baseline. Kaplan-Meier estimate curve demonstrated a median time to return to baseline endoscopy at 18.9 weeks (95% CI: 14.9 – 38.3).

Conclusion:

The longitudinal data exhibited subjective improvement of patients based on SNOT-22 scores within 2-4 weeks post-MIPS. However, the objective endoscopic data revealed a lag in improvement of the exam typically at 16-20 weeks. This underscores ongoing careful endoscopic assessment to ensure proper mucosal healing beyond just subjective symptoms as the gauge to postoperative recovery.

Poster# D079

Surgical experience does not affect predictors of patency after transnasal endoscopic dacryocystorhinostomy with ultrasonic bone aspirator

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Purpose:

To determine if surgical experience improves outcomes after endoscopic dacryocystorhinostomy (eDCR) with ultrasonic bone aspirator (UBA).

Methods:

A retrospective, institutional review board approved chart review of 550 eDCRs with UBA over three years with a follow-up of nine months. Data included demographics, indication of nasolacrimal duct obstruction, intraoperative findings, and postoperative sequela. Patients undergoing primary eDCR were grouped in early phase (2012-2013) and recent phase (2014-2015)

Results:

One hundred and twenty primary eDCRs with UBA were included. 60 patients in the early phase and 60 patients in the recent phase were match controlled by age and ethnicity. Patients were Caucasians (75%) and women (82.0%) with a mean age of 61. 10% of the early phase had persistent epiphora at 6 months vs 3.3% of the recent phase ($p=0.27$). 3.3% of the early phase and 5% of the recent phase experience postoperative dacryocystitis. 8.3% of patients in the early phase required a revision eDCR with UBA vs 0 patients in the recent phase ($p=0.057$). The average time to revision DCR was 8 months (range of 3-16 months). There were no cases of cerebrospinal fluid leakage, visual loss, diplopia, or uncontrolled epistaxis in either group.

Conclusions:

Our growing experience with the eDCR with UBA appears to show equivalent efficacy to other published techniques. While the surgical outcomes show improving trends with experience, there was no statistically significant difference between the early and recent phase. Predictors of patency are unlikely to be related to surgical experience.

Poster# D080

Surgical management of esthesioneuroblastoma: quality metrics and long-term outcomes of endoscopic and open approaches

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Introduction:

Esthesioneuroblastoma is a rare malignancy with propensity for late recurrence and metastasis. The objective of our study was to describe perioperative quality metrics, financial implications, and long-term oncologic outcomes after esthesioneuroblastoma resection.

Methods:

Retrospective case series of patients with pathologically diagnosed esthesioneuroblastoma treated with definitive surgery at a tertiary care academic center from 1997-2013.

Results:

Twenty patients met criteria for the study: 10 patients treated with endoscopic resection and 10 patients treated with open craniofacial resection. Five patients in the endoscopic group and all 10 patients in the open group were modified Kadish stage C or D. Negative margins were achieved in 90% of the endoscopic group and 70% of the open group. Complications included postoperative CSF leak and persistent cavernous sinus bleeding necessitating re-exploration in the endoscopic group, and 2 patients with pneumocephalus, 1 venous infarct, and 1 CSF leak in the open group. The length of hospital stay was significantly shorter in the endoscopic group (mean 4.3 vs. 9.4 days, $p=0.002$), which translated to significant direct and indirect cost savings. There were no unplanned readmissions in the endoscopic group and 1 in the open group. At a median follow-up of 79.5 months, all patients in the endoscopic group are alive, with a 5 year RFS of 90.0%. The 5 year DSS and RFS in the craniofacial resection group are 77.8% and 45.7%, respectively.

Conclusions:

Endoscopic resection of advanced stage esthesioneuroblastomas can be accomplished with excellent long-term oncologic outcomes with decreased length of stay, cost, and complication rates.

Poster# D081

Surgically relevant endoscopic landmarks of the olfactory system

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Introduction:

Olfactory loss following sinonasal and skull base surgery is a known risk that is devastating to patients. The olfactory fila are vital structures at potential risk during a number of sinonasal procedures. A better anatomical understanding is required to minimize harm to patients.

Objective:

The objective of this study is to assess the relationship between the first and last olfactory fila and other more visible and consistent endoscopic landmarks.

