American Rhinologic Society

ARS at COSM 2014

May 16-17, 2014

Caesar's Palace
Las Vegas, Nevada

american-rhinologic.org

American Rhinologic Society

50% DISCOUNT
Half-price registration for first time attendees of the meeting.

Open to all Otolaryngologists who treat and manage nasal and sinus issues.

COURSE DIRECTORS

Rakesh Chandra, MD
James Palmer, MD
Kevin Welch, MD

MEETING CONTACT

ARS Summer Sinus Symposium
c/o American College of Surgeons
633 N. Saint Clair Street
Chicago, IL 60611
Tel: 312-202-5244
Fax: 312-202-5003
Email: registration@facs.org

Wendi Perez
ARS Administrator
PO Box 495
Warwick, NY 10990
Tel: 845-988-1631
Fax: 845-986-1527
Email: wendi@amrhso.com

3rd Annual Summer SINUS SYMPOSIUM

July 18-19, 2014

Westin Michigan Ave.
Chicago, Illinois

COURSE HIGHLIGHTS

- Demonstration dissections using the latest technology
- Panel discussions with renown faculty on hot topics
- Sinus surgery
- Allergy and Immunology
- Rhinoplasty
- Office Procedures
- Practice Management

Thursday, 7/17/14; 12:00pm - 8:00pm
Acclarent/Olympus Dissection Lab
Location: Westin Hotel
This is a non-CME event sponsored by Acclarent & Olympus. It is neither sponsored by, nor endorsed by, the ARS.

Friday, 7/18/14; 6:45am - 7:45am
Olympus Symposium
"Addressing Efficiencies, Outcomes & Patient Satisfaction"
Location: Westin Hotel
This is a non-CME event sponsored by Olympus. It is neither sponsored by, nor endorsed by, the ARS.

ARS Reception at the Signature Room
6:30pm - 9:30pm
John Hancock Building

Saturday, 7/19/14; 6:45am - 7:45am
Acclarent Symposium
"Clinical Application of Balloon Sinuplasty in the Treatment of Rhinosinusitus."
This is a non-CME event sponsored by Acclarent. It is neither sponsored by, nor endorsed by, the ARS.

Details online at: *www.american-rhinologic.org/ars_courses*

https://www.facebook.com/americanrhinologicsociety

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

Credit Designation Statement: ARS designates this live activity for a maximum of 16.75 AMA PRA Category 1 Credits ™. Physicians should claim only the credit commensurate with the extent of their participation in the activity.

Tim L. Smith, MD, MPH

Presidential Welcome
to the ARS at COSM 2014

On behalf of the Board of Directors, it is my great honor and pleasure to welcome you to the American Rhinologic Society meeting at COSM in VEGAS! Under the direction of Program Chair, Roy Casiano, MD, and his program committee, we once again hope to offer an exciting, valuable and enjoyable program. It is our sincere goal to provide program content that is broad and timely as we recognize the wide array of interests and needs amongst our membership. On display during this program will be unparalleled scientific research and clinically relevant panel discussions. It is our sincere goal for the ARS to become a society that appeals to all otolaryngologists and health professionals with interest in the field of rhinology.

We greatly appreciate the generosity our corporate partners in support of our organization and its endeavors. It is only through these strong partnerships that we are able to realize our lofty goals of excellence in education, training, research, and patient advocacy. On behalf of the entire Board of Directors, I am proud to say that these partnerships are stronger than ever with aligned strategic goals. Please join me in thanking our corporate partners by exploring the exhibits and visiting with them.

I believe this COSM will prove to be our finest yet as an organization.
Please enjoy your time in Vegas (but not too much!) and welcome to the ARS.

Tim L. Smith, MD, MPH
President, American Rhinologic Society


Roy Casiano, MD, FACS

Program Chair Welcome

Welcome to the American Rhinologic Society at COSM Las Vegas!

I would like to welcome you to the ARS at COSM Las Vegas 2014! The ARS is proud to provide this educational program to serve our members, all otolaryngologists, and allied health care providers from throughout the United States, North America, and the world.

The American Rhinologic Society has worked very hard to develop a program that has something for everyone; academic and community rhinologists, as well as residents and fellows. We've developed clinical debates, moderated panels that address the most pressing issues in our field, and a scientific program that is state-of-the-art, well rounded, and highly educational.

It is our sincere hope that there is something outstanding in this program for every attendee. Thank you for your continued support of the American Rhinologic Society. Please seek me out and provide me with your critical feedback about the program.

I'll see you at our corporate partners coffee breaks!

Roy R Casiano, MD, FARS
ARS President-elect & Program Chair

P.S. If you think the ARS at COSM Program is great, wait until you see the program for the ***ARS at AAO 60th Annual Meeting*** on ***Saturday, September 20, 2014*** at the ***Hyatt Regency Orlando*** in sunny ***Orlando, Florida. Please save the date!***

Highlights of the ARS at AAO 2014:

Panels:

- *Allergic Fungal Rhinosinusitis: Is it Really Different?*
- *Rhinology Past, Present, and Future: Emerging Technologies, Promising Medical Therapies, New Directions in Research, and Scope of Practice*
- *Pediatric Rhinology: Endoscopic Endonasal Surgery for nonCRS Conditions*
- *My most challenging case and how I handled it*

Film FESStival:

- Featuring this year's most educational, novel, rare and exciting cases in short 3-minute videos with lively discussion by a panel of experts.

Guest Speaker

- **10th Annual Kennedy Lecture**
  - Claus Bachert, MD
  "Endotypes of Chronic Rhinosinusitis and Therapeutic Consequences"

Satellite Symposia: Olympus Breakfast Symposium: *Pearls and Perils in the Office*

Saturday, September 20, 2014; 6:55-7:55 AM

This is a non-CME event sponsored by Olympus. It is neither sponsored by, nor endorsed by, the ARS.

TEVA Symposium: *Advances in Aerosol Therapy for Patients with Allergic Rhinitis*

4-corners Session

Saturday, September 20, 2014; 5:00-6:30 PM

This is a non-CME event sponsored by TEVA. It is neither sponsored by, nor endorsed by, the ARS.

Internationally renowned rhinologists, discussing their personal pearls and pitfalls with a variety of medical and surgical treatments.

Interactive format, video presentations, and insightful lively discussions, about new technogical innovations, and discoveries.

The latest in cutting-edge research from around the globe

Explore the exhibits and latest technological advancements with of our industry partners

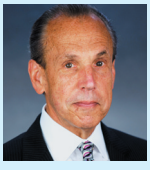
AND MORE…

American Rhinologic Society Executives - 2014

Timothy Smith, MD
President
Oregon Health & Science University
Oregon Sinus Center
3181 SW Sam Jackson
Park Rd PV- 01
Portland, OR 97239
Tel: 503-494-7413
Fax: 503-494-4631
Email: smithtim@ohsu.edu

Roy Casiano, MD
President-Elect
University of Miami Hospitals
& Clinics
1120 NW 14th Street
5th floor, Clinical Research Bldg
Miami, FL 33136
Tel: 305-401-7088
Email: rcasiano@med.miami.edu

James Palmer, MD
Secretary
University of Pennsylvania
Medical Center
5 Ravdin, Division of Rhinology
3400 Spruce Street
Philadelphia, PA 19104
Tel: 215-662-7746
Fax: 215-614-0071
Email: secretaryars@gmail.com



Joseph B. Jacobs, MD
Treasurer
NYU Medical Center
345 E. 37th Street #306
New York, NY 10016
Tel: 646-754-1202
Fax: 646-754-1222
Email: joseph.jacobs@nyumc.org

Peter Hwang, MD
First Vice President
801 Welch Road
Stanford, CA 94305
Tel: 650-725-6500
Fax: 650-725-8502
Email: phwang@ohns.stanford.edu

John DelGaudio, MD
Second Vice President
Emory University
550 Peachtree Street, NE
11th Floor
Atlanta, GA 30305
Tel: 404-778-3381
Email: jdelgau@emory.edu

Todd Kingdom, MD
Immediate Past President
University of Colorado
School of Medicine
12631 E. 17th Avenue, #B205
Aurora, CO 80045
Tel: 303-724-1960
Fax: 303-724-1961
Email:
todd.kingdom@ucdenver.edu

Wendi Perez
Executive Administrator
PO Box 495
Warwick, NY 10990
Tel: 845-988-1631
Fax: 845-986-1527
Email: wendi@amrhso.com

Board of Directors


Pete Batra, MD


Michael Stewart, MD


Marc Dubin, MD


Joseph Han, MD


Robert Kern, MD


Jivianne Lee, MD

Consultants to the Board


Parul Goyal, MD


David Poetker, MD


Kevin Welch, MD


Sarah Wise, MD

Staff


Wendi Perez
Executive Administrator


Susan Arias
Development Liaison


Mary Stahl
Administrative Assistant, Membership & Committee Chair Liaison


Kathryn Belluci
Treasurer's Assistant


Kathleen Bogie
Meetings Assistant

Committee Chairs

AUDIT
Subinoy Das, MD

AWARDS
David Poetker, MD

BY-LAWS
Douglas Reh, MD

BUSINESS DEVELOPMENT
Joe Jacobs, MD

CME
Raj Sindwani, MD

EDUCATION
Rick Chandra, MD

ETHICS
Mark Zacharek, MD

FELLOWSHIP
Todd Kingdom, MD

INFORMATION TECHNOLOGY
Kevin Welch, MD

INTERNATIONAL LIAISON
Nicholas Busaba, MD

MEMBERSHIP
Christopher Melroy, MD

NEWSLETTER
Sarah Wise, MD

PATIENT ADVOCACY
Seth Brown, MD

PEDIATRIC RHINOLOGY
Hassan Ramadan, MD

RESEARCH GRANTS
Noam Cohen, MD

RESIDENT/FELLOWS
Belachew Tessema, MD

Past Presidents

1954 - 1955	Maurice H. Cottle, MD*
1955 - 1956	Ralph H. Riggs, MD*
1956 - 1957	Walter E. E. Loch, MD*
1958 - 1959	Kenneth H. Hinderer, MD*
1959 - 1960	Roland M. Loring, MD*
1960 - 1961	Ivan W. Philpott, MD*
1962 - 1963	Raymond I. Hilsinger, MD*
1963 - 1964	H. Ashton Thomas, MD*
1964 - 1965	Carl B. Sputh, MD
1966 - 1967	Walter J. Aagesen, MD
1967 - 1968	Richard Hadley, MD*
1968 - 1969	Henry L. Williams, MD*
1970 - 1971	Charles A. Tucker, MD*
1971 - 1972	Pat A. Barelli, MD
1972 - 1973	Gerald F. Joseph, MD
1973 - 1974	Manuel R. Wexler, MD*
1974 - 1975	George H. Drumheiler, MD*
1975 - 1976	Joseph W. West, MD*
1976 - 1977	Albert Steiner, MD*
1977 - 1978	Anthony Failla, MD*
1978 - 1979	Clifford F. Lake, MD*
1979 - 1980	W. K. Locklin, MD
1981 - 1982	Eugene B. Kern, MD
1982 - 1983	Carlos G. Benavides, MD
1983 - 1984	Leon Neiman, MD
1984 - 1985	George C. Facer, MD
1985 - 1986	Larry E. Duberstein, MD
1986 - 1987	Glenn W. Drumheiler, DO
1987 - 1988	Alvin Katz, MD
1988 - 1989	Donald Leopold, MD
1990 - 1991	Pierre Arbour, MD
1991 - 1992	Fred Stucker, MD
1992 - 1993	David W. Kennedy, MD
1993 - 1994	Sanford R. Hoffman, MD
1994 - 1995	Richard J. Trevino, MD
1995 - 1996	Vijay K. Anand, MD
1996 - 1997	Dale H. Rice, MD
1997 - 1998	Michael S. Benninger, MD
1998 - 1999	William Panje, MD
1999 - 2000	Charles W. Gross, MD
2000 - 2001	Frederick A. Kuhn, MD
2001 - 2002	Paul Toffel, MD
2002 - 2003	Donald C. Lanza, MD
2003 - 2004	James A. Hadley, MD
2004 - 2005	Joseph B. Jacobs, MD
2005 - 2006	Michael J. Sillers, MD
2006 - 2007	Howard L. Levine, MD
2007 - 2008	Marvin P. Fried, MD
2008 - 2009	James Stankiewicz, MD
2009 - 2010	Stilianos Kountakis, MD
2010 - 2011	Brent A. Senior, MD
2011 - 2012	Michael Setzen, MD
2012 - 2013	Todd Kingdom, MD

**Deceased*

Secretaries

2012 - present	James Palmer, MD
2009 - 2012	Peter Hwang, MD
2005 - 2008	Brent A. Senior, MD
1999 - 2005	Marvin P. Fried, MD
1995 - 1999	Frederick Stucker, MD
1990 - 1995	Frank Lucente, MD
1985 - 1990	George Facer, MD
1980 - 1985	Pat A. Barelli, MD
1975 - 1980	Glenn H. Drumhiller, MD
1970 - 1975	Ralph H. Riggs, MD

ARS Mission Statement

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

Business/ACCME

Continuing Education

Accreditation Statement

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

Credit Designation Statement

ARS designates this live activity for a maximum of 10.75 *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.

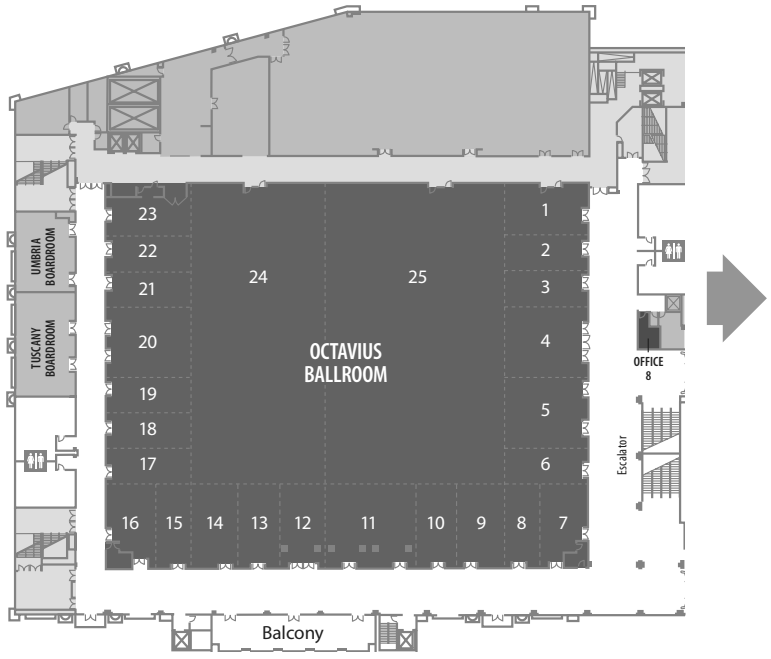
2. Gain an understanding of the advances in operative and in-office based procedures used in the management of conditions affecting the nose, sinuses and skull base.

3. Discuss the applications of new technologies in the treatment of sinus patients and demonstrate competence in their safe and effective use.

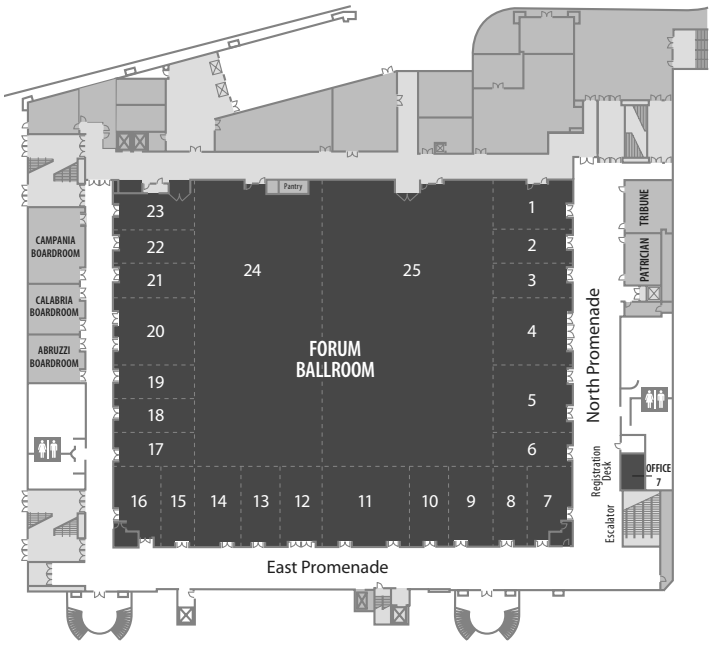
Floor Plan

CAESARS PALACE CONFERENCE CENTER

PROMENADE SOUTH

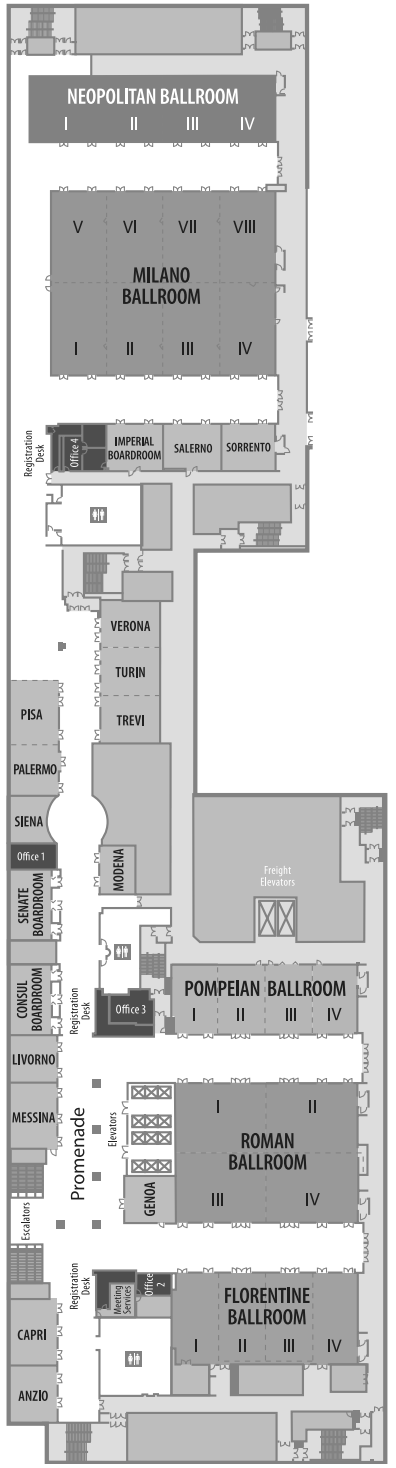


POOL LEVEL

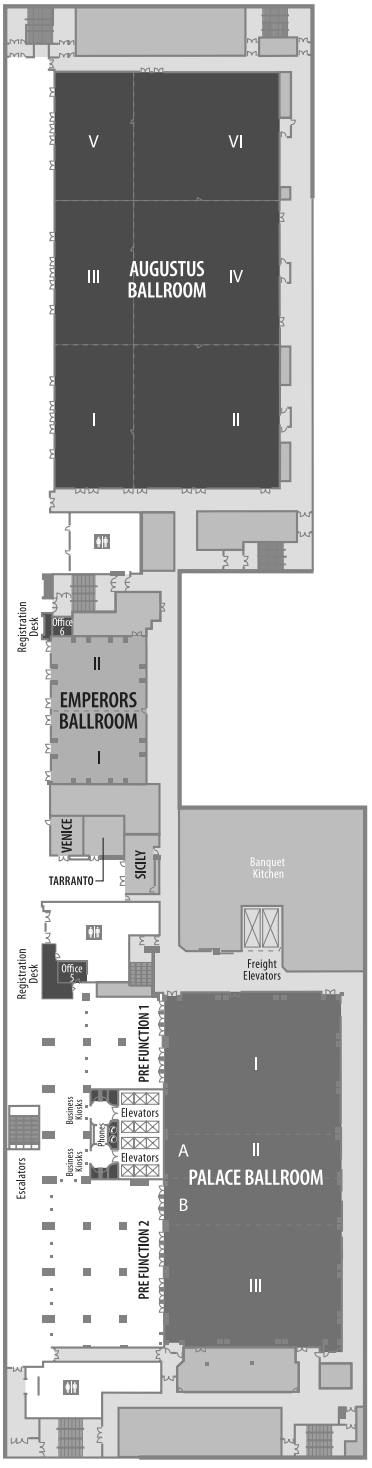


Floor Plan

PROMENADE LEVEL



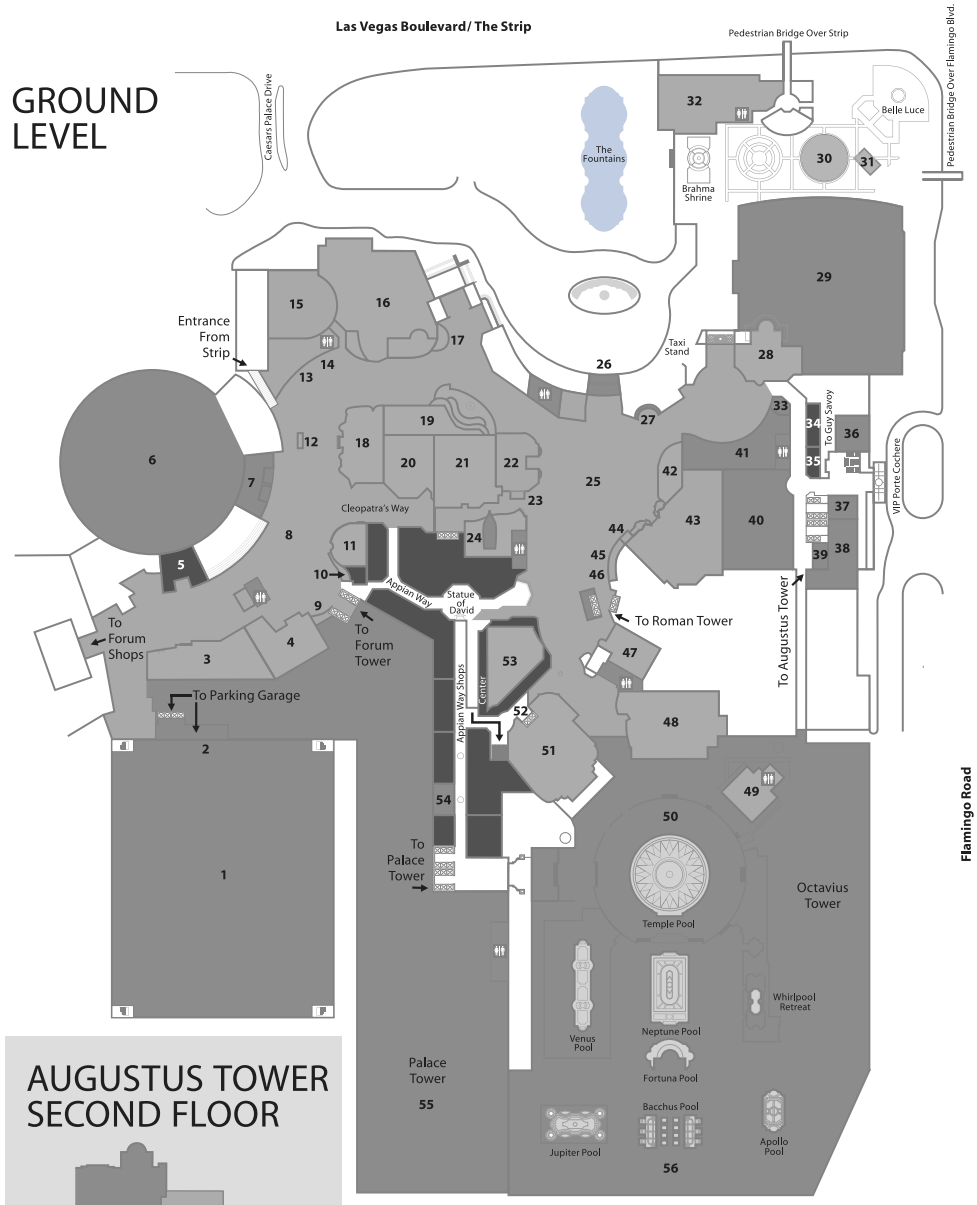
EMPERORS LEVEL



Floor Plan

CAESARS PALACE

Property Map



Floor Plan

RESTAURANTS/BARS

3. Cypress Street Marketplace
4. Bradley Ogden
11. Shadow: A Bar At Caesars Palace
12. Sports Bar
16. PURE Nightclub
17. munchbar
18. Mesa Grill
19. Seahorse Lounge
20. Old Homestead Steakhouse
21. Hyakumi
24. Cleopatra's Barge / Gossy Room
28. Central by Michel Richard
30. Spanish Steps
31. Lemonade and Hot Chocolate Stand
32. Serendipity 3
42. Galleria Bar
47. Beijing Noodle No. 9
48. Something New Coming Soon!
49. Snackus Maximus
51. Rao's
52. Empress Court
53. Payard Patisserie & Bistro
56. Restaurant Guy Savoy

CASINO

8. Forum Casino
9. Total Rewards
10. Numb Bar & Frozen Cocktails
13. Race & Sports Book
14. Keno
15. Poker Room
22. Palace Court Slots
23. Security
25. Palace Casino
43. Palace Court Tables
44. Casino Host
45. Cashier
46. Total Rewards

SHOPPING

5. The Colosseum Boutique
34. Caesars Exclusively!
35. Starbucks

FACILITY

1. Parking Garage
2. Colosseum Valet
6. The Colosseum at Caesars Palace
7. Colosseum Box Office
26. Main Valet
27. Bell Desk
29. Roman Plaza
33. Concierge
36. Wedding Services
37. Octavius Tower Registration
38. Diamond Lounge
39. Events Desk
40. Diamond and Seven Stars Registration & Lounge
41. Concierge & Hotel Registration
50. Garden of the Gods Pool Oasis
54. Business Center
55. Caesars Palace Conference Center
57. Classico Wedding Chapel
58. Tuscana Chapel
59. Romano Chapel
60. Color – A Michael Boychuck Salon
61. QUA Baths & Spa

Oral Presentations - *At-A-Glance*

Friday, May 16

12:55pm
Welcome - ARS President and President-Elect
Tim Smith, MD, MPH; Roy R Casiano, MD, FACS

1:00pm *Audience Interactive Participation*
Panel: Ethical Dilemmas in Rhinology and Skull Base Surgery
Moderator: Mark Zacharek, MD
Panelists: Andrew Shuman, MD; Brian Rottenberg, MD; James Hadley, MD

Session: Allergic vs Non-Allergic Manifestation of Disease
Moderators: Richard Orlandi, MD and Bruce Tan, MD

1:40pm
Allergic Sensitization, Rhinitis and Tobacco Smoke Exposure in US Children and Adolescents
Josef Shargorodsky, MD, PhD

1:47pm
Association between Chronic Acetaminophen Exposure and Allergic Rhinitis in a Rat Model
Nadieska Caballero, MD

1:54pm
Air Pollutants Cause Release of Hydrogen Peroxide and IL-8 in a Human Primary Nasal Tissue Culture Model
Do-Yeon Cho, MD

2:01pm
Non-Allergic Rhinitis is Associated with Increased Environmentally Mediated Sinonasal Epithelial Cell Oxidative Stress
Murugappan Ramanathan, MD

2:08pm - Discussion/Q&A

2:15pm Audience Interactive Participation
Panel: Nonallergic Rhinitis: Latest Medical and Surgical Treatments
Moderator: Rodney Schlosser, MD
Panelists: John DelGaudio, MD; Raymond Sacks, MD; Benjamin Bleier, MD

2:55pm - Break with Exhibitors

Session: The Sinonasal Microbiome
Moderators: Amber Luong, MD and Charles S. Ebert Jr. MD

3:15pm
Coagulase Negative Staphylococcus Culture in Chronic Rhinosinusitis
Zi Zhang, MD

3:22pm
Sinus Culture Poorly Predicts Resident Microbiota
Leah J. Hauser, MD

3:29pm
Baseline "Core" Sinus Microbiome Predicts Postoperative Surgical Outcome
Leah J. Hauser, MD

3:36pm
Staphylococcus aureus Burden and the Sinonasal Epithelial Cell Innate Response in Chronic Rhinosinusitis
Michael A. Kohanski, MD, PhD

3:43pm - Discussion/Q&A

Session: Immunologic Factors Influencing Disease
Moderators: Nithin D. Adappa, MD and Greg E. Davis, MD

3:50pm
CRS as a Window into the Bacteria and Mucosal Immunity of CF: A Prospective Cross-sectional Analysis
Raymond JT Kim, MB, ChB

3:57pm
Assessment of Epithelial Innate Antimicrobial Factors in Sinus Tissue from Patients with and without Chronic Rhinosinusitis
Jivianne Lee, MD

4:04pm
B Lymphocyte and Immunoglobulin Diversity in Upper Airway Mucosal Immunity in Chronic Rhinosinusitis
Ali R. Rashan, MD

4:11pm - Discussion/Q&A

4:18pm *Audience Interactive Participation*
Panel: Etiology of Chronic Rhinosinusitis, Where's the Evidence? Allergies, Innate Immune Defects or Microbes?
Moderator: Noam Cohen, MD
Panelists: Brad Marple, MD; Amber Luong, MD; Andrew Goldberg, MD

5:00pm
Closing Remarks and Adjournment
Roy R Casiano MD, FACS, Program Chair

5:30pm-7:00pm
ARS Poster Reception

6:30pm-7:30pm
ARS Cocktail Reception, Verona/Promenade Level.
Registration is mandatory.

Saturday, May 17

8:00am
Welcome
Roy R Casiano, MD, FACS, President-Elect and Program Chair

8:05am
Presidential Address:
Tim Smith, MD, MPH

Session: Novel Research at the Cutting Edge
Moderators: Justin Turner, MD and Erin O'Brien, MD

8:15am
Upper Airway Basal Progenitor Cells Exist in a Defined Anatomic Niche and Spontaneously Form Nasospheres in Culture
Dawn T. Bravo, PhD

8:22am
Development and In Vitro Characterization of Erythrosine Nanoparticles for Chronic Rhinosinusitis using Photodynamic Therapy
Chandrasekhar Garapati

8:29am
Gamma-Delta T cells are selectively Expanded in Upper Airway Mucosal Tissues in Chronic Rhinosinusitis
Ali R. Rashan, MD

8:36am - Discussion/Q&A

Session: Chronic Rhinosinusitis and Nasal Polyps
Moderators: Jeb Justice, MD and Esther Kim, MD

8:43am
Decreased expression of IGFBP5 in Chronic Rhinosinutsitis with Polyps
Andrew Lane, MD

8:50am
The Utility of Routine Histopathology for Nasal Polyps in Endoscopic Sinus Surgery for Chronic Rhinosinusitis
David Yeh, MD

8:57am
Cellular Comparison of Sinus Mucosa vs Polyp Tissue from a Single Sinus Cavity in Chronic Rhinosinusitis
Jacqueline Ho, MS

9:04am
Quality of Life Improvement from Endoscopic Sinus Surgery in Chronic Rhinosinusitis Patients with Asthma and Nasal Polyps
Zi Zhang, MD

9:11am - Discussion/Q&A

9:18am
Panel: "ObamaCare", ICD10, and Coding Changes: What all of this Means to the Rhinologist
Moderator: Seth Brown, MD
Presenters: Richard Waguespack, MD; Michael Setzen, MD; David Nielsen, MD

9:58am - Break with Exhibitors

Session: Steroids in Chronic Rhinosinusitis
Moderators: Nathan Sautter, MD and Jayakar V. Nayak, MD

10:18am
Pretreatment with Topical Budesonide Mitigates the Inflammatory Effects of Caustic Injury in Sinonasal Epithelium
Zhenxiao Huang, MD, PhD

10:25am
P-glycoprotein Inhibition Promotes Intracellular Prednisone Retention in Human Sinonasal Polyps Explants
Benjamin Bleier, MD

10:32am
Intranasal Topical Steroids and Growth Assessment in Children: A Meta-Analysis of Prospective Studies
David Mener, MD, PhD

10:39am
Effects of Intranasal Dexamethasone on Endosgnous Cortisol Levels and Intraocular Pressures
Benjamin J Martino, MD

10:46am - Discussion/Q&A

Session: Epistaxis and the Role of Topical Saline Irrigations
Moderators: Lori Lemonnier, MD and Zachary Soler, MD

10:53am
The Effect of Epistaxis on Health-Related Quality of Life in Patients with Hereditary Hemorrhagic Talangiectasia
Linda X. Yin, BA

11:00am
The Efficacy of Hot Saline Irrigation in Control of Intraoperative Bleeding During Functional Endoscopic Surgery: A Randomized Controlled Trial
Eng C. Gan, MBBS

11:07am
Impact of Nasal Saline Irrigations on the Post-surgical Sinonasal Microbiome
Cindy Liu, MD, PhD

11:14am - Discussion/Q&A

11:20am
Panel: Biomaterials in Rhinology: What's the Evidence?
Moderator: Ameet Singh, MD
Panelists: Bellachew Tessema, MD; Stacey Gray, MD; Raj Sindwani, MD

12:00pm
Lunch with Exhibitors

12:00pm
Mentorship Program Luncheon
(Verona/Promenade Level)
"Medical Malpractice in Rhinology"
Topics Covered:
• What can I do in my daily practice to safeguard against medical malpractice?

• *What should I do from a medico-legal perspective when I have a complication?*
• *How can I successfully navigate a medical malpractice event?*

Session: Factors Influencing Recalcitrance in Chronic Rhinosinusitis
Moderators: Stella Lee, MD and Peter Manes, MD

1:00pm
Periostin and RANKL Expression in Allergic Fungal Sinusitis (ARS Resident Research Award)
Adrienne M. Laury, MD

1:07pm
Differential Human Sinonasal Epithelial Cell Inflammatory Response to Aspergillus and Alternaria Exposure
Rodney Schlosser, MD

1:14pm
Comparison of Radiographic and Clinical Characteristics of Low-risk and High-risk CF Genotypes
Geoffrey R. Ferril, MD

1:21pm
Remodeling Changes of the Upper Airway with Chronic Rhinosinusitis
Jodi L. Osborn, MBBS

1:28pm - Discussion/Q&A

Session: Treatment Outcomes for Chronic Rhinosinusitis
Moderators: Adam Folbe, MD and John Lee, MD

1:36pm
Differences in Long-Term Quality of Life Outcomes in Patients with RARS and CRSsNP
David N. Carlson, DO

1:43pm
Cost-Effectiveness Analysis of Medical Therapy vs Surgery for Chronic Rhinosinusitis
Evan S. Walgama, MD

1:50pm
Endoscopic Sinus Surgery Compared to Continued Medical Therapy for Patients with Refractory CRS
Kristine A. Smith, MD

1:57pm
Long-Term Outcomes of Endoscopic Maxillary Mega-antrostomy in Patients with Chronic Rhinosinusitis
Milena Lopes da Costa, MD

2:04pm - Discussion/Q&A

2:12pm *Audience Interactive Participation*
Panel: Recalcitrant CRS: When should we extend Sinusotomies or Remove Mucosa?
Moderator: Jean Anderson Eloy, MD
Panelists: Zara Patel, MD; Peter Hwang, MD; Satish Govindaraj, MD

2:52pm - Break with Exhbitors

Session: CSF Leak and Skull Base Tumors
Moderators: Amy Anstead, MD and Vijay Anand, MD

3:12pm
Immediate Postoperative Imaging after Uncomplicated Endoscopic Approach to the Anterior Skull Base: Is It Necessary?
Sahar Nadimi, MD

3:19pm
Perioperative Continuous CSF Pressure Monitoring in Patients with Spontaneous CSF Leak
Yanjun J. Xie, BA

3:26pm
The Nasal Floor Pedicled Flap: A Novel Technique for Use in Skull Base Reconstruction
Pedram Deraei, BS

3:33pm
Prognostic Value of Surgical Margins During Endoscopic Resection of the Paranasal Sinus Malignancy
Lakshman K. Manjunath, MS

3:40pm - Discussion/Q&A

Session: Olfactory and Taste Disorders
Moderators: Steven Pletcher, MD and Erin D. Wright, MD

3:48pm
PTC Taste Sensitivity Predicts Sinonasal Symptoms in Healthy Adults
Douglas Farquhar, BA

3:55pm
Impact of Treatment Modality on Olfaction in CRS: A Prospective, Multi-institutional Study
Adam S. DeConde, MD

4:02pm
Olfactory Outcomes in CRS after Medical or Surgical Treatments: A Meta-Analysis
Sarfaraz M. Banglawala, MD

4:09pm - Discussion/Q&A

4:17pm
Panel: Doctor I can't smell or taste; what's new in the area of olfaction?
Moderator: Bradley Goldstein, MD
Panelists: Andrew Lane, MD; Eric Holbrook, MD; Greg Davis, MD

5:00pm
Closing Remarks & Meeting Adjourned
President and President-Elect Tim L. Smith, MD, MPH and Roy R. Casiano, MD, FACS

Oral Presentations - *Program Details*

Friday, May 16, 2014

12:55pm
Welcome - ARS President and President Elect
Timothy Smith, MD, MPH and Roy Casiano, MD

1:00pm (Audience Interactive Participation)
Panel: Ethical Dilemmas in Rhinology and Skull Base Surgery
Moderator: Mark Zacharek, MD
Panelists: Andrew Shuman, MD; Brian Rottenberg, MD; James Hadley, MD

Session: Allergic vs. Non-Allergic Manifestation of Disease
Moderators: Richard Orlandi, MD & Bruce Tan, MD

1:40pm
Allergic Sensitization, Rhinitis and Tobacco Smoke Exposure in US Children and Adolescents
Josef Shargorodsky, MD, MPH; Esther Garcia-Esquinas, MPH; Ana Navas-Acien, MD, PhD; Sandra Lin, MD
Baltimore, MD, USA

Introduction:
Childhood tobacco exposure has been linked with sinonasal pathology, and may be associated with allergic sensitization. This study evaluates the association between exposure to active smoking or secondhand smoke (SHS) and the prevalence of chronic rhinitis and allergic sensitization in the US pediatric population.