Methods:

A cadaveric study was performed on 8 fresh heads (a total of 16 sides). The distance between the first olfactory fila to the middle turbinate skull base insertion at the axilla, the distance from the posterior table of the frontal sinus to the first olfactory fila, and the distance between the last olfactory fila and the leading edge of the planum sphenoidale were recorded.

Results:

The distances from the first olfactory fila to the middle turbinate axilla and the posterior table of the frontal sinus were $11.88 \pm 3.67\text{mm}$ and $1.31 \pm 1.89\text{mm}$, respectively. The distance between the last olfactory fila and planum sphenoidale was $4.43 \pm 2.39\text{mm}$.

Conclusions

Our study delineates the distances of the first and last olfactory fila from consistent landmarks within the sinonasal cavity. An appreciation of these distances, as well as an understanding that these fila are not the beginning of the olfactory system, but instead the end bundle of coalescing neurons spread out beyond the fila within the nasal mucosal lining, should help surgeons minimize the risk to olfaction when performing sinonasal procedures.

Poster# D082

Survival outcomes after anterior skull base invasion due to cutaneous malignancies

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Introduction:

Cutaneous malignancies can invade distance sites from the primary tumor through nerve conduits leading to increased morbidity and mortality. However, limited research has examined perineural tumor spread (PNTS) to the skull base. Our objective was to investigate anterior skull base invasion patterns and we hypothesized that PNTS affects survival outcomes.

Methods:

38 patients met inclusion criteria through a retrospective chart review of consecutive patients treated for anterior skull base invasion due to head and neck cutaneous malignancies, excluding melanoma, from 2004 - 2014. Demographics, treatment, and tumor characteristics associated with anterior skull base invasion through PNTS or direct extension were examined. PNTS was defined as peripheral (zone 1), skull base (zone 2), and cisternal (zone 3).

Results:

The mean follow up time was 38.2 months. PNTS was seen in 86.8% of patients with anterior skull base invasion, while 13.2% had direct extension. The route of skull base invasion, in addition to age, T stage, and histology were significantly associated with disease-specific and overall survival ($p < 0.05$). Patients with zone 2 PNTS had significantly improved disease-specific and overall survival compared to patients with zone 3 PNTS or direct invasion ($p < 0.05$). Basal cell carcinoma was significantly associated with direct invasion and exhibited improved disease-specific and overall survival compared to other histologic subtypes ($p < 0.05$).

Conclusion:

Head and neck cutaneous malignancies invade the anterior skull base primarily through PNTS, and basal cell carcinoma and zone 2 extent of disease were associated with improved survival. Further investigations are needed to better understand these findings.

Poster# D083

Systematic review of outcomes of endoscopic optic nerve decompression in patients with idiopathic intracranial hypertension

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This systematic review examines the outcomes of performing endoscopic optic nerve decompression (EOND) in patients with idiopathic intracranial hypertension (IIH). The included medical articles were selected by conducting a detailed online search of English language publications. The search yielded a total of 150 articles from which only articles containing fully endoscopic optic nerve decompression procedures on IIH patients met the inclusion criteria. A total of six studies were included in our review: two case reports, three retrospective studies, and one prospective study for a total of 34 patients. Patients had either persistent symptoms of headache {30 of 33(90.1%)}, signs of papilledema {26 of 33(78.8%)} or a combination of them. The mean duration of these symptoms ranged from 7 to 32 months. Overall, patients showed post-operative improvement of symptoms and signs associated with IIH, specifically headache (89%) and papilledema (88%) after EOND. The improvements in headaches and papilledema were associated with bony decompression of the optic strut independent of nerve sheath fenestration (75% and 100%) or lack thereof (92% and 86%). Nerve sheath fenestration does not appear to confer a higher incidence of complications. Authors did not report a single major adverse event with the EOND approach.

Poster# D084

Taste disability and quality of life in chronic rhinosinusitis

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Introduction:

The relationship between taste dysfunction and quality-of-life (QOL) in patients with chronic rhinosinusitis (CRS) is poorly understood. This study evaluates the prevalence of taste dysfunction and how it contributes to disease-specific QOL in patients with CRS.

Methods:

Adult patients with CRS were prospectively enrolled. Patients completed a baseline SinoNasal Outcomes Test-22 (SNOT-22), Rhinosinusitis Disability Index (RSDI), Questionnaire for Olfactory Disorders (QOD), and University of Pennsylvania Smell Identification Test (UPSIT). Taste dysfunction was determined using taste-specific questions from the QOD and RSDI. Lund McKay CT scores and Lund Kennedy endoscopy scores were calculated. Logistic regression modeling was used to identify potential confounding factors.

Results:

Sixty-nine patients with CRS were enrolled including 36 with nasal polyposis (CRSwNP) and 33 without nasal polyposis (CRSsNP). Patients with CRSwNP reported greater taste dysfunction than patients with CRSsNP (mean \pm standard deviation [SD]: 7.93 ± 3.55 vs. 4.97 ± 4.12 ; $p=0.003$). Taste dysfunction was associated with worse disease-specific QOL and worse olfactory scores in all CRS patients and in both CRSsNP and CRSwNP subgroups. Significant correlations were found between taste dysfunction and CT and endoscopy scores in all CRS patients and in the CRSsNP subgroup.

Conclusion:

In patients with CRS, greater taste dysfunction is associated with worse disease-specific QOL. Patients with CRSwNP reported overall worse taste dysfunction than patients with CRSsNP. Further investigation is warranted to better delineate the factors contributing to taste dysfunction in patients with CRS.

Poster# D085

The correlation between preoperative endoscopic, radiological and operative findings of np (nasal polyposis)

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Giza, Giza

Objectives:

To assess the correlation between preoperative endoscopic, radiological and operative findings of NP (nasal polyposis).

Materials and

Methods:

Thirty Patients with NP underwent endoscopic (Meltzer staging system), radiologic (Lund-Mackay staging system) and operative assessment during FESS (Meltzer staging system and findings in each sinus (polyp, fungal mud, mucous and normal).

Results:

There was a highly significant positive correlation between pre operative CT, the preoperative endoscopic and operative findings.

Conclusion:

No single procedure can be sufficient in accurately diagnosing NP, and both the preoperative CT and the preoperative endoscopic examination are complementary to each other.

Key Words: Para nasal Sinuses-CT-Endoscope-NP

Poster# D086

The effect of allergy and asthma on cell populations in chronic rhinosinusitis

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Introduction:

Chronic rhinosinusitis (CRS) is a heterogeneous group. A CRS patient's phenotype can be used to determine if there is a difference in cell types in nasal polyps. The objective of this study is to determine if lymphocytes in CRS patients are affected by allergy and asthma.

Methods:

CRS patients undergoing ESS were prospectively recruited for the study. Samples of sinonasal mucosa or polyps were collected from the ethmoid sinuses during surgery. Presence or absence of allergy and asthma were documented in the CRS study group. The control group had no history of allergy, asthma, or CRS. Using flow cytometry, specimens were gated for CD 45 and then gated for CD 3, 4, 8, 19, 45, and 56. Data was compared among study groups and controls using one-way ANOVA with Tukey post-hoc analyses.

Results:

There were 134 patients in the study with 17 control patients. There were 45 patients with allergy and 66 patients with asthma. CRS patients had elevated CD45 cells ($p < 0.007$), CD4 cells ($p < 0.0001$), and CD19 cells ($p < 0.001$) than the control group. Even though there was no difference in CD8 cells between the CRS and control groups, the CRS patients had elevated ratios of CD4:CD8 ($p < 0.003$). CRS patients with allergy and asthma had elevated levels of CD4 and CD19 cells relative to controls.

Conclusions:

CRS is associated with higher numbers of leukocytes, T helper cells, and B cells. Asthma and allergy are likely to affect the CRS endotype.

Poster# D087

The effect of ESS on bronchiectasis patients with CRS

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Background:

The concept of unified airway disease has linked bronchiectasis and chronic rhinosinusitis (CRS), much in the same way as asthma and CRS. Although outcomes of endoscopic sinus surgery (ESS) on co-morbid asthma have been relatively well studied, outcomes of ESS on co-morbid bronchiectasis have rarely been examined.

Objective:

We sought to determine sinonasal and pulmonary clinical outcomes of ESS in bronchiectasis patients with CRS.

Method:

We reviewed all bronchiectasis patients undergoing ESS for CRS at our institution from 2006 to present. The Sinonasal Outcome Test (SNOT-22) was administered pre-operatively and at 3 months, 1 year and 3 years post-operatively. Pulmonary function tests (PFT) — FEV1, FVC, and FEV1/FVC—were measured pre-operatively and at 6 months and 1 year post-operatively. Paired t-test and Pearson correlation were used to compare pre- and post-surgical results.