Methods:
Cross-sectional study in 2,714 children and adolescents aged 6 to 19 in the National Health and Nutrition Examination Survey, 2004-2005. Active smoking was defined as self-reported smoking or serum cotinine concentrations > 10 ng/mL. SHS was defined as non-active smokers who reported living with = 1smokers or had serum cotinine = 0.05 ng/mL. Self-reported rhinitis was based on symptoms during the past 12 months, and allergen sensitization was defined as a positive response to any of the 19 specific IgE antigens tested.

Results:
Almost half of the total population (48.5%) had detectable levels of specific IgE to at least one of the tested allergens, and 29% reported history of rhinitis. Active smokers had a significantly higher prevalence ratio (PR) of rhinitis (1.41, 95%CI 1.02-1.96). After multivariate adjustment, a 2-fold increase in cotinine level was associated with a PR of rhinitis of 1.18 (95%CI: 1.00-1.39). IgE levels were inversely associated with serum cotinine in participants sensitized to both food and inhalant allergens [PR for 2-fold increase in cotinine levels 0.97 (0.93-1.00)].

Conclusions:
Tobacco smoke exposure was associated with increased prevalence of rhinitis symptoms, but decreased prevalence of allergic sensitization. The results highlight the complex relationship between tobacco exposure and sinonasal pathology.

1:47pm
Association between Chronic Acetaminophen Exposure and Allergic Rhinitis in a Rat Model
Nadieska Caballero, MD; Kevin Welch, MD; Eileen Foecking, PhD; Patrick Carpenter, BS, MA
Maywood, IL , USA

Background:
Recent population studies have demonstrated an increased risk of allergic rhinitis in patients exposed to acetaminophen. However, no histological studies have been conducted to assess the relationship between acetaminophen exposure and allergic rhinitis.

Objective:
In this study, we aimed to investigate the association between chronic acetaminophen exposure and the development of allergic rhinitis in a rat model.

Methods:
10 female Sprague Dawley rats were randomly assigned to either a control or acetaminophen group. The acetaminophen group received 200 mg/Kg/day via oral gavage for 120 days. Control animals received a yogurt vehicle. Allergic behavioral responses including nose rub, eye rub, ear and neck/face scratching were

quantified. The animals were sacrificed and the noses harvested. The portion of the nose containing the nasal septum and the inferior turbinates was embedded in paraffin, sectioned and stained with H&E.

Results:
The average number of allergic responses/animal was 13.2 in the acetaminophen group versus 6.2 in the control group (p = 0.032). All (100%) of the animals in the acetaminophen group had mast cells infiltrating the lamina propia of the inferior turbinate, while mast cells were detected in only 40% of the animals in the control group. The average number of mast cells per animal in the acetaminophen group was 134 versus 21 in the control group (p = 0.0476).

Conclusions:
Our study is the first to demonstrate a histologic association between chronic exposure to acetaminophen and allergic rhinitis. Further research to elucidate the mechanism underlying these findings is necessary.

1:54pm

Air Pollutants Cause Release of Hydrogen Peroxide (H2O2) and IL-8 in a Human Primary Nasal Tissue Culture Model

Do-Yeon Cho, MD; Jayakar Nayak, MD, PHD; Beate Illek, PHD; Peter Hwang, MD; Alan Nguyen, BA; Horst Fischer, PhD
Stanford, CA, USA

Backgrounds:
A component of primary innate defense of the nasal mucosa against inhaled pathogens includes continuous, low-level release of H2O2 into luminal secretion. At the same time, there are evidences that oxidative stress caused by airborne particulate matters (PM) worsens rhinosinusitis. To understand the effects of PM on oxidative stress in nasal mucosa, we studied the release of H2O2 and IL-8 after PM exposure.

Methods:
Normal human nasal tissues were collected from surgery, and cultured on polytetrafluoroethane membranes in serum free growth medium. Cell integrity and recovery on culture was monitored by lactate dehydrogenase (LDH) release into medium. Cultures were exposed to PM for 24 hours with/without diphenyleneiodonium sulfate (DPI; NADPH oxidase blocker). Luminex cytokine and Amplex-Red H2O2 assays were performed.

Results:
LDH levels dropped rapidly within 2 days, indicative for stabilization and cell recovery. All cultures released H2O2 into the medium. Exposure to PM (20 µg/cm2) increased H2O2 levels significantly (94.6±7.7 NRFU) compared to untreated controls (55.8±4.0 NRFU; p=0.001). PM-induced H2O2 production was partially inhibited by DPI (80.1±3.8NRFU) indicating a cellular NADPH oxidase origin for H2O2. Exposure to PM increased IL-8 levels in dose-dependent fashion (control,2301±412 MFI; 20µg/cm2,5002±1327 MFI; 40µg/cm2,8219±1090 MFI; p=0.022).

Conclusion:
PM increases level of H2O2 released by nasal tissues indicating that PM causes oxidative stress in part by activating a normal cellular defense mechanism. Increased IL-8 levels indicate a proinflammatory state after PM exposure. Reduction of H2O2 production in sinonasal epithelium may limit the toxic effects to upper airway and serve as a novel therapeutic target

---

2:01pm

Non-Allergic Rhinitis is Associated with Increased Environmentally Mediated Sinonasal Epithelial Cell Oxidative Stress

Murugappan Ramanathan, MD; Mai-Tien Nguyen, BS; James Benke, BS; Andrew Lane, MD; Sandra Lin, MD
Baltimore, MD, USA

Background:
Non-allergic rhinitis is a common sinonasal condition that affects millions of people yet its pathogenesis remains poorly understood. Recent findings have suggested that environmental exposures may trigger oxidative stress mechanisms to activate the inflammatory response independent of allergy. The purpose of this study is to compare oxidative stress levels in sinonasal epithelial cells from allergic and non-allergic rhinitis patients and to determine whether sinonasal epithelial cells from these

patients have increased sensitivity to environmental allergens.

Methods:
Chronic rhinitis (symptoms > 6 months) patients were evaluated in clinic by allergy testing, nasal endoscopy, and CT scans. Patients were classified as allergic (AR) or non-allergic rhinitis (NAR) based on skin testing. Patients with radiographic or endoscopic findings of chronic sinusitis were excluded. Sinonasal epithelial cells were collected by endoscopically guided brushings and levels of reactive oxygen species (ROS) were measured using a fluorometric assay at baseline and after stimulation with house dust mite antigen.

Results:
NAR patients had significantly higher sinonasal epithelial cell ROS levels (>3 fold, $p<0.001$) at baseline. NAR patients also had increased ROS levels (>3 fold, $p<0.001$) after allergen stimulation suggesting that sinonasal epithelial cells in these patients may have increased sensitivity to environmental allergens.

Conclusions:
This study is one of the first to demonstrate that NAR is associated with increased sinonasal epithelial cell oxidative stress and sensitivity to environmental allergens in comparison to AR patients. This unique mechanism could play a major role in the pathogenesis of non-allergic rhinitis, suggesting a role for anti-oxidant therapies.

2:08pm
Discussion/Q&A

2:15pm
Panel: Nonallergic Rhinitis: Latest Medical and Surgical Treatments
Moderator: Rodney Schlosser, MD
Panelists: John DelGaudio, MD; Raymond Sacks, MD; Benjamin Bleier, MD

2:55pm
Break with Exhbitors

Session: The Sinonasal Microbiome
Moderators: Amber Luong, MD & Charles Ebert, MD

3:15pm
Coagulase-negative Staphylococcus Culture in Chronic Rhinosinusitis
Zi Zhang, MD, MSCE; Nithin Adappa, MD; Ebbing Lautenbach, MD, MPH, MSCE; Alexander Chiu, MD; Noam Cohen, MD, PhD; James Palmer, MD
Philadelphia, Pennsylvania, USA

Objective:
Coagulase-negative staphylococcus (CoNS) is one of the most common culture isolates in patient with chronic rhinosinusitis (CRS). However, its pathogenic nature in CRS remains controversial. We decided to look for concordance between positive CoNS culture at functional endoscopic sinus surgery (FESS) and CRS severity measures.

Methods:
Adult CRS patients who underwent FESS between10/1/2007 to 12/31/2011 were recruited. Patient demographics, disease characteristics, medication use, Lund-Mackay CT scores, and SNOT-22 scores were collected at baseline before FESS. Intraoperative culture was obtained in standard manner. Patients were placed into two groups based on culture findings: patients with CoNS as the sole positive culture result, and the other group included all other positive culture results, including CoNS as part of a polymicrobial culture.

Results:
376 CRS patients met criteria. 106 patients (28%) had CoNS as their only isolate, 259 (69%) had polymicrobial or other bacterial isolates, and 11(3%) had no bacterial growth. Compared to patients with polymicrobial or other bacterial isolates, patients with the sole result of CoNS were significantly less likely to have revision FESS (52% versus 64%, $p=0.025$), less likely to have nasal polyps (50% versus 64%, $p=0.012$), and had a better Lund-Mackay CT score (11.7 versus 13.0, $p=0.042$). No other differences were significant.

Conclusion:
CRS patients with CoNS intraoperative culture result have less disease burden than CRS patients with different bacterial or polymicrobial

culture isolates. These findings suggest a minimal pathogenic role of CoNS in CRS.

3:22pm

Sinus Culture Poorly Predicts Resident Microbiota

Leah Hauser, MD; Daniel Frank, PhD; Vijay Ramakrishnan, MD
Aurora, CO, USA

Introduction:
Chronic rhinosinusitis (CRS) is an inflammatory disorder of the paranasal sinuses in which bacteria are thought to play some role. Culture-based assays are commonly used in clinical and research practice, however cultures may not accurately report the microbial populations present. The objective of this study was to determine the accuracy of clinical culture when compared to advanced molecular techniques.

Methods:
Ethmoid samples from 46 CRS patients collected during endoscopic sinus surgery were analyzed by both clinical culture and 16S rRNA gene sequencing. Comparisons were made using t-test and chi-square statistical tests.

Results:
Each subject had an average of 3 isolates identified by bacterial culture and 21.5 species (standard deviation 12.5) identified by 16S sequencing (p= 0.005). On average, there was one dominant species using molecular techniques (>10% abundance of 16S sequences), but only 52.5% of these species were identified by culture. Low abundance species (<1%), which may also play a role in community dynamics were only detected in 11% of cultures. Bacterial species were significantly more likely to be detected by culture if the 16S abundance was >10% compared to 1-10% (p=0.0007) or <1% (p= 0.0001). Conversely, only 29.3% of isolates identified by culture represented the dominant species, while 44% accounted for species with 1-10% abundance (p= 0.0005). Interestingly, 12% of isolates detected by culture were not identified by DNA pyrosequencing.

Conclusions:
Standard clinical culture is a poor representation of resident microbiota. Modern culture-independent techniques should be incorporated into clinical and research practices as cost and turnaround time improve.

3:29pm

Baseline "Core" Sinus Microbiome Predicts Postoperative Surgical Outcome

Leah Hauser, MD; Daniel Frank, PhD; Vijay Ramakrishnan, MD
Aurora, Colorado , USA

Introduction:
Success rates for endoscopic sinus surgery (ESS) for chronic rhinosinusitis (CRS) are favorable, however, many patients have persistent disease necessitating continued antibiotics, steroids, and/or revision surgery. The bacterial microbiome is a potentially powerful modifier of health and disease, and may be able to modulate mucosal inflammation. The objective of this study was to determine whether surgical outcomes can be influenced by a patient's core microbiome.

Methods:
Twenty-seven patients had sinus microbiota characterized at the time of ESS and >6 month post-operative follow up. Microbiota were characterized using quantitative PCR and 16S rRNA pyrosequencing. Post-operative outcomes were analyzed, including endoscopy score, additional courses of antibiotics or steroids, and need for revision surgery. "Optimal" outcome was defined as >50% reduction in endoscopy score and no need for postoperative antibiotic, steroid, or surgical therapy.

Results:
Thirteen patients had an "optimal outcome" and fourteen patients had a "suboptimal" outcome. Both groups had similar mean preoperative CT and endoscopy scores. Optimal outcomes were associated with increased richness and diversity of the baseline microbiome (p= 0.05 and p=0.006), and with an increased abundance of Corynebacteria (p= 0.017).

Conclusions:
A richer and more complex microbiome and an increased abundance of Corynebacteria may be predictive of surgical outcome, as these patients are less likely to suffer from persistent inflammation or require post-operative antibiotics, steroids or revision surgery. Mechanisms

for such beneficial effects may offer insights into disease pathogenesis and treatment, and are critical for future study.

3:36pm

Staphylococcus aureus burden and the sinonasal epithelial cell innate response in chronic sinusitis

Michael Kohanski, MD, PhD; Andrew Lane, MD
Baltimore, MD, USA

Introduction:
Recent research has linked Staphylococcus aureus with chronic rhinosinusitis (CRS) exacerbations. However, the mechanisms through which bacteria, and Staphylococcus aureus specifically, activate sinonasal inflammatory pathways is incompletely understood. This study investigates the innate immune response to Staphylococcus aureus in cultured sinonasal epithelial cells (SNEC) derived from CRS patients and controls.

Methods:
SNEC were collected from 14 surgical patients and grown in culture at the air-liquid interface. Differentiated SNEC from control and CRS subjects were infected with Staphylococcus aureus at three different concentrations for 24 hours. Bacterial growth and SNEC viability were assessed, as was induced expression of mediators of inflammation and innate immunity.

Results:
Cultured SNEC from CRS patients demonstrated a significant increase in expression of IL8, TNF-alpha, and mucin5b at all the tested concentrations of Staphylococcus aureus, whereas SNEC from control patients demonstrated a significant increase in expression only at the higher inoculum of Staphylococcus aureus. There were correlating increases in basal secretion of inflammatory proteins. No significant changes in expression were observed for IL25 or TSLP, however, there was a trend toward increased expression of IL33 in the CRS population.

Conclusions:
This study demonstrates that bacterial burden can be detected by sinonasal epithelium in the absence of adaptive immune cells. Furthermore, CRS SNEC activate an inflammatory response at a lower initial bacterial inoculum than controls. These findings may suggest that CRS patients are unusually susceptible to bacterial-triggered innate immune inflammation and thus may benefit from reduction of bacterial burden with antimicrobials.

3:43pm

Discussion/Q&A

3:50pm

Chronic Rhinosinusitis as a Window into the Bacteria and Mucosal Immunity of Cystic Fibrosis: A Prospective Cross-sectional Analysis

Raymond Kim, MBChB; Lydia Park, MBChB; Andrew Wood, BMBCh, PhD; P Rod Dunbar, MBChB, PhD; Richard Douglas, MD, FRACS
Auckland, New Zealand

Background:
Chronic rhinosinusitis (CRS) is highly prevalent in cystic fibrosis (CF) patients, where a close correlation exists between upper and lower respiratory tract microbiology. We have reported intramucosal bacterial microcolonies in the sinus mucosa from idiopathic CRS patients, and have made observations suggesting that these may result from mucosal immunotolerance secondary to altered macrophage function. In this study, we sought to determine whether intramucosal microcolonies exist in the mucosa of CF patients with CRS, and to investigate the mucosal immunology.

Methods:
Mucus swabs and tissue biopsies were taken from 9 patients with CF undergoing functional endoscopic sinus surgery (FESS) for CRS, 11 with idiopathic CRS undergoing FESS, and 9 with normal sinuses having transnasal pituitary surgery. Swabs were cultured, and intramucosal microcolonies was sought using Gram staining and fluorescence in situ hybridization. Mucosal immune cells were identified using fluorescent immunohistochemistry.

Results:
Swab culture rates were similar between CRS patients and controls, but there were significantly more intramucosal microcolonies in the CRS groups (8/9 CF-CRS, 7/11 idiopathic CRS),

compared to controls (1/9). Furthermore, the bio-volume of intramucosal microcolonies was significantly higher in CF-CRS than idiopathic-CRS. Mirroring the microbiological observations, the number of CD163+ macrophages was significantly increased in CF-CRS compared to idiopathic CRS (p = 0.03).

Conclusions:
Intramucosal bacteria exist within the sinus mucosa of patients with CF, and in significantly greater numbers than in patients with idiopathic CRS. We suspect that intramucosal microcolonies exist in the lower respiratory tract mucosa in CF and may play a role in disease recalcitrance.

3:57pm

Assessment of Epithelial Innate Antimicrobial Factors in Sinus Tissue from Patients with and without Chronic Rhinosinusitis

Jivianne Lee, MD; Oswaldo Escobar, BS; Rabin Anouyesan, BS; Agnieszka Janisiewicz, MD; Edith Porter, MD
Irvine, CA, USA

Background:
Airway secretions contain endogenous antimicrobial factors which contribute to the innate host defense of the respiratory tract. Antibacterial peptides as well as host-derived lipids including cholesteryl esters have been previously detected in maxillary sinus lavage fluid. The purpose of this study is to provide evidence that such intrinsic microbicidal molecules are acutely expressed within sinus epithelia and to compare the levels of expression between patients with and without chronic rhinosinusitis (CRS).

Methods:
Sinus mucosa was obtained from subjects with (20) and without (5) a history of CRS from January-December 2011. Immunofluorescent tissue staining and RT-PCR following RNA extraction from embedded tissues were used to analyze sinus mucosa for the presence of epithelial beta-defensins(HBD-2,3), cathelicidin(LL-37), sterol O-acyltransferase(SOAT-1), a key enzyme in generation of cholesteryl esters, and their corresponding mRNA. Staining for human neutrophil peptide(HNP) was included as a marker for inflammation. Relative mRNA expression was determined with SYBR GREEN using ribosomal protein RPLP0 as the housekeeping gene, and specificity of PCR amplification confirmed by melt curve analysis and agarose gel electrophoresis.

Results:
Immunofluorescence showed a significant increase in HNP staining between CRS versus nonCRS specimens in agreement with clinical inflammation status. SOAT1 mRNA expression, and less prominently, HBD-2 and HBD-3 mRNA expression, were also elevated in CRS samples compared to controls.

Conclusions:
An upregulation of multiple antimicrobial factors including increased biosynthesis of antimicrobial lipids was observed in the sinus mucosa of CRS patients. Further study is necessary to delineate whether different subtypes of CRS exhibit unique signatures of antimicrobial factors.

4:04pm

B Lymphocyte and Immunoglobulin Diversity in Upper Airway Mucosal Immunity in Chronic Rhinosinusitis

Ali Rashan, MD, MS; Yang Yang, PhD; Megan Philips, BS; Peter Hwang, MD; Leonore Herzenberg, PhD; Jayakar Nayak, MD, PhD
Stanford, California, USA

Introduction:
Chronic rhinosinusitis (CRS) is an upper airway disorder characterized by aberrant sinonasal mucosal inflammation. Although human IgD-expressing B lymphocytes have been found in tonsil and adenoid lymphoid tissues, the presence of these immune cells in nasal mucosa, and their possible dysregulation in the context of CRS, remains enigmatic.

Methods:
Blood, ethmoid sinus mucosa, and nasal polyp tissue samples were analyzed from 16 patients in 3 cohorts: control, CRSsNP (without polyps), and CRSwNP (with polyps). Tissue samples were evaluated using 14-parameter hi-dimensional flow cytometry of single cell suspensions.

Results:
A population of CD20+ CD19+ B cells is signifi-

cantly expanded within ethmoid sinus ($p<0.002$) and nasal polyp tissues ($p<0.003$) when compared to normal nasal tissue. This expanded pool of B cells displays heterogeneous surface expression of both IgM and IgD receptors. When stratified, a distinct subpopulation of IgM-IgD+ cells selectively expresses l light chain, heightened CD38 expression and Ki-67 activity, suggestive of the presence of secreted IgD within mucosal tissues of CRS patients.

Conclusions:
CRS patients demonstrate significant regional spikes in B lymphocyte proportions in upper airway sinus and polyp mucosa that are absent from and control tissues. A subset of these B cells (IgM- IgD+) undergo in situ IgD class-switching. In the setting of CRS, these data collectively indicate that the upper airway mucosa harbors unique IgD-producing B cell populations, and likely a wider spectrum of immunoglobulins than previously appreciated. These findings hold both diagnostic and therapeutic significance for CRS mucosal immunity.

4:11pm
Discussion/Q&A

4:18pm (Audience Interactive Session)
Panel: Etiology of Chronic Rhinosinusitis, Where's the Evidence? Allergies, Innate Immune Defects or Microbes?
Moderator: Noam Cohen, MD
Panelists: Bradley Marple, MD; Amber Luong, MD; Andrew Goldberg, MD

5:00pm
Closing Remarks and Adjournment

5:30-7:00pm
ARS Poster Reception

6:30pm - 7:30pm
ARS Cocktail Reception

Saturday, May 17, 2014

8:00am
Welcome
Roy R. Casiano, MD - President Elect and Program Chair

8:05am
Presidential Address
Tim Smith, MD

Session
Novel Research at the Cutting Edge
Moderators: Justin Turner, MD, and Erin O'Brien, MD

8:15am
Upper Airway Basal Progenitor Cells Exist in a Defined Anatomic Niche and Spontaneously Form Nasospheres in Culture
Dawn Bravo, PhD; Ethan Soudry, MD; Alan Nguyen, BS; Peter Hwang, MD; Jayakar Nayak, MD, PhD
Stanford, CA, USA

Introduction:
The upper airway epithelium undergoes continual repair to maintain mucosal integrity following disease, exposure and surgery. However, the in situ progenitor populations that are responsible for mucosal regeneration are poorly understood. We utilized stem cell marker expression to define and isolate progenitor cell populations in both mouse and human tissues.

Methods:
Stem cell markers p63, nerve growth factor receptor (NGFR), cytokeratin (Krt) 5, and selected mitotic indicators, were used in murine tissues to study progenitor cell dynamics using high-resolution confocal microscopy, and in human tissues to isolate single progenitor cells for organoid formation and differentiation in 3-D matrigel cultures. Sulfur dioxide (SO_2, 300 ppm over 3 hours) gas exposure permitted understanding of kinetics of epithelial repair following injury.

Results:
p63+/Krt5+/NGFR+ upper airway progenitors line the entire epithelial basement membrane. These multipotent cells derive from a newly identified, highly proliferative nasal floor reser-

voir/niche with prominent mitotic activity compared to normal epithelium ($p<0.005$). Upon SO2 volatile gas injury, complete upper airway mucosal cellular regeneration is achieved from unperturbed progenitor cell pools within 7 days. When isolated from human nasal mucosa, single multipotent progenitors spontaneously generate nasosphere organoids and develop foci of ciliated cell differentiation.

Conclusions:
Using nuclear, cytosolic, and surface stem cell markers, we report the identification of a native population of epithelial progenitors in both murine and human nasal tissues, as well as a progenitor cell reservoir/niche. Multipotent progenitor cells form organoids undergoing cellular differentiation, and hold promise for future cell-based regenerative therapies for airway disease.

8:22am
Development and In Vitro Characterization of Erythrosine Nanoparticles for Chronic Sinusitis Using Photodynamic Therapy
Chandrasekhar Garapati; Brent Cameron, PhD; Ronald Fournier, PhD; Reginald Baugh, MD; Sai Boddu, PhD
Toledo, OH, USA

Introduction:
Antimicrobial therapy for sinusitis has been shown to reduce or eliminate pathologic bacteria associated with rhinosinusitis and improve the symptoms associated with the disease. However, the continuing rise in antibiotic resistance, the ongoing problem with patient compliance and the intrinsic difficulty in eradication of biofilms complicates antibiotic therapy. The introduction of photodynamic antimicrobial therapy (PAT) using erythrosine, a photosensitizer, could eliminate the bacteria without inducing antibiotic resistance or even requiring daily dosing. In the present study, erythrosine nanoparticles were prepared using poly-lactic-co-glycolic acid (PLGA) and evaluated for their potential in PAT against Staphylococcus aureus bio?lms.

Methods:
PLGA nanoparticles of erythrosine were prepared by nanoprecipitation technique using polyvinyl alcohol as a stabilizer. Erythrosine nanoparticles were characterized for size, zeta potential, morphology and in vitro release. Qualitative and quantitative uptake studies of erythrosine nanoparticles were carried out in Staphylococcus aureus biofilms.

Results:
Nanoprecipitation technique resulted in nanoparticles with a mean diameter of 385nm and zeta potential of -9.36 mV. Erythrosine was slowly released from nanoparticles over a period of 120 hours. The qualitative study showed the ability of Staphylococcus aureus cells to internalize erythrosine nanoparticles. Moreover, erythrosine nanoparticles exhibited a higher uptake and antimicrobial efficacy compared to pure drug in Staphylococcus aureus biofilms. A single dose resulted in effective treatment for over 3 days.

Conclusion:
In conclusion, erythrosine loaded PLGA nanoparticles can be a potential long term drug delivery system for PAT and are useful for the eradication of Staphylococcus aureus biofilms.

8:36am
Discussion/Q&A

Session
Chronic Rhinosinusitis and Nasal Polyps
Moderators: Jeb Justice, MD, and Esther Kim, MD

8:43am
Decreased Expression of IGFBP5 in Chronic Rhinosinusitis with Polyps
Gina Paris, BA; Andrew Lane, MD
Baltimore, MD, USA

Background:
Sinonasal epithelial cells participate actively in mucosal immunity, producing mediators that help orchestrate local inflammation and repair. A recently implicated signaling pathway in asthma involves Insulin-like Growth Factor (IGF) and its associated binding proteins (IGFBPs). IGFBPs are thought to function as key anti-inflammatory mediators, interacting with cytokines and extracellular matrix proteins to facilitate barrier reconstitution and resolution of inflammation.

Methods:
Differential expression of IGFBP5 was identified

through an expression microarray comparing cultured differentiated sinonasal epithelial cells derived from polyp and normal sinus mucosa. Real-time PCR was utilized to confirm and further analyze the level of expression of IGFBP5 in whole sinonasal tissue and in epithelial cell primary cultures (n=30).

Results:
The expression of IGFBP5 mRNA was significantly diminished in sinonasal mucosa samples from patients with chronic rhinosinusitis with polyps, as compared to non-polyp sinus mucosa (5.7-fold, p=0.002). This disease-specific difference was maintained in primary culture shortly after isolation (p=0.003); however, expression increased by an average 128-fold after growth at the air-liquid interface for 3 weeks (p=0.001), at which time the disease-specific difference in IGFBP5 expression became non-significant.

Conclusion:
IGFBP5, a molecule involved in resolution of inflammation, is expressed by sinonasal epithelial cells. Similar to the pro-fibrotic mediator TGF-beta, IGFBP5 expression is reduced in CRSwNP, providing further evidence that deficient repair mechanisms may play a role in perpetuating chronic inflammation in nasal polyposis. Further studies are required to establish the role of IGFBP5 and other IGF axis proteins in CRSwNP and to determine the potential for therapeutic targeting.

8:50am

The Utility of Routine Histopathology for Nasal Polyps in Functional Endoscopic Sinus Surgery for Chronic Rhinosinusitis

David Yeh, MD; Jay Wong, MD; Stephanie Hoffbauer, BHSc (Hon); Brett Wehrli, MD, FRCPC; Doron Sommer, MD, FRCSC; Brian Rotenberg, MD, MPH, FRCSC
London, ON, Canada

Background:
Routine histopathological assessment is currently standard practice for nasal polyp specimens obtained during endoscopic sinus surgery (ESS) for chronic rhinosinusitis (CRS). Retrospective studies in the literature suggest that routine histopathology of nasal polyps is unnecessary as few unexpected diagnoses are discovered that alter patient management. We further support this hypothesis with prospective data and demonstrate the costly nature of routine histopathology.

Methods:
A multicenter prospective assessment was performed from data collected between 2007 and 2013. Only cases of patients undergoing ESS for bilateral CRS were included. We excluded unilateral disease cases and cases in which pathologies other than polyps were suspected intraoperatively or during the preoperative work-up. We then compared the preoperative diagnosis with the final histopathology and determined the number of unexpected pathologies. Cost analysis of pathological analysis was performed.

Results:
Only 4 of 828 pathological specimens were identified as having a clinically significant unexpected diagnosis. These four cases account for 0.48% of all specimens reviewed. This translates to a number needed to screen of 207 cases of bilateral CRS to discover one unexpected pathology. The associated cost for making an unexpected diagnosis was $18,350.55. All unexpected pathologies in this series were benign.

Conclusion:
Routine histopathology of nasal polyps in ESS for bilateral CRS with polyps yields few unexpected or management-altering diagnoses. It carries a significant cost to the healthcare system. Clinicians should consider abandoning routine polyp analysis in cases of bilateral CRS without any further concerning clinical features.

8:57am

Cellular Comparison of Sinus Mucosa versus Polyp Tissue from a Single Sinus Cavity in Chronic Rhinosinusitis

Jacqueline Ho, MS; Michelle Bailey, BBiomedSc; John Zaunders, PhD; Raymond Sacks, MBBCh; William Sewell, MBBS PhD; Richard Harvey, MD
Sydney, NSW, Australia

Background:
Nasal polyposis is a common development in chronic rhinosinusitis (CRS) and sinus mucosa

and polyp tissue have been used interchangeably in studies investigating CRS. However, potential differences may exist between these two tissue types, which have not been entirely characterised.

Methods:
A cross-sectional study of patients with CRSwNP undergoing endoscopic sinus surgery was conducted. Sinus mucosal biopsies and corresponding polyp tissue were obtained from the same sinus cavity. Through flow cytometry, single cell suspensions identified type 2 innate lymphoid cells (ILC2s), CD4 and CD8 T cells, activated CD4 and CD8 T cells, plasma cells, plasmacytoid dendritic cells (PDCs), regulatory T cells, T follicular helper cells, B cells and IgA+ and IgG+ B cells. Cells were measured as a percentage of CD45+ cells. Paired non-parametric comparisons between sinus and polyp tissue were performed.

Results:
10 patients (50% female, 48±16 years) were recruited. Significantly elevated ILC2 levels were found in polyp tissue compared to sinus mucosa (0.12(0.07-0.23) v. 0.07(0.04-0.16), p=0.01), as well as plasma cells (2.25(0.84-3.68) v. 1.18(0.74-2.41), p=0.01); PDCs (0.15(0.12-0.50) v. 0.04(0.02-0.17), p=0.03); activated CD8 T cells (29.22(17.60-41.43) v. 16.32(10.07-36.16), p=0.04) and IgG+ B cells (6.96(0.06-11.82) v. 1.51(0.38-5.13), p=0.04). Other cell populations showed no significant differences.

Conclusions:
Whilst overall similar in terms of cellular composition, the significantly higher levels of ILC2s, plasma cells, PDCs, activated CD8 T cells and IgG+ B cells in polyp tissue may be reflective of cell populations driving nasal polyp development. The cellular machinery of CRS is present in polyps and representative of the disease process.

9:04am

Quality of Life Improvement from Sinus Surgery in Chronic Rhinosinusitis Patients with Asthma and Nasal Polyps

Zi Zhang, MD, MSCE; Noam Cohen, MD, PhD; Nithin Adappa, MD; Ebbing Lautenbach, MD, MPH, MSCE; Alexander Chiu, MD; James Palmer, MD
Philadelphia, PA, USA

Objective:
Nasal polyps and asthma have been associated with the refractory nature of chronic rhinosinusitis (CRS). We aimed to evaluate whether CRS patients with asthma and nasal polyps had a larger quality of life (QOL) improvement from functional endoscopic sinus surgery (FESS) compared to CRS patients without asthma or polyps.

Methods:
Adult CRS patients who underwent FESS between 2007 and 2011 were enrolled in this retrospective cohort study. QOL was measured using the 22-item Sinonasal Outcome Test (SNOT-22). Variables collected included baseline demographics, clinical factors, SNOT-22 scores before FESS, and 1-month, 3-month and 6-month after FESS. Groups tested were asthma alone, polyps alone, asthma and polyps, and no asthma or polyps. Linear mixed-effects regression model was performed to calculate ß-coefficients, which can be interpreted as the adjusted mean QOL differences.

Results:
Among the 382 patients enrolled, 45% had asthma (n=172) and 49% had polyps (n=187). After adjusting for all clinical factors, there were significantly more improvements in postoperative QOL in patients with nasal polyps alone at 3-month follow-up (ß-coefficient -12.22; 95% CI, -19.85, -4.59; p=0.002), patients with asthma alone at 6-month follow-up (ß-coefficient -9.81; 95% CI, -17.36, -2.26; p=0.011), and patients with both asthma and nasal polyps at 3-month (ß-coefficient -16.74; 95% CI, -26.03, -7.45; p<0.001) and 6-month follow-up (ß-coefficient -13.27; 95% CI, -22.83, -3.71; p=0.007), when compared to patients without asthma or nasal polyps.

Conclusion:
CRS patients with asthma and nasal polyps experience a larger QOL benefit from FESS compared to CRS patients without asthma or polyps.

9:11am

Discussion/Q&A

9:18am
Panel
"ObamaCare", ICD10, and Coding Changes: What all of this Means to the Rhinologist
Moderators: Seth Brown, MD
Presenters: Richard Waguespack, MD; Michael Setzen, MD; David Nielsen, MD

9:58am
Break with Exhibitors

Session
Steroids in Chronic Rhinosinusitis
Moderators: Nathan Sautter, MD and Jayakar V. Nayak, MD

10:18am
Pretreatment with Topical Budesonide Mitigates the Inflammatory Effects of Caustic Injury in Sinonasal Epithelium
Zhenxiao Huang, MD, PhD; Alan Nguyen, BS; Ting Ye, MD; Dawn Bravo, MD,PhD; Bing Zhou, MD; Jayakar Nayak, MD,PhD
Stanford, CA, USA

Background:
The fundamental mechanisms that permit functional epithelial repair in the nasal cavity remain poorly understood. To promote post-surgical wound healing following endoscopic sinus surgery, topical budesonide (BDS) steroid administration is often employed, however it is unknown whether BDS pre-treatment, prior to mucosal injury, holds benefit for mucosal regeneration.

Methods:
Fifty C57BL/6 mice received 5 days of unilateral BDS pre-treatment via topical intranasal rinse (0.6ug in 12uL/treatment, pH=6.3) prior to single intranasal exposure to 35% topical TCA (pH=1.1). Controls included saline rinses pre-treatment (pH=6.5), or BDS rinses post-treatment. Murine whole nasal cavity sections were analyzed 1 day and 5 days post injury at a gross and cellular level against epithelial and proliferative cell markers.

Results:
BDS topical rinse pre-treatment of the nasal cavity significantly reduced acute stages of nasal cavity inflammation and damage despite TCA exposure at day 1, including reduced subepithelial edema (74.09mm±3.45 vs. 158.69mm±24.16, p=0.003), maintained epithelial cell survival (median 29/high power field (hpf) vs. 1/hpf (range 0-24), p=0.01), and limited intranasal synechiae, compared to controls. Five days following TCA exposure, subepithelial and cellular changes in the BDS pre-treatment group were equivalent to controls, but the initial benefits of reduced synechiae formation were maintained.

Conclusion:
Our findings suggest that topical pre-treatment of the sinonasal mucosa with BDS can unexpectedly mitigate many early deleterious effects of acute nasal mucosal injury. Findings from this model system may serve as an effective pre-operative treatment algorithm using BDS to assist with reduction in post-surgical inflammatory changes.

10:25am
P-glycoprotein Inhibition Promotes Intracellular Prednisone Retention in Human Sinonasal Polyp Explants
Benjamin Bleier, MD; Armine Kocharyan, MD; John Hoang, BS; Rachel Feldman, BA; Amy Singleton, BS; Xue Han, PhD
Boston, MA, USA

Introduction:
P-glycoprotein(P-gp) is an efflux pump which is part of the innate chemo-immunity defense system and is overexpressed in Chronic Rhinosinusitis with Nasal Polyps(CRSwNP). P-gp is capable of regulating corticosteroid retention and thus P-gp upregulation has been implicated in steroid resistance in several inflammatory disorders. The goal of this study is to determine whether P-gp activity limits intracellular steroid retention in CRSwNP.

Methods:
IRB approved study in 16 nasal polyp explants. Polyps were exposed to 50micg/mL of prednisone for 30min with or without the presence of a P-gp inhibitor(Verapamil 12.5micM or Zosuquidar 0.31micM) followed by a 40min washout period. Intracellular steroid retention was determined by quantifying the concentration of both intracytoplasmic and secreted steroid using an ELISA. Concentrations relative to control were compared using a Student's t-test.

Results:
The intracytoplasmic prednisone concentration was significantly greater relative to control following P-gp inhibition with Verapamil(156.98+/-106.6%, p<0.05) and Zosuquidar(135.11+/-68.6, p<0.05). Similarly, the amount of prednisone secreted by the explant was significantly reduced following P-gp inhibition with Verapamil(80.56+/-14.20%, p<0.05) and demonstrated a trend towards a reduction following P-gp inhibition with Zosuquidar(81.82+/-15.57%, p=NS).

Conclusions:
Inhibition of P-gp enhances the intracellular accumulation of prednisone in nasal polyps suggesting that P-gp regulates glucocorticoid retention in sinonasal mucosa. These findings, coupled with the known overexpression of P-gp in CRSwNP, may point to a possible mechanism for steroid resistance in this patient population.

10:32am

Intranasal Topical Steroids and Growth Assessment in Children: A Meta-Analysis of Prospective Studies

David Mener, MD, MPH; Josef Shargorodsky, MD, MPH; Sandra Lin, MD
Baltimore, MD, USA

Introduction:
Intranasal topical steroids (ITS) are common first line treatments for allergic rhinitis. Continual treatment with topical corticosteroids, however, has raised concerns about potential growth suppression in children due to hypothalamus-pituitary axis suppression. We therefore propose a meta-analysis of prospective studies comparing the growth rate of children receiving ITS treatment to placebo controls.

Methods:
Meta-analysis of prospective studies using MEDLINE and EMBASE, including all placebo-controlled prospective studies comparing ITS with placebo, evaluating stadiometry or knemometry growth outcomes in children age <18 years with allergic rhinitis. Individuals were pooled using the random effects model, and standardized mean difference was used as the comparison summary statistic. All p values were two-sided.

Results:
Seven studies with 1046 total participants, age 3.5-15 years, met the inclusion criteria and were stratified by growth measurement modality. Among the 3 studies utilizing stadiometry, there was no significant growth difference between ITS and placebo (standard mean difference 0.11 cm, p=0.62). Among the 4 studies utilizing knemometry, mean growth was significantly lower in the ITS group compared with placebo (-.223 mm, p=.034). None of the individual studies demonstrated a statistically significant difference in growth when comparing ITS with placebo using knemometry.

Conclusions:
While there was no significant difference in growth among studies utilizing stadiometry, the standardized mean growth was significantly lower in children receiving ITS than placebo in studies utilizing knemometry for growth assessment. The findings demonstrate a potential decrease in bone growth in children receiving topical nasal corticosteroids and may be an important consideration for prescribing clinicians.

10:39am

Effects of Intranasal Dexamethasone on Endogenous Cortisol Levels and Intraocular Pressures

Benjamin Martino, MD; Kristin Seiberling, MD; Christopher Church, MD
Loma Linda, CA, USA

Introduction:
Medical treatment of chronic rhinosinusitis with nasal polyposis (CRSwNP) centers around administration of steroids. High-dose topical nasal steroids (HDTNS) have shown promising results with less systemic effects than oral steroids. One promising HDTNS is 0.132% dexamethasone nasal spray. We investigated whether intranasal dexamethasone was associated with any decrease in serum cortisol and/or increase in intraocular pressures (IOPs).

Methods:
Patients with CRSwNP currently using dexamethasone spray or initiating therapy were enrolled. Patients were categorized into two groups. In group 1 serum cortisol and IOP were checked after at least 4 weeks of therapy. In

group 2 serum cortisol was checked before and after 4 weeks of therapy.

Results:
Twenty-eight patients enrolled, 23 in group 1 and 5 in group 2. In group 1, the average serum cortisol level after at least 4 weeks of therapy (average duration of 44.5 ± 94.3 weeks) was 8.0 ± 20.2 µg/dL (normal range is 6-19 µg/dL). Nine patients had suppressed cortisol levels (average of 2.4 ± 5.4 µg/dL). Seven underwent IOP measurements and none revealed ocular hypertension on tonometry. In group 2, the average pre-treatment cortisol level was 14.0 ± 10.2 µg/dL and the average after 4 weeks of therapy was 8.7 ± 12.5 µg/dL. All five patients demonstrated a drop in cortisol level (average decrease of 5.3 ± 6.4 µg/dL).

Conclusions:
High-dose dexamethasone nasal spray may be associated with a decrease in serum cortisol. Patients treated with this modality should undergo pretreatment serum cortisol measurement followed by regular post-administration measurements with continued use.

10:46am
Discussion / Q&A

Session
Epistaxis and the Role of Topical Saline Irrigations
Moderators: Lori Lemonnier, MD and Zachary Soler, MD

10:53am
The Effect of Epistaxis on Health-Related Quality of Life in Patients with Hereditary Hemorrhagic Telangiectasia
Linda Yin, BA; Christian Merlo, MD, MPH; Jeffrey Hoag, MD; Peter Terry, MD; Sally Mitchell, MD; Douglas Reh, MD
Baltimore, MD, USA

Introduction:
Hereditary hemorrhagic telangiectasia (HHT) is an autosomal dominant disease mainly characterized by epistaxis in more than 96% of patients. Recently, a validated questionnaire known as the HHT Epistaxis Severity Score (ESS) was developed. However, little is known about the relationship between epistaxis and quality of life. We hypothesize that epistaxis severity is a major factor predicting Health-Related Quality of Life (HR-QoL) in HHT patients.

Methods:
This is a cross-sectional study. The ESS questionnaire and Medical Outcomes Study 36-item short form (SF-36) were administered to subjects through an Internet survey. All participants had a definitive diagnosis of HHT through Curacao Criteria or genetic testing. Demographic information, genetics, and extensive histories were also collected. Descriptive analyses were performed with calculations of means and SDs for continuous variables and proportions for categorical variables. Linear regressions were then performed to assess the association between HR-QoL and ESS.

Results:
604 subjects aged 18 or older participated between April and August 2008. All patients reported epistaxis, 285 (47.2%) had telangiectasias, and 545 (90.2%) had a family history of HHT. 167 (27.6%) patients had mild epistaxis (ESS < 4), 285 (47.2%) reported moderate epistaxis (ESS >=4 & <7), and 152 (25.2%) reported severe epistaxis (ESS >=7). Patients with severe epistaxis had lower scores for both the Physical (PCS) and Mental (MCS) components of HR-QoL when compared to those with mild epistaxis ($p<0.001$, $p<0.001$).

Conclusions:
Epistaxis severity is a major determinant of HR-QoL and should be considered as a measurement of treatment efficacy in HHT-related epistaxis.

11:00am
The Efficacy of Hot Saline Irrigation in Control of Intraoperative Bleeding During Functional Endoscopic Sinus Surgery (FESS): A Randomized Controlled Trial
Eng Gan, MBBS FRCSC; Saad Alsaleh, MBBS FRCSC; Al-Rahim Habib, MSc; Jamil Manji, MSc; Ameen Amanian, BSc; Amin Javer, MD, FRCSC FARS
Vancouver, BC, Canada

Introduction:
Functional endoscopic sinus surgery (FESS) is

a minimally invasive surgical approach to treat chronic rhinosinusitis (CRS). The endoscopically magnified operative field in FESS makes even a small amount of bleeding a potentially significant hindrance. It is thought that irrigation with hot water during surgery may improve surgical field of view by producing a hemostatic effect. Our objective was to assess the effectiveness of hot saline irrigation (HSI) compared to room temperature saline irrigation (RTSI) in the control of intraoperative bleeding during FESS.

Methods:
CRS patients undergoing FESS were randomized to two treatment arms in equal ratio. Subjects received either HSI (49°C) or RTSI (18°C), 30 mL every 10 minutes, for the duration of FESS. The Boezaart endoscopic field of view grading system was the primary outcome measure. Boezaart score, heart rate, and mean arterial blood pressure (MABP) were recorded at 10-minute intervals between irrigations.

Results:
Sixty-two individuals were randomized in equal ratio into two treatment groups. Baseline clinical characteristics did not differ between groups. Mean endoscopic surgical field of view did not significantly differ between the HSI and RTSI groups (1.5±0.6 vs. 1.5±0.6, p=0.85). We found that blood loss per minute was significantly reduced (p=0.04) in cases utilizing HSI (2.2±1.9) compared to RTSI (2.4±1.2). Despite this, heart rate (p=0.54) and MABP (p=0.26) did not significantly differ between treatment groups.

Conclusion:
HSI does not significantly improve surgical field of view compared to RTSI. However, a significant reduction in rate of blood loss may be attained with HSI.

11:07am
Impact of Nasal Saline Irrigations on the Post-surgical Sinonasal Microbiome
Cindy Liu, MD, MPH, PhD; Michael Kohanski, MD, PhD; Lance Price, PhD; Andrew Lane, MD Baltimore, MD, USA

Introduction:
Topical treatment such as nasal saline irrigation can improve the symptoms of patients with chronic rhinosinusitis (CRS); however, its impact on sinonasal commensals (Corynebacterium) and on pathogens associated CRS (Staphylococcus aureus and Pseudomonas) is little known.

Methods:
We collected paired nasal and sinus swabs endoscopically from controls (n = 29) and patients with CRS with nasal polyposis (CRSwNP, n = 13) who have not received systemic antibiotics or corticosteroids in the previous eight weeks. We extracted total DNA from swab eluents, which underwent 16S rRNA gene-based pyrosequencing and resultant pyrosequences classified taxonomically. Sinonasal bacteria present at >0.05% proportional abundance comprising of 407,863 reads were analyzed. History of nasal irrigation use was extracted. Sinonasal bacterial abundance was compared by two-tailed Kolmogorov-Smirnov test.

Result:
We found no significant impact of nasal irrigation on the proportional abundances of Pseudomonas or S. aureus in the nasal or sinus microbiota of control patients. There was a minor decrease in Corynebacterium in the sinus patients who irrigate (Median = 0.16, Range = 0.00 - 0.43, No irrigation; Median = 0.07, Range = 0.00 - 0.29, Irrigation), but the difference was not significant statistically (p = 0.49). Comparison in CRSwNP patients revealed similar finding regarding Pseudomonas, S. aureus, and Corynebacterium.

Conclusion:
We found no evidence of nasal irrigation to be associated with distinct nasal or sinus microbiota profile. In particular, patients-whether with or without CRS symptoms-who utilize nasal irrigation do not have decreased proportional abundances of two common CRS pathogens.

11:14am
Discussion/Q&A

11:20am
Panel
Biomaterials in Rhinology: What's the Evidence?
Moderator: Ameet Singh, MD
Panelists: Belachew Tessema, MD; Stacey Gray, MD; Raj Sindwani, MD

12:00pm
Lunch with Exhbitors

12:00pm
Mentorship Program Luncheon
"Medical Malpractice in Rhinology"
Topics Covered:
** What can I do in my daily practice to safeguard against medical malpractice?*
** What should I do from a medico-legal perspective when I have a complication?*
** How can I successfully navigate a medical malpractice event?*
Moderator: Abtin Tabee, MD (Program Director)
Verona - Promenade Level

Session
Factors Influencing Recalcitrance in Chronic Rhinosinusitis
Moderators: Stella Lee, MD, and Peter Manes, MD

1:00pm
Periostin and RANKL Expression in Allergic Fungal Rhinosinusitis
Adrienne Laury, MD; Roland Hilgarth, PhD; Asma Nusrat, MD; Sarah Wise, MD
Atlanta, GA, USA

Introduction:
Allergic fungal rhinosinusitis (AFRS) is a disease entity demonstrating substantial eosinophilic inflammation and characteristic radiographic bony erosion/expansion. Periostin is an extracellular matrix protein associated with eosinophil accumulation in eosinophilic esophagitis, allergic asthma mucus production, and chronic rhinosinusitis polyp formation. RANKL is an osteoclast activator present in osteoporosis and periodontal disease. We sought to evaluate periostin and RANKL expression in AFRS and correlate these levels with radiographic scales of disease severity.

Methods:
Thirty sinus tissue specimens were intraoperatively collected from three patient groups - AFRS, chronic rhinosinusitis without nasal polyps (CRSsNP), and controls (n=10 per group). Specimens were analyzed via semi-quantitative polymerase chain reaction (qt-PCR) and immunofluorescence (IF) for the presence of both periostin and RANKL. Protein levels on IF were quantified via pixel density analysis. Preoperative CT scans from each patient were scored using both the Lund-MacKay and CT bone erosion scoring systems.

Results:
Periostin was significantly elevated in AFRS sinus tissue compared to CRSsNP and controls, as demonstrated by IF ($p<0.001$) and PCR ($p=0.011$). RANKL was not detected in sinus tissue specimens by IF or PCR. Periostin levels positively correlated with radiographic indices of disease severity for both soft tissue and bone, using Lund-MacKay ($r=0.926$ [PCR] and $r=0.581$ [IF]) and CT bone erosion ($r=0.672$ [PCR] and $r=0.616$ [IF]) scoring systems, respectively.

Conclusion:
Periostin is increased in AFRS tissue compared to CRSsNP and controls. Periostin levels positively correlate with radiologic disease severity scores. The increased levels of periostin in AFRS are likely tied to its intense eosinophilic inflammatory etiology.

1:07pm
Differential Human Sinonasal Epithelial Cell Inflammatory Response to Aspergillus and Alternaria Exposure
(Presented by: Rodney Schlosser, MD)
Viran Ranasinghe, BS; Rodney Schlosser, MD; Zachary Soler, MD, MSc; Sarfaraz Banglawala, MD; Whitney Nagel, BS; Jennifer Mulligan, PhD
Charleston, SC, USA

Introduction:
Human sinonasal epithelial cells (HSNECs) have been shown to drive the immune cell and downstream inflammatory response in chronic rhinosinusitis (CRS). Fungal species are abundantly present in the sinonasal mucosa and it has been suggested that fungal antigens cause

an inflammatory response in susceptible individuals. In this study we investigated the differential HSNEC inflammatory response to Aspergillus fumigatus and Alternaria alternata.

Methods:
Primary HSNECs were cultured from control (n=5), chronic sinusitis without nasal polyposis (CRSsNP)(n=10), and chronic sinusitis with nasal polyposis (CRSwNP)(n=9) patients and then exposed to Aspergillus and Alternaria fungal extracts. HSNEC supernatant cytokine levels were measured with enzyme-linked immunosorbent assay for CCL20, GM-CSF, IL-6, IL-8, and VEGF.

Results:
The GM-CSF and IL-8 response to Aspergillus was significantly higher than the response to Alternaria in all 3 HSNEC groups. CRSsNP and CRSwNP HSNECs showed elevated IL-8 levels in response to Alternaria compared to disease-matched baseline. CRSwNP HSNECs demonstrated elevated levels of CCL20 from baseline in response to Aspergillus and Alternaria and elevated VEGF levels in response to Aspergillus.

Conclusions:
HSNECs demonstrate a greater GM-CSF and IL-8 response to Aspergillus than to Alternaria. CRSwNP HSNECs showed a hyper-responsive secretion of CCL20 and VEGF in response to fungal antigen exposure that was not observed in CRSsNP or control HSNECs.

1:14pm

Comparison of Radiographic and Clinical Characteristics of Low-risk and High-risk CF Genotypes

Geoffrey Ferril, MD; Vijay Ramakrishnan, MD; Jerry Nick, MD
Aurora, CO, USA

Introduction:
Patients with cystic fibrosis (CF) exhibit known radiographic and clinical abnormalities, and can now be stratified into high-risk and low-risk groups using modern genetic testing, with the latter often exhibiting milder disease and equivocal sweat testing. The aim of the current study was to better understand radiographic and clinical characteristics of adult CF patients in terms of risk category.

Methods:
IRB approved study at a tertiary facility comparing adult CF patients to an age-matched control group of patients with chronic rhinosinusitis. Demographic data were recorded, and patients were categorized as high- or low-risk CF, and control. CF diagnostic testing and pulmonary characteristics were compared between the two CF groups, and sinus CT findings were compared among all three groups.

Results:
When comparing the high-risk and low-risk CF groups (n = 25 and 30, respectively), earlier ages at diagnosis ($p<0.001$), higher sweat chloride tests ($p=0.002$), lower FEV1 values ($p<0.001$), and a higher likelihood of pulmonary Pseudomonas culture positivity ($p=0.0028$) were found in the high-risk group. A significantly increased incidence of sinus hypoplasia/aplasia and bony sclerosis was seen when comparing both CF groups to the control cohort (n = 30), as well as when comparing the high-risk to low-risk group.

Conclusion:
The current study describes clinicopathologic findings in adult CF patients in terms of high-risk and low-risk genotypes. Our data have shown that low-risk CF groups have milder disease, but retain classic radiographic findings that can help raise the index of suspicion for a CF diagnostic workup.

1:21pm

Remodelling Changes of the Upper Airway with Chronic Rhinosinusitis

Jodi Osborn, MBBS; Kornkiat Snidvongs, MD; Nadine Mrad, MSc; Raymond Sacks, FCS(SA)ORL, FRACS; Richard Harvey, MD
Hornsby, Sydney, NSW, Australia

Introduction:
Although the remodelling changes of the lower airway in chronic disease are well described, similar changes in the upper airway are less well known. The remodelling changes of the upper airway in chronic rhinosinusitis (CRS), phenotypes/endotypes and clinical characteristics are investigated.

Methods:
A cross-sectional study of adult patients with

CRS was performed. Mucosal samples were taken during endoscopic sinus surgery (ESS). Histopathology analysis included eosinophil count, eosinophil activation, and remodelling changes (basement membrane thickening, fibrosis, squamous metaplasia). Patient reported outcomes (PROMs) were assessed using a Nasal Symptom Score and Sino-Nasal Outcome Test (SNOT-22). Patients were subgrouped by: 1. Presence of polyps, CRS with nasal polyps (CRSwNP) / CRS without nasal polyps (CRSsNP), 2. Tissue eosinophilia (>10/high power field), 3. T-helper cell skew (eosinophilic/neutrophillic). Analysis between subgroups, pathology and PROMs was performed.

Results:
259 patients (mean age 48.5±15.6 years, 45% female) were recruited. 5% smokers, 41% asthmatic, 9% aspirin hypersensitivity. 53% CRSwNP, 51% Eosinophilic CRS (ECRS), 17% neutrophilic/Th1 skew. Squamous metaplasia, remodelling changes, eosinophil aggregates, Charcot-Leyden crystals and eosinophil activation were associated with CRSwNP, ECRS, and Eosinophilic/Th2 skew ($p<0.05$). ECRS was most associated with mucosal damage ($p<0.05$). Eosinophil activation was associated with high tissue eosinophilia, subepithelial oedema and polyp formation ($p<0.05$). PROMs were significantly worse in CRSwNP, ECRS, and Eosinophilic/Th skew subgroups.

Conclusions:
Remodelling features are present in CRS. Tissue eosinophilia better predicts remodelling features of CRS and mucosal damage compared to phenotypes. Tissue eosinophilia more closely correlates with clinical symptoms than traditional classifications of CRSwNP and CRSsNP, especially cough.

1:28pm
Discussion/Q&A

Session
Treatment Outcomes for Chronic Rhinosinusitis
Moderators: Adam Folbe & John Lee, MD

1:36pm
Differences in Long-term Quality of Life Outcomes in Patients with RARS and CRSsNP
David Carlson, DO; Brendan Fennessy, MD; Niranjan Sritharan, MD; Peter Catalano, MD
Brighton, MA, USA

Introduction:
Improvements in quality of life (QoL) after surgical management of chronic sinusitis without nasal polyps (CRSsNP) is well defined and universally accepted as a rationale for surgical intervention, whereas the similar management of recurrent acute rhinosinusitis (RARS) remains controversial. The aim of this study is to compare the changes in QoL before and one year after surgical intervention between patients with RARS and CRSsNP.

Methods:
A prospective cohort of 32 patients with RARS (defined by the Rhinosinusitis Task force) and 25 patients with CRSsNP were enrolled in the study upon failing medical management. CT scan findings were reported using the Lund Mackay (LMS) scoring system. A SNOT-20 QoL assessment was completed both preoperatively and one year postoperatively. Patient data was collected, scored and transferred for analysis using Prism6 Graph Pad software.

Results:
Fifty-seven patients enrolled in this prospective study exhibited a mean age of 39 years. The mean pre-operative LM scores were similar between subgroups: RARS=7.5; CRSsNP=6.3 ($p>.05$). Pre-operative SNOT-20 scores were slightly higher for the CRSsNP vs RARS group: 44.3 vs 32.3, respectively ($p=.0092$). However, the magnitude of QoL improvement between pre-operative and post-operative SNOT-20 scores were identical (delta=-21) and statistically significant in both RARS and CRSsNP groups.

Conclusions:
These results show statistically significant, similar and durable improvements in QoL outcomes following endoscopic sinus surgery in patients

with RARS and CRSsNP, providing further evidence that targeted surgical intervention is as appropriate for medically refractory patients with RARS as it is for those with CRSsNP.

1:43pm

Cost-Effectiveness Analysis of Medical Therapy versus Surgery for Chronic Rhinosinusitis

Evan Walgama, MD; Matthew Ryan, MD; Mark Newcomer, MD; Brad Marple, MD; Pete Batra, MD
Dallas, TX, USA

Introduction:
Chronic rhinosinusitis (CRS) represents a chronic disease process which requires long-term medical management and, in select cases, endoscopic sinus surgery. The current study evaluates the cost-effectiveness of the two treatment modalities in the management algorithm of CRS.

Methods:
A decision analysis using Markov modeling techniques was performed from a third-party payer perspective. Probabilities and health utility values were estimated for the 2 treatment arms utilizing data from an ARS sponsored, multi-institutional, prospective study and other published literature.The primary outcome was cost-effectiveness in terms of quality adjusted life-years (QALYs) at a time endpoint of one year. Monte Carlo simulation was used to evaluate cost-effectiveness at various thresholds. Additional analysis was performed from a societal cost perspective.

Results:
The incremental cost effectiveness ratio (ICER) for surgical therapy was 50,248 US dollars per QALY by probabilistic sensitivity analysis. At a willingness-to-pay of $50K, $75K, and $100K, surgical therapy was more cost effective than medical therapy for 48.92%, 56.33%, and 62.79% of simulated patients, respectively. When analyzed from a societal perspective and indirect costs of missed work were considered, there was average of $1799 and $1811 in lost income at one year for surgical and medical treatments, respectively, resulting in no significant change in the ICER of surgery ($50203/QALY) from a societal perspective.

Conclusions:
At an endpoint of one year, despite the upfront costs of surgery, surgery is a cost-effective treatment of CRS from both third-party payer and societal perspectives given the currently accepted willingness-to-pay threshold of 50K-100K US dollars per QALY.

1:50pm

Endoscopic Sinus Surgery Compared to Continued Medical Therapy for Patients with Refractory Chronic Rhinosinusitis

Kristine Smith, MD; Timothy Smith, MD, MPH; Jess Mace, MPH; Luke Rudmik, MD, MSc
Calgary, Alberta, Canada

Background:
There is a continued debate whether patients with refractory chronic rhinosinusitis (CRS) should be managed with endoscopic sinus surgery (ESS) or continued medical therapy alone. The primary objective of this study was to compare ESS versus continued medical therapy alone for patients with refractory CRS who have severe reductions in their baseline quality of life (QoL).

Methods:
This was a prospective longitudinal crossover study. 31 patients with refractory CRS were enrolled between August 2011 and June 2013. All patients failed initial medical therapy, had severe reductions in baseline QoL (mean SNOT-22 = 57.6) and elected ESS. While waiting to receive ESS, all patients received continued medical therapy which included appropriately prescribed topical corticosteroids, and rescue systemic corticosteroids, and antibiotics. The primary outcome was change in disease-specific QoL (SNOT-22). Secondary outcomes were change in endoscopic score, medication consumption, and work-days missed.

Results:
Following a mean of 7.1 months of continued medical therapy, patients with refractory CRS experienced worsening QoL (mean SNOT-22 score change from 57.6 to 66.1; p=0.006). This cohort then received ESS. With a mean postoperative follow-up of 14.6 months, there was significant improvement in SNOT-22 (mean change from 66.1 to 16.0; <0.001). There was also a significant improvement in endoscopic

grading (<0.001) coupled with a reduction in both work days lost (<0.001) and medication consumption (<0.01).

Conclusions:
Results from the study suggest that ESS is a more effective intervention compared to continued medical therapy alone for patients with refractory CRS who have severe reductions in their baseline QoL.

1:57pm
Long-term Outcomes of Endoscopic Maxillary Mega-antrostomy in Patients with Chronic Rhinosinusitis
Milena Costa, MD; Alkis Psaltis, PhD; Jayakar Nayak, PhD; Peter Hwang, MD
Stanford, CA, USA

Background:
Endoscopic maxillary mega-antrostomy (EMMA) is indicated for recalcitrant maxillary sinusitis despite medical therapy and previous antrostomy. In 2008 our group published favorable outcomes in 28 patients with relatively short follow-up and non-validated outcomes. This study reports long-term outcomes of the original cohort, as well as long-term outcomes of an interval cohort of 93 patients using validated outcome measures.

Methods:
A retrospective chart review was performed for 122 patients who underwent EMMA between 2005-2013. For the 28 patients constituting the original 2008 cohort, the original questionnaire from 2008 was re-administered by telephone interview. For the remaining 94 patients, prospectively collected data was reviewed regarding pre- and postoperative Lund-Kennedy endoscopic scores, SNOT-22 symptom scores, and CT scores.

Results:
The original 2008 cohort demonstrated sustained improvement of symptoms over a mean follow-up period of 6.9 years. The outcomes were statistically identical to the 2008 study, with 72.4% reporting complete or significant improvement, 27.6% reporting partial improvement or unchanged, and 0% reporting worsening (P< .05). The patients of the interval cohort had a mean follow-up time of 3.6 years years; this group showed statistically significant postoperative improvement of endoscopic, radiographic, and symptom scores at all time points throughout the follow-up period (P< .01 for all categories). There were no complications and the revision rate was 0%.

Conclusion:
EMMA is an effective revision surgery for recalcitrant maxillary sinusitis. Patients who improve after EMMA can expect sustained improvement for at least several years postoperatively.

2:04pm
Discussion/Q&A

2:12pm (Audience Interactive Participation)
Panel
Recalcitrant CRS: When should we Extend Sinusotomies or Remove Mucosa?
Moderator: Jean Anderson Eloy, MD
Panelists: Zara Patel, MD; Peter Hwang, MD; Satish Govinderaj, MD

2:52pm
Break with Exhibitors

Session
CSF Leak and Skull Base Tumors
Moderators: Amy Anstead, MD and Vijay Anand, MD

3:12pm
Immediate Postoperative Imaging After Uncomplicated Endoscopic Approach to the Anterior Skull Base: Is It Necessary?
Sahar Nadimi, MD; Nadieska Caballero, MD; Kevin Welch, MD
Maywood, IL, USA

Introduction:
Postoperative imaging is frequently performed to assess for intracranial complications following anterior skull base (ASB) surgery. However, there is little data to suggest that imaging changes the management of complications. In this study, the utility of postoperative imaging within 72 hours after uncomplicated ASB surgery was examined.

Methods:
Retrospective review of 143 patients who underwent endoscopic ASB surgery between 2007 and 2013 at Loyola University Medical Center. Outcomes measured included whether routine CT head scan could detect postoperative complications not otherwise detected on clinical exam, major postoperative complications, and clinical symptoms associated with complications.

Results:
Seventy-nine patients received postoperative imaging within 72 hours of the initial surgery. Most common finding on postoperative imaging was pneumocephalus (35/79 or 44%). Expanding pneumocephalus requiring surgical intervention developed in 3 cases. Cerebrospinal fluid (CSF) leak was the most common complication occurring in 22/143, or 15%, of all patients. Complications requiring intervention was 17% (24/143). Of the 24 patients who developed a postoperative complication, all had clinical signs or symptoms indicative of the need for surgical or medical intervention. The positive predictive value for a head CT scan to detect a complication was 12%, negative predictive value was 92% and sensitivity and specificity were 63% and 48%, respectively.

Conclusions:
Routine postoperative imaging is unnecessary after uncomplicated endoscopic ASB surgery because (1) it does not alter patient management, (2) it does not detect the most common complication (CSF leak), and (3) when imaging is positive, the patient has clinical symptoms suggesting a need for intervention.

3:19pm

Perioperative Continuous Cerebrospinal Fluid Pressure Monitoring in Patients with Spontaneous CSF Leaks

Yanjun Xie, BA; Josef Shargorodsky, MD, MPH; Masaru Ishii, MD, PhD; Andrew Lane, MD; Gary Gallia, MD, PhD; Douglas Reh, MD
Baltimore, MD, USA

Introduction:
Elevated intracranial pressure (ICP) is an inciting factor for cerebrospinal fluid (CSF) leaks and can be measured by CSF pressure (CSFP) monitoring. Current CSFP literature is mostly limited to assessments of opening pressure. This study re-investigates a previously discussed novel monitoring approach that evaluates continuous CSFP parameters, physiologic measurements, and treatment outcomes in patients undergoing endoscopic repair of spontaneous CSF leaks.

Methods:
Prospective case series of patients undergoing endoscopic endonasal repair of spontaneous CSF leaks. All participants had a lumbar catheter placed for 24-hour continuous preoperative pressure monitoring, and 24 hours of continuous monitoring starting 48 hours post-repair. In addition to patient characteristics, mean and peak CSFP, pulse waveform amplitudes (PWA), and related parameters were calculated.

Results:
Twenty-three patients underwent monitoring between 2004 and 2013, with a mean follow-up of 483 days. The mean age was 48.9 years, the mean BMI 38.5, and 8/23 (34.8%) had obstructive sleep apnea. While mean CSFP and PWA did not change after the repair, mean peak CSFP increased by 1.56cm H2O. Six patients (26.1%) had elevation in their CSFP > 25cmH2O for a minimum of 4% of the recording time. Based on their continuous pressure monitoring data, 9 patients (39.1%) underwent treatment for high ICP, either with acetazolamide or a ventriculostomy shunt. There were no CSF leak recurrences.

Conclusions:
Continuous perioperative CSFP monitoring provides valuable insight into multiple physiologic parameters. Systematic continuous CSFP monitoring can identify individuals in need of ICP-lowering therapy, possibly improving the outcomes in CSF leak repair surgeries.

3:26pm

The Nasal Floor Pedicled Flap: A Novel Technique for use in Skull Base Reconstruction

Pedram Daraei, BS; Zara Patel, MD
Atlanta, GA, USA

Introduction:
Skull base reconstruction can be accomplished

using various donor sites. Vascularized tissue, commonly the nasoseptal flap, is the most effective option for large defects or high flow leaks. In cases where the septum cannot be used, a nasal floor mucoperiosteal flap, pedicled from the sphenopalatine artery, is a viable option without reported outcomes. We aim to describe this flap and report successful outcomes in a cohort of patients.

Methods:
Retrospective chart review of patients seen by the senior author from 2011 to 2013 requiring skull base reconstruction for defects with cerebrospinal fluid leak.

Results:
108 patients underwent endoscopic skull base reconstruction. Ten patients had reconstruction with use of a pedicled nasal floor flap. Mean age was 53.3 years. Defects involved the ethmoid roof in five patients, sellar floor in two, clivus in two, and planum sphenoidale in one. Reasons why the septal flap could not be used were intentional sacrifice due to disease involvement, sacrifice for proper exposure, or previous septal perforation. Mean length of follow-up was 10.2 months (range 4 - 25 months). No patient developed cerebrospinal fluid leaks post-operatively.

Conclusions:
Nasal floor pedicled flaps are an effective alternative to nasoseptal flaps for reconstruction of the skull base and have not been previously described in the literature. Outcomes are promising in our cohort of patients. If the septum must be sacrificed, attention should be paid to the nasal floor, which provides a large mucoperiosteal flap that can be consistently exposed and elevated by the experienced surgeon.

3:33pm
Prognostic Value of Surgical Margins During Endoscopic Resection of Paranasal Sinus Malignancy
Lakshman Manjunath, MSII; Taylor Derousseau, MSII; Pete Batra, MD, FACS
Dallas, Texas, USA

Background:
Complete tumor resection with intraoperative frozen section control remains a central tenet of head and neck surgical oncology. The purpose of the present study was evaluate the significance of margins in predicting local recurrence and disease status following endoscopic resection of sinonasal cancer.

Methods:
This single-institution observational cohort study was performed on 68 patients over a 5-year period that underwent curative minimally invasive endoscopic resection (MIER) for sinonasal malignancies.

Results:
The mean age was 58.8 years and 69.1% were male. Mean follow-up after definitive MIER was 15.9 months. A mean of 10.8 margins were taken per surgery (range 2 - 27). False negative frozen section analysis was 22.1% for the entire cohort, being slightly higher at 25.0% for T3 or T4 malignancies. At last follow-up, no evidence of disease (NED) status was noted in 60.0% of those with positive margins versus 83.0% in those with negative margins, respectively ($p = 0.0795$). Regional or distant recurrences were observed in 40.9% of patients with positive margins and 14.5% of those with negative margins, respectively. Disease free survival (DFS) was 9.7 months for patients with positive margins, whereas those with negative margins had a DFS of 15.9 months.

Conclusion:
Statistical significance could not be achieved regarding the prognostic value of margin status on patient outcome. However, NED status as a function of residual microscopic disease proved to be marginally significant. These results suggest that complete resection with clear margins may reduce mortality in patients undergoing MIER for cancers of the paranasal sinuses.

3:40pm
Discussion/Q&A

Session
Olfactory and Taste Disorders
Moderators: Steven Pletcher, MD and Erin Wright, MD

3:48pm
PTC Taste Sensitivity Predicts Sinonasal Symptoms in Healthy Adults
Douglas Farquhar, BA
Kevin Kovatch, BS; Nithin Adappa, MD; James Palmer, MD; Frances Shofer, PhD; Noam Cohen, MD
Philadelphia, PA, USA

Background:
The bitter taste receptor T2R38, expressed in the tongue and nasal epithelium, has been shown to trigger a sinonasal innate immune response that aids in prevention of gram-negative bacterial infections. Common polymorphisms of the TAS2R38 gene, correlating with taste sensitivity to phenothiocarbamide (PTC), have been linked to differences in sinonasal innate immune response, with specific genotypes significantly more common in medically recalcitrant chronic rhinosinusitis patients. The purpose of this study was to examine the association between T2R38 function and sinonasal symptoms in a healthy population.

Methods:
A survey of nasal symptoms such as sinus infections, colds, allergies, and overall nasal quality of life (nQOL), was administered to healthy adult participants in a university setting. nQOL was measured using a 0-4 scale of worsening symptoms. A PTC compound taste strip was administered with T2R38 sensitivity classified as extremely, somewhat, or not sensitive. Descriptive statistics and ANOVA was used to compare nasal symptoms with T2R38 sensitivity.

Results:
Among 217 participants (55% female, 70% Caucasian, 41% age 21-25 years), 30% did not detect bitterness (non-tasters), 34% were moderate tasters, and 36% were "supertasters", experiencing a strong, unpalatable bitterness. PTC sensitivity was predictive of nasal symptoms: supertasters had the best nQOL scores, followed by moderate tasters and non-tasters (means 0.65, 0.81, 1.00, respectively; p=0.046). There were no significant associations with frequency of cold, allergy, or sinusitis symptoms.

Conclusion:
This study provides evidence that the function of the T2R38 receptor in the tongue may be associated with nasal symptoms in healthy individuals.

3:55pm
Impact of Treatment Modality on Olfaction in Chronic Rhinosinusitis: A Prospective, Multi-institutional Study
Adam DeConde, MD; Jess Mace, MPH, CCRP; Rodney Schlosser, MD; Timothy Smith, MD, MPH; Zachary Soler, MD, MSc
Portland, OR, USA

Introduction:
Evidence comparing the impact of medical and surgical management of chronic rhinosinusitis on olfactory function is limited. This study evaluates olfactory outcomes in patients who failed initial medical management and elect either continued medical management or endoscopic sinus surgery (ESS) followed by medical management.

Methods:
Adult subjects were prospectively enrolled into a non-randomized, multi-institutional cohort. Baseline characteristics, quality-of-life and objective clinical findings were collected along with two quality-of-life disease-specific measures, the Rhinosinusitis Disability Index (RSDI) and Sinonasal Outcome Test (SNOT-22). The primary outcome measure was the post-treatment change (>6 months) in the Brief Smell Identification Test (B-SIT). Bivariate and multivariate analyses compared B-SIT changes by treatment type while controlling for baseline cofactors.

Results:
Subjects (n=280) were enrolled between March, 2011 and May, 2013. Baseline B-SIT scores were comparable between medical and surgical treatment groups (8.8(3.2) vs 9.0(3.2); p=0.703). Subjects with baseline impaired olfaction (n=83; 29.6%) experienced mean B-SIT improvement in both the medical (n=17, 2.3(2.8), p=0.005) and surgical (n=66, 2.1(3.0), p<0.001) cohort. 38.6% of subjects with impaired olfaction return to normal olfaction at follow-up with no difference identified between treatment modalities (p=0.803). Multivariate analyses identified prior surgery as a predictor of less improvement regardless of treatment

modality in patients with baseline impaired olfaction. Average changes in B-SIT scores were comparable between treatment groups (p>0.050).

Conclusion:
Subjects electing ESS experienced gains in olfaction comparable to subjects electing continued medical management. Further study with larger sample size and more sensitive measures of olfaction are needed to determine differences between treatment groups.