Results:

141 bronchiectasis patients undergoing ESS for CRS were studied. The most common causes of bronchiectasis were cystic fibrosis (CF) (42.55%), recurrent infection (19.15%), idiopathic (8.51%), and aspiration (2.84%). SNOT-22 scores improved at 3 months postoperatively and showed sustained postoperative improvement at 1 year and 3 years ($P < 0.001$). All SNOT sub-domains showed a significant improvement after surgery ($P < 0.01$). However, PFTs were unchanged after surgery, both at 6 months and 1 year postoperatively ($P > 0.05$). There were no differences in outcome in CF versus Non-CF patients, nor by sex or age.

Conclusion:

ESS is effective in improving long term sinonasal outcomes in bronchiectasis patients with CRS; However, ESS does not appear to benefit pulmonary function.

Poster# D088

The Honrubia Technique™ Of Balloon Sinuplasty For The Improvement Of Symptoms In Chronic Sinusitis

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Introduction:

This study examines the benefits of balloon dilation of the sinuses coupled with turbinate reduction and septoplasty when necessary. These supplementary procedures are allowed for by the general anesthesia used under the Honrubia Technique™. The Honrubia Technique™ includes the use of general anesthesia in the clinic during Balloon Sinuplasty procedures (BSP) which allows for turbinate reduction, septoplasty, and more aggressive irrigation of the sinuses without additional discomfort to the patient.

Methods:

To survey the degree of recurrent symptoms due to rhinosinusitis and rhinitis, 34 patients undergoing the Balloon Sinuplasty procedure were pre-and several weeks post-operatively administered the Sino-Nasal Outcome Test (SNOT-20). The SNOT-20 includes a set of 20 symptoms related to sinus infections which can be rated on a scale from 0-5.

Results:

Results from the SNOT-20 administered in clinic show a decrease in score by an average of 35.499 points, with an individual patient's score decreasing up to as much as 71 points.

Conclusion:

These results decline on average and, therefore, depict an overall decline of patients' symptoms. The results obtained from the SNOT-20 displays that BSP coupled with the Honrubia Technique™ provides for positive results towards the improvement in patients with chronic sinusitis and validates that the Honrubia Technique™ provides for better immediate results.

Poster# D089

The unified airway: Does asthma impact paranasal sinus pneumatization?

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Introduction:

Asthma has been implicated as a driving force in lower airway remodeling, yet its effect on upper airway development remains unknown. The purpose of this study was to determine if a diagnosis of asthma is associated with the extent of paranasal sinus pneumatization.

Methods:

A total of 591 computed tomography (CT) scans including 303 adolescents (age 13-18 years) and 288 adults (>18 years) were evaluated for Lund-MacKay Score (LMS) and Assessment of Pneumatization of the Paranasal Sinus (APPS) score, a validated metric for defining the degree of sinus pneumatization. Blinded chart review was conducted to determine presence or absence of asthma, and the relationship with APPS and LMS was analyzed. Presence of cystic fibrosis (CF) was also analyzed as a positive control group.

Results:

Patients with asthma (n=90) had mean LMS and APPS scores of 3.11 and 9.66 respectively, compared to 2.94 and 9.85 in those with no airway disease (n=469; p=0.709, 0.585). Patients with a diagnosis of CF (n=32) had mean LMS and APPS scores of 12.44 and 3.50, respectively, as compared to 2.94 and 9.85 in healthy controls (p< 0.001, < 0.001). These results were upheld in both adult and adolescent subgroups.

Conclusion:

The presence of asthma is not associated with the degree of paranasal sinus pneumatization or radiographic evidence of sinus disease. In contrast, CF is associated with significantly reduced paranasal sinus pneumatization. These findings suggest that arrested sinus development is not a consequence of asthmatic disease.

Poster# D090

Training in endoscopic sinus surgery, experience in a biological model

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Introduction:

Training in endoscopic sinus surgery (ESS) is essential for developing surgical abilities. Dissecting in an animal model seems to be a good alternative due to the lack and cost of human cadaver. The aim of this study was to validate a sheep model for surgical training in ESS, specifically in endoscopic septoplasty, maxillary antrostomy and sphenopalatine artery dissection.

Materials and Methods:

This study was a prospective evaluation study. The investigators accomplished and recorded the 3 procedures described in a sheep model. Trained rhinologist were recruited to watch the videos and evaluate them according to a validated questionnaire using a 5-point Likert scale to assess the model across 4 domains: face validity (FV), global content (GC), task-specific content (TSC), and curriculum applicability (CTR).