4:02pm
Olfactory Outcomes in Chronic Rhinosinusis after Medical or Surgical Treatments: A Meta-Analysis
Sarfaraz Banglawala, MD; Lohia Shivangi, MD; Oyer Samuel, MD; Psaltis Alkis, MD, PhD; Soler Zachary, MD, MSc; Schlosser Rodney, MD
Charleston, SC, USA

Background:
Olfactory dysfunction is common among patients with chronic rhinosinusitis with nasal polys (CRSwNP). However the efficacy of medical and surgical interventions on olfaction among patients with CRSwNP is not well established.

Objective:
To perform a systematic review with meta-analysis of the efficacy of medical and surgical therapies on objective and subjective hyposmia among patients with CRSwNP.

Methods:
Olfaction specific outcomes from randomized controlled trials and prospective studies evaluating medical and surgical interventions on patients with CRSwNP were evaluated. Interventions included placebo, corticosteroids (tabs, sprays, powders) regimens, and endoscopic sinus surgery.

Results:
Sufficient data for meta-analysis was retrieved for 10 trials. Olfaction outcomes included hyposmia score, olfactory testing (Sniffin' Sticks test), quality of life, symptoms, and nasal patency. Overall objective hyposmia, after both medical and surgical intervention, was noted to significantly improve compared to placebo [-0.74; CI -1.06 to -0.41]. This was also reflected in hyposmia scores in the subgroup of patients who underwent surgery [-0.72; CL -0.88 to -0.56], and those who only underwent treatment with steroids versus placebo [-1.07; CI -1.56 to -0.58]. Overall objective hyposmia scores were also significantly improved [-0.46; CI -0.49 to -0.43]. This was also noted in the subgroup of patients who underwent treatment with oral corticosteroids compared to placebo [-0.6; CI -0.65 to -0.55]; and nasal corticosteroids compare to placebo [-0.40; CI -0.44 to -0.36].

Conclusion:
The results of this meta-analysis demonstrated that both medical and surgical interventions significantly improve both subjective and objective olfactory dysfunction in patients suffering from CRSwNP.

4:09pm
Discussion/Q&A

4:17pm
Panel
Doctor I Can't Smell or Taste; What's New in the Area of Olfaction?
Moderator: Bradley Goldstein, MD
Panelists: Andrew Lane, MD; Eric Holbrook, MD; Greg Davis

5:00pm
Closing Remarks & Meeting Adjournment
Timothy Smith, MD, ARS President
Roy Casiano, MD, ARS President Elect & Program Chair

Poster Presentatios

A Case of New World Leshmaniasis Involving Nasal Mucosa

Ankona Ghosh, MD; Jonathan Lee, MD
Philadelphia, PA, USA

Objective:

We present a case of New World leshmaniasis involving nasal mucosa and treatment with experimental Pentostam

Methods:

The study is presented as a case report of a previously healthy 22 year old man with a history of cutaneous leshmaniasis presenting with nasal congestion. Workup included nasal endoscopy and diagnostic biopsy of intranasal mucosal lesions. We discuss this rare case of metastatic sequelae to cutaneous leshmaniasis, known as New World leshmaniasis, and undertake a review of the literature.

Case Report:

The patient initially presented to an ENT four months following a trip to Costa Rica with an ulcerative lesion to his right pinna; this was biopsy-proven to be cutaneous leshmaniasis. He was subsequently treated with amphotericin. He re-presented after three months with nasal congestion in the left nostril. Nasal endoscopy revealed L>R anterior nasal ulcerations on the inferior turbinate and nasal septum. Biopsy confirmed mucosal leshmaniasis. He was treated with Pentostam (a pentavalent antimonial), an intravenous drug experimentally approved for treatment of leshmaniasis. He completed a one month course with resolution noted at conclusion of treatment. Details of the clinical exam and photos throughout treatment are presented.

Conclusion:

New World leshmaniasis, transmitted by the Lutzomyia sandfly, is an extremely rare diagnosis and must be diagnosed early for treatment with systemic antimonials in order to prevent severe tissue destruction in the nasopharyngeal airway. This case of a 22 year old male with mucocutaneous leshmaniasis ultimately resulted in complete resolution of lesions after a one month course of IV Pentostam.

A Comparison of Key Inflammatory Histologic Markers in Primary and Revision Endoscopic Sinus Surgery (ESS)

Devyani Lal, MD; Alexis Rounds, BS; Yu-Hui Chang, Ph.D; Matthew Rank, MD; Matthew Zarka, MD
Phoenix, Arizona, USA

Background:

Structured histopathology has recently been reported to be an objective and indirect metric of the quality and severity of sinonasal inflammation.

Aim:

Compare key histological markers of sinonasal inflammation in patients undergoing primary and revision sinus surgery.

Methods:

An IRB-approved retrospective review of patients who underwent ESS between November 2011-2013 was conducted. The following histopathology report components were included for analysis: overall degree of inflammation (absent, mild, moderate, severe); tissue eosinophilia (<10 per high power field [HPF], >10 per HPF), neutrophilic infiltrate (absent, focal, diffuse), inflammatory cell predominance (lymphocytic, lymphoplasmocytic, eosinophilic, neutrophilic), basement membrane thickening (absent, <7.5 µm, 7.5-15 µm, >15 µm), subepithelial edema (absent, mild, moderate, severe), hyperplastic/ papillary change; mucosal ulceration, squamous metaplasia and fibrosis, presence of fungal elements, Charcot-Leyden crystals, and eosinophil aggregates. High tissue eosinophilia in CRS (ECRS) was defined when tissue eosinophil count was greater than 10/HPF. Neutrophilic infiltrate was defined as absent or present (focal or diffuse). Descriptive and analytic statistical analysis of overall degree of reported inflammation and key variables were compared in patients undergoing primary and revision ESS.

Results:

Of 259 patients undergoing ESS, 93 patients underwent revision ESS. The number of prior surgeries varied from 1-18. Complete structured histopathology reports were available in 62 of 259 patients. We report differences in clinical diagnosis, overall impression of inflammation and key variables on histopathology (eosinophils/hpf, subepithelial edema, basement membrane fibrosis, etc).

Conclusions:

Patients undergoing primary versus revision ESS show varied degree of inflammation on key histopathological markers.

A Comparison of the Incidence of Radiographic Frontal Sinusitis in Middle-Turbinate Sacrificing to Middle-Turbinate Sparing Approaches for Pituitary Surgery

Leigh Sowerby, MD, FRCSC; Brad Mechor, MD, FRCSC; Sumeer Mann, MD; Trevor Kotylak, MD, FRCPC; Yves Starreveld, MD, PhD, FRCSC; Erin Wright, MDCM, FRCSC
London, ON, Canada

Background:
Initial descriptions of endoscopic approaches to the pituitary involved resecting the middle turbinate to help improve access and visualization. Modifications of this procedure to preserve the middle turbinate have since been described - the rationale being, among others, to reduce the incidence of frontal sinusitis. The objective of this study is to establish the incidence of post-operative frontal sinusitis in MT sparing (MTsp) and MT sacrificing approaches (MTsc) to the sella.

Methods:
A retrospective cohort study comparing radiographic evidence of frontal sinusitis or frontal recess obstruction post-pituitary surgery in consecutive patients was designed. Pre- and post-operative CT and/or MRI images from two institutions in geographic proximity but with different approaches to the sella were measured and graded by a blinded radiologist.

Results:
47 patients were included at each site, based on sample size calculations. The MTsc cohort had an 11% incidence of frontal sinus mucosal thickening greater than 1mm, versus 17% in the MTsp cohort. 4% of the MTsc group had mucosal thickening that was increased from their pre-operative scan versus 11% in the MTsp group. The differences between groups were not significant.

Conclusions:
The choice of middle turbinate sacrifice versus middle turbinate preservation in endonasal endoscopic approach does not appear to make a difference in the incidence of post-operative radiographic frontal sinusitis.

A Rare and Emerging Entity: Sinonasal IgG4-Related Sclerosing Disease

Brian Song, MD; Jonathan Liang, MD
Oakland, CA, USA

Objective:
To discuss the diagnostic features, differential diagnosis, workup, and treatment for sinonasal IgG4-related sclerosing disease (IgG4-rSD).

Background:
IgG4-rSD is a new disease entity first described in 2001. This systemic disease is related to autoimmune pancreatitis and commonly presents with lesions in multiple organ systems. IgG4-rSD affecting the nasal cavity and paranasal sinuses is rare with only a handful of reported cases of which half demonstrate malignant characteristics.

Methods:
Case report. A 72 year- old man who presented with left exophthalmos, periorbital pain, and epiphora.

Results:
Radiographic workup with CT and MRI demonstrated a sinonasal mass involving the left maxillary and ethmoid sinuses with surrounding bony expansion and orbital invasion. Nasal endoscopy demonstrated a fibrous lesion emanating from the middle meatus with surrounding mucosal inflammation. The patient underwent a biopsy, followed by endoscopic medial maxillectomy and ethmoidectomy with tumor debulking. Pathology demonstrated respiratory mucosa with dense inflammatory lymphoplasmacytic infiltrate and fibrosis; flow cytometry demonstrated no malignant cell population; immunophenotyping demonstrated multiple foci of IgG4 cells. Plasma-IgG4 was elevated in the setting of normal total-IgG. The patient was treated with post-operative systemic and topical corticosteroids. Post-operative surveillance imaging and nasal endoscopy demonstrated disease resolution without recurrence.

Conclusions:
Sinonasal IgG4-rSD is a rare disease which can present with bony and soft tissue invasion. Our case is the first to demonstrate osseous destruction and orbital invasion. Its locally aggressive features make it paramount to differentiate this disease from benign sinonasal tumors and chronic rhinosinusitis. Treatment involves surgical debulking and corticosteroids.

A Rare Recurrence of a Middle Turbinate Schwannoma

Anh Truong, MD; Shannon Poti, MD; Scott Fuller, MD; Brian Orisek, MD
Sacramento, CA, USA

Sinonasal schwannomas are a rare entity, representing less than 4% of head and neck schwannomas. There are only a few cases of sinonasal schwannoma originating from the middle turbinate described in the current literature. We report a case of a 73 year-old-man who presented with right sided nasal obstruction and a history of resection of a neurofibroma from the right ala over 20 years prior to presentation. Preoperative CT imaging revealed a soft tissue mass that was completely filling the right nasal cavity with associated maxillary, ethmoid and sphenoid sinus opacification on the ipsilateral side. The patient had endoscopic gross total resection of the tumor. Histopathologic evaluation of the tumor was consistent with a sinonasal schwannoma arising from the middle turbinate. Given the patient's slow, but progressive development of recurrent unilateral nasal mass at the middle turbinate, the patient is suspected to have a recurrence of nasal schwannoma that was initially mis-diagnosed. On review of the current literature, endoscopic resection of sinonasal schwannoma is often sufficient for gross total resection. Most cases are followed for up to two years without evidence of recurrence if completely extirpated at the initial setting. Our experience with this case suggests that a longer surveillance may be helpful in detecting recurrence of sinonasal schwannoma.

A Report on 15 Years of Medical Negligence Claims in Rhinology

Thomas Geyton, Sarah Little. Tunde Odutoye, Rajeev Mathew
Tooting, London, UK

Objective:

To determine the characteristics of medical negligence claims in rhinology.
Introduction: In 2010-2011 the NHS litigation bill surpassed £1 billion GBP (£1.52 billion USD). Systematic analysis of malpractice complaints allows for the identification of errors and can thereby improve patients safety and reduce the burden of litigation claims on health services.

Methods:

Claims relating to rhinology between 1995 and 2010 were obtained from the NHS Litigation Authority and analysed.

Results:

The series contains 65 closed claims that resulted in payment totalling £3.1 million GBP ($4.7 million USD). 50 claims were related to surgical complications. Functional endoscopic sinus surgery and septoplasty were the procedures most commonly associated with successful claims. There were 11 cases of orbital injury including 6 cases of visual loss and 5 cases of diplopia. The most common cause of a claim was failure to recognize the complication or manage it appropriately. Lack of informed consent was claimed in 8 cases. Other claims arose due to errors in outpatient procedures (2), diagnosis (6), delayed surgery (1) and errors in medical management (3).

Conclusions:

This is the first study to report the outcomes of negligence claims in rhinology in the United Kingdom. Claims in rhinology are associated with a high success rate. Steps that can be taken to reduce litigation include careful patient work up and ensuring adequate informed consent. Where there is a suspicion of orbital damage early recognition and intervention is needed to reduce long term injury to the patient.

Acquired Nasal Encephalocele: A Unique Presentation and Literature Review with Focus on the Seemingly Spontaneous Encephalocele

Adam Satteson, MD; John Clinger, MD
Winston-Salem, NC, USA

Introduction:
Encephaloceles are extracranial herniations of cranial contents through a skull defect. They can be congenital or acquired and develop in one of several locations, one of which is the nasal cavity. Acquired encephaloceles develop as a result of a bony skull defect - most commonly after accidental trauma, surgery, infection, tumor, radiation or benign/idiopathic intracranial hypertension (BIH). This report details an acquired nasal encephalocele likely secondary to BIH in a patient presenting with seizures. The diagnosis, surgical treatment and post operative considerations are discussed.

Methods:
Case report and literature review.

Results:
(1) The otolaryngologist must be aware of acquired nasal encephaloceles and inquire into patient risk factors. Prior negative imaging does not rule out the development of an encephalocele. (2) The spontaneous encephalocele may be caused by BIH or even OSA, and signs and symptoms of these disorders should be evaluated to help prevent surgical failure or secondary encephalocele. (3) This is the third reported case of nasal encephalocele detected following seizure, and the otolaryngologist should be aware of this rare but possible scenario. (4) An ethmoid encephalocele can present as chronic rhinosinusitis and skull base defect may not be evident on imaging, so a high index of suspicion must be maintained.

Conclusions:
Acquired nasal encephaloceles are a diagnostic and treatment challenge made simpler by thorough history gathering, knowledge of both common and uncommon etiologies, appropriate imaging studies, and a multidisciplinary surgical approach.

An Alternative Approach to Nasal Valve Collapse - The Role of Conservative Therapy

Sandeep Mistry, MBChB MRCS; Patrick Jassar, MBChB FRCS
Cottingham, UK

Introduction:
Nasal valve incompetence secondary to lateral nasal soft tissue collapse is often managed with either removable nasal dilators or functional rhinoplasty. Removable dilators are frequently not well tolerated. Surgery is technically challenging, and the necessary surgical experience in treating this problem is frequently not accessible by patients. In any case, surgery does not guarantee success. Nasal-muscle building exercises are a less publicised technique that has previously shown promising results. This review evaluates the role of this conservative method in treating lateral soft tissue nasal valve collapse.

Methods:
Literature review (PUBMED and EMBASE databases) for terms "nasal valve collapse", "alar collapse" and "nasal exercises" was performed. Participants with nasal valve collapse who proceeded to conservative and surgical treatments were reviewed. Subjective and objective outcomes (e.g. patient reported outcome measures (PROM) and acoustic rhinometry/rhinomanometry) were included for analysis.

Results:
Nasal dilators were shown to significantly improve nasal patency, but were commonly associated with discomfort and poor long-term tolerance. Only one study (34 participants) used nasal-muscle exercises and reported that nasal airflow increased (75-80%) and inspiratory resistance fell (66-70%) for patients who underwent nasal-muscle exercise +/- electrical stimulation. There were no reported adverse effects within this group. In comparison, literature review showed functional rhinoplasty to improve nasal patency by 83-100% objectively. Adverse effects of surgery included; adhesions (14%), infection (9%), graft resorption (7%) and deformity.

Conclusions:
Nasal-muscle building exercises have exhibited similar outcomes when compared to functional rhinoplasty, with fewer adverse effects. Such techniques warrant further consideration when managing this challenging problem.

An Evaluation of the Severity and Progression of Epistaxis in HHT1 vs. HHT2

Benjamin Hunter, BS; Benjamin Timmins, MS; P. Daniel Ward, MD, MS; Kevin Wilson, MD; Jamie McDonald, MS; Kevin Whitehead, MD, PhD
Salt Lake City, UT, USA

Introduction:

Hereditary hemorrhagic telangiectasia (HHT) is an autosomal dominant vascular dysplasia whose hallmark symptom is spontaneous recurrent epistaxis. Two major sub-types of this syndrome are HHT1 and HHT2. Severity of epistaxis ranges from occasional low-volume bleeding to frequent large-volume hemorrhages resulting in anemia. This study evaluated the severity and progression of epistaxis in HHT1 vs. HHT2 and examined the efficacy of certain treatments for epistaxis.

Methods:

Retrospective chart review was done for all genotyped HHT subjects at our center from 2010-2013. Data collected included epistaxis severity score (ESS), age of epistaxis onset, number and type of treatments, age at which treatments were sought, complete blood count values, ferritin, number of telangiectases, blood transfusions, iron therapy history, and patient demographics. Telephone interviews were conducted to collect current data from subjects who had undergone intranasal laser photocoagulation in the last 24 months. Data was analyzed to identify relationships and trends.

Results:

115 subjects with HHT2 were compared to 68 with HHT1. Subjects with HHT2 reported having a higher ESS compared to HHT1 ($p<0.05$) and a later age of onset of epistaxis ($p<0.05$). HHT2 subjects were more likely to be anemic (Hemoglobin <13g/dL) and were more likely to seek interventions to control their epistaxis. Subsequent to laser photocoagulation 23 subjects representative of both HHT subtypes experienced worsening of epistaxis evidenced by a time dependent increase in ESS.

Conclusion:

HHT2 is associated with more severe epistaxis and anemia, requiring more aggressive therapy as compared to HHT1.

An Extended Nasoseptal Flap for Coverage of Frontal Sinus Defects

Ethan Bassett, MD; Alfred Iloreta, MD; Christopher Farrell, MD; Marc Rosen, MD; Gurston Nyquist, MD
Philadelphia, PA, USA

Introduction:

The pedicled nasoseptal flap currently serves as the primary treatment option in the multilayer reconstruction algorithm for endoscopic repair of skull base defects. The original description of the technique includes two parallel incisions that follow the sagittal plane of the septum. The superior incision is made 1.5-2.0 centimeters below the olfactory cleft, while the inferior incision traditionally lies along the maxillary crest. The resulting flap, however, has a limited range of skull base coverage.

Methods:

We describe a novel modification to the traditional nasoseptal flap that allows for extended coverage, in this case to superior aspects of the posterior wall of the frontal sinus. The inferior incision is made under the inferior turbinate to include mucosa of the nasal floor and sidewall. A third sagittal, or "relaxing," incision is made from the posterior free edge of the nasal septum along the maxillary crest to the midseptum, preserving the pedicle. The flap is then rotated in the usual fashion with the mucosa from the nasal floor and sidewall extending beyond the traditional caudal septal mucosa.

Results:

We describe a case of a 77 year old female with a large encephalocele originating from the posterior table of the frontal sinus that was resected and successfully reconstructed with an extended nasoseptal flap.

Conclusion:

The novel relaxing incision introduced here preserves the pedicle and allows for expanded coverage of skull base defects.

Chicken versus Egg in Silent Sinus Syndrome. Lateralized Uncinate Versus Opacification of Maxillary Sinus

Orly Coblens, MD; Dana Crosby, MD; Raewynn Campbell, MD; James Palmer, MD
Philadelphia, PA, USA

Objective:
Explain the first pathophysiological mechanism for development of "silent sinus syndrome (SSS)."

Methods:
Retrospective case series report of two patients with unilateral SSS with lateralization of the contralateral uncinate process and no evidence of infection of the osteomeatal complex (OMC).

Results:
A presentation of two young patients with bilateral lateralization of the uncinate process and radiologically evident SSS on only one side. An accessory ostium on the contralateral side was found on endoscopic evaluation in both patients, which further supports the established principle that an aerated sinus will not develop SSS because there is a drainage outlet that prevents development of negative pressure. Interestingly, and perhaps the most important finding on complete evaluation of both patients was that both had bilateral lateralized uncinate processes. We present these two cases from time of presentation, surgical treatment and follow up.

Conclusion:
“Silent sinus syndrome” is the seemingly spontaneous development of enophthalmos and maxillary sinus atelectasis in a patient who is largely free of characteristic sinus symptoms. While there has been much debate in the literature in the past regarding “what comes first,” infection of the OMC or lateralization of the uncinate process, the two cases presented here undoubtedly favor lateralization of the uncinate process being the first step and arresting this step prevents the development of enophthalmos and maxillary sinus atelectasis.

Chronic Invasive Fungal Sinusitis: Granulomatous and Nongranulomatous Subtypes

Lacey Adkins, MD; Adedoyin Kalejaiye, MD; Hosai Hesham, MD; Ziad Deeb, MD; Jamie Litvack, MD; Stanley Chia, MD
Washington, DC, USA

Introduction:
Chronic invasive fungal sinusitis is a disease spectrum that can present in granulomatous and nongranulomatous forms. The purpose of this study is to present three cases representing chronic invasive granulomatous and nongranulomatous fungal sinusitis and to understand the prevalence, diagnosis, pathologic features, and management of these subtypes.

Methods:
Retrospective review of two cases of chronic nongranulomatous sinonasal mucormycosis and one case of chronic granulomatous dematiaceous sinusitis with literature review.

Results:
Two cases of indolent sinonasal mucormucosis consist of an immunocompromised patient presenting with facial pain and extensive palate ulceration and an immunocompetent patient with fluid collections within the orbit, cheek, and pterygopalatine fossa. Both had symptoms developing over the course of one month and pathology confirming invasive Mucor infection. The case of chronic dematiaceous fungal sinusitis presented in an immunocompetent individual with vision changes from acute orbital hydrops incidentally found to have pansinusitis and hyperostotic bone with intracranial and orbital extension. Pathology revealed noncaseating granulomatous inflammation and dematiaceous mold. These patients were evaluated and treated by nasal endoscopy and biopsy, aggressive surgical debridement, and intravenous antifungal therapy.

Conclusion:
Chronic sinonasal mucormycosis and chronic dematiaceous fungal sinusitis represent seldom reported entities along the spectrum of chronic invasive fungal sinusitis. This disease process is characterized by a prolonged and indolent clinical course - often lasting weeks to years. Histopathology reveals hyphal elements within the mucosa, submucosa, blood vessels or bony walls of the paranasal sinuses. Mainstays of treatment for both subtypes include rapid and aggressive surgical debridement, and intravenous antifungal medications.

Cigarette Smoke Exposure Induces MUC5B Secretion in Primary Nasal Cell Derived Acini in Culture

Amarel Tomney, MS; Stephanie Val, PhD; Lena Sun, BS; Maria Pena, MD; Xiaofang Wu, PhD; Diego Preciado, MD; PhD
Washington, DC , USA

Rationale/Objectives:

Cigarette smoke exposure has been shown to be a risk factor in the development of chronic rhinosinusitis (CRS). Molecular mechanisms which contribute to this pathologic link are unknown. MUC5B, a secreted mucin protein, has been shown to be preferentially up-regulated in CRS. Our group has developed a 3D model of primary nasal cell acinar formation in vitro. We hypothesized that in vitro stimulation of primary nasal epithelial cells (PNEC) grown in a 3D matrix have increased MUC5B secretion upon cigarette smoke condensate (CSC) exposure.

Methods:

CSC stimulation of PNEC grown in Matrigel over 20 days was performed. Reverse transcriptase polymerase chain reaction (RT-PCR) was done to show whether CSC induces MUC5B expression. Immunoflourescence and Western blots were used to assay for MUC5B protein.

Results:

RT-PCR demonstrated minimal induction of MUC5B expression with CSC in the acinar structures. However there was a significant 2-fold increase in the amount of secreted protein from these 3D PNEC acinar structures as demonstrated by IF and Western blot.

Conclusions:

CSC induces MUC5B secretion from PNEC derived in vitro acinar structures. Mechanisms for this induction remain to be elucidated as there appears to be little change in the genetic expression of MUC5B with CSC in this cell culture model.

Comparison of Electrosurgical Plasma Coagulation and Potassium-titanyl-phosphate Laser Photocoagulation for Treatment of Hereditary Hemorrhagic Telangiectasia-related Epistaxis

Lauren Luk, MD; Jess Mace, MPH, CCRP; Naveen Bhandarkar, MD; Nathan Sautter, MD
Portland, OR, USA

Introduction:

Potassium-titanyl-phosphate (KTP) laser photocoagulation is commonly utilized for treatment of hereditary hemorrhagic telangiectasia-related epistaxis (HHT-RE). Electrosurgical plasma coagulation (EPC), also known as coblation, has not been rigorously evaluated for HHT-RE.

Methods:

Patients seeking treatment for HHT-RE between September 2010 and September, 2012 were prospectively randomized (1:1) to KTP or EPC in a single blind prospective cohort study. Length of surgery and estimated blood loss (EBL) were recorded. Epistaxis severity scores (ESS) and 10 cm visual analog scales (VAS) for HHT-RE related symptoms were administered at enrollment and 3-, 6-, 12-months following surgery. Statistical analysis utilized Friedman's and Pearson's chi-square tests.

Results:

Eleven HHT patients were prospectively enrolled and followed. Six patients underwent EPC treatment while five underwent KTP. Three patients in the KTP subgroup and two patients in the EPC subgroup requested additional surgical treatment within 12 months($p>0.999$). There were no significant differences in terms of EBL ($p=0.126$), and length of surgery ($p=0.429$) between treatment groups. Mean ESS were not significantly different between groups at any follow-up point (KTP,$p=0.896$; EPC,$p=0.159$). Compared to KTP, mean ESS were higher in the EPC subgroup at baseline and lower at all other time points. Mean nasal obstruction VAS scores were significantly lower in the EPC subgroup at all follow-up points.

Conclusion:

EPC is a viable alternative to KTP laser photocoagulation for epistaxis control in patients with HHT. Subjectively, patients experience less nasal obstruction following EPC as compared to KTP treatment. A multi-centered, well-powered study is warranted to better determine treatment outcomes.

Comparison of Quality of Life and Lund Mackay Score in Subgroups of Rhinosinusitis

Brendan Fennessy, MD; Niranjan Sritharan, MD; David Carlson, MD; Peter Catalano, MD
Brighton, MA, USA

Introduction:

Rhinosinusitis (RS) can significantly impact quality of life (QoL) for the millions of patients affected each year. The major recognized subtypes of RS are Recurrent Acute RhinoSinusitis (RARS), Chronic Rhinosinusitis with nasal polyps (CRSwNP) and without (CRSsNP), Sampter's triad, and Allergic Fungal Sinusitis. To our knowledge, there is no published comparison between QoL and CT grading among the various subtypes. The aim of this study is to explore the relationship between Lund-Mackay (LM) CT scores and QoL assessments in each subtype of RS.

Methods:

A prospective study was undertaken evaluating patients diagnosed with RARS, CRSsNP, CRSwNP, and Sampters/Fungal disease, incorporating a pre-treatment Sinonasal Outcome Test-20 (SNOT 20) questionnaire, and a CT of the paranasal sinuses graded by the Lund-Mackay (LMS) system. Statistical analysis was performed using GraphPad Prism 6.

Results:

Ninety patients were enrolled into the following subtypes: RARS n=25; CRSsNP n=25; CRSwNP n=19; Sampter's/Fungal n=21. The mean pre-operative SNOT-20 scores were 35.6, 45.5, 48, and 54.3, respectively, and the mean LM scores were 6.6, 5.0, 12.6 and 17.6, respectively. Overall, the mean SNOT-20 and LM scores differed significantly between each subtype. However, there was no statistical relationship between QoL and LM scores within each given subtype.

Conclusion:

Our results show that QoL and LM scores are significantly different between the major subtypes of RS, but do not correlate within each subtype. Thus, QoL and CT scores may provide different information regarding the burden of disease in a given patient, casting further doubt on conventional indicators for sinus surgery.

Compliance with Steroid Irrigations: Are Our Patients Actually Doing Them?

Marie Bussières, MD; Erin Wright, MD
Edmonton, Alberta, Canada

In recent years the use of budesonide irrigations has become a popular treatment for patients with Chronic Rhinosinusitis (CRS), with widespread penetration into clinical care. However, budesonide irrigations are complex and potentially cumbersome and poor compliance could explain a failure of the therapy. Thus the objective of this study was to investigate the compliance rate of our patients to their topical nasal irrigations and the reasons underlying any non-compliance.

This study is a cross-sectional, anonymous survey of 100 consecutive patients using budesonide irrigations for CRS. All the patients were asked to complete a short questionnaire based on both the Brief Medication Questionnaire and the Chronic Sinusitis Survey.

Our results show that approximately 75% of our patients were compliant more than 90% of the time. However, 25% of them stopped their treatment at one point or another during the 2-month period because they were either feeling better, travelling, or had simply forgotten to take it. Sixteen percent were bothered by their irrigation in some way, finding it painful/irritating, cumbersome to prepare, or complaining of persistent discharge afterwards. Cost or reimbursement was not reported as a barrier to compliance. The majority of patients reported improvement in their symptoms related to their CRS with postnasal drip being the most common persisting symptom.

Despite a more cumbersome therapy our compliance rate for steroid irrigations compares favourably to historical studies involving conventional topical therapies. Understanding the reasons for non-compliance as outlined above should improve the counselling we give our patients when initiating steroid irrigation therapy.

Computational Fluid Dynamics (CFD) Study in Patients with Persistent Unilateral Maxillary Disease After Surgery

Kevin Choi, MD; David Jang, MD; Matthew Ellison, MD; Dennis Frank-Ito, PhD
Durham, NC, USA

Introduction:

Recalcitrant maxillary sinus disease after functional endoscopic sinus surgery (FESS) is poorly understood. Hyper-responsive immune function, biofilms, ciliary dysfunction, and anatomy (i.e. antrostomy size) all likely play a role. Disturbances in nasal airflow, wall stress, and air-conditioning may also contribute to recalcitrant disease.

Methods:

This is a retrospective chart review with computational analysis of patients from a tertiary-level academic rhinology practice over a six-month period. Patients with clinical and radiographic evidence of chronic (>3 months) unilateral maxillary sinus disease after bilateral FESS were selected. Those with an obvious cause of unilateral disease (i.e. odontogenic sinusitis, allergic fungal sinusitis, mucous recirculation) were excluded. CFD modeling and simulation were used to determine differences between diseased and non-diseased sides for each patient. Intra-patient comparison allowed for control of intrinsic disease factors.

Results:

Three patients met the inclusion criteria. Two patients had eosinophilic CRS with polyposis and one patient had non-polypoid CRS. Compared to the non-diseased side, the diseased side had smaller antrostomy size, (diseased: 0.28-0.85cm2, non-diseased:1.47-2.41cm2); higher nasal resistance (diseased: 0.98-1.83Pa.min/L, non-diseased: 0.81-0.93Pa.min/L); and higher anterior-posterior concentrations of shear stress in the maxillary sinus.

Conclusion:

This pilot study suggests that smaller antrostomy size with diminished airflow and increased shear stress may contribute to recalcitrant disease of the maxillary sinus. Future studies with a greater number of patients may elucidate surgical techniques that can minimize these factors.

Computational Streamline Rhinometry: A Novel Method to Evaluate Nasal Anatomy

Guilherme Garcia, PhD; Ruchin Patel, MD; Dennis Frank-Ito, PhD; Julie Kimbell, PhD; John Rhee, MD, MPH
Milwaukee, WI, USA

Introduction:

The relationship between nasal anatomy and function remains unclear. Multiple investigators have used acoustic rhinometry and rhinomanometry to try to relate form with function, but found low correlation between these objective measures and subjective symptoms of nasal airway obstruction (NAO). The objective of this study is to (1) describe a new method to quantify nasal cross-sectional areas (CSA) using computational fluid dynamics and (2) explore the relationship between CSAs, nasal resistance, and subjective nasal patency scores.

Methods:

Airflow patterns, CSAs perpendicular to a streamline parallel to the nasal floor, and nasal resistance were computed in 10 NAO patients based on pre- and post-surgery computed tomography scans. Calculated CSAs were compared to experimental values obtained with acoustic rhinometry on three patients. Nasal Obstruction Symptom Evaluation (NOSE) and visual analog scores (VAS) were collected pre and post-operatively to quantify subjective symptoms.

Results:

Cross-sectional areas estimated via computational streamline rhinometry compared favorably with acoustic rhinometry. The minimal CSA (mCSA) was predictive of nasal resistance on the preoperatively most obstructed side, but this relationship became much weaker when patients with mCSA < 0.2 cm2 were excluded. The mCSA had a statistically significant correlation with NOSE and VAS scores (r=0.53 and 0.55, respectively), but the strongest correlation was found between unilateral nasal resistance (as a ratio to bilateral resistance) with NOSE and VAS scores (r=0.71 and 0.60).

Conclusion:

Cross-sectional areas can be calculated perpendicular to airflow streamlines, yielding results similar to acoustic rhinometry. The mCSA correlates with nasal resistance and subjective nasal patency scores.

Cortical Mastoid Bone Graft for Augmentation Rhinoplasty - A Novel Technique

Sandeep Mistry, MBChB MRCS; David Strachan, MBChB FRCS
Bradford, West Yorkshire, UK

Introduction:

Reconstruction of the nasal dorsum and tip may be performed with the use of adjuvant autologous bone and cartilage grafts in cases of severe nasal deformity.

Methods:

We describe a novel technique of harvesting autologous cortical mastoid bone and conchal cartilage simultaneously through the same post-auricular incision.

Results:

We show that adequate amounts of good quality, easily sculpted membranous bone can be harvested for use within nasal augmentation with minimal donor site morbidity.

Conclusion:

To our knowledge, this is the first description of this particular technique for harvesting cortical mastoid bone for its use in augmentation rhinoplasty. We believe it is a useful option in the armamentarium for clinicians with experience of temporal bone dissection.

Corticosteroid Hypersensitivity in the Difficult Airway Patient: Case Series and Review of the Literature

Anna Knisely, MD; Libby Smith, DO; Stella Lee, MD
Pittsburgh, PA, USA

Introduction:

Corticosteroids are utilized for their anti-inflammatory and immunomodulatory properties. Type-I hypersensitivity to corticosteroids is rare but should be suspected in patients who demonstrate urticaria, bronchospasm, or angioedema with exposure. Patients with intravenous corticosteroid hypersensitivity (CH) who require laryngeal intervention pose particularly difficult therapeutic dilemmas and benefit from allergy testing in a systematic fashion.

Methods:

Three patients with type-I CH who presented with laryngeal symptoms secondary to vocal fold motion abnormalities are described in this retrospective review. Allergy testing and subsequent management are discussed.

Results:

All three patients presented with a history of urticaria or pruritis after exposure to the offending corticosteroid and demonstrated CH to dexamethasone. Our first patient demonstrated serial intradermal dilutional testing (IDT) confirmation of CH and required revision thyroplasty. This was performed without corticosteroids but was complicated by postoperative laryngeal edema requiring tracheostomy. A second patient underwent skin prick testing (SPT) to dexamethasone and planned desensitization prior to medialization laryngoplasty. She subsequently declined desensitization and continued serial vocal fold injections (VFI) of calcium hydroxylapatite. Our third patient underwent SPT and IDT that confirmed dexamethasone CH, but was tolerant to betamethasone via SPT and intramuscular challenge. She deferred laryngeal intervention after initial VFI.

Conclusions:

To date, our case series is the first to highlight the significant challenges managing the difficult airway patient with IgE-mediated CH. In suspect cases allergy testing via SPT or IDT prior to surgical manipulation may provide opportunities for desensitization while others may require non-surgical alternatives.

Decreasing Bacterial Cross-Contamination with a Pulsating Nasal Irrigation Device

Mark Keen, MD; Philip Chen, MD; Peter-John Wormald, MD
Woodville South, SA, Australia

Background:

The use of nasal irrigation in the management of post-operative endoscopic sinus surgery (ESS) patients is commonplace, however, the potential contamination of these bottles is concerning. The Sinugator® cordless pulsating nasal wash (NeilMed Pharmaceuticals, Inc. Santa Rosa, CA) is a battery-operated, positive pressure, pulsatile pump with a unidirectional flow. The principle aim of this study was to determine the incidence of cross contamination using the pulsating nasal irrigation device and compare it with the traditional squeeze bottle.

Methods:

11 post ESS patients were given a NeilMed Sinugator nasal wash to use three times per day. A sterile nasal swab was obtained at the initial and second post-operative visits. A swab of the plastic irrigation reservoir was collected at the second visit.

Results:

The overall contamination rate of bottles was found to be 45%. During the study several different organisms were cultured in the nose and bottles. The most commonly isolated organisms were coliforms and S. aureus. We did not observe concomitant organisms in the nasal cultures and bottles in any subject.

Conclusion:

Despite using a motorized irrigation device, patients and their bottles grew positive cultures. Further, no cross-contamination between the patients and bottles was identified, which can be attributed to a design that minimizes backwash.

Deposition Patterns of Topical Nasal Sprays in Chronic Rhinosinusitis Before and After Surgery

Gitanjali Fleischman, MD; Dennis Frank, PhD; Charles Ebert, Jr; Adam Zanation, MD; Brent Senior, MD; Julia Kimbell, PhD
Chapel Hill, NC, USA

Introduction:

Topical nasal sprays are important in medically managing chronic rhinosinusitis (CRS). However, quantitative information is lacking on regional nasal deposition of sprayed particles both before and after functional endoscopic sinus surgery (FESS). Our goal was to estimate the effects of particle size on nasal spray deposition using computational fluid dynamics, to help achieve maximal therapeutic effect, both before and after surgery.

Methods:

Sinonasal cavities were reconstructed from pre- and post-FESS CT scans in a CRS patient. Transport of monodisperse particles (aerodynamic diameters 10, 20, 50μm) was simulated through the nasal cavity under typical spray conditions as follows: 1000 particles per size were released at 3m/s from 49 locations representing potential nozzle positions in the nasal vestibule, with steady-state inspiratory resting airflow present. Simulations did not include a spray nozzle, and results were aggregated across all release locations. Regional deposition was predicted in the nasal vestibule (NV) and ostiomeatal complex plus maxillary sinus (OMC).

Results:

Pre-FESS, as size increased from 10μm to 50μm, aggregated NV filtration increased from 1% to 95%, and aggregated OMC deposition decreased from 45% to 0%. Post-surgery, aggregated NV filtration increased from 1% to 72% as size increased from 10μm to 50μm, and aggregated OMC deposition was highest (38%) at 20μm.

Conclusion:

Large particles (50μm) were predicted to deposit in the anterior-most regions of the nasal cavity, especially pre-FESS. Reducing the peak aerosolized particle size to the 10-20μm range may allow for increased deposition in the OMC to achieve maximal therapeutic effect, both pre- and post-FESS.

Does Structured Histopathology Report Better Predict SNOT-22 Assessed Clinical Impression after Endoscopic Sinus Surgery (ESS)?

Devyani Lal, MD; Alexis Rounds, BS; Yu-Hui Chang, Ph.D; Matthew Zarka, MD; Matthew Rank, MD
Phoenix, AZ, USA

Background:

Structured histopathology has recently been reported to be an objective and indirect metric of the quality and severity of sinonasal inflammation. Criticisms of the structured report include intra-and inter-observer variability and clinical validity. Our aims were therefore:
1. Assess structured histopathology report in predicting response after ESS
2. Compare traditional versus structured histopathological report in predicting such outcome

Methods:

An IRB-approved retrospective review of patients who underwent ESS between November 2011 and July 2013 was conducted. When available, the following components of the histopathology report were populated: overall degree of inflammation, tissue eosinophilia, neutrophilic infiltrate, inflammatory cell predominance, basement membrane thickening, subepithelial edema, hyperplastic/papillary change, mucosal ulceration, squamous metaplasia, fibrosis, fungal elements, Charcot-Leyden crystals and eosinophil aggregates. SNOT-22 data (preoperative and post-ESS at 3 and 6 months) was correlated with traditional or structured histopathology.

Results:

Of 259 patients, structured histopathology reports were available in 62 (adopted universally in April 2013). The overall degree of reported inflammation was predictive of response from ESS. The detailed correlation of key histopathological variables to outcome will be presented. The standardized report was more consistently complete in reporting key inflammatory data. Of the 197 traditional reports, missing data included: overall degree of inflammation in 46 (23.35%), eosinophilic aggregates and Charcot-Leyden crystals in 186 (94.41%); fungal elements in160 (81.2%)

Conclusions:

Although the clinical significance of several components of the structured histopathology report is unknown, the structured report was found to more consistent in reporting several clinically relevant variables, and predictive of response after ESS.

Effect of Maximal Endoscopic Sinus Surgery Techniques on Patients with Asthmatic Refractory Chronic Rhinosinusitis

Zhenxiao Huang, MD,PhD; Ting Ye, MD; Qi Zhang, MD,PhD; Qian Huang, MD; Shunjiu Cui, MD; Bing Zhou, MD
Beijing, China

Introduction:

The maximal endoscopic sinus surgery technique (maximal technique) was designed to enlarge ostia of sinuses and to remove bone partition extensively. Maximal techniques, including endoscopic modified Lothrop procedure (EMLP), nasolazation, have been used as salvage procedures for severe CRS or failed endoscopic sinus surgery (ESS).

Objective:

The aim of this study was to examine the objective and subjective outcomes after maximal techniques for asthmatic refractory chronic rhinosinusitis (RCRS).

Study Design:

Retrospective study

Method:

We performed a retrospective analysis of 20 patients with asthmatic RCRS with nasal polyps after maximal techniques. Lund-Kennedy endoscopic score (LKES) and visual analogue scale (VAS) symptom score were used to measure outcome response to the maximal techniques. Patients were also evaluated with endoscopic examination of the sinonasal cavities.

Results:

The average time of follow up was 14.5 months and the mean of Lund-Mackay scores is 18.1 ± 3.8. The patients showed significant improvement of VAS symptoms after maximal techniques except for loss sense of smell. LKES decreased significantly from median of 10 preoperative to 4 postoperative ($P<0.001$).

Conclusions:

The maximal techniques combined with careful postoperative care and medical therapies have a positive effect on patients with RCRS.
Elevated Anti-neutrophil Cytoplasmic Antibody (ANCA) Titers are Associated with Increased

Healthcare Utilization and Poorer Surgical Outcomes in Patients with Granulomatosis with Polyangiitis (GPA)

Agnieszka Janisiewicz, MD; David Keschner, MD, JD; Randy Lehmer, MD; Karam Badran, BA; Ryan Leary, BA; Jivianne Lee, MD
Irvine, CA, USA

Background:

GPA is an autoimmune disease characterized by necrotizing granulomatous airway inflammation and vasculitis. Sinonasal involvement occurs in >80% cases, with ANCA titers used as a marker of disease severity. The purpose of this study was to determine if ANCA levels impact healthcare utilization and patient outcomes following endoscopic sinus surgery (ESS).

Methods:

A retrospective review was performed on all patients with GPA evaluated in a multidisciplinary rheumatologic/otolaryngologic clinic from 2008-2013. Data were collected with respect to age, gender, clinical presentation, ANCA titers, Lund-Mackay(LM) scores, surgical interventions, and healthcare utilization; the latter of which were determined by assessing the number of rheumatology/otolaryngology clinic visits, computed tomography(CT) scans, and email/telephone encounters.

Results:

44 GPA patients were identified, 11 male and 33 female. Sinonasal manifestations were evident in 70.4%, with chronic rhinosinusitis (41.9%), septal perforation (38.7%), and crusting (32.2%) the most common findings. 14(31.8%) underwent ESS. Patients with higher ANCA titers >1:80 demonstrated worse postoperative LM scores (mean,+12.67) compared to preoperative imaging. Increased healthcare utilization was also observed, with a statistically significant greater number of mean CT scans (2.92 versus 1.43, p=0.0326) and rheumatologic/ otolaryngologic resource utilization (mean, 121 versus 63.3, p=0.0099) seen in patients with ANCA titers >1:80 (n=28) versus <1:80 (n=16), respectively.

Conslusion:

GPA patients with higher presenting ANCA titers (>1:80) demonstrated significantly greater healthcare utilization than their lower ANCA level counterparts (<1:80) The former were also found to have worsening LM scores following surgery, suggesting that GPA patients with more extensive disease may be less likely to benefit from ESS.

Endoscopic Dacryocystorhinostomy for Sarcoidosis of the Nasolacrimal System

Aron Pollack, MD; Gady Har-El, MD
New York, NY, USA

Introduction:

Sarcoidosis of the lacrimal system is rare. Reports of external dacryocystorhinostomy (DCR) in patients with sarcoidosis involving the lacrimal system reveals an increased risk of failure. The purpose of this study is to evaluate the long term outcome of endoscopic DCR in patients with nasolacrimal duct obstruction (NLDO) secondary to sarcoidosis.

Methods:

Retrospective chart review of all patients with acquired NLDO secondary to sarcoidosis undergoing endoscopic DCR in one practice.

Results:

Four procedures in four patients were performed. The mean age was 48.8 (range 37 to 66). The presenting symptom in all cases was epiphora. All patients received at least one two-week trial of oral prednisone taper prior to surgery and were prescribed long term nasal steroids postoperatively. On long term follow-up (mean 52.4 months, range 4-144 months), all patients showed subjective and objective symptom resolution.

Conclusion:

Endoscopic DCR achieves excellent long term outcome in patients with NLDO secondary to sarcoidosis. Endoscopic DCR should be employed in these patients after failed medical therapy and/or canalicular intubation.

Endoscopic Dacryocystorhinostomy for the Management of Nasolacrimal Duct Obstruction Following Radioactive Iodine Thyroid Ablation

Nicole Hsu, MD; Sarah Van Tassel, MD; Kira Segal, MD; Gary Lelli, Jr, MD; Ashutosh Kacker, MBBS
New York, NY, USA

Objective:

Epiphora due to nasolacrimal duct obstruction (NLDO) has been previously described as an intermediate to late sequela of radioactive iodine (RAI) ablation for thyroid carcinoma. Endoscopic dacryocystorhinostomy (eDCR) for the treatment of NLDO has increased in popularity, yet the success and safety profile of eDCR for this patient population has not been evaluated.

Methods:

Medical records of patients age 18 or older who underwent eDCR performed jointly by the New York Presbyterian Hospital/Weill Cornell Medical Center Ophthalmology and Otolaryngology department between 2008 and 2013 with history of thyroid carcinoma treated with RAI ablation were retrospectively reviewed.

Results:

Five eDCR procedures were performed on 4 patients with a history of RAI ablation for thyroid carcinoma; one patient underwent bilateral eDCR. Patients were followed post-operatively for an average of 12.75 months. Two patients had history of prior DCR, and both developed recurrent epiphora. One had a post-operative course complicated by dacryocystitis treated with oral antibiotics and subsequent external DCR. The patient who underwent bilateral eDCR developed symptom recurrence unilaterally. Average time to recurrence of obstruction was 6 months.

Conclusion:

NLDO is an under-recognized complication of RAI ablation in thyroid cancer patients. While eDCR has emerged as a safe and effective method for treating NLDO, it has not been well evaluated in this patient population. This subgroup of patients may be more likely to experience recurrent symptoms after eDCR, but additional longitudinal and prospective studies are needed to evaluate the potential significance of this preliminary finding.

Endoscopic Dacryocystorhinostomy Without Mucosal Flap Preservation

Kevin McLaughlin, MD
Covington, LA, USA

Background:

The purpose of the study was to evaluate the outcomes of endoscopic dacryocystorhinostomy without mucosal flap preservation.

Methods:

Retrospective review of prospectively collected data on patients who underwent endoscopic DCR without mucosal flap preservation from June 2001 to January 2012. One hundred and sixteen procedures were performed for nasolacrimal duct obstruction. Patients presented with epiphora, dacryocele, and/or recurrent dacryocystitis. Main outcome measures were subjective resolution of symptoms and objective potency of DCR site.

Results:

One year follow-up was obtained on all patients. Symptom resolution was noted in 110/116 (95%). Objective patency confirmed in 115/116 (98%).

Conclusion:

Our results our comparable with previously published series and suggest that endoscopic DCR can be performed without preservation of mucosal flaps.

Transnasal Endoscopic Management of Central Skull Base Osteomyelitis

Alfred Marc Iloreta, MD; Jared Goldfarb, MS; Gurston Nyquist, MD; Christopher Farrell, MD; James Evans, MD; Marc Rosen, MD
Philadelphia, PA, USA

Background:

Skull base osteomyelitis (SBO) is a rare infectious condition most commonly presenting in elderly immunocompromised, diabetic patient populations. We present our series of nineteen patients with central skull base osteomyelitis including our management paradigm and a review of literature.

Design:

Retrospective chart review.

Results:

A total of 14 patients were identified. There were 11 male and 3 female patients. Ten patients were culture positive for staphylococcus, 3 for pseudomonas, 2 for aspergillus. 9 patients had eradication of disease, 9 patients needed repeat surgical procedures. Patients with a history of staphylococcus aureus infection had a higher percentage of treatment cure while patients with cultures positive for aspergillus fungal disease. Patients that had positive pseudomonas cultures had an average of 3.7 operative procedures, patients with positive aspergillus cultures had an average of 4 operative procedures, patients with positive staphylococcus cultures had an average of 1.8 operative procedures.

Conclusion:

Our experience suggests that central SBO is a distinct entity and disease process than SBO. A large proportion of patients had history of staphylococcal infection and in addition these patients had higher overall rate of cure when compared to patients with pseudomonas or fungal infections. Patients with staphylococcus positive cultures had a decreased need for subsequent operative debridements and resection. We believe patients with patients with history of pseudomonas infections, fungal infections and cranial nerve involvement are at higher risk of failing therapy and may need more aggressive surgical debridement. Mainstays of therapy remain to be surgical debridement and culture directed intravenous antibiotic/antimicrobial therapy.

Endoscopic Management of Rosai-Dorfman

Kevin McLaughlin, MD
Covington, LA, USA

Rosai-Dorfman disease, also known as sinus histiocytosis with massive lymphadenopathy, is a rare disorder of unknown etiology that is characterized by abundant histiocytes in the lymph nodes throughout the body and can present with nasal obstructive secondary to submucosal collections of histiocytes. Little is published concerning surgical management. We present a patient whose nasal lesions were managed with two techniques. One side with submucosal resection of obstructing lesions and the contralateral side without mucosal preservation. The patient has been followed for three years and serial postop endoscopic imaging is presented to illustrate the outcome for each technique.

Endoscopic Removal of Intra-Maxillary Sinus Dentigerous Cyst: A Case Report

Anthony Sheyn, MD; Joseph Seymour, MD; Adam Folbe, MD
Detroit, Michigan, USA

Introduction:

Dentigerous cysts are the most common odontogenic cysts, constituting 20% of all epithelial-lined cysts. They arise from the crown of impacted, unerupted or embedded teeth. 70% occur in the mandible and 30% occur in the maxilla. Dentigerous cysts contained within the maxillary sinus are very rare, with less than 25 cases reported in the literature. We present a case of a 53 year old man with intra-maxillary sinus dentigerous cyst removed via the endoscopic approach.

Case:

A 53 year old man presented to our office with a firm maxillary mass on left located in the gingivobuccal sulcus. On exam this appeared as a submucosal firm mass. On imaging a 3.8 cm cyst was noted in the left maxillary sinus originating from an unerupted third molar and expanding the surrounding bone. The patient subsequently underwent a endoscopic left medial maxillectomy to remove the mass. Frozen sections were sent intraoperatively to rule out malignancy and were returned as benign. We then proceeded with complete removal of the cyst wall lining and the offending third molar. Pathology results were consistent with an epithelial lined cyst.

Conclusion:
We present a rare case of an intra-maxillary sinus dentigerous cyst removed via an endoscopic approach. Typically, intra-maxillary cysts are removed via an intra-oral Caldwell-Luc approach. We believe that dentigerous cysts, while rare, should be in the differential for maxillary sinus lesions and can be safely and successfully removed via an endoscopic approach.

Endoscopic Resection of a Pediatric Congenital Clival Encephalocele

Carol Yan, MD; James Palmer, MD; John Lee, MD; Phillip Storm, MD; Nithin Adappa, MD
Philadelphia, PA, USA

Case Presentation:
A 21-month-old full-term female with multiple congenital problems presented at 2 months of age with progressive difficulty with oral feeding, respiratory distress, and seizures. Head CT and Brain MRI revealed hydrocephalus with no midline shift and a clival encephalocele measuring 1.2 x 3.6 cm extending through a dehiscence in the clivus in the region of the spheno-occipital suture with a large cystic component obstructing the nasopharynx and posterior oropharynx. Patient underwent a ventriculoperitoneal shunt, tracheostomy, and gastrostomy tube placement. Patient was referred at 20 months of age for surgical resection. She underwent endoscopic transnasal and transoral resection of the lesion off the pons and clivus. The mucosal defect was closed endoscopically with sutures. The patient was subsequently decannulated and able to commence oral feeding.

Discussion:
Encephaloceles are protrusions of brain parenchyma from failure of neural tube closure during fetal development. Pediatric clival encephalocele repair has only been previously reported once in the literature and due to size constraints, most resections of clival lesions are described using a mandibular osteotomy for transoral access. We describe the first case of a congenital encephalocele with complete nasopharyngeal and oropharyngeal obstruction causing respiratory and oral feeding issues subsequently resected entirely endoscopically through a combined transnasal and transoral approach. This case demonstrates the feasibility of performing this procedure safely with minimal morbidity despite the large nature of the clival defect and encephalocele.

Enhancing the Safety of Sinus Surgery: The Role of Staining Materials

William Yao, MD; Rachel Regone, MD; Masayoshi Takashima, MD
Houston, TX, USA

Objective:
Oxymetazoline, 1:100,000 lidocaine w/ epinephrine (lido+epi) and 1:1,000 epinephrine are all colorless solutions employed in sinus surgery. Since lido+epi is injected while others are not, care must be taken to label all solutions to avoid inadvertent injection of oxymetazoline or concentrated epinephrine because of life-threatening complications. Dyes have been utilized to color solutions for visual identification, but efficacy and cost have never been compared. We sought to determine the effectiveness of surgical marking pen (gentian violet) and fluorescein strips as coloring agents in mediums commonly used in sinus surgery.

Study design:
Experimental study

Methods:
Four liquid mediums (normal saline [NS], 0.05% oxymetazoline, 1:1,000 epinephrine and lido+epi) and two coloring agents (fluorescein strip and surgical marking pen) were combined separately. Photos and absorbances of each solution were obtained at 15-minute intervals over two-hours using a spectrophotometer.

Results:
Peak absorbance remained stable for all solutions with fluorescein. Absorbance also remained constant for NS (0.37AU->0.37AU) and oxymetazoline (2.8AU->2.8AU) mixed with marking pen. Absorbance decreased over 2 hours when marking pen was mixed with 1:1,000 epinephrine (0.82AU->0.32AU) and lido+epi (1.19AU->0.33AU). Furthermore, the majority of color visibility and absorbance decreased in the first 15 minutes for concentrated epinephrine (0.82->0.33) and lido+epi (1.19->0.51). Cost of fluorescein strips ($0.14-$0.20/strip) was less than marking pens ($13-46/pen).

Conclusion:
Compared to marking pen dye, solutions dyed with fluorescein retained its color and did not decay over time. We recommend fluorescein strips to label colorless materials in the operating room because of its lack of color decay and cost advantages.

Eosinophilic Fungal Rhinosinusitis Confined to the Nasal Cavities: a Case Report

Logan Rush, BA; Patrick Haas, MD; Scott Stringer, MD
Jackson, MS, USA

Introduction:

Eosinophilic Fungal Rhinosinusitis (EFRS) is a non-invasive fungal disease affecting immunocompetent hosts. EFRS is characterized by symptoms of chronic rhinosinusitis with findings of eosinophil rich allergic mucin, nasal polyps, and fungal elements on microscopy. Computed tomography (CT) typically reveals inspissated mucous of at least one paranasal sinus with nasal cavity disease centered predominantly in the middle meatus and the sphenoethmoidal recess. We present a case of EFRS confined to the bilateral and predominantly inferior nasal cavities without significant paranasal sinus involvement.

Methods:

Case report and literature review.

Results:

A 71-year-old male with Waldenstrom macroglobulinemia presented with chronic nasal obstruction. Exam demonstrated tenacious, golden mucin filling both nasal cavities and a polypoid unilateral inferior turbinate mass. CT scan demonstrated thick inspissated mucous in the inferior meatus bilaterally with near complete opacification of the nasal cavity. The paranasal sinuses were free of significant mucoperiosteal thickening. The mass was biopsied and the nasal cavities were debrided in the operating room. Microscopic examination revealed eosinophilic rich mucin and fungal elements without evidence of neoplasm. Budesonide irrigations and multiple in-office debridements were required to stop recurrence of the mucin plugs.

Conclusions:

This is the first report to demonstrate that EFRS may be confined to the nasal cavities without paranasal sinus involvement and result in complete nasal obstruction.

Epidemiology of the Complications of Acute Rhinosinusitis in the United States, 2010

Christopher Gouveia, MD; Charlesnika Evans, PhD; Rakesh Chandra, MD; Robert Kern, MD; Stephanie Shintani Smith, MD
Chicago, IL , USA

Introduction:

Despite the widespread availability of broad spectrum antibiotics and their likely overuse in the treatment of upper respiratory infections, the incidence of complications of acute rhinosinusitis (ARS) remains an important issue. There are no contemporary studies examining rates of ARS complications in the United States. This study aims to determine the national incidence of ARS complications among adults and describe associated management, outcomes, and sociodemographic factors.

Methods:

A representative sample of adult inpatient visits was extracted from the Healthcare Cost and Utilization Project (HCUP) Nationwide Inpatient Sample for 2010. Admissions associated with ARS were tabulated, as were associated procedures performed. Statistical analyses were conducted to analyze the data.

Results:

There were an estimated 1,690 admissions (60% male, unweighted N=336) for ARS complications. The mean age for males was lower than that for females (24.9 vs. 35.4 years, $p<0.01$). Means were as follows: length of stay, 7.1 days; charges, $62,000; procedure number, 2.8; and mortality, 0.6%. The highest proportion (31%) of admissions with ARS complications was in the lowest income quartile. Multiple procedures were performed for ARS complications, including otolaryngological (743 ± 82.51), neurosurgical (473 ± 56.14), and ophthalmological (392 ± 53.79).

Conclusions:

This study provides an overview of the incidence, management, and outcomes of complications of ARS among US adults. The low incidence of complications, and evidence of frequent antibiotic prescribing practices warrants further research to determine whether antibiotics reduce the frequency of ARS complications.:

Establishing Baseline Practice Regarding Perioperative Methods to Reduce Surgical Site Infections in Rhinologic Surgery

Erin Smith, MS; Scott Stringer, MD
Jackson, MS, USA

Introduction:
There is a paucity of information in the literature regarding the best practices to reduce surgical site infections associated with rhinologic surgery.

Methods:
We surveyed the American Rhinologic Society to assess current perioperative infection control measures performed for rhinologic procedures, with the goal of establishing a baseline of current practice.

Results:
Results revealed that for most rhinologic procedures performed in the operating room setting, the majority of physicians gown and drape in a sterile fashion and perform a complete surgical scrub of their hands and forearms but do not prep the facial skin with an antimicrobial agent. For rhinologic procedures performed in the office setting, the majority of physicians do not perform any of the aforementioned perioperative measures for any of the office procedures. Interestingly, for physicians that perform inferior turbinate reductions in both settings, 45% gown and drape in a sterile fashion and 28% perform a complete surgical scrub of their hands in the OR setting but not in the office setting. For endoscopic skull based procedures, the most stringent measures were performed, with over 90% of responders administering perioperative antibiotics, gowning and draping in a sterile fashion, and performing a complete surgical scrub of their hands. Despite lack of demonstrated benefit, antibiotics were used variably for the other procedures.

Conclusion:
This survey demonstrates that there is great variability in the perioperative measures rhinologists perform to reduce surgical site infection, which differs by the practice site. These data serve as a baseline for future studies.

Evolution of Sinonasal Quality of Life in Patients Undergoing Endoscopic Transsphenoidal Surgery

Jasmin Sahbaz, MS; Allan So, MS; Walter Hall, MD; Lawrence Chin, MD; Satish Krishnamurthy, MD, MCh; Parul Goyal, MD, MBA
Syracuse, NY, USA

Introduction:
Endoscopic transsphenoidal surgery has been used with greater frequency in recent decades. The purpose of this study was to analyze the evolution of postoperative sinonasal quality of life at short-term and long-term follow-up.

Methods:
A retrospective study was conducted on 36 patients undergoing transsphenoidal surgery. Sinonasal quality of life was measured using the Rhinosinusitis Outcomes Measure - 31 (RSOM-31) questionnaire preoperatively, at three weeks postoperatively, and at six months postoperatively.

Results:
The cohort's mean sinonasal quality of life score was a 31.39 preoperatively, decreasing to 28.90 ($p = 0.56$) at an average of three weeks postoperatively. In the cohort of individuals completing the long term follow up questionnaire, the RSOM-31 score was 20.64 ($p = 0.049$) at six months post operatively. Statistically significant improvements were seen in the sleep and general domains at the six month follow up. The average sleep domain scores improved from 6.12 to 3.36 ($p = 0.027$) and the average general domain scores improved from 8.36 to 4.54 ($p = 0.045$) at six months postoperatively.

Conclusion:
Endoscopic transsphenoidal skull base surgery results in overall improvement of long-term sinonasal quality of life. On short term follow up, patients did not have a significant change in their sinonasal quality of life compared to preoperatively. However, at long term follow up, patients reported a statistically significant improvement. These results suggest that transsphenoidal surgery does not lead to significant worsening of sinonasal symptoms in the immediate postoperative period. Over the long term, surgery improves sinonasal quality of life.

Extanodal Rosai-Dorfman Disease Masquerading as Sinonasal Polyposis

Brian D'Anza, MD; J. Greene, MD, FACS
Danville, PA, USA

Introduction/Methods:

Rosai-Dorfman disease is an idiopathic histoproliferative disorder that often manifests as massive lymphadenopathy, fever, and polyclonal hypergammaglobulinemia. The disease was first categorized based on its striking histopathological characteristics of marked proliferation of sinus histiocytes engorged with phagocytosed lymphocytes. Most commonly found in younger populations, it is typically benign and self-limiting. Isolated extranodal disease of the paranasal sinuses is rare and may be confused with inflammatory nasal polyposis. We highlight the characteristic endoscopic features and distinguishing histopathology of Rosai-Dorfman disease.

Results/Case Presentation:

A 57 year old male presented to our department with 2 years of progressive nasal congestion. Large obstructive polypoid masses were noted on intranasal exam. Biopsy was obtained which revealed tissue consistent with an inflammatory polyp. Operative endoscopic debridement revealed brown to yellow colored, rubbery, broad-based polyps attached to the septum and inferior turbinate mucosa, sparing the paranasal sinuses. Final pathology revealed marked plasmacytic and histiocytic infiltration consistent with Rosai-Dorfman disease.

Conclusions:

The case highlights endonasal findings of Rosai-Dorfman disease that distinguish it from inflammatory polyposis. Namely, the masses were broad-based and yellow to brown in appearance, lacking the edematous, glass-like quality seen in chronic sinusitis. Additionally, the polyps did not follow the typical pattern of inflammatory polyposis as the ethmoid and ostiomeatal complexes were spared. We believe this case illustrates the need for clinical acumen while relying on pathological samples to confirm the diagnosis. Our hope is that by describing some of the unique endoscopic findings we may help other clinicians recognize this unusual disease entity.

Facial Paresis Secondary to Acute Bacterial Rhinosinusitis

Arya Namin, BA; Mary S Czerny, MD; Jastin Antisdel, MD
Saint Louis, MO, USA

Background:

This is the first known reported case of cranial nerve (CN) seven paresis secondary to bacterial acute rhinosinusitis (ARS). A 59-year-old male presented to a tertiary care Emergency Department with a five-week history of right facial paresis and a more recent onset of ipsilateral severe headaches and facial numbness. Chronic medical conditions included hypothyroidism and poorly controlled diabetes mellitus.

Methods:

Physical exam was notable for right-sided chemosis and exophthalmos, purulent nasal secretions, right V2 hypoesthesia, and House-Brackmann III facial paresis. CT scan showed right-sided rhinosinusitis with erosion of the lamina papyracea and posterolateral wall of the maxillary sinus. There was evidence of an orbital abscess, as well as purulence extending into the infratemporal fossa with tracking to the stylomastoid foramen. The patient underwent right four-sinus endoscopic sinus surgery with transantral drainage of the infratemporal and orbital abscesses. The patient was initially treated with intravenous unasyn and vancomycin, fluticasone spray, saline irrigations, and erythromycin eye drops.

Results:

Frozen sections were negative for fungi, and culture grew coagulase-negative staphylococcus and enterococcus faecalis. He ultimately underwent several revision surgeries with long-term topical and parenteral antibiotics with improvement of orbital infection but without change in his facial paresis at four months.

Conclusions:

Bacterial ARS is not generally related with CN deficits, especially CN 7. This patient with major medical comorbitidies, who significantly delayed seeking treatment, illustrates a relationship between sinonasal and skull base pathology. This case serves to expand the differential diagnosis of facial nerve paresis.:

Frequency and Duration of Topical Nasal Budesonide Treatment Among Post-functional Endoscopic Sinus Surgery Cases at a Tertiary Rhinology Centre

Saad Alsaleh, MBBS FRCSC; Al-Rahim Habib, MSc; Jamil Manji, MSc; Ameen Amanian, BSc; Andrew Thamboo, MD; Amin Javer, MD FRCSC FARS
Vancouver, BC, Canada

Introduction:

Recent literature shows that chronic rhinosinusitis (CRS) patients treated with topical nasal budesonide for more than 60-days may be at risk of developing tertiary adrenal suppression. Our objective was to determine whether patients treated with budesonide for postoperative edema would fall within a safe treatment exposure period.

Methods:

This retrospective study reviewed charts of 293 CRS patients with or without nasal polyposis at a tertiary rhinology center. One hundred thirty (44.4%) patients with a history of bilateral FESS were included. Baseline characteristics, Lund-Mackay (LM) CT score, and use of budesonide were recorded. The study observation window spanned from postoperative day 1 to 100.

Results:

A total of 100/130 (76.9%) were prescribed topical budesonide at 33.3±12.2 days. Prescription of budesonide was associated with individuals receiving primary FESS (OR: 2.6, 95%CI: 1.1, 5.9) and was not associated with age, gender and LM score. All patients with preoperative polyposis (n=9) were prescribed budesonide postoperatively. Budesonide was required for 53.5±47.6 days in 6% of patients. The remainder (94%) continued to require budesonide beyond the observation period. Subjects with greater LM score were found to have longer usage of budesonide.

Conclusion:

The majority of patients undergoing FESS received topical nasal budesonide for control of their disease. The clinical indications for budesonide use tended to persist beyond 60-days, suggesting that these patients should be followed closely for symptoms of tertiary adrenal suppression. Safety guidelines for the postoperative use of topical nasal corticosteroids should be developed to ensure appropriate monitoring of this at-risk population.

Fungal Septal Abscess in an Immunocompetent Host

Rusha Patel, MD; Walter Merritt, MD; Richard Orlandi, MD
Salt Lake City, UT, USA

Introduction:

Fungal infections of the nasal cavity can range in presentation from benign entities in the general population, to invasive and destructive processes in immunocompromised hosts. We present a case of a fungal nasal septal abscess in an immunocompetent host following short-term oral steroid therapy.

Clinical Case:

A 51 year old women with a history of asthma requiring intermittent oral steroid therapy presented with bilateral maxillary sinusitis. She underwent endoscopic sinus surgery with intraoperative findings consistent with bilateral maxillary sinus mycetomas. Her post-operative course was complicated by an asthma flare a month after surgery requiring oral steroids. Five days after starting steroid treatment, the patient presented with nasal obstruction and exam an imaging showing a nasal septal abscess. Operative drainage was performed with cultures showing fungal elements. The abscess recurred and the patient was referred to our institution. She was taken to the operating room for drainage and placement of a catheter in the septal abscess cavity; 48 hours of amphotericin irrigations were performed through this site. Immune work-up, including HIV testing and immunoglobulin levels, was negative. Fungal cultures were identified as Scedosporium apiospermum, sensitive to voriconazle. The patient completed systemic therapy without further recurrence.

Conclusions:

Invasive sinonasal fungal infections can rarely occur in immunocompetent hosts. The use of oral steroids may have been a risk factor for development of an aggressive nasal septal fungal abscess in this patient. This is the first reported case of a nasal septal abscess due to Scedosporium apiospermum in an otherwise immunocompetent host.

Gene Network Analysis Identifies Functional Pathways Associated with Pediatric Chronic Rhinosinusitis

Michael Purkey, MD; Jin Li, PhD; Frank Mentch, PhD; Struan Grant, PhD; Hakon Hakonarson, MD, PhD; Elina Toskala, MD, PhD
Philadelphia, PA, USA

Chronic rhinosinusitis (CRS) has a strong genetic component as evidenced by family-based studies. A genetic predisposition is also supported by the fact that several syndromes with a clear genetic basis have CRS as a component of their phenotype. To identify novel genetic determinants of CRS, we conducted a genome-wide association study (GWAS) in a population of 230 African American and 598 Caucasian children. We then performed gene network analyses for each trait including all SNPs with a p-value < 10-3 from the individual GWAS. In the African American cohort, gene networks involved in B- and T-cell signaling (PI3K and iCOS, respectively), neutrophil (fMLP), and eosinophil (CCR3 signaling) activation were associated with CRS. In the Caucasian cohort SNPs in gene networks involved in T-cell signaling (iCOS and CD28 in Th cells) and regulation of interleukin 2 (IL-2) were found to be associated with a CRS phenotype. In this study, we have identified specific gene network pathways that are significantly associated with CRS at genome-wide significance.

Geographic and Temporal Trends in Frontal Sinus Surgery

Peter Svider, MD; Vibhav Sekhsaria, MD; David Cohen, MD; Jean Anderson Eloy, MD; Michael Setzen, MD; Adam Folbe, MD
Detroit, MI, USA

Objectives:

To evaluate geographic and temporal trends in frontal sinus surgery procedures.

Methods:

Medicare Part B data-files from 2000 to 2011 were examined for temporal trends in various frontal sinus procedures, and the most recent year containing geographic information (2010) was evaluated for CPT code utilization. Additionally, nationwide charges per procedure were recorded. Regional populations of individuals > 65 years old were obtained from the 2010 U.S. census, and surgical society websites were used to determine the number of practicing rhinologists and otolaryngologists in each region.

Results:

The use of open approaches declined by a third, while endoscopic procedures went from 6,463 to 19,262 annually, with the most marked increases occurring from 2006 through 2011. Geographic variation was noted, with practitioners in South Atlantic states performing the greatest number of endoscopic procedures in 2010, while East South Central states had the greatest number when controlling for population. There was an inverse relationship between endoscopic procedures performed and number of fellowship-trained rhinologists (controlling for regional populations)(R2=0.66). The first year frontal sinus ballooning had a unique CPT code reinforces decreased reimbursements for non-balloon endoscopic surgery ($609) relative to balloon approaches ($2,635).

Conclusions:

Declines in open frontal sinus surgery and marked increases in endoscopic approaches have potential implications for residency training. Potential reasons for marked increases in the latter include the rising popularity of balloon technologies, although this is speculative. Geographic variation exists in frontal sinus surgery patterns, including an inverse relationship between endoscopic approaches and the number of fellowship-trained rhinologists.

Gorham Stout Syndrome Presenting as a Sphenoid Mass: Case Report and Review of the Literature

Ashleigh Halderman, MD; Raj Sindwani, MD
Cleveland, OH, USA

Introduction:
Gorham Stout Syndrome is a rare, idiopathic disease of progressive osteolysis caused by the proliferation of vascular channels with adjacent soft tissue involvement. In later stages, the bone is replaced by fibrous connective tissue which eventually pneumatizes. It most commonly affects the shoulder and pelvis and can predispose to pathologic fractures. We present a unique case involving the spheno-clival region.

Methods:
Case report and literature review.

Results:
A sixty-six year old man was referred to neurosurgery for headaches and findings on CT scan of a soft tissue mass in the right spheno-clivus with extension to the petrous bone. Bone adjacent to the lesion and on the contralateral side was extensively pneumatized. An MRI was obtained and rhinology was consulted for evaluation of a sphenoid sinus neoplasm. The patient underwent an endoscopic sphenoidotomy and biopsy in the operating room. Pathology showed fibrous tissue with areas of hyalinization, no malignant or inflammatory cells were present. Based upon radiographic imaging and pathological findings, a diagnosis of Gorham's syndrome was made. Conservative management was recommended. He was counseled on his increased risk for major sequelae following head trauma, including major vascular disruption, intracranial injury, and CSF leak. The patient was followed with serial imaging which remained unchanged after 12 months.

Conclusions:
Gorham's disease can affect the sinonasal tract and can mimic neoplasia. Otolaryngologists should be aware of this peculiar fibro-osseous lesion and the potential serious sequelae of sinonasal involvement. These patients should be advised to avoid contact sports, and protect against head injury.

Gradenigo's Syndrome: Is Fusobacterium different? Two cases and Review of the Literature

Merav Heshin-Bekenstein, MD
Jerusalem, Israel, Israel

Gradenigo's syndrome is a rare but life threatening complication of acute otitis media (AOM), which includes a classic triad of otitis media, deep facial pain and ipsilateral abducens nerve paralysis. The incidence of Fusobacterium necrophorum infections, has increased in recent years. We describe two cases of Gradenigo's syndrome caused by F. necrophorum. Additional four cases were identified in review of the literature. Gradenigo's syndrome as well as other neurologic complications should be considered in cases of complicated acute otitis media. F. necrophorum should be empirically treated while awaiting culture results.

Hazards of Walking the Plank: A Case Report of Traumatic CSF Rhinorrhea

Aaron Thatcher, MD; Mark Zacharek, MD
Ann Arbor, MI , USA

Accidental traumatic cerebrospinal fluid (CSF) rhinorrhea can occur even with seemingly minor closed head injuries. The anatomy of the anterior skull base contributes to the vulnerability of this pathophysiology. Evaluation of CSF rhinorrhea is aimed at confirming CSF leak, identifying location and size of the skull base defect, and detecting any complications of CSF leak. Management is typically conservative with bedrest, and spontaneous resolution is common. The risks of persistent CSF leak include meningitis, brain abscess, and progressive pneumocephalus, however prophylactic antibiotics are controversial. We present a case report of a patient who sustained confirmed CSF rhinorrhea, as well as acute sinusitis and auricular cellulitis, from jumping 15 feet into a pool of water during a popular, muddy, high-intensity endurance obstacle course. CSF rhinorrhea spontaneously resolved with conservative measures; however his antibiotic treatment was complicated by Clostridium dificile colitis.