The results were analyzed using the Intraclass Correlation Coefficient (ICC) and test Z.

Results:

The ICC conjunct for all the evaluators was 0.91, $p < 0.001$. All evaluators agreed or strongly agreed that the sheep model is useful in face validity, global content and curriculum applicability. The CCI conjunct for FV was 0.83 ($p = 0.001$), for GC was 0.81 ($p = 0.001$), for CTR was 0.74 ($p = 0.017$).

The CCI conjunct for endoscopic septoplasty and sphenopalatine artery dissection was 0.75 ($p = 0.023$). However the evaluators agreed or strongly agreed that is not useful for training uncinectomy and maxillary antrostomy $z = 2.03$ ($p = 0.045$).

Conclusions:

The sheep head model achieved face and content validity for endoscopic rhinology training. It is specifically useful for endoscopic septoplasty and sphenopalatine artery dissection.

Poster# D091

Training individuals to use an open-source platform for 3d volumetric scoring of sinonasal disease

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Objective:

3D volumetric scoring of sinonasal disease is the most accurate and objective method for assessing mucosal disease in CRS. However, this method is infrequently utilized due to the lack of training and accessibility to software. We hypothesized that individuals with no prior experience could be trained to use 3d slicer, an open source program to efficiently and accurately score sinus CT scans with improved precision compared to the Lund-Mackay system.

Methods:

Five subjects with varying degrees of experience in sinus anatomy were trained to perform 3D scoring on 20 individuals with CT-positive CRS. All subjects were novices and underwent an initial thirty-minute training session. Subjects calculated the pneumatization and mucosal thickening of each individual sinus and compared against experienced individuals and Lund-Mackay scores.

Results:

We determined that accuracy in 3D segmentation was directly related to the amount of time spent segmenting, regardless of training level. 3D sinus CRS disease scoring correlated with Lund-Mackay scoring and were more precise in correlating to patient symptoms and disease.

Conclusion:

After initial training, any individual can have access to 3D sinus CRS disease scoring. In order to improve accuracy, users should understand sinus anatomy and undergo a training period of at least 3 scans. 3D sinus scoring had improved precision in detecting disease and correlating to symptom scores as compared to Lund-Mackay. However, a minimum of 30 minutes was required to segment and score each sinus CT. Future automation of this process will allow high-throughput screening for CRS.

Poster# D092

Transorbital management of paranasal sinus mucoceles

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 USA

Introduction:

Paranasal sinus mucoceles have various etiologies including trauma, obstruction, inflammation, and iatrogenic or idiopathic causes. These mucoceles may expand into the orbit and intracranially. Transnasal endoscopic management of mucoceles has largely replaced open approaches. This study aims to investigate the efficacy of the transorbital approach in conjunction with transnasal for management of paranasal sinus mucoceles.

Methods:

Retrospective review at tertiary care center.

Results:

From 2008-2015, 29 patients were surgically treated for mucoceles originating from the paranasal sinuses. Risk factors included craniofacial trauma with operative fixation (14/29), chronic sinusitis (6/29), craniofacial trauma without operative fixation (2/29) and other (7/29). Initial operative interventions were transorbital and transnasal in combination (13/29), transnasal alone (9/29), endoscopic assisted coronal (3/29), transorbital alone (4/29). Six of 29 patients had previous attempts at mucocele excision at other institutions. Complications included CSF leak in 3 patients, two of which required operative repair. Two patients had recurrences after transnasal resections. Most mucoceles were localized to the orbitofrontal region (15) followed by the orbit (6), frontal (5), orbitonasal (2), sphenoid (2), frontoethmoid (2), and maxillary (1). There were no complications related to permanent visual loss or new onset.

Conclusions:

Transorbital approaches to mucoceles originating from the paranasal sinuses are safe, complement the transnasal approach, and may provide improved access to pathology in the lateral frontal sinus and orbit.

Poster# D093

Unplanned readmissions in pituitary surgery

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Introduction:

Unplanned readmissions within 30 days of surgery represent a significant marker for healthcare quality. Several studies have described rates of readmissions for pituitary surgery. However, large, multi-institutional analyses are lacking.

Methods:

A retrospective study was performed on cases from the American College of Surgeons National Surgical Quality Improvement Program (NSQIP) database. Patients receiving transsphenoidal or transcranial pituitary surgery from 2011 to 2013 were identified. Univariate analyses of unplanned readmissions based on patient and hospital course characteristics were conducted.