Health care Costs and Antibiotic Utilization Following Endoscopic Surgery for Chronic Rhinosinusitis

Patricia Purcell, MD; Sara Beck, MS;
Greg Davis, MD, MPH
Seattle, WA, USA

Purpose:

This study investigates how endoscopic sinus surgery (ESS) impacts health care-related costs and antibiotic utilization.

Methods:

Data were obtained from Marketscan databases, which contain claims information for millions of patients nationwide. Patients who underwent ESS in 2008 were identified. Health care costs and antibiotic prescription claims data were collected for 12 months prior to and 36 months after surgery and were evaluated in 6-month intervals.

Results:

The query identified 8,963 surgical patients in 2008. During 7-12 months prior to surgery, total health care-related costs were median $819.24. Costs increased to $9666.41 during 0-6 months prior to surgery and $9575.69 during 0-6 months after surgery; these values include costs of surgery. Total costs fell to median $1031.06 at 7-12 months after surgery, then became relatively stable totaling $990.40 at 13-18 months, $957.84 at 19-24 months, $936.06 at 25-30 months and $958.46 at 31-36 months. Average days of antibiotic usage totaled 8.3 days 7-12 months prior to surgery, increasing to 19.9 days at 0-6 months prior to surgery. Antibiotic duration trended downward to 14.2 days 0-6 months after surgery before stabilizing at approximately 8 days of average antibiotic usage per 6-month interval.

Conclusion:

This study, which is limited by being unable to consider the quality-of-life benefit of surgery, finds health care-related costs stabilized 1 year after surgery at a level slightly above the median total seen 7-12 months prior to surgery. In contrast, antibiotic utilization returned to baseline level after increasing in the 6 months before and after surgery.

Identification of Potential Risk Factors Associated with Development of Synechiae Following Functional Endoscopic Sinus Surgery

Saad Alsaleh, MBBS FRCSC; Jamil Manji, MSc;
Al-Rahim Habib, MSc; Ameen Amanian, BSc;
Andrew Thamboo, MD;
Amin Javer, MD FRCSC FARS
Vancouver, BC, Canada

Introduction:

Synechiae formation in the middle meatus is one of the most common complications of functional endoscopic sinus surgery (FESS). Our objectives were to determine the incidence of synechiae occurring in a cohort of patients who had undergone FESS, and to determine characteristics associated with development of synechiae postoperatively.

Methods:

This retrospective study examined CRS patients with or without nasal polyposis that had undergone bilateral FESS at a tertiary rhinology centre. All patients received middle meatal merocel spacers intraoperatively left in situ for six days and followed up in clinic at least once per month for the first three months following ESS.

Results:

130 cases receiving complete bilateral FESS were retrospectively reviewed. Twenty-five (19.2%) patients developed synechiae within an average of 41.0 ± 27.5 days post-FESS. Individuals receiving primary sinus surgery and nasal septal reconstruction were associated with the development of post-operative synechiae (OR: 4.5, 95%CI: 1.6,13.0; OR: 4.4, 95%CI: 1.4,13.8). Subject demographics and preoperative factors such as gender, age, nasal polyposis, Lund-Mackay CT score and endoscopic evidence of concha bullosa were not associated with the development of post-operative synechiae.

Conclusion:

Patients undergoing primary FESS and nasal septal reconstruction are at greater odds of developing synechiae than those having revision surgery and warrant careful postoperative evaluation. Possible methods of preventing synechiae formation in this population should be evaluated in future studies.

IL-17A Deficiency Induces Decreased Chemotactic Response to CCL7 in Eosinophils in Allergic Rhinitis Animal Model

Doo Hee Han, MD, PhD; Yoon-Seok Choi, MD; Yu-Lian Zhang, PhD; Jae-Cheul Ahn, MD; Il Gyu Kong, MD, PhD; Chae-Seo Rhee, MD, PhD
Seoul, Korea

Objectives:

The proinflammatory cytokine IL-17 is associated with eosinophil infiltration into nasal mucosa in a murine model of allergic rhinitis. The chemokine receptor CCR3, which is found on the surface of eosinophils; CCL7, a ligand of CCR3, induces chemotaxis of monocytes, eosinophils, basophils, NK cells and T lymphocytes. In this study we investigated suppressive role of IL-17 for eosinophil inflammation through CCL7/CCR3 pathway in experimental allergic rhinitis.

Methods:

IL-17A-deficient and wild-type mice were sensitized and challenged with ovalbumin to induce allergic rhinitis. Multiple parameters of allergic responses were evaluated and the mRNA and protein levels of CCL7 and CCR3 in nasal tissue and serum in the two groups were compared. The chemotactic response to CCL7 in bone marrow-derived eosinophils (bmEos) from WT and IL-17A-deficient mice was measured.

Results:

In the allergic rhinitis model, IL-17 deficiency can significantly decrease nasal symptoms, OVA-specific IgE in serum, and eosinophil infiltration and cytokine production in the nasal mucosa. The CCL7 and CCR3 mRNA and protein levels were decreased in the nasal mucosa of IL-17 KO mice. The bmEos from IL-17 KO mice showed a significantly decreased chemotactic response to 500 ng/ml CCL7.

Conclusion:

Suppression of nasal inflammation by IL-17 deficiency in allergic rhinitis is partly responsible for the regulation of CCL7 secretion and eosinophil infiltration, which may be regulated by the CCL7/CCR3 pathway.

Immediate and Delayed Complications Following Endoscopic Skull Base Surgery

Matthew Naunheim, MD, MBA; Ahmad Sedaghat, MD, PhD; Benjamin Bleier, MD; Eric Holbrook, MD; William Curry, MD; Stacey Gray, MD
Boston, MA, USA

Introduction:

The temporal distribution and resolution rate of post-operative complications from endoscopic skull base surgery is not well characterized.

Methods:

Retrospective review of sixty-one consecutive patients treated in a multidisciplinary skull base center who underwent endoscopic resection of paranasal sinus or skull base neoplasm. Post-operative complications were broadly categorized as CSF leak, pituitary, orbital, intracranial or sinonasal. Timing of post-operative complications was categorized as “peri-operative” if occurring within the first post-operative week, “early” if between one week and 6 months, and "delayed" if occurring after 6 months.

Results:

The most common tumor pathologies were pituitary macroadenomas (32.8%), craniopharyngioma (18.0%) and clival chordoma (13.1%). The most common peri-operative complications were diabetes insipidus (21.3%), decreased vision (3.3%) and CSF leak (3.3%), with resolution rates of 76.9%, 100% and 100%, respectively. Overall, CSF leak occurred in 9.8% of patients (all within 2 weeks of surgery) and resolved in all patients. 64.3% of all complications occurred within the first 2 weeks of surgery. Chronic rhinosinusitis (CRS) was the most common delayed complication, occurring in 3.3% of all patients. Resolution of complications was less likely if the complication was hypopituitarism (P=0.014, odds ratio [OR]=0.06) or if the complication developed later after surgery (P=0.080, OR=0.09).

Conclusions:

Monitoring of complications after endoscopic skull base surgery should focus on pituitary function, vision changes and CSF leak in the peri-operative period and development of CRS in the long term. Late-onset complications and hypopituitarism are less likely to resolve.

Impact of Educational Intervention on the Inter-rater Agreement of Nasal Endoscopy

Patrick Colley, MD; Jess Mace, MD, MPH; Madeleine Schaberg, MD, MPH; Timothy Smith, MD, MPH; Abtin Tabaee, MD
New York, NY, USA

Objective:

Nasal endoscopy is integral to the evaluation of sinonasal disorders. However, a standardized method of interpreting nasal endoscopy findings does not exist. Prior studies have shown significant variability in the inter-rater agreement of nasal endoscopy amongst practicing rhinologists. Standardizing the interpretation of nasal endoscopy findings is necessary to improve the inter-rater agreement of the procedure.

Methods:

11 otolaryngology residents completed grading forms for 8 digitally recorded nasal endoscopic examinations. An educational lecture reviewing nasal endoscopy interpretation was subsequently provided. The residents then completed grading forms for 8 different nasal endoscopic examinations. Inter-rate agreement amongst residents for the pre- and post-educational videos was calculated using the unweighted Fleiss' kappa statistic (Kf) and intra-class correlation agreement (ICC).

Results:

Inter-rater agreement amongst residents improved from a baseline level of fair (Kf range 0.21 - 0.4) to a post-educational level of moderate (Kf range 0.41 - 0.6) for the nasal endoscopy findings of middle meatus mucosa, middle turbinate mucosa, middle meatus discharge, sphenoethmoid recess mucosa, sphenoethmoid recess discharge and atypical lesions (ICC for all measures, $p<0.001$). The baseline level of agreement for nasal septum deviation was poor/fair and did not improve following educational intervention.

Conclusions:

This study demonstrates a low baseline level of inter-rater agreement of nasal endoscopy interpretation amongst otolaryngology residents. The majority of the characteristics that were evaluated improved following educational intervention. Given the importance of nasal endoscopy in rhinology, increased consensus and didactic education is necessary to improve the inter-rater agreement and clinical utility of the procedure.

Impact of Fungal Speciation on the Clinical Presentation of an Allergic Fungal Sinusitis Population

Jose Gurrola II, MD; Thomas Holmes, BS; Stilianos Kountakis, MD, PhD
Augusta, GA, USA

Introduction:

Many fungal species have been cultured from patients with allergic fungal sinusitis (AFS), however the impact of specific fugal speciation is not well documented. This study examines the impact of fungal speciation on the radiological and clinical outcome of patients presenting with AFS to a tertiary care facility.

Methods:

A total of 56 surgical patients were diagnosed with AFS from 2003-2013. Pathology reports, fungal cultures with speciation and preoperative and postoperative sinonasal outcomes test (SNOT-20) and nasal endoscopy scores were available for 24 of these patients. Evaluation of preoperative CT scan determined the Lund-Mackay score, level of osteitis and any erosive pattern on CT in each patient. Student's t-test was utilized for statistical analysis.

Results:

Thirteen of 24 (54.2%) patients grew Curvularia, 5(20.8%) grew Bipolaris, 2(8.3%) grew Aspergillus. Four of 24 patients (16.7%) grew Alternaria, Basidiomycete, Candida or Exserohilum, respectively. Patients with Curvularia had higher mean preoperative SNOT-20 scores compared to the non-Curvularia population (36 vs. 20, respectively $p = 0.046$). Patients presenting with Curvularia had higher endoscopy scores compared to those presenting with other fungal species (9 vs. 6, $p = 0.045$). Differences in Lund-Mackay CT scoring, level of bony osteitis and CT erosion findings between the Curvularia and non-Curvularia groups were not found to be statistically significant.

Conclusion:

Curvularia was the most frequently cultured fungal species in patients presenting with AFS in our study. The preoperative CT scores and preoperative endoscopic scores were greater in patients presenting with Curvularia compared to patients presenting with other fungal species.

Improvement of Diplopia after Balanced Three Walls Orbital Decompression for Graves' Orbitopathy

Chadi Makary, MD; Justin Douglas, MD; John Nguyen, MD; Hassan Ramadan, MD
Morgantown, WV, USA

Introduction:

Graves' orbitopathy results in orbital fat and muscle hypertrophy leading to proptosis, compressive optic neuropathy, and diplopia. Multiple techniques for orbital decompression have been described. Balanced decompression is the most widely used. The goal of this study is to evaluate the risk of diplopia after balanced three walls orbital decompression.

Methods:

We retrospectively reviewed the charts of patients who underwent orbital decompression for Graves' orbitopathy between January 2010 and March 2013. All surgeries were performed by the same oculoplastic surgeon (lateral wall decompression) and the same otolaryngologist (medial and inferior endoscopic decompression). The vertical buttress of the maxillary sinus was resected, but no orbital fat was removed.

Results:

43 orbital decompressions (29 patients) were performed. One patient was lost to follow up and hence was excluded. The mean age was 56 year-old. The incidence of new onset post-operative diplopia was 20%. However, among patients who had pre-operative diplopia, 43.8% had resolution of their diplopia post-operatively. The mean reduction in proptosis was 5.0 mm. No worsening vision, vision loss or increased intraocular pressure was encountered.

Conclusion:

Balanced lateral, medial and inferior orbital decompression can result in resolution of pre-existing diplopia in Graves' orbitopathy while allowing for significant reduction in proptosis.

Inter-rater and Intra-rater Reliability of Boezaart Staging for Endoscopic Sinus Surgery Based on Training

Warren Mullings, MD; Saad Alsaleh, MBBS; Jamil Manji, MSc; Al-Rahim Habib, MSc; Andrew Thamboo, MD; Amin Javer, MD FRCSC FARS
Vancouver, BC, Canada

Introduction:

The Boezaart endoscopic field-of-view grading system is the most commonly used measure of bleeding during endoscopic sinus surgery (ESS). However, this scale may be influenced by the observers' level of training. Our objective was to determine the inter-rater and intra-rater observer reliability of the Boezaart scoring system among otorhinolaryngology learners at different levels of training.

Methods:

115 videos were extracted from a total of 23 ESS cases performed between January and February 2013 at a tertiary rhinology centre. Five 10-second videos were randomly selected from each surgery. Videos were retrospectively scored twice, two months apart, using the Boezaart scoring system by a staff rhinologist, a rhinology fellow, a senior otorhinolaryngology resident, a junior otorhinolaryngology resident, and a medical student.

Results:

The overall inter-rater agreement between the staff rhinologist and fellow was 0.32 (95%CI: 0.21, 0.44) suggesting fair agreement for the Boezaart scoring system. Kappa values appeared consistent when agreement was compared between the staff rhinologist and each learner: senior otorhinolaryngology resident (0.35; 95%CI: 0.24, 0.46), junior resident (0.39; 95CI%: 0.28, 0.50), medical student (0.34; 95%CI; 0.22, 0.46). Intra-rater data showed moderate to fair reliability between first and second evaluations for each rater (kappa values between 0.55 and 0.22). Intra-rater reliability appeared highest for the staff rhinologist (0.56; 95%CI: 0.46, 0.66).

Conclusion:

Our results suggest that the Boezaart grading system has only fair to moderate inter-rater and intra-rater reliability between different levels of clinical training. These results support the development of an improved endoscopic field of view grading system.

Intranasal Eosinophilic Angiocentric Fibrosis and Granuloma Faciale - Case Report and Literature Review

Krupal PAtel, BSc (Hon), MD; Brett Wherli, MD, FRCPC; Corey Moore, MD, MSc, FRCSC; Leigh Sowerby, BSc (Hon), MD, FRCSC
London, Ontario. Canada

Background:

Eosinophilic Angiocentric Fibrosis (EAF) is a rare condition of unknown etiology, and has been reported in association with Granuloma Faciale (GF). EAF typically presents in young to middle-aged females as progressive upper airway obstruction and is often missed as a diagnosis in surgical failures in Rhinoplasty. Both EAF and GF have recently been associated with IgG4-systemic related diseases as well.

Materials and Methods:

A case of EAF with GF is presented in this paper. The patient had a history of a failed septoplasty with subsequent septal perforation and 2 previous failed rhinoplasties. Her primary complaint was nasal obstruction, with Rhinomanometry values in the high 40s. Diagnosis was made on clinical suspicion and on biopsy results. A comprehensive literature review was subsequently performed.

Results:

Patient had the areas of lesion causing obstruction resected with a satisfactory result in nasal obstruction. Systematic review of the literature identified a total of 55 previously reported cases of EAF, with one-third of cases having concurrent GF. Majority of the cases present with lesions originating from the nasal septum and may involve the lateral nasal wall and sinuses. Treatment is particularly challenging, with the primary modality of choice being surgical resection of the lesion. Many different agents have been tried for medical therapy, but none have been universally successful.

Conclusion:

EAF is a particularly challenging disease to treat, and can be an underlying cause for failure in Rhinoplasty. A high index of suspicion is necessary for diagnosis, as treatment largely consists of complete surgical excision.

Inverted Papilloma of the Sphenoid Sinus: Risk Factors for Disease Recurrence

Christopher Thompson, MD; Jeffrey Suh, MD; Alexander Chiu, MD; VIjay Ramakrishnan, MD; James Palmer, MD
Los Angeles, CA, USA

Introduction:

Inverted papilloma (IP) of the sphenoid sinus can be more difficult to treat compared to other sites in the nasal cavity and paranasal sinuses. Identifying the attachment site and achieving complete surgical extirpation can be challenging. Our objective is to illustrate the presentation, management, and risk factors for disease recurrence for IP within the sphenoid sinus.

Methods:

A multi-institutional, retrospective review of endoscopic resections of IP based within the sphenoid sinus was performed. Charts were reviewed for demographic data, operative technique, IP attachment sites within the sphenoid sinus, complications, and postoperative follow-up.

Results:

Twenty-four patients underwent endoscopic resection of sphenoid sinus IP between 1996-2013. Median follow-up was 31-months. Seven patients suffered recurrences. All had further endoscopic resections except one patient, who underwent midfacial degloving with medial maxillectomy and microscopic transsphenoidal resection of tumor. Median time to recurrence was 22-months. IP attachment site was identified in 21 patients (92%). Having multiple tumor attachment sites, or having IP pedicled over the carotid artery or optic nerve, are significant risk factors for recurrence. There were 3 intraoperative complications including CSF leak (n=2) and cavernous sinus bleeding (n=1) without long-term adverse outcomes. Nasal obstruction was the main presenting symptom (33%).

Conclusion:

Treatment of sphenoid sinus IP is associated with a higher rate of recurrence than IP treated at other sites. Preoperative radiologic and intraoperative assessment is critical to reduce the risk of carotid artery and optic nerve injuries. Close surveillance is essential, especially for IP based on the carotid artery and optic nerve.

Is Anterior Turbinate Reduction More Effective Than Posterior? - A Follow-Up CFD Study

Thomas Lee, MD; Lesenia Santiago, high school; Parul Goyal, MD; Kai Zhao, PhD
Richmond, VA, USA

Background:

Inferior turbinate reduction (ITR) is commonly performed anteriorly for the treatment of nasal obstruction, where it is thought to be most effective. We have previously reported (2 cases) that the most effective partial ITR may depend on individual patient anatomy. The objective of this study was to continue use computational fluid dynamics (CFD) analysis to evaluate the nasal resistance (NR) changes after reduction along different portions of the inferior turbinate.

Methods:

Five patients were enrolled. Seven CFD models were created for each patient based on CT: 1 unaltered and 6 various ITR, including: Anterior, middle, and posterior one-third ITR; anterior and posterior two thirds ITR; and full-length ITR models. Total 35 models were simulated to obtain left and right NR.

Results:

Full-length ITR were consistently most effective to improve NR for all patients, adjusted for the volume removed. Surprisingly, for three out of five patients (7 out-of 10 sides), anterior ITR is not the most effective locations. For one patient, the outcome for left and right side is reversed. These variations, along with the strong linear regressions that were found between flow and nasal volume changes, may indicate that the entire length of the IT has a functional impact on nasal airflow and resistance, however, the most effective partial ITR location is highly variable between individuals.

Conclusion:

Contrary to the common belief, the location of the most effective partial ITR is highly variable between individuals. Future personal preoperative planning may improve surgical outcome.

Is Transillumination as Predictive as CT Image Guidance at Confirming Device Access of the Frontal Sinus?

Robert Glatz, MD
McAllen, TX , USA

Background:

Transillumination of the frontal sinus to confirm transnasal balloon device position prior to sinus dilation is commonly used. This study measured the accuracy of using transillumination and of CT Image Guidance (IGS) probes to confirm device tip location in the frontal sinus.

Methods:

Sixteen cadaveric specimens (32 frontal sinuses) were prepared by cutting a window through the posterolateral wall of the frontal sinus for transfrontal endoscopic visualization of the ostium. Frontal sinus access was randomized to a malleable balloon device with transillumination or rigid probe with IGS. Physicians blinded to transfrontal views used endoscopic visualization during transnasal access to the frontal sinus and reported their confidence (0=none, 4=very) at entering the sinus. Two observers, using the transfrontal view of the frontal sinus ostium, recorded ostial cannulation success/failure.

Results:

Access to the frontal sinus was successful in 30 of 32 attempts (94%) using the balloon device with transillumination and in 29 of 32 attempts (91%) using IGS. When physician confidence at entering the frontal was rated a 4, this correctly predicted frontal cannulation in 29 of 29 instances with transillumination and in 27 of 28 instances with IGS. When physicians were not "very confident", transillumination correctly indicated device placement was not in the frontal sinus in 2 of 3 cannulation attempts, and IGS was correct in 2 of 4 attempts.

Conclusion:

Access to the frontal sinus using transillumination is as effective as IGS. With both technologies, the positive predictive value of device placement in the frontal sinus is very high.

Long-term Effectiveness of Balloon Catheter Sinuplasty in the Pediatric Population.

Herman Lam, MD; Hassan Ramadan, MD, MSC
Morgantown, WV, USA

Introduction:

Chronic rhinosinusitis (CRS) is one of the most common diseases affecting the general population. In the United States, $1.8 billion is spent on CRS in children under 12 years of age annually. A majority of children will improve with medical therapy however when symptoms persist despite maximal medical management, surgical intervention is indicated. Adenoidectomy is currently the first-line surgical intervention followed by endoscopic sinus surgery (ESS). Although complication rates are low, serious complications can occur. Balloon catheter sinuplasty (BCS) was introduced in 2005. It has been proven to be effective for CRS in children and adults; however long-term success of BCS has not been clearly established especially in children. The purpose of this review was to study the long-term effectiveness of BCS for CRS in children.

Method:

A retrospective review of BCS performed on children age 12 and under between August 2006 and March 2011 for CRS at West Virginia University. Recorded variables included: gender, asthma, allergies and Lund-Mackay CT scores. Outcome was assessed by the need for revision surgery with at least 3 years of follow-up.

Results:

Sixty-two patients were reviewed. The age range was 2 to 12 years (mean, 6.4 years) and mean Lund-Mackay score was 7.8. Eight individuals (12.9%) required revision surgery. All failures had Lund-Mackay score of 5 and above. Asthma, allergy or gender did not show any statistical significant impact on outcome.

Conclusion:

BCS offers an effective long-term treatment for pediatric CRS with high success rate and reduced risk of complications compared to ESS.

Markers of Increased Aeration in the Paranasal Sinuses and Along the Skull Base: Association between Anatomic Variants

Shruthi Rereddy, Med. St.; David Johnson, MD; Sarah Wise, MD, MS
Atlanta, GA, USA

Background:

Substantial variation may be present in paranasal sinus pneumatization across patients and between right and left sides. Patients with extensive sinus aeration, especially along the skull base, often have protrusion of critical structures into the pneumatized sinus cavities, potentially placing these structures at risk during sinus surgery. This study aimed to evaluate associations between specific anatomic markers of increased paranasal sinus pneumatization and aeration along the skull base to determine if the presence of certain markers predicted other critical anatomic variants.

Methods:

Submillimeter axial CT scans and associated triplanar reconstructions from one hundred subjects were reviewed for the presence of 22 anatomic variants by two separate evaluators. Twelve of these variants were selected as markers of increased pneumatization. Average numbers of markers were compared with t-tests; associations between markers were evaluated by McNemar's test and kappa statistics. The Holm-Bonferroni method was used to correct for multiple tests.

Results:

Five anatomic variants were associated with increased paranasal sinus pneumatization, as defined by total number of markers of pneumatization: anterior ethmoid artery below the skull base, dehiscent/protruding internal carotid artery, dehiscent/protruding optic nerve, pneumatized pterygoid recess, and middle turbinate concha bullosa (all $p<0.02$). Moderate, statistically significant associations were found between Onodi cells and anterior ethmoid arteries below the skull base (kappa=0.1152, $p<0.0001$), and pneumatized uncinate process and middle turbinate concha bullosa (kappa=0.1395, $p=0.0012$).

Conclusion:

The markers of increased pneumatization and anatomic associations identified in this study have important implications for surgeons planning and undertaking operative approaches in and around the sinuses.

Maxillary Sinus Pseudoaneurysm Following Blunt Facial Trauma

Brook McConnell, MD; Vijay Ramakrishnan, MD
Aurora, CO, USA

Pseudoaneurysms of the internal maxillary artery (IMA) and its terminal branches are rare occurrences, usually described as a complication of penetrating trauma, sinus surgery, or orthognathic surgery. Less commonly, these pseudoaneurysms occur as a result of blunt facial trauma, where condylar fractures are the most common associated injury. Only one prior report of an IMA pseudoaneurysm resulting from maxillary sinus trauma has been previously described. The following is a case report of a traumatic maxillary sinus pseudoaneurysm in a 76 year-old male with a history of a non-displaced maxillary sinus fracture initially presenting with 26 days of intermittent, large volume epistaxis and significant decrease in hemoglobin level requiring transfusion. Initial endoscopic evaluation revealed a bulging, pulsatile medial maxillary wall, and subsequent maxillary antrostomy yielded large volume arterial bleeding from within the maxillary sinus controlled temporarily with nasal packing. Subsequent angiography revealed sphenopalatine artery transection with contrast extravasation into the maxillary sinus. The injured vessel was successfully embolized without further bleeding. Although this is a rare complication of blunt facial trauma, it reinforces the utility of embolization for minimally invasive and selective control of bleeding from IMA pseudoaneurysms.

Metastatic Basaloid Squamous Cell Carcinoma from the Nasal Septum to Lung and Local Recurrence

Jon Vanderweele, DO; Holly Rataiczak, DO; Esther Kim, MD
Bethesda, MD, USA

Introduction:

Basaloid squamous cell carcinoma (BSCC) is a highly aggressive variant of squamous cell carcinoma. Most often found in the larynx, hypo-pharynx, tonsils, and base of tongue, BSCC of the sinonasal tract is rare.

Methods:

Case report and literature review

Results:

A 55 year-old male was referred for nasal congestion and epistaxis. Clinical endoscopy revealed a large, obstructing right nasal mass, which was biopsied and determined to be BSCC. PET/CT imaging suggested focal area of growth, without evidence of lymphadenopathy or metastasis. Endoscopic tumor excision of the right nasal septum was performed with one cm margins. Two years after being disease free, a surveillance PET/CT revealed a solitary 1.3cm mass in the left upper pulmonary lobe. The mass was surgically resected and found to be BSCC. Six weeks after pulmonary wedge resection, a planning PET/CT was performed for chemotherapy that revealed an new area of hypermetabolic activity in the left nasal cavity. Repeat endoscopic tumor excision was performed of the nasal septum. BSSC was again diagnosed by microscopic and immunohistochemical analysis. Patient has recently completed course of radiation and chemotherapy and is doing well.

Conclusions:

BSCC is a distinct clinical and pathological entity that displays an aggressive pattern of behavior. Although rarely found in the sinonasal tract, it should be included in the differential for intranasal tumors. Our experience with this case suggests that prolonged surveillance may be helpful in detecting local recurrence and metastasis. Further study is needed to determine the most beneficial adjuvant treatment regimen and surveillance protocol.

Microbial DNA analysis of Sinus Purulence: Advantages and Disadvantages Compared to Standard Microbiology

Adam Rourke, DO; Adil Fatakia, MD; Alla Solyar, MD; Jeb Justice, MD; Brent Senior, MD; Donald Lanza, MD
St. Petersburg, FL, USA

Objectives:
Compare standard sinus cultures(SSCult.) results from purulence with data from commercially available microbial DNA test that genetically identifies microbes.

Study Design:
Retrospective, case-series

Methods:
Sinus purulence from 100 consecutive patients in a tertiary Rhinology practice between May-July of 2013 was evaluated. All SSCult. were sent for gram stain, aerobic bacteria, fungal organisms and microbial DNA sequencing. In 26 SSCult. anaerobic bacteria were also sought. Predominant organisms, resistance profiles and the detection of anaerobes were compared between technologies.

Results:
Of the 100 SSCult., DNA microarray provided identical, enhanced and inferior data 8%, 82%, and 10% of the time, respectively. The mean number of bacteria and fungus/specimen on SSCult. was 1.03 and 0.49, respectively. On DNA microarray, the mean number of bacteria and fungus/specimen was 3.64 and 1.29, respectively. The predominant organisms on DNA microarray and standard culture were identical in 58% of the specimens. Quinolone resistance could not be tested by DNA microarray. Methicillin resistance was shown in 14% of standard cultures and 26% of DNA microarray cultures. None of the 74 aerobic SSCult. produced anaerobes but 12 (16%) of these had anaerobes on DNA evaluation. Of the 26 anaerobic SSCult., 13 (50%) were positive for anaerobes. Only 5/13 (38%) anaerobes on SSCult. were positive on DNA microarray.

Middle Turbinate Resection in Chronic Rhinosinusitis with Nasal Polyposis Requiring Recurrent Surgery

Jon Dautremont, MD; Brad Mechor, MD
Calgary, Alberta, Canada

Introduction:
Management of the middle turbinate in patients undergoing recurrent functional endoscopic sinus surgery (FESS) for chronic rhinosinusitis with nasal polyposis (CRSwNP) is controversial. The turbinate is commonly involved with, and may contribute to, inflamed mucosa and polyp formation. Resection of turbinates may increase the risk of empty nose syndrome among other adverse outcomes. We hypothesized that resection of the middle turbinate in CRSwNP patients that had undergone prior FESS procedures would reduce the need for recurrent surgery without impacting postoperative quality of life (QOL) improvement compared to previous turbinate-preservation surgery.

Methods:
A non-blinded prospective study in which patients with medically-refractory CRSwNP who had undergone previous FESS with middle turbinate preservation elected to undergo revision FESS with middle turbinate resection. Postoperative outcomes from this group were compared to outcomes collected following prior turbinate-preserving surgery. Primary outcome was subjective QOL 2-months postoperatively using the SNOT-22 questionnaire. Secondary outcome was the need for further revision surgery.

Results:
Thirty-nine patients were included in the study. Patients had undergone a mean of 2.2 prior FESS procedures. 3 of 39 patients (7.7 %) have required recurrent surgical intervention since middle turbinate resection. Mean improvement in SNOT-22 score was 37.8 following FESS with turbinate resection and 31.6 following FESS with turbinate preservation (p=0.361). There was no significant difference in nasal obstruction symptom scores (p=0.441).

Conclusions:
Patients with CRSwNP who have required recurrent FESS may benefit from reduced disease recurrence following middle turbinate resection, without reduction in postoperative QOL measures, including subjective nasal obstruction sensation.

Nasal Microvasculature Changes during Continuous Flow Left Ventricular Assist Device (CF-LVAD) Support and Implications on Epistaxis

Patricia Loftus, MD; Alexis Jackman, MD; Nad F, MD; Sampath Gunda, MD; Snehal Patel, MD
Bronx, NY, USA

Introduction:

Higher rates of epistaxis have been identified in heart failure patients after implantation of continuous-flow left ventricular assist devices (CF-LVAD) as compared to the older pulsatile-flow LVAD version. We sought to characterize the effect of this continuous-flow system on the nasal mucosa of CF-LVAD patients.

Methods:

An IRB-approved cross-sectional study was performed to evaluate the nasal mucosa of 15 CF-LVAD patients and 6 heart failure patients without CF-LVAD using both rigid and flexible nasal endoscopy. Patients were recruited from the LVAD clinic at the authors' institution.

Results:

All patients were maintained on both aspirin and warfarin (within guideline INR) at the time of endoscopy. Of the 15 CF-LVAD patients, 14(93.3%) subjects showed nasal crusting or old hemorrhage sites and 8(53.3%) subjects demonstrated areas of dilated microvasculature on nasal endoscopy, all suggesting previous or potential sites of epistaxis. Of the 6 pre-LVAD heart failure patients, 1(16.7%) subject showed evidence of nasal crusting/previous hemorrhage site and 2(33.3%) subjects demonstrated dilated endonasal microvasculature.

Conclusions:

93.3% of CF-LVAD subjects demonstrated abnormal endonasal microvasculature as compared to only 50.0% in the heart failure without CF-LVAD group. The likely mechanism of these changes includes reduced vessel pulsatility in subjects with a CF-LVAD leading to vessel distention, and decreased nasal mucosal perfusion resulting in unregulated angiogenesis(1,2). These findings not only alert otolaryngologists to the increased risk of epistaxis in CF-LVAD patients, but also help further define the mechanism of nasal mucosa changes at the microvasculature level in all epistaxis patients.

Nasal Mucosal Contact Point and Association with Headache and Facial Pain

Joshua Levy, MD; Michael Marino, MD; Knight Worley, MD
New Orleans, LA, USA

Introduction:

There has been considerable investigation into nasal mucosal contact points as a potential etiology for headache and facial pain. Nevertheless controversy remains on whether contact of septal mucosa into nasal sidewall structures represents a source of headache. We reviewed patients in our practice undergoing isolated septoplasty in order to determine if there was an association between nasal contact point and reported headache and facial pain.

Methods:

A retrospective review of 69 patients undergoing septoplasty was completed. Patients with comorbid conditions for headache and facial pain were excluded, resulting in a study group of 32 patients. Chart review was undertaken to determine preoperative complaint of headache or facial pain in addition to intraoperative finding of mucosal contact point, and if present, the contact location (middle/inferior turbinate or nasal sidewall).

Results:

Contingency analysis was performed using Fischer Exact Test in order to determine statistically significant association of mucosal contact point with subjective complaint of headache or facial pain. The presence of a mucosal contact point was found to be associated with preoperative subjective complaint of headache or facial pain ($p = 0.013$). A statistically significant association could not be made between contact point location and facial pain or headache ($p = 0.366$).

Conclusions:

Nasal mucosal contact point is associated with a subjective complaint of headache or facial pain. This association achieves statistical significance by Fischer Exact Test in our study group. We believe that isolated nasal mucosal contact point ought to be considered as a source for headache or facial pain.

Nasal Whistling - A Novel and Debilitating Complication of Endonasal Surgery

Lucas Bryant, MD; Yuxiang Wen, BS; Edmund Pribitkin, MD
Philadelphia, PA, USA

Objectives:
Describe a post-operative complication of nasal whistling not due to septal perforation.

Introduction:
There are several reports discussing patients with audible nasal airflow symptoms after undergoing endonasal surgery. These patient's symptoms were typically found to be from the development of a septal perforation. Nasal whistling has never been previously described as the result of airflow changes following injury to the uncinate in a patient without septal perforation.

Case:
A patient presented after undergoing septoplasty and turbinectomy for chronic sinusitis. Her post-operative course was complicated by an audible whistling noise when breathing through the left side of her nose. The whistling resulted in significant sleep disturbance for the patient. Examination revealed a perforation of the mid-portion of the left uncinate. Computed tomography failed to reveal any other potential sources of whistling.

Methods:
A Pub Med literature search was performed for cases of nasal whistling after endonasal or sinus surgery.

Results:
The patient's symptoms completely resolved after uncinectomy, anterior ethmoidectomy and maxillary antrostomy. No previous cases of nasal whistling secondary to uncinate perforation have been described in medical literature. Airflow directed against the lip of an uncinate perforation can produce a whistling noise in the same manner that airflow through a whistle causes an audible sound via the oscillatory pattern of airflow that is created.

Conclusions:
Nasal whistling may occur secondary to a perforation of the uncinate and care must be taken during endonasal sugery to prevent such an injury. Such whistling can be eliminated through an uncinectomy.

Neurofibroma of the Sinonasal Cavity: Case Report and Review of Literature

Minhui (Laura) Kim, BSc, MSc; Jonathan Yip, MD; Kimberley Higgins, BSc; John Lee, MD, FRCSC, MSc
Toronto, Ontario, Canada

Background:
Neurofibromas are slow-growing, benign tumors of neuroectodermal origin arising from non-myelinating Schwann cells. These tumors can arise in any part of the body, occurring as either a solitary lesion or as part of a generalized syndrome of neurofibromatosis. Neurofibromas of the nose and paranasal sinuses are typically solitary and are extremely rare.

Methods:
This is a case report of a neurofibroma arising from the right sinonasal cavity with extension to the skull base. A review of the literature and discussion of the presentation, histopathology, investigations and management of this condition was performed.

Results:
A 50-year-old East Asian female was referred for assessment of a large right sinonasal mass. Investigations includiong a CT and MRI revealed a 4.2 x 2.5 x 4.1 cm, vascular, soft tissue mass occupying the right sinonasal cavity, extending to the skull base and causing bony remodeling. Complete endoscopic surgical excision was successful with no evidence of recurrence at one year post-operatively. There are 21 cases reported in the English literature to this date.

Conclusions:
Sinonasal neurofibromas are rare benign peripheral nerve tumors that require histopathological examination for definitive diagnosis. Distinguishing this unencapsulated tumor from schwannomas is important, as neurofibromas carry a risk of malignant transformation.

Non-hybrid Balloon Sinuplasty to Compress a Type III Frontal Cell for the Treatment of Chronic Frontal Sinusitis

Duc Tien, MD; Troy Woodard, MD
Cleveland, OH, USA

Introduction:

Aberrant frontal sinus cells commonly cause obstruction of the frontal sinus tract which can lead to chronic rhinosinusitis (CRS). Treatment of this blockage typically involves surgical removal of the bony cell walls to reestablish the drainage pathway of the frontal sinus. In this case study, we present the application of non-hybrid balloon dilation of the frontal sinus outflow tract to compress a Type III frontal cell.

Methods:

Case study of a 54 year old female presenting with chronic sinusitis with nasal polyposis and recalcitrant left frontal sinus disease.

Results:

The patient presented to our clinic with recalcitrant CRS after previously undergoing several endoscopic sinus surgeries. Pre-operative computerized tomography (CT) sinus scan demonstrated complete opacification of the frontal sinus with a left Type III cell. The patient was taken to the operating room for revision functional endoscopic sinus surgery and non-hybrid balloon sinuplasty of the left frontal outflow tract with compression of a left Type III frontal sinus cell. The patient had significant relief of her sinus symptoms and a post-operative CT sinus scan demonstrated collapse of the Type III frontal cell and a patent frontal drainage pathway.

Conclusion:

Balloon sinuplasty may be an effective, minimally invasive tool for the treatment of chronic frontal sinusitis secondary to obstruction by aberrant frontal cell anatomy.

Novel Technique for Repair of Failed Frontal Sinus Cranialization

Aaron Feinstein, MD, MHS; Christopher Thompson, MD; Jeffrey Suh, MD
Los Angeles, CA, USA

Introduction:

Frontal Sinus cranialization is an important technique for the management of comminuted frontal sinus fractures after head trauma. Via a craniotomy, the damaged posterior frontal table is removed, sinus mucosa stripped, and any dural tears repaired. The brain is then allowed to settle against the anterior table and frontal sinus floor. Potential complications are pneumocephalus and meningitis due to inadequate separation of the intracranial cavity from the sinonasal tract. We present a novel endoscopic technique to repair the exposed anterior skull base after a failed cranialization procedure, despite the use of a pericranial flap.

Methods:

Case report and literature review.

Results:

A 42 year old male was referred to our tertiary medical center one-year after a frontal sinus cranialization with pericranial flap was performed for severe facial trauma. His main complaints were recurrent frontal headaches, nasal congestion, post-nasal drip, and an episode of post-op meningitis that resolved with IV antibiotics. Pre-operative CT scan revealed opacification of the residual frontal sinus. The patient underwent an endoscopic sinus surgery including a Draf III procedure.Intra-operatively, areas of the frontal dura were exposed in the sinus. There was no CSF leak. A synthetic collagen matrix graft was placed over the residual posterior frontal sinus bone and onto the dura to reconstruct the skull base. This graft was secured using fibrin glue; temporary silastic spacers were used to support the graft.

Conclusions:

Endoscopic repair of the anterior skull base can be successfully performed via a Draf III after failed frontal sinus cranialization.

Novel use of Intraoperative MRI for Anterior Skull Base Lesions

Prateek Srinet, MD; Boris Paskhover, MD; Richard Manes, MD
New Haven, CT, USA

Introduction:

Intraoperative image guidance is an essential aspect of anterior skull base surgery and has helped improve patient safety with adequate surgical resection. Unfortunately image guidance has its own limitations, mainly the lack of real-time feedback. Intraoperative MRI (iMRI) on the other hand provides real-time surgical field assessment and has been an integral part of Neurosurgery for approximately 15 years. Our institution noted the possible beneficial aspects of iMRI and has applied it to our anterior skull base cases.

Methods:

Retrospective case series review of our experience with 3 male patients from age 13 to 19 years with Juvenile Nasopharyngeal Angiofibromas on whom iMRI with and without contrast was performed post tumor resection. Patients were followed up post operatively with follow up MRI in 6 months.

Results:

We noted that iMRI has been beneficial in large tumors, and specifically with tumors extending into pterygomaxillary and infratemporal fossa. Residual tumor was identified in 1/3 of our patients subsequently enabling complete resection. No residual tumor was seen on follow up imaging.

Conclusions:

iMRI has the ability to improve patient outcomes by identifying residual tumor and assist in localizing tumor intraoperatively.

Objective Radiographic Density Measurements of Sinus Opacities are not Strong Predictors of Fungal Disease

Daniel Killeen, BA; Ahmad Sedaghat, MD, PhD; Mary Cunnane, MD; Stacey Gray, MD
Boston, MA, USA

Introduction:

High-density characteristics of paranasal sinus opacities are often deemed to be consistent with fungal elements. However, no studies of objective quantitative radiographic density measures have been performed to support such an assumption.

Methods:

A consecutive series of 121 patients who underwent maxillary antrostomy with microbiologic evaluation of contents for fungus (cultures and histopathology) within 60 days of sinus computed tomography scanning. Radiographic density characteristics of opacities in cultured maxillary sinuses (minimum, maximum, average and standard deviation of Hounsfield Units [HU]) were recorded. Receiver operator characteristic (ROC) curves were used to analyze the accuracy of these radiographic characteristics in predicting presence of fungus in opacities.

Results:

Of 134 maxillary sinus opacities, 23 were ultimately consistent with fungal disease, of which 11 were allergic fungal mucin. Average HU had ROC curve reaching statistical significance for detection of any fungal opacity (area-under-the-curve [AUC]=0.71, P=0.002) or just allergic fungal mucin (AUC=0.78, P=0.002). An average HU cut-off of 42.9 HU produced the greatest sum of sensitivity (91.3%) and specificity (49.5%) for any fungal sinus disease and for allergic fungal mucin (sensitivity: 100%, specificity: 46.3%). Inclusion of nasal polyposis as a second requirement for allergic fungal rhinosinusitis improved the specificity of a 42.9 HU cut-off for average HU in detecting allergic fungal mucin to 73.2% while maintaining a sensitivity of 100%.

Conclusions:

Higher average HU more accurately predicts allergic fungal mucin than fungal sinus disease in general. However, no objective radiographic density measure, in isolation, is a specific predictor of fungal sinus disease.

Orbital Apex Syndrome Secondary to Metastatic Bladder Carcinoma to the Orbit and Sinus Cavity

Gregory Kruper, MD; Mahdi Shkoukani, MD
Detroit, MI, USA

72 year old male with bladder carcinoma in remission presents with 1 month of progressive loss of visual acuity, headaches and diplopia. He had a negative temporal artery biopsy and had been treated empirically with steroids on admission with poorly controlled blood sugars. On physical exam he had painful left eye proptosis, V1 and V2 numbness, with significant loss of visual acuity. MRI was obtained demonstrating left sphenoid, ethmoid, maxillary sinus mucosal thickening, and osteogenic changes in the posterior ethmoids with similar appearance to fibrous dysplasia. He was taken for functional endoscopic sinus surgery with orbital decompression due to concern for orbital apex syndrome and suspicion for invasive fungal sinusitis. Intraoperatively no mass or lesions were noted other then bony thickening of the posterior ethmoids. Pathology at that time showed carcinoma consistant with his previous bladder carcinoma.

Osteoblastoma of the Frontal Sinus: A Rare Benign Neoplasm

Jonathan Young, MD; Joshua Yelverton, MD; Evan Reiter, MD
Richmond, VA, USA

Introduction:

Osteoblastoma is a rare benign neoplasm which may mimic more common fibro-osseous lesions of the sinuses. We present a case of this rare entity and review its imaging, pathology, and treatment.

Methods:

Case report, literature review.

Results:

A 23-year old otherwise healthy male presented with a 6-month history of a hard lump over his left eye. He denied change in size of the lesion over this time, changes in vision or smell, congestion, rhinorrhea, facial pressure, or headache. Examination showed a smooth, nontender bony prominence above the left brow with no changes to the overlying skin. Sinus CT demonstrated a bony mass occupying the lateral ¾ of the left frontal sinus, with thinning and expansion of the anterior table. The lesion was successfully excised via a bicoronal approach with left unilateral osteoplastic flap sparing the posterior table and intersinus septum. The osteoplastic flap was replaced and a 1.5 cm defect of the lateral superior orbital rim and anterior table of the sinus was repaired with titanium mesh. Pathology revealed osteoid tissue with osteoblasts present consistent with osteoblastoma.

Conclusion:

Osteoblastomas occurring in the sinuses are rare benign tumors only reported in a handful of cases. These lesions more commonly occur in the vertebral column or long bones of young adults. To our knowledge, this is the 7th reported osteoblastoma of the frontal sinus. Osteoblastoma, although rare, should remain on the differential for bony lesions of the paranasal sinuses in young adults.

Patient Perception of the In-Office Point of Care Computed Tomography Scan in Management of Chronic Rhinosinusitis

Opeyemi O. Daramola MD; Rakesh K. Chandra MD; Stephanie Shintani- Smith MD; David B. Conley MD; Robert C. Kern, MD; Bruce K. Tan MD
Chicago, IL, USA

Background:
Consensus guidelines for diagnosis of chronic rhinosinusitis (CRS) require endoscopic or radiographic confirmation of objective inflammation. No existing literature has examined patient perceptions of computed tomography (CT) imaging for nasal/sinus complaints.

Objectives:
(1) Assess patients' knowledge and comfort level with CT imaging
(2) Compare patient willingness to undergo empiric medical therapy (EMT) versus CT-directed therapy.

Method:
A 22-item prospective survey was administered to patients with nasal/sinus symptoms in a tertiary care rhinology clinic. Survey questions elicited demographic data, imaging history, knowledge/comfort regarding imaging-related radiation exposure, and patients were presented with the choice of EMT vs CT-directed therapy given the positive predictive value of symptoms for a CRS diagnosis.

Results:
Two hundred patients (96 male, 104 female, age range 18-83) participated. Of these, 85% had symptoms for over three months. Most patients (80%) preferred CT-directed therapy over EMT. Only 91 patients (45.5%) were aware that CT imaging involved radiation exposure. When a CT sinus was recommended, 64 patients (32%) had concerns, of which 32 patients (16%) ranked radiation exposure as their top concern. Prior CT experience and past sinus surgery ($p<0.05$), but not sex or education level, were associated with increased comfort with CT imaging. The majority (70%) were unsure about the relative radiation dosage of a conventional CT.

Conclusions:
Patients with CRS symptoms are willing to undergo confirmatory CT imaging to more accurately direct therapy.However, a significant portion of patients have radiation-related concerns and patients lack knowledge regarding radiation exposure in medical imaging.

Peripheral Blood T Helper Cells in Patients with Atopic and Non-atopic Chronic Rhinosinusitis

Zhenxiao Huang, MD,PhD; Ting Ye, MD; Yan Sun, MD,PhD; Chengshuo Wang, MD; Yang Wang, BS; Bing Zhou, MD
Beijing, China

Background:
Recent research suggests that T helper cell (TH) may play an important role in the pathogenesis of chronic rhinosinusitis with and without nasal polyps (CRSsNP and CRSwNP). The purpose of this study was to investigate the peripheral blood TH1/TH2 cells population in CRSsNP and CRSwNP.

Study design:
Prospective study

Methods:
Peripheral blood samples were obtained from controls, CRSsNP and CRSwNP. Percentage of TH1 and TH2 cells were measured by flow cytometry (FACS). Patients were stratified into three groups based on allergic status using skin-prick testing and IgE level measurement: (1) non-atopic CRSsNP, (2) non-atopic CRSwNP, (3) atopic CRSsNP, (4) atopic CRSwNP.

Results:
Percentage of TH1 cells were significantly higher in atopic CRSsNP compared to control, but not difference were found between atopic CRSwNP and control. No differences in TH2 cells were found between all the atopic and non-atopic CRS groups and control. Serum eosinophils were only significantly elevated in peripheral blood of atopic CRSsNP and CRSwNP compared to control.

Conclusion:
Our finding indicates that atopic CRSsNP exhibit an increased percentage of systemic TH1 cells, but not true of TH2 cells.

Physical Properties of Mucus in Chronic Rhinosinusitis

Thomas Willson, MD; Jean Muderhwa, MS; Kassie Pfluger, BS; Mark Appleford, PhD; Erik Weitzel, MD
San Antonio, TX, USA

Background:
Nasal mucus undergoes a change in character during the course of chronic infection. However, little research has been done to evaluate the change in the quality of mucus that is produced in allergic fungal sinusitis (AFS) as compared with Chronic Rhinosinusitis (CRS). Initiation of this investigation was the goal of this pilot study.

Methods:
IRB approval was obtained from our institution. Fresh mucus samples were obtained from individuals suffering from AFS, CRS and healthy controls. Mucus was then evaluated using Brookfield viscometer to assess viscosity, and with Beckman Coulter Counter to assess particle content and size.

Results:
Variations in viscosity related to differing severity and duration of disease. Patients with histologically confirmed eosinophilic mucin were found to have greatest viscosity. Particle size and count of mucus suspension showed clustering around a broad range of particles. Overall particulate was significantly increased in the diseased samples versus disease free controls.

Conclusions:
Physical characteristics of mucus in CRS exist along a spectrum likely corresponding with state of disease and immune response. Samples from patients with confirmed AFS tended to display the highest viscosity among all samples tested. Pilot data showing particle size counts suggested difference in mucus composition among groups.

Posterior Septal Widening: Promoting Nasal Endoscopy in the Evaluation of Nasal Airway Obstruction

Mofiyinfolu Sokoya, MD; Henry Barham, MD
Aurora, CO, USA

Introduction:
Nasal airway obstruction, a well-known cause of patient discomfort, is one of the most common presenting complaints to the Otolaryngologist. The different causes of nasal airway obstruction are very wide-ranging, spanning from congenital life threatening causes to acquired benign causes. Herein, we present a case of nasal airway obstruction caused by widening of the posterior septum, highlighting the importance of nasal endoscopy in the diagnosis of nasal airway obstruction.

Methods:
Case report

Case Presentation:
A 52-year-old gentleman presented to the rhinology clinic complaining of chronic nasal congestion for 4 years. He had undergone evaluation and treatment by primary care doctors and otolaryngologists with trials of topical steroid sprays and nasal saline rinses, unsuccessful in symptomatic resolution. On nasal endoscopy, the septum is straight anteriorly, but appeared to be '"deviated" bilaterally, flaring into the nasopharynx and obstructing the airway. A CT scan was performed, which showed soft tissue enlargement on the posterior aspect of the septum. Patient was subsequently taken to the operating room for a posterior septectomy and inferior turbinectomy. Patient reported alleviation of symptoms postoperatively.

Conclusion:
Nasal airway obstruction is a common chief complaint in primary care and otolaryngology. It is important for the otolaryngologist to be aware of the myriad of causes of nasal airway obstruction. An accurate history and physical examination including nasal endoscopy is important in the diagnosis of nasal airway obstruction. More importantly, the physician should be aware of the possibility of a widened posterior septum as a cause of nasal airway obstruction.

Predicting Alterations in Nasal Physiology Using Virtual Skull Base Surgery: A Computational Fluid Dynamics (CFD) Study

Dennis Frank-Ito, PhD; Mirabelle Sajisevi, MD; C. Arturo Solares, MD; David Jang, MD
Durham, NC, USA

Introduction:

Endonasal endoscopic skull base surgery often requires posterior septectomy (PS) with middle turbinate resection (MTR) in order to provide access to large sellar and clival tumors. However, little is known about the alterations that occur in nasal physiology.

Methods:

We constructed three-dimensional models from computed tomography scans for three patients-(1) no septal deviation (SD), (2) right anterior SD, and (3) left anterior SD. The following virtual surgeries were performed on each model: (1) endoscopic transphenoidal approach (ETSA) with small (1cm) PS, (2) ETSA with complete (2cm) PS, (3) ETSA with small PS and right MTR, (4) ETSA with complete PS and right MTR. CFD simulations were performed on each of the 3 pre-surgical and 12 post-surgical models to detect changes in airflow, resistance, wall shear stress, relative humidity, and heat flux.

Results:

With no SD, larger PS size and MTR decreased nasal resistance without changing laterality of flow allocation. In both cases of SD, PS increased flow allocation to the contralateral side. Ipsilateral MTR with SD was able to re-allocate more flow to the ipsilateral side. However, contralateral MTR with SD further disrupted flow allocation. Small PS with no MTR preserved physiology to the greatest degree.

Conclusions:

CFD simulations on virtual surgery models are able to detect changes in nasal physiology. This pilot study suggests that patients may experience improved nasal airflow at the expense of increased crusting and dryness. In patients with SD, the sensation of unilateral nasal obstruction may be heightened with posterior septectomy and contralateral MTR.

Primary Actinomyces Infection of the Sinuses

Anni Wong, MS; Ashutosh Kacker, MD
New York, NY, USA

Introduction:

Actinomycosis of the sinuses is rare, especially in those who are immunocompetent, with very few documented cases in the literature and found only in isolated case reports. Sino-actinomycosis is usually secondary to an odontogenic infection or trauma where a break in the mucosal barrier and the presence of synergistic bacteria allows pathogenesis and rarely as a primary infection. We report a rare case of Actinomyces odontolyticus in the paranasal sinus in a healthy individual with the absence of dental or facial trauma.

Methods:

A case report on a patient under the care of AK at Cornell Weill Medical Center/New York Presbyterian Hospital. Electronic medical records were reviewed for patient information including but not limited to past medical history, present illness, pathology, radiology and surgery reports.

Results:

CT scan of the paranasal sinuses shows near-complete opacification of the right maxillary sinus, right ethmoid sinus and frontal sinus. Patient undergoes sinus surgery and gram stain of sinus culture showed beaded, branching gram-positive anaerobic bacilli, A. odontolyticus.

Conclusion:

In our case study, the patient most likely developed actinomycosis due to recurrent and chronic sinusitis refractory to medication, which prolonged inflammation and led to sinus occlusion creating an anaerobic environment for A. odontolyticus to proliferate. Although uncommon, actinomycosis should be included in the differential diagnosis of chronic or recurrent sinus infections refractory to medical therapy with purulent drainage. Prompt treatment including long term antibiotic therapy and usually surgical intervention has been shown to be successful.

Primary Care Practitioner and Emergency Room Employee Knowledge of Epistaxis First-Aid Management.

Chandheeb Rajakumar, MD; Brain Rotenberg, MD; Leigh Sowerby, MD
London, Ontario, Canada

Introduction:
Epistaxis is common and can be life-threatening. It is usually managed initially, and often exclusively, by primary care physicians. Despite this, many family physicians and Emergency Room (ER) staff practice inappropriate first-aid measures in epistaxis management. We sought to determine management trends from these health care providers in order to identify where knowledge requires improvement.

Methods:
This study was conducted in two parts: 1) ER attending physicians, resident physicians training in the ER, and ER nurses were surveyed in a tertiary-care teaching hospital's emergency department. 2) Family physicians attending a continuing medical education event were also surveyed. Multiple-choice questionnaires asked respondents to identify where to pinch and apply pressure to the nose and how patients should be positioned during an acute episode of epistaxis.

Results:
Regarding where to place pressure, 18.5% of family physicians, 54.5% of ER attending physicians, 60% of residents, and 5% of ER nurses correctly responded to place pressure over the ala, thus tamponading Kiesselbach's plexus. Regarding positioning, all groups responded similarly with 54.6-60% responding correctly to tilt the patient's head forward, thus protecting the airway. Of concern, 7.4-10% of family physicians, ER attending physicians, and ER nurses suggested tilting the head backwards, which can lead to airway obstruction.

Conclusion:
Most family physicians and ER nurses, and a large proportion of ER attending and resident physicians, were not able to identify the correct first-aid measures to take in epistaxis management. This highlights the need for greater emphasis on this condition in undergraduate and continuing medical education.

Quality of Life Outcomes in Adult Cystic Fibrosis Patients

Sapna Patel, MD; Rod Teasley, JD; Greg Davis, MD, MPH
Seattle, WA, USA

Objectives:
Most adults with cystic fibrosis (CF) suffer from challenging chronic rhinosinusitis (CRS). While some data suggest that endoscopic sinus surgery (ESS) may improve quality of life (QoL), little outcomes research has compared ESS to medical management of CF-related CRS. This study aims to evaluate QoL and objective changes associated with ESS vs. medical management of CRS in adults with CF.

Study Design:
Retrospective case-control study.

Setting:
Tertiary care center.

Methods:
12 adults with CF who underwent ESS for CRS were matched to 6 controls whose CF-related CRS was managed medically. Pre- and post-treatment measures included Lund-Mackay computed tomography (CT) scores, pulmonary function testing (PFT), and QoL scores on the Sino-Nasal Outcome Test (SNOT-20), a validated QoL instrument.

Results:
For cases vs. controls, mean follow-up (15 ±10 months vs. 31 ±20 months, P=0.12), preoperative CT scores (11 ±5 vs. 10 ±2, P=0.28), % predicted FEV1 (75% ±18% vs. 61% ±14%, P=0.09), % predicted FEV1/FVC (83% ±14% vs. 80% ±12%, P=0.68) and SNOT-20 scores (38 ±19 vs. 42 ±15, P=0.69) did not differ significantly. Patients undergoing ESS experienced greater improvement in SNOT-20 scores than patients managed medically (-8.7 ±11.3 vs. +6.0 ±5.7, P=0.002). Relative improvement in CT and PFT scores did not differ significantly between groups (all P=0.25).

Conclusions:
Adults with CF-related CRS who underwent ESS demonstrated a greater improvement in SNOT-20 QoL scores than those managed medically. In this sample, however, improvement in post-treatment objective measures did not differ between groups.

Race and the Workup of Chronic Rhinosinusitis

Mary Ashmead, MD; Scott Stringer, MD; Chris Clark, MD
Jackson, MS, USA

Objective:

The objective of this study is to demonstrate any relationship of severity of sinusitis findings on computed tomography (CT) to ethnicity or race, specifically comparing Caucasian and African American populations in Mississippi. Symptomatology does not always correlate to physical findings of sinusitis, and this study was designed to evaluate whether race has predictive value to positivity on CT imaging.

Methods:

The charts of all new patients with symptoms consistent with chronic rhinosinusitis from 2003-2012 were reviewed. Sinus CT images were collected and scored according to the Lund-Mackay classification. The medical records of these patients were then reviewed for demographic data including age at presentation, gender, and self-reported race. Other information including antibiotic history, polyposis on exam, and comorbidities.

Results:

636 patients met criteria for inclusion for the analysis, with 334 white and 265 African American by self-reporting. Overall, CT positivity, defined as Lund-MacKay score >2, in all patients was 43.9%, which is in accordance with other publications. There was no association between race and the overall rate of positive CT scan or in mean Lund-McKay score. There was a significant difference in the presence of polyposis, being twice as likely in African Americans. African Americans were also more likely to have been given antibiotics.

Conclusion:

This study did not find any difference between white and African American patients in rates of positivity on imaging for the workup of CRS. This does not mean, however, that racial differences do not exist within the disease, which will require further research.

Radiologic, Clinicopathologic, and Survival Features Among Trigeminal Nerve Sinonasal Tract Malignant Peripheral Nerve Sheath Tumors Treated by Endoscopic Skull Base Resection

Derrick Randall, MD MSc; Yves Starreveld, MD PhD; Brad Mechor, MD
Calgary, AB, Canada

Introduction:

Malignant peripheral nerve sheath tumors (MPNST) are rare soft tissue sarcomas derived from or demonstrating differentiation toward Schwann cells. The cranial nerves represent an exceedingly uncommon source of MPNST, and those within the sinonasal tract comprise a minority. Reported literature outcomes among the few known sinonasal MPNST are varied but generally considered guarded.

Methods:

Retrospective review of sinonasal MPNST at our tertiary academic centre evaluating radiologic and clinicopathologic features, surgical management, and treatment outcomes.

Results:

Two MPNST were identified within the sinonasal tract, both derived from the V2 branch of the trigeminal nerve. One patient had a pre-existing diagnosis of neurofibromatosis type 2 (NF-2), while the second patient developed a de novo tumor. Pre-operative annual serial MRIs monitoring the NF-2 patient's neurofibromas indicate MPSNT growth rate of 6.4 cm3 per annum. Both patients were treated with unimodal endoscopic surgical resection by a combined otolaryngology-neurosurgery team and are currently alive and disease free at 56 and 77 months follow-up duration.

Conclusion:

MPNST involving the sinonasal tract are extremely rare tumors with variable outcomes. Cellular features, early detection, and surgical accessibility of the sinonasal MPNST may differ from other MPNST of the head and neck, leading to better survival outcomes with surgical management.

Readability Assessment of Internet-Based Patient Education Materials Related to Rhinoplasty

Amit Chaudhari, BA; Tekchand Ramchand, BA; Leila Mady, PhD; Jean Anderson Eloy, MD, FACS
Newark, NJ, USA

Introduction:

Though clinical practices and professional societies provide Internet-based patient education materials (IPEMs) to the general public, not all information is written at a reading level appropriate for patients. The National Institutes of Health and United States Department of Health and Human Services recommend that IPEMs be written at a 4th-6th grade reading level. This study aims to assess the readability of rhinoplasty-related IPEMs.

Methods:

Readabilities of 20 rhinoplasty-related IPEMs were assessed with 4 different readability indices: Flesch-Kincaid Grade Level (FKGL), Flesch Reading Ease Score (FRES), Simple Measure of Gobbledygook (SMOG), and Gunning Frequency of Gobbledygook (Gunning FOG). IPEM scores were compared with national recommendations and subgroup analysis was performed based on authorship by clinical practices or professional societies.

Results:

All of the IPEMs analyzed were written above the national recommendation of 4th-6th grade level, based on both the FRES and the FKGL. The mean readability scores were FRES 50.10 (+/- 6.56), FKGL 10.40 (+/- 1.26), SMOG 13.07 (+/- 0.92), and Gunning FOG 13.31 (+/- 1.17).

Conclusions:

Current IPEMs related to rhinoplasty, regardless of authorship, were written well above the recommended 4th-6th grade level. Material written at these levels may hinder patients from fully understanding complex medical procedures. As such, we encourage authors to revise their IPEMs according to national guidelines and make them easily comprehensible for patients, thereby effectively increasing both understanding and informed decision-making.

Recurrent Electrocardiographic Artifact as a Result of Microdebrider Malfunction during Functional Endoscopic Sinus Surgery

Matthew Bartindale, BS; Nadia Caballero, MD; Monica Patadia, MD
Maywood, IL, USA

Introduction:

Electrocardiographic (EKG) artifacts can lead to unnecessary treatment and costly diagnostic workup. Two prior studies have reported a ventricular tachycardia artifact as a result of microdebrider malfunction. In this study, we report the first case of EKG artifact mimicking asystole from microdebrider use during functional endoscopic surgery (FESS).

Case:

A healthy 19 year old female presented with chronic rhinosinusitis and a deviated nasal septum. She was scheduled for a bilateral FESS and septoplasty. The microdebrider was changed after one hour. While using the second microdebrider near the left Agger Nasi, the EKG monitor showed two asystolic events. The third event occurred while removing the right uncinate. Each episode lasted approximately three seconds. The EKG tracing returned to normal sinus rhythm every time the microdebrider was stopped. The patient's oxygen saturation remained at 100% during the episodes. The patient's pulse was not checked. The case was aborted and an extensive cardiology workup was performed. An echocardiogram, telemetry monitoring, and serial troponins were negative. Biomedical engineering investigated the microdebrider and found an abnormally elevated voltage, which likely caused electrical interference. Six months later the patient underwent a right-sided FESS and revision left frontal FESS. There were no EKG abnormalities during during the second surgery.

Discussion:

Although other EKG artifacts have been reported in the literature, this is the first case report of an artifact mimicking asystole stemming from microdebrider use. Improved awareness of this potential EKG artifact for both the surgeon and anesthesiologist may prevent an unnecessary costly work-up.

Safety and Outcomes Following Low Pressure Osmotic Dilation of the Maxillary Ostia: A Multicenter 6 month Analysis

Peter Catalano, MD; Amin Javer, MD; Jim Gordon, MD; Hesham Saleh, MD; Scott Lee, MD
Boston, MA, USA

Introduction:

Balloon dilation technology is now commonly used to expand sinus ostia and their respective transition spaces to enable sinus drainage while preserving mucosa and minimizing trauma to adjacent intranasal structures. A multicenter, single arm, prospective study was conducted to assess the safety and sustained effectiveness of a new low pressure, gradual expansion device for dilation of maxillary sinus ostia in symptomatic patients.

Methods:

34 patients (12M/22F) refractory to standard of care medical management of their recurring sinusitis were enrolled at one of five clinical trial sites. The maxillary sinus dilation procedure was completed either under local or general anesthesia, as a stand-alone procedure or in conjunction with ESS, depending upon the clinical situation. Patients were evaluated at 3 and 6 months to assess ostial patency, sinus health, and device-related/procedural complications.

Results:

57 maxillary ostia were accessed and successfully dilated in 34 patients. There were no device related adverse events. One patient withdrew after 1 month, leaving 55 ostia available for evaluation through 3 months (51/55, or 93% of treated ostia were visibly patent; 7% could not be visualized). No maxillary ostia were clinically non-functional. At 6 months, 29 patients were available for follow-up and 45/49 (92%) of treated ostia were visibly patent with 4/49 (8%) not visualized; no maxillary ostia were clinically non-functional. One patient (3.3%) developed sinusitis 4 days after surgery and was successfully treated medically.

Conclusions:

These results demonstrate that a self-expanding low-pressure dilator can provide durable patency of the maxillary sinus ostia in patients with CRS.

Safety of In-office Balloon Sinus Dilation with Concurrent Antiplatelet and Anticoagulant Therapy

Jillian Detherage, MA; Thomas Higgins, MD
Louisville,KY, USA

Introduction:

Due to the high risk of bleeding in patients taking antiplatelets and anticoagulants, it is usually recommended that patients discontinue these medications around the time of endoscopic sinus surgery. Balloon sinus dilation is a tissue-sparing technique and may be an alternative for patients who cannot discontinue these medications.

Method:

We analyzed patients with chronic rhinosinusitis who met criteria for surgical intervention after maximal medical therapy and underwent in-office sinus dilation while on antiplatelet and anticoagulant therapy. Sino-Nasal Outcome Test was used to determine the effectiveness of the procedure. Outcome measures of risks of bleeding included postoperative control of hemorrhage, need for nasal packing, cauterization,and emergency room visits within 30 days.

Results:

During a 2-year period, there were 11 patients with a diagnosis of chronic rhinosinusitis who underwent the in-office balloon sinus dilation while on antiplatelet and anticoagulant therapy. The average score on the SNOT-22 decreased from 21.8 preoperatively to 17.4 postoperatively. Two patients were packed in the middle meatus with absorbable packing for mild bleeding after the procedure. There was no significant bleeding events postoperatively,including no need for packing,cauterization,or emergency room visits. There were no systemic complications within 30 days. Two patients ultimately required endoscopic sinus surgery once cleared to discontinue antiplatelet and anticoagulant therapy.

Conclusion:

In-office balloon sinus dilation appears to be a safe alternative to endoscopic sinus surgery in patients who cannot discontinue antiplatelet and anticoagulant therapy.

Septorhinoplasty and Functional Endoscopic Sinus Surgery: Improving Day Case Rates

Nisha Ranga, MD; Paul Glossop; Nakita Bhalla, MD
Wolverhampton, UK, England

Introduction:

In 2000, the National Health Service (NHS) stated in the NHS plan that 75% was the target for day case surgery. The Audit Commission basket of procedures lists 25 procedures that can be performed as day case. Rhinology day case surgery is variable across NHS trusts and dependent on each surgeon's own practice. Rhinoplasty, septoplasty and functional endoscopic sinus surgery (FESS) in suitable patients are often day case procedures.

Methods:

We carried out a 2-cycle retrospective notes audit. All patients who underwent FESS, septoplasty, rhinoplasty and setorhinoplasty and were listed as day case procedures were included. A standard pro-forma was used for each patient to document patient demographics, co-morbidities, length of stay, reason for overnight stay, post-op complications and readmissions.

Results:

100 patients were included in each cycle. The first cycle revealed an overall day case rate of 84%. In 50% of patients who stayed overnight, a reason was not documented in the notes to explain the overnight stay. The remaining 50% stayed secondary to bleeding. 1% of patients had a readmission with infected haematoma, which required draining under general anaesthetic. The results of the first cycle were presented locally and an action plan. The second cycle revealed a 91% day case surgery rate with 0% readmissions.

Conclusions:

With clear instructions for discharge and education of all staff on how to carry out a safe discharge, we improved our day case rate. We conclude that FESS, rhinoplasty, septoplasty and septorhinoplasty in the right patient are appropriate day case procedures.

Silent Sinus Syndrome after Orbital Trauma

Duc Tien, MD; Raj Sindwani, MD
Cleveland, OH, USA

Introduction:

Silent sinus syndrome is a rare idiopathic entity which includes maxillary sinus atelectasis and enophthalmos or hypoglobus in the absence of clinically evident sinonasal disease. It is hypothesized that maxillary sinus hypoventilation somehow results in maxillary atelectasis and collapse of the orbital floor, thus producing enophthalmos or hypoglobus. We present the unique case of a patient who developed silent sinus syndrome following orbital trauma one year prior.

Methods:

Case study and literature review.

Results:

A 45 year old male experienced right orbital trauma and underwent several ophthalmologic procedures for the resultant enopthalmos and diplopia. Imaging at time of injury showed a small blow out fracture with entrapment and otherwise normal appearing maxillary sinuses bilaterally. His enopthlamos and diplopia began to worsen, however, and a CT scan months later demonstrated atelectasis and opacification of the ipsilateral maxillary sinus. The diagnosis of silent sinus syndrome was made and he underwent uneventful endoscopic maxillary sinus surgery. The patient's diplopia resolved shortly postop, and an 8-month postop CT scan demonstrated clear maxillary sinuses, with minimal upward migration of the right orbital floor. Radiographic findings at the time of initial orbital injury, pre-sinus surgery and post -sinus surgery document the evolution of maxillary atelectasis.

Conclusions:

Silent sinus syndrome can develop after orbital trauma, and should be considered in the differential diagnosis of enophthalmos and/or diplopia following orbital injury. Sinus anatomy should be evaluated in any patient presenting with enophthalmos in which surgical intervention is being considered.

Sinonasal Eosinophilic Angiocentric Fibrosis: A Systematic Review

Christina Fang, BS; Leila Mady, PhD; Neena Mirani, MD; Soly Baredes, MD, FACS; Jean Anderson Eloy, MD, FACS
Newark, NJ, USA

Introduction:
Eosinophilic angiocentric fibrosis (EAF) is a benign rare lesion of the upper respiratory mucosa. EAF most commonly presents with an obstructive nasal mass. Due to the rarity of EAF, case reports and case studies predominates the literature. This systematic review discusses the demographics, clinical presentation, associated findings, management and outcomes of this uncommon entity.

Methods:
The PubMed database was searched for all articles describing patients diagnosed with sinonasal EAF. Additional cases were examined from bibliographies of selected articles. Demographics, clinical presentation, associated findings, radiography, management and outcome were analyzed.

Results:
Fifty cases were included from 33 articles, and an additional case was included from our institution. The most common presenting symptom was nasal obstruction (78.4%). Fourteen patients (27.5%) had a previous history of nasal surgery or trauma. Surgical resection alone was the most commonly used primary treatment approach (52.9%), resulting in the greatest proportion of disease-free patients (57.9%) over a median follow-up period of 36 months. A combination of surgery and corticosteroids was the second most common treatment modality, used in 23.5% of cases. Of the 39 cases reporting patient outcomes, 100% of patients were alive at follow-up independent of treatment modality. Overall, 20.5% of patients had recurrence of disease half of which underwent surgical resection alone as primary treatment.

Conclusions:
To date, this review contains the largest number of patients with sinonasal EAF. Although local recurrence remains an issue, aggressive surgical resection constitutes the most common treatment modality and may offer symptomatic relief as well as disease eradication.

Sinonasal Mucoepidermoid Carcinoma: A Comparative Analysis of 149 Cases

Alejandro Vazquez, MD; Tapan Patel, BS; Dhruv Patel, BA; Evelyne Kalyoussef, MD; Soly Baredes, MD; Jean Anderson Eloy, MD
Newark, NJ, USA

Introduction:
Mucoepidermoid carcinoma (MEC) is the most common salivary gland malignancy. Primary sinonasal MEC (SN-MEC) is rare, and thought to arise from minor mucoserous glands beneath the sinonasal tract epithelium. This study analyzes the demographic, clinicopathologic and survival characteristics of SN-MEC, and establishes comparisons with primary major salivary gland MEC (SG-MEC).

Methods:
The Surveillance, Epidemiology, and End Results (SEER) database (1973-2010) was queried for SN-MEC (149 cases) and SG-MEC (4,234 cases). Data were analyzed comparatively with respect to various demographic and clinicopathologic factors. Survival was analyzed using the Kaplan-Meier and Cox proportional hazards models.

Results:
Mean age at diagnosis was 58.6 (±16.6) years for SN-MEC. The maxillary sinus was most commonly affected (51.7%), followed by the nasal cavity (32.9%) and ethmoid sinus (11.4%). High histologic grade (i.e., III and IV) was more common among SN-MEC than SG-MEC (42.3% vs. 25.5%, $p<0.0001$). Overall 5-year disease-specific survival (DSS) was 61.7% for SN-MEC and 84.1% for SG-MEC ($p<0.001$). For SN-MEC, DSS was worst among males (48.9%), those aged 75 years and older (29.1%), high tumor grade (43.6%), tumor size >4 cm (45.4%), and tumors originating in the ethmoid sinus (18.5%) (all $p<0.05$). Survival was better among those treated with surgery (with [64.4%] or without [79.2%] adjuvant radiotherapy) than those treated with primary radiotherapy alone (22.0%) ($p<0.05$).