Results:

600 patients were included in the analysis, with 509 transsphenoidal procedures and 91 transcranial procedures. In transsphenoidal procedures, the 30-day unplanned readmission rate was 8.3%. On univariate analysis, the single preoperative factor associated with unplanned readmission in transsphenoidal procedures was congestive heart failure. Postoperative medical complication was also associated with higher rates of unplanned readmission in transsphenoidal procedures. In transcranial procedures, the 30-day readmission rate was not significantly different than in transsphenoidal procedures, at 10.6%. Univariate analysis of transcranial outcomes revealed that the only preoperative factor associated with unplanned readmission was an open wound. Postoperative factors associated with unplanned readmission in transcranial procedures were pneumonia, cerebrovascular accident, and overall medical complications.

Conclusion:

The rates of unplanned readmissions did not differ between transsphenoidal and transcranial pituitary surgeries. In transsphenoidal procedures, a history of congestive heart failure, as well as overall postoperative medical complication, is associated with unplanned readmission. In transcranial procedures, a preoperative open wound, as well as postoperative pneumonia, cerebrovascular accident, and overall medical complication are associated with unplanned readmission.

Poster# D094

Utility of imaging in the diagnosis and surgical management of aifs

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Introduction: Acute invasive fungal rhinosinusitis (AIFR) is an aggressive disease with high mortality and morbidity. Rapid identification and complete surgical removal is critical to improving outcomes. There is insufficient data correlating imaging findings to pathological evidence of disease. The objective of this study was to identify factors on pre-operative imaging that may help identify and localize AIFR and aid in management.

Methods:

A retrospective case series was performed, identifying patients treated for AIFR. Radiology reports and images were reviewed to look for findings associated with AIFR. Pathology reports were reviewed and correlated with imaging studies.

Results:

26 patients were treated surgically for biopsy-proven AIFR. All patients had pre-operative imaging. 25 received a pre-operative CT and 9 had a pre-operative MRI. The most common findings on CT and MRI was mucosal thickening and sinus opacification, both non-specific findings. Bony erosion on CT, noted in 20% of patients, was associated with the location of disease. MRI detected intracranial involvement in 44.4% of patients, while CT detected 0%. Intracranial extension on MRI was associated with 100% mortality. Both contrast-enhancement (44.4%) and focal loss of enhancement (11.1%) were noted on MRI and associated with the area of disease.

Conclusions:

CT and MRI are both sensitive to non-specific findings such as mucosal thickening and sinus opacification. Bony destruction, when present on CT, likely indicates an area of active disease. MRI is adept at identifying poor prognostic factors such as intracranial extension. Extent of resection should be guided by intraoperative findings and not imaging.

Poster# D095

Viability of lactobacillus probiotic in normal saline for sinus irrigation

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Introduction:

While chronic rhinosinusitis (CRS) likely represents a variety of inflammatory conditions, specific etiologies remain uncertain. Recent evidence, however, suggests that an alteration in the nasal bacterial flora composition, termed the microbiome, may be an underlying factor in a subset of CRS patients. Several studies have demonstrated a shift in the microbiome from normal bacteria, such as lactobacillus species, towards pro-inflammatory bacteria. Despite this, there has been a paucity of literature pursuing the potential repopulation of the sinonasal microbiome with probiotics. This study takes the initial step of investigating the viability of lactobacillus species in commercially available probiotics.

Methods:

Commercially available probiotic preparations containing lactobacillus species were evaluated in both liquid and capsule form. The manufacturer recommended dose was mixed with 240mL of normal saline for 1 minute. Twenty microliters of the probiotic saline solutions were placed on de Man, Rogosa, and Sharpe (MRS) agar culture plates and incubated for 36 hours at 37 degrees centigrade in anaerobic and aerobic conditions. The colony forming units were calculated for each solution.

Results:

The capsule probiotic preparation demonstrated bacterial colony growth in both anaerobic and aerobic environments with colony forming units per mL of 2.07×10^7 and 1.97×10^7 , respectively. There was no observed bacterial growth in the control or liquid probiotic groups.

Conclusion:

This study demonstrates the potential for commercially available probiotics capsules to be used in sinonasal saline irrigations. Future studies are necessary to determine if the intranasal application of probiotics could provide a therapeutic benefit for patients with CRS.



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