Conclusion:
This report represents the largest series of SN-MEC to date. Although SN-MEC and SG-MEC share a common histology, there are important clinical differences between the two.

Sinonasal Myeloid Sarcoma

Andres Bur, MD; Raewyn Campbell, MD; Michael Purkey, MD; Kyle Hatten, MD; Nithin Adappa, MD; James Palmer, MD
Philadelphia, PA, USA

Case Report:

An eighteen year-old male with relapsed acute myeloid leukemia (AML) was admitted with one week of fever, worsening retro-orbital pain and diplopia. On physical exam, left periorbital edema and erythema were present. Extraocular movements and visual acuity were intact. Nasal endoscopy was unremarkable. White blood cell count was 82,500/μL, predominantly blasts. CT showed opacified left ethmoid and maxillary sinuses and partial erosion of the fovea ethmoidalis. MRI orbits revealed contrast-enhancing tissue in the left orbit, masticator space and pterygopalatine fossa. Dural enhancement in the left anterior cranial fossa was concerning for early intracranial involvement. Given a high clinical suspicion for invasive fungal sinusitis, the patient was taken to the operating room for nasal endoscopy, debridement and biopsy. A left maxillary antrostomy was performed revealing necrotic mucosa, which was biopsied and sent for culture and pathology. Frozen section indicated no fungal organisms were present. Final pathology returned on post-operative day 3 as sinonasal mucosal necrosis with infiltration by leukemic blasts, consistent with myeloid sarcoma (MS).

Discussion:

Myeloid sarcoma, or extramedullary leukemia, is a solid tumor composed of malignant myeloid precursor cells occurring outside of the bone marrow. MS is a rare complication of AML and may occur in virtually any organ system. We describe the case of a young patient with sinonasal MS, which may mimic invasive fungal sinusitis. Sinonasal MS should be considered as part of the differential diagnosis for patients with AML presenting with fever, pain, leukocytosis and mucosal necrosis.

Sinunasal Changes on Computed Tomography after Laryngectomy

Graham Whitaker, MD; Helen Zhang, BS; Mikhail Vaysberg, DO; Neil Chheda, MD
Gainesville, FL, USA

Introduction:

It has been previously reported that following laryngectomy, patients tend to develop inferior turbinate hypertrophy accompanied by significantly more frequent sinus abnormalities seen on standard sinus radiographs. However, there are studies indicating that laryngectomy patients experience fewer episodes of sinusitis. We sought to further evaluate the sinunasal complex by reviewing the preoperative and postoperative computed tomography (CT) scans of laryngectomy patients.

Design:

Retrospective radiographic review

Setting:

Single tertiary care center

Patient Population:

All patients (age >18 years old) who underwent laryngectomy from 2001-2010 and who had available radiographic data to assess the sinunasal complex were evaluated. A total of 226 patients were identified with 44 patients meeting inclusion criteria. Exclusion criteria included lack of adequate imaging, previous sinus or turbinate surgery, sinunasal radiation, sinunasal tumors, and sinunasal deforming trauma.

Main Outcome Measure:

CT scans were evaluated preoperatively and postoperatively for changes in the Lund-McKay (LM) sinus score and average inferior turbinate volume.

Results:

Inferior turbinate volume increased by 21.0% ($p=0.007$) on average from preoperative baseline. One year post-laryngectomy, this number increased to 29.5% ($p<0.0001$). Though the LM opacification scores also increased ($p=0.034$), this increase did not reach clinical significance.

Conclusion:

The inferior turbinate volume increases significantly following laryngectomy. Lack of nasal airflow and turbinate hypertrophy do not appear to correlate with sinus opacification. More research is required to elucidate the exact mechanism by which lack of nasal airflow leads to turbinate hypertrophy.

Subjective Olfactory Dysfunction correlates with Gastroesophageal Reflux Disease

Zara Patel, MD; Sarah Wise, MD, MSCR; John DelGaudio, MD
Atlanta, GA, USA

Introduction:

Gastroesophageal Reflux Disease (GERD) has been shown to induce inflammation in pulmonary and laryngeal tissues. Increasing data suggests inflammation may reach the nasal cavity as well. To date, there has been no study directly assessing GERD in patients with subjective olfactory dysfunction. The purpose of this study was to compare GERD in a group of patients with subjective olfactory dysfunction to a group without subjective olfactory complaints.

Methods:

Retrospective matched case-control study. 60 patients were identified who presented to a tertiary care rhinologic center with subjective smell dysfunction over the course of one year, after excluding neoplastic and obstructive etiologies, using diagnosis codes and SNOT-22 responses. Demographic data such as age, gender, and race were reviewed, as well as current and active diagnosis of GERD and smoking status. 60 age, gender and race matched control patients were selected from those presenting to the rhinology practice over the last year, but without subjective olfactory dysfunction. Chi-square testing was used.

Results:

26 out of 60 patients (43%) in the olfactory dysfunction group had a current and active diagnosis of GERD, compared to 15 out of 60 patients (25%) in the control group. Chi-square testing showed this was a statistically significant difference ($p= 0.034$).

Conclusions:

Patients with subjective olfactory dysfunction appear to suffer from GERD at a higher rate than rhinologic patients without olfactory complaints. Prospective clinical research should examine this further to determine if GERD may be a causative factor in inflammation and subsequent dysfunction of the olfactory epithelium.

The Accuracy of Touch Preparation for Diagnosis of Invasive Fungal Sinusitis

Josephine Nguyen, MD; Joshua Yelverton, MD; Theodore Schuman, MD; Jorge Almenara, PhD; Celeste Powers, MD, PhD
Richmond, VA, USA

Objective:

To calculate the accuracy of pre-operative cytologic imprint/touch preparation as a diagnostic tool for invasive fungal sinusitis.

Methods:

A retrospective chart review of 13 patients undergoing surgery due to suspicion for invasive fungal sinusitis was performed. Results from pre-operative touch preparation of nasal biopsies and final pathology interpretation were compared.

Results:

Of 13 patients, 7 were found to have invasive fungal sinusitis. Six patients had no evidence of angioinvasion on final pathology. Three patients had multiple pre-operative biopsies. The sensitivity of pre-operative touch preparation was 55.6%, specificity was 100%, positive predictive value was 100%, and negative predictive value was 66.7%.

Conclusion:

Pre-operative touch preparation has high specificity and positive predictive value as a diagnostic test for invasive fungal sinusitis, but poor sensitivity and negative predictive value. It may be useful in cases with high clinical suspicion for invasive fungal sinusitis, when a rapid diagnosis is required to determine the need for surgical intervention. Ideally, such a technique could be used to avoid surgery in immunocompromised or critically ill patients.

The Current Status of the Riedel Procedure - An Analysis of 22 Cases

William Lawson, MD; Anthony Reino, MD; Robert Deeb, MD
New York, NY, USA

Objectives:
To report one institution's experience with 22 cases of the Riedel procedure in order to establish a profile for those patients with chronic frontal sinusitis who develop chronic osteomyelitis.

Study Design:
Retrospective review

Methods:
Review of all patients undergoing the Riedel procedure at one institution with analysis of demographic data, indications for procedure, technical aspects of performing the procedure, outcomes and complications. Comprehensive review of the literature was performed as well.

Results:
Twenty-two patients were identified. The age range in patients varied from 20 years to 86 years. The etiology of the condition requiring the Riedel procedure was infectious in 16 patients, traumatic in 5 and neoplastic in 1. All patients with chronic osteomyelitis of the frontal sinus had undergone multiple intranasal and external procedures. Postoperative follow-up interval ranged from 4 months to 21years.

Conclusion:
The Riedel procedure remains a relevant tool in the armamentarium of the rhinologic surgeon. Its primary indication, chronic frontal osteomyelitis, is an indolent process that generally occurs as sequelae of Pott's Puffy tumor, trauma or neoplasm. The natural history is that of multiple failed endoscopic and open procedures. Despite the radical nature of the Riedel procedure, it may not be curative and patients require long term follow up.

The Effect of Endoscopic Sinus Surgery on Nasal Nitric Oxide Levels in Patients with Chronic Rhinosinusitis

John Lee, MD FRCSC MSc; Aman Grewal, MD; Theresa Aves, HBSc; Carmen McKnight, MASc; Samir Gupta, MD MSc FRCPC
Toronto, Ontario, Canada

Background:
Nasal nitric oxide may play a role in the maintenance of sinonasal health through mucociliary regulation as well as anti-microbial action. Some studies have suggested a reduced level of nNO in patients with chronic rhinosinusitis (CRS).

Objectives:
1) To evaluate the effect of endoscopic sinus surgery (ESS) on nNO in CRS patients. 2) To explore the relationship between nNO and various clinical measures of CRS.

Methods:
This was a prospective cohort study involving adult patients undergoing ESS for CRS who previously had failed maximal medical therapy. nNO levels and SNOT-22 symptom scores were measured preoperatively and again at the 1 month-follow-up visit.

Results:
Twenty-four patients were included in this study. 79.2% of patients had CRS with nasal polyps and 62.5% had previously undergone ESS. Baseline disease severity as measured by the Lund-Mackay (LM) CT score was 17.4 +/- 5.2. There was a statistically significant improvement in the mean baseline nNO from 406 +/- 327 ppb to 613 +/- 307 ppb at 1 month post-operatively ($p = 0.0005$). The mean SNOT-22 score improved from 52.5 +/- 17.9 to 24.7 +/- 18.4 post ESS ($p<0.0001$). A higher LM score was negatively correlated with a lower baseline nNO level ($r=-0.757$, $p<0.0001$).

Conclusion:
This study has demonstrated that ESS may increase nNO levels as well as improve patient symptoms in individuals with CRS. Furthermore, patients with more severe disease tend to have a lower baseline nNO. Future studies are required to better understand the role of nNO in the pathophysiology of CRS.

The Impact of Comorbid Gastroesophageal Reflux Disease on Endoscopic Sinus Surgery Quality-of-Life Outcomes

Adam DeConde, MD; Jess Mace, MPH, CCRP; Timothy Smith, MD, MPH
Portland, OR, USA

Objectives:

Chronic rhinosinusitis (CRS) and gastroesophageal reflux disease (GERD) are common entities that overlap in patient demographics. The pathophysiologic role of GERD has yet to be elucidated, but it is postulated the extra-esophageal reflux may contribute to worsening symptoms of CRS. This study seeks to investigate whether patients with CRS with and without a history of GERD experience comparable quality-of-life (QOL) improvement after endoscopic sinus surgery (ESS).

Methods:

An adult cohort (n=229) with medically refractory CRS was prospectively assessed following ESS using three disease-specific QOL constructs. A patient subset with a history of comorbid GERD was retrospectively identified (n=72) and preoperative and postoperative QOL were compared to patients without GERD (n=157).

Results:

Patients with comorbid GERD and CRS were comparable across all baseline patient characterstics ($p>0.050$) with the exception of patients with a history of GERD were less likely to have undergone allergy testing ($p<0.002$) and were older (53.8 years vs. 47.6; $p<0.002$). Similarly, baseline objective and subjective measures of disease were comparable between patients with CRS with and without GERD ($p>0.050$). All patients had significant QOL improvement across all QOL constructs ($p<0.021$), and no difference was detected in the magnitude of that improvement between patients with and without a history of GERD ($p>0.050$). Similarly, patients on active medical therapy for GERD (n=49) had QOL gains comparable to patients not reporting GERD medical therapy ($p>0.050$).

Conclusions:

Patients electing ESS for CRS with and without comorbid GERD have comparable baseline characteristics and QOL outcomes following surgery.

The Significance of Response Shift in Sinus Surgery Outcomes

Jack Liu, MD; Greg Davis, MD, MPH
Seattle, WA, USA

Introduction:

Functional endoscopic sinus surgery (FESS) is often performed to improve quality of life (QOL). Perception of QOL can change according to one's current medical or emotional state. This is known as response shift. It can be measured by the Then-test, which asks patients to report pre-treatment symptoms in the post-treatment period. Patients often do not understand their disease burden until their symptoms are improved. This study aims to assess the significance of response shift in sinus surgery outcomes.

Methods:

This was a prospective cohort study that included chronic rhinosinusitis patients from 2010-2012 who completed a pre-operative sino-nasal outcome test (SNOT-20). Two SNOT-20's were mailed approximately 6 months after surgery. Patients completed one SNOT-20 according to how they recall their pre-operative symptoms ("then-test") and the other based on post-operative symptoms. The pre- and post-operative SNOT-20 difference represented the treatment effect and the pre-operative SNOT-20 and then-test difference represented response shift. Results: 32 completed responses were obtained. Using a zero to five scale, mean treatment effect was -0.96 ($P<0.01$), which signifies a QOL improvement. Mean response shift was +0.42 ($P=0.01$). This positive value signifies that patients recall worse pre-operative symptoms, likely due to a positive change in health status. The actual treatment effect is the sum of the measured treatment effect and response shift, which was -1.38.

Discussion:

Response shift exists and can be quantified. The actual treatment effect was more profound when response shift was included. Therefore, future studies should account for this often unmeasured, potential change in QOL.

The Use of Pharyngeal Packing in Nasal/Oral Surgeries: A Systematic Review

Mandeep Gill, MD; Jason Kim, BHSc (Candidate); James Khan, MD; Sarfaraz Banglawala, MD; Doron Sommer, MD
Hamilton, Ontario, Canada

Objective:

Pharyngeal packing for nasal/oral surgeries is common in some centers. Pharyngeal packing is thought to prevent blood from entering the aero digestive track and thus reduce nausea and vomiting postoperatively. The purpose of this study was to perform a systematic review on the existing literature to evaluate the effectiveness of pharyngeal packing in nasal/oral surgery and to assess throat pain associated with this type of packing.

Methods:

A literature search was conducted by two independent reviewers using Pubmed, Medline, OVID, Cochrane library, Google Scholar as well as Web of science from 1966 to December 2013 to identify relevant studies assessing pharyngeal packing in nasal/oral surgery. All papers were reviewed for study design, results and were assigned an Oxford level of evidence grade and DETSKY score.

Results:

A total of seven studies were identified that met the inclusion criteria. Four studies looked at the rates of postoperative nausea and vomiting and found no difference between packing and no packing. Six studies looked at postoperative pain, three of which illustrated that packing causes more pain and two of which found no effect. One study illustrated that tenoxicam impregnated gauze is less painful than 0.9% saline impregnated gauze.

Conclusion:

There no evidence to suggest that pharyngeal packing reduces the rates of postoperative nausea and vomiting and may in fact cause more patient discomfort. Further research is needed to fully elucidate the role of pharyngeal packing.

Transnasal Endoscopic Management of Central Skull Base Osteomyelitis

Alfred Marc Iloreta, MD; Jared Goldfarb, MS; Gurston Nyquist, MD; Christopher Farrell, MD; James Evans, MD; Marc Rosen, MD
Philadelphia, PA, USA

Skull base osteomyelitis (SBO) is a rare infectious condition most commonly presenting in elderly immunocompromised, diabetic patient populations. We present our series of nineteen patients with central skull base osteomyelitis including our management paradigm and a review of literature.

Design:

Retrospective chart review.

Results:

A total of 14 patients were identified. There were 11 male and 3 female patients. Ten patients were culture positive for staphylococcus, 3 for pseudomonas, 2 for aspergillus. 9 patients had eradication of disease, 9 patients needed repeat surgical procedures. Patients with a history of staphylococcus aureus infection had a higher percentage of treatment cure while patients with cultures positive for aspergillus fungal disease. Patients that had positive pseudomonas cultures had an average of 3.7 operative procedures, patients with positive aspergillus cultures had an average of 4 operative procedures, patients with positive staphylococcus cultures had an average of 1.8 operative procedures.

Conclusion:

Our experience suggests that central SBO is a distinct entity and disease process than SBO. A large proportion of patients had history of staphylococcal infection and in addition these patients had higher overall rate of cure when compared to patients with pseudomonas or fungal infections. Patients with staphylococcus positive cultures had a decreased need for subsequent operative debridements and resection. We believe patients with patients with history of pseudomonas infections, fungal infections and cranial nerve involvement are at higher risk of failing therapy and may need more aggressive surgical debridement. Mainstays of therapy remain to be surgical debridement and culture directed intravenous antibiotic/antimicrobial therapy.

Transorbital Endoscopic Approach to the Frontal Sinus: A Case Series

Jack Liu, MD; Randall Bly, MD; Kris Moe, MD
Seattle, WA, USA

Introduction:

Direct visualization and surgical access to the frontal sinus can be challenging. Options for extended frontal sinus access include the modified Lothrop procedure and an open coronal approach. The goals of this study are to describe and present outcomes of a transorbital endoscopic approach (alone or in combination with transnasal surgery) to access and visualize challenging lesions in the frontal sinus.

Methods:

This is a retrospective case series of patients who underwent transorbital endoscopic frontal sinus surgery from 2008-2013. Medical records were reviewed for surgical indication, treatment outcome, complications, length of stay, operative time, and need for repeat surgery. The transorbital approach begins with a superior lid crease incision to expose the orbital roof. An osteotomy is made under image-guidance. The transorbital window provides a direct pathway for instruments and an endoscope which can provide a panoramic view of the frontal sinus.

Results:

20 patients were identified. Surgical indications included mucocele, lateral tumors, cerebral spinal fluid leak, epidural abscess, osteoma, and chronic sinusitis. 17/20 patients had resolution of their preoperative symptoms. Six patients had prior surgery. There were no major complications, specifically no loss of vision, extraocular muscle injury, cosmetic deformity, or intracranial injury.

Conclusion:

The endoscopic transorbital approach provides a rapid, direct, and safe method of accessing the entire frontal sinus. It can be particularly useful for far lateral and superior frontal sinus lesions or defects. This approach can be considered as an alternative or adjunct to the modified Lothrop approach.

Treatment of Severe Epistaxis in Patients with Hereditary Hemorrhagic Telangiectasia Using a Simple Two-flap Nasal Closure Method

Benjamin Timmins, MS; Benjamin Hunter, BS; P. Daniel Ward, MD, MS; Kevin Wilson, MD
Salt Lake City, UT, USA

Introduction:

Nasal closure has been shown to be effective in the management of severe epistaxis refractory to other treatments in patients with hereditary hemorrhagic telangiectasia (HHT). The modified Young's procedure has drawbacks due to its complexity and breakdown at the point of trifurcation. Here we report on the outcomes of a new, simpler two-flap technique for nasal closure and compare them to those of the traditional method.

Method:

Retrospective chart review of HHT patients treated for severe epistaxis with nasal closure between 2005 and 2013. Operating room (OR) time, need for revision surgery, pre- and post-procedure epistaxis severity score (ESS), complete blood count values and Glasgow Benefit Inventory (GBI) questionnaire results were collected for each patient.

Results:

Average decrease in ESS subsequent to nasal closure using the two flap method is 6.54 (3.9-9.09) and mean GBI score is 56.3 (38.9-83.3). Comparison of six patients who underwent the traditional nasal closure procedure and eight patients receiving the simplified two flap nasal closure showed no statistically significant difference in ESS or GBI metrics. Mean OR times of the traditional and simplified methods were 5.12 hours and 2.36 hours respectively ($p < 0.05$). Mean time to first revision for six nasal closure patients is 25.5 months (2-59 months).

Conclusions:

In short-term follow-up, the two-flap procedure has shown comparable effectiveness with significantly reduced complexity and operative time compared to the traditional nasal closure method.

Ultrasonic Bone Aspirator Assisted Dacryocystorhinostomy

Toby Steele, MD; Edward Strong, MD
Sacramento, CA, USA

Purpose:
To evaluate a new and evolving technique for endonasal dacryocystorhinostomy and assess its efficacy.

Introduction:
Multiple surgical techniques have been described for bone removal during endonasal dacryocystorhinostomy, including bone ronguers, lasers, radiofrequency devices, and drills. The ultrasonic bone aspirator utilizes vibration generated by a piezoelectric motor to emulsify bone with limited heat and energy transfer to surrounding tissue. Early investigations using the ultrasonic bone aspirator are promising.

Methods:
An institutional review board approved, retrospective review of 52 consecutive endoscopic dacryocystorhinostomies over a 40 month period.

Results:
52 consecutive patients underwent endoscopic dacryocystorhinostomy (DCR) from June 2010 through October 2013. Of the 52 patients, 23 underwent ultrasonic bone aspirator assisted DCR (uDCR), while 29 underwent microdrill assisted DCR (mDCR). The majority of patients were female (73%), with a mean age of 54.7 years (Range 18-91). Concurrent septoplasty was performed in 34.7% of patients, (21.7% uDCR, 44.8% mDCR, p = 0.013). There was no statistically significant difference between the two surgical approaches (uDCR 95.6% vs mDCR 89.6% p = 0.55).

Conclusion:
As endonasal techniques continue to evolve, greater emphasis is placed on mucosal sparing and minimally invasive techniques. The small size and profile of the ultrasonic bone aspirator may help reduce the number of septoplasties required and minimize soft tissue trauma, while offering similar success rates to the microdrill technique.

Utility of the CBC in predicting AERD in patients with CRSwNP

Brian Langford, MD; Hans Carlson, MD; Spencer Payne, MD
Charlottesville, VA, USA

Background:
Aspirin exacerbated respiratory disease (AERD) represents one of the severest forms of asthma and chronic sinusitis with nasal polyps (CRSwNP). Without clinical history of aspirin sensitivity, the differentiation of AERD from other forms of CRSwNP relies on ketorolac or aspirin challenge.

Purpose:
To investigate whether aspirin sensitivity can be predicted by CBC with differential in patients who present with nasal polyps.

Methods:
Retrospective chart review of prospectively gathered data in a tertiary care academic medical center. 294 consecutive patients who presented with CRSwNP between 2008 and 2012 on whom a CBC with differential was obtained at presentation were divided into those with and without AERD. The main outcome measure was absolute eosinophil count and platelet/neutrophil ratio in the CBC with differential.

Results:
The mean absolute eosinophil count in AERD patients was 0.61 K/uL versus 0.41 K/uL in CRSwNP alone (P = 0.0006). The mean platelet/neutrophil ratio in AERD patients was 76.32 versus 65.55 in CRSwNP alone (P = 0.03). There was no other statistically significant difference between the two groups regarding the ratios between platelets and other leukocytes. Receiver operator characteristic (ROC) curves were generated for eosinophil count and the platelet-neutrophil ratio with areas under the curve of 0.595 and 0.567 respectively indicating a low overall accuracy.

Conclusions:
Hypereosinophilia and an elevated platelet/neutrophil ratio computed from the CBC with differential may have some diagnostic utility in predicting whether patient with CRSwNP have underlying AERD. This simple objective lab test may help clinicians differentiate these two distinct populations of patients.

Utilization of Balloon versus Traditional Endoscopic Sinus Surgery Based on Patient Characteristics

Elisabeth Ference, MD, MPH; Madeline Graber, BA; David Conley, MD; Rakesh Chandra, MD; Melissa Pynnonen, MD; Stephani Smith, MD, MS
Chicago, IL, USA

Objectives:

To study the utilization of balloon compared to traditional endoscopic surgery (ESS) and identify variations in surgical practices based on patient characteristics.

Methods:

The State Ambulatory Surgery Databases (SASD) 2011 for California, Maryland and New York were examined, extracting all cases of endoscopic or balloon maxillary, sphenoid or frontal procedures. Demographic characteristics including age, gender, race, number of chronic diseases, primary payer, median household income for patient's zip code, and state were compared using logistic regression between patients undergoing ESS and those having a balloon procedure as part of their surgery.

Results:

Overall, 23,783 patients underwent paranasal sinus surgery in 2011 in the included states, of whom 8.40% had a balloon procedure. 5.00% of maxillary, 4.33% of sphenoid and 14.44% of frontal procedures were performed utilizing a balloon. Adjusting for age, gender, primary payer, and median income: Black and Asian patients were less likely than white patients to have a balloon procedure [OR black 0.55(0.42-0.71), Asian 0.48(0.36-0.65), p <0.001], patients with chronic diseases were more likely compared to patients with no chronic diseases [OR 1-5 chronic diseases 2.37(1.57-3.58), >6 1.95 (1.21-3.15), p<0.001)], and patients in NY were more likely and in MD less likely to have a balloon procedure compared to patients in CA [OR NY 1.78(1.60-1.98), MD 0.79(0.65-0.97), p<0.0001).

Conclusions:

Balloon technology was used in 8.40% of ESS in the sampled states in 2011, and there are significant racial and geographic disparities in its use. Further analyses are necessary to determine whether individual surgeon characteristics influence balloon utilization.

Utilization of Sinonasal and Nasopharyngeal Anatomy in the Endoscopic Endonasal Approach to the Inferior Clivus and Foramen Magnum

Satyan Sreenath, BS; Pablo Recinos, MD; Stanley McClurg, MD; Brian Thorp, MD; Adam Zanation, MD
Chapel Hill, NC, USA

Introduction:

Through advancements in nasal endoscopy and skull base reconstruction, the endoscopic endonasal approach (EEA) has become a valuable option to approach lesions ventromedial to the brainstem, in the region of the anterior foramen magnum (FM) and inferolateral clivus. We sought to define the EEA to this region by referencing sinonasal, nasopharyngeal, and posterior skull base anatomy.

Methods:

An EEA to the inferior clivus and foramen magnum was carried out in five, latex-injected cadaver heads. Images and bilateral measurements of mean anatomic distances were obtained.

Results:

The operative window was 32mm wide anterosuperiorly, marked by the lacerum segments of the internal carotid artery, and 19mm wide posteroinferiorly, marked by the occipital condyles. In the anteroposterior axis, the supracondylar groove was identified in the same plane as and 27mm from the nasopharyngeal orifice of the Eustachian tube, a landmark for the hypoglossal canal at the border of the FM. In the same axis, the posterosuperior edge of the salpingopharyngeal fold was 13mm from the anterior edge of the occipital condyle, and the superior edge of the torus tubarius laid in the same plane as the jugular tubercle, a landmark for the lateral, inferior clivus. Lastly, the vertebrobasilar junction was noted to lay 13mm above the foramen magnum.

Conclusions:

Through referencing nasopharyngeal, sinonasal, and skull base anatomy, the EEA offers a viable route in approaching ventral lesions involving the foramen magnum and inferior clival region. This approach minimizes displacement of normal tissue and achieves visualization through a direct surgical corridor.

Variations in the Diagnosis of Chronic Sinusitis in the Primary Care Setting

Sarah Novis, MD; Sarah Akkina, BS; Shana Lynn, BS; Hayley Kern, BS; Matthew Davis, MD, MAPP; Melissa Pynnonen, MD, MS
Ann Arbor, MI, USA

Introduction:
Chronic sinusitis is a common primary care diagnosis with high associated healthcare costs. The diagnosis of chronic sinusitis is clinically complex and often difficult in the primary care setting where endoscopy and imaging studies may not be available. We hypothesized that significant variation exists in the diagnosis of chronic sinusitis among primary care providers.

Methods:
We created a retrospective cohort of adults diagnosed with chronic sinusitis (ICD-9 code 473.X) during a two year period. This cohort was limited to visits to primary care clinics or the emergency department. Patients with concurrent diagnosis of pharyngitis, otitis media, acute tonsillitis, bronchitis or strep throat were excluded to minimize confounding.

Results:
We identified 114 patients with the diagnosis of chronic sinusitis. These diagnoses were made in the emergency department (66%) and in primary care clinics (34%). There was poor correlation between ICD-9 coding and clinical documentation. Review of the clinic note demonstrated that only 7% of patients had the diagnosis of "chronic sinusitis" explicitly charted. There was no mention of any type of sinusitis in the clinical documentation for 25% of patients. The average symptom duration was 37 days (range 1-365 days), and 79% of patients had symptoms for less than twelve weeks.

Conclusions:
Based on this detailed chart review, substantial discrepancy exists between ICD-9 codes and clinical documentation for patients diagnosed with chronic sinusitis in a primary care/emergency department setting. This demonstrates the need for granular level studies of chronic sinusitis to evaluate diagnostic accuracy before considering treatment and outcomes.

Vitamin D Metabolism in Chronic Rhinosinusitis

Jasmine Cheng, Ms; Raymond Sacks, A/Prof; William Sewell, A/Prof; Jenny Gunton, Dr; Peter Earls, Dr; Richard Harvey, A/Prof
Darlinghurst, NSW, Australia

Background:
Deficiency in Vitamin D activity has been associated with several mechanisms linked with inflammatory respiratory disease. Studies investigating the association between serum Vitamin D and these diseases have yielded conflicting results. It has been suggested that the local synthesis of the active metabolite may be more relevant than serum levels. This study investigates the local metabolism of Vitamin D in chronic rhinosinusitis (CRS).

Methods:
Sinus mucosal biopsies were taken from patients undergoing endoscopic sinus surgery. The samples were analysed using quantitative-PCR to determine the mRNA expression of vitamin D receptors (VDR), synthesis enzymes (1a-hydroxylase and 25-hydroxylase) and breakdown (24-hydroxylase) enzymes. These results were correlated to patient clinical data including histopathology, serum vitamin D and patient-reported outcome measures.

Results:
31 patients (age 53.78±18.58, 38.7% female) were recruited for this study, 9 eosinophilic-CRS, 9 non-eosinophilic-CRS and 13 controls. This study found that 1a-hydroxylase expression was downregulated in CRS compared to controls [0.0029(0-0.0076) and 0.003(0-0.008) vs 0.009(0-0.020), p=0.039], while 24-hydroxylase was upregulated [0.154(0-0.44) and 0.307(0-0.99) vs 0.019(0-0.059), p=0.025]. VDR expression was increased relative to controls but not significantly. No difference was determined in 25-hydroxylase expression, and the Vitamin D parameters were not correlated with serum vitamin D levels or patient outcomes.

Conclusions:
These results suggest that tissue vitamin D metabolism is altered in CRS, and that change is not necessarily reflected in serum levels. However its relationship to persistent inflammation is unknown. Furthermore, this may have clinical implications regarding the interpretation of serum Vitamin D and the use of supplementation.

Volumetric Analysis of Chronic Maxillary Atelectasis

Giant Lin, MD; Ahmad Sedaghat, MD, PhD; Benjamin Bleier, MD; Busaba Nicholas, MD; Yoon Michael, MD; Stacey Gray, MD
Boston, MA, USA

Introduction:

The relationship between orbit and sinus volumes at presentation and after functional endoscopic sinus surgery (FESS) for chronic maxillary atelectasis (CMA) was evaluated.

Methods:

A retrospective review of patients with CMA treated since 2007 was performed. CT images were analyzed using OsiriX 5.8.2 software.

Results:

Twenty patients underwent FESS for CMA. All patients had complete obstruction of the maxillary sinus with opacification. CMA was left in 8 patients, right in 11 patients, and bilateral in 1 patient. Septal deviation toward the diseased side (DS) was observed in 15/19 patients (P=0.01). Pre-treatment orbit volumes on DS and contralateral sides (CS) were 28.98 cc and 26.30 cc (P<0.001). Sinus volumes on DS and CS were 8.42 cc and 16.79 cc (P<0.001). The percentage decrease in sinus volume on the DS compared to the CS did not significantly correlate with percent orbit volume changes. Enophthalmos was present in 8 patients and diplopia in 2 patients. Orbit and sinus volume changes did not significantly predict the presence of enophthalmos. Six patients underwent sinus CT more than 6 months postoperatively. In these patients, orbit volume on DS decreased from 30.14 to 28.27 cc (p=0.005), and sinus volume on DS increased from 11.00 to 13.16 cc (p=0.06).

Conclusion:

CMA leads to significant orbit volume expansion and sinus contraction. Enophthalmos is not reliably predicted based on volume changes of the orbit or maxillary sinus. Spontaneous maxillary sinus expansion and decrease in orbit volume occurs after FESS but does not normalize when compared to the contralateral side.
:

American Rhinologic Society

EARLY BIRD REGISTRATION ENDS 7/1

FIRST TIME ATTENDEES FREE until 7/1

60mo Meeting Anual de la Sociedad Rinológica Americana (ARS)

(el día antes de la Academia Americana de ORL)

Septiembre 20 de 2014

Orlando Hyatt Regency, Orlando, Florida

Países invitados: Brazil, Colombia, México, Venezuela

Detalles del Meeting: *http://www.american-rhinologic.org/annual_meeting*

Oportunidades de Exhibición y de Marketing de productos:
http://www.american-rhinologic.org/annual_exhibitor_information

Fechas límites entrega de trabajos: Resúmenes: Mayo 24 de 2014; Manuscrito: Agosto 21 de 2014

https://www.facebook.com/americanrhinologicsociety?fref=ts

PUNTOS DESTACADOS DEL MEETING:

- **Desayuno, almuerzo y cafe con los auspiciadores corporativos de la ARS.**
- **Mesa redonda:**
  - Sinusitis alérgica fúngica: reduciendo las exacerbaciones de la enfermedad.
  - Pasado, presente y futuro de la rinología: tecnologías emergentes, terapias médicas prometedoras, nuevas directivas para investigación y campo profesional.
  - Rinología pediátrica: Cirugía endoscópica endonasal para enfermedades no relacionadas a la rinosinusits crónica.
  - "Mi caso más exigente y como lo manejé".
- **Oradores invitados:**
  - **X Lectura anual Kennedy** - Dr. Claus Bachert: *"Endotipos de la Rinosinusitis Crónica y sus Consecuencias Terapéuticas"*
- **FESStival de Videos Rinológicos:**
  - Destacándose este año los videos más emocionantes, raros, educativos e innovadores en un formato de 3 minutos de duración, con discusión en vivo y un panel de expertos.
- **Velada de Residentes y Fellows auspiciada por la ASL.**
- **Velada de Mentores de Programas.**
- **Simposios y Recepciones:**
  - Simposio de Desayuno (por Olympus):
    - Sábado 20/09/14; 06:55 - 7:55 am
  - Presentación de Posters (por TEVA):
    - Sábado 20/09/14; 5:00 - 6:30 pm.
  - Recepción del Presidente de la ARS (por Intersect ENT)
    - Sábado 20/09/14; 06:30 - 8:00 pm
- **Adicional:**
  - Lo último en investigación innovadora recogida de alrededor del mundo.
  - Rinólogos renombrados internacionales discutiendo sus perlas y desaciertos en su variedad de tratamientos médicos y quirúrgicos.
  - Discusiones de los nuevos descubrimientos e innovaciones tecnológicas, en un formato interactivo, presentaciones de video y casos en vivo.
  - Exhibición de la última tecnología por nuestros auspiciadores.

Contacto:
Wendi Pérez - Administradora ARS
PO Box 495 Warwick, NY 10990
Tel: 845-988-1631; Fax: 845-986-1527
Email: wendi@amrhso.com

American Rhinologic Society

EARLY BIRD REGISTRATION ENDS 7/1

FIRST TIME ATTENDEES FREE until 7/1

Saturday, 9/20/14; 6:55 - 7:55am
Olympus Breakfast Symposium
"Pearls and Perils in the Office
This is a non-CME event sponsored by Olympus. It is neither sponsored by, for endorsed by, the ARS.

Saturday, 9/20/14; 5:00 - 6:30pm
TEVA Respiratory Four Corner QNASL Research Update
"Advances in Aerosol Therapy for Patients with Allergic Rhinitis"
- Safety/Efficacy
- Spray Force
- Patient Outcomes
- Aerosol Attributes

This is a non-CME event sponsored by TEVA Respiratory. It is neither sponsored by, nor endorsed by, the ARS.

Saturday, 9/20/14; 6:30 - 8:00pm
ARS President's Wine & Cheese Poster Reception - *Supported by Intersect ENT*

The ARS at AAO
60th ANNUAL MEETING

September 20, 2014

Hyatt Regency Orlando,
Orlando, Florida

GUEST COUNTRIES: Brazil, Columbia, Mexico, Venezuela

MEETING HIGHLIGHTS:

- 10th Annual David W. Kennedy Lectureship Series
- Residents/Fellows Luncheon
- Lunch, Breakfast & Coffee Breaks with ARS Corporate Partners
- Mentorship Program Luncheon

Meeting details: *www.american-rhinologic.org/annual_meeting*

Exhibitors and Marketing Opportunities:
http://www.american-rhinologic.org/annual_exhibitor_information

Deadlines: **Abstract: May 24, 2014, Manuscript: August 21, 2014**

Meeting Contact: **Wendi Perez, Administrator, ARS, PO Box 495, Warwick, NY 10990**
Tel: 845-988-1631, Fax: 845-986-1527, Email: *wendi@amrhso.com*

https://www.facebook.com/americanrhinologicsociety

Panels:

- Allergic Fungal Rhinosinusitis: Is it Really Different?
- Rhinology Past, Present, and Future: Emerging Technologies, Promising Medical Therapies, New Directions in Research, and Scope of Practice
- Pediatric Rhinology: Endoscopic Endonasal Surgery for nonCRS Conditions
- My most challenging case and how I handled it

Rhinology Film FESStival:

Featuring this year's most educational, novel, rare and exciting cases in short 3-minute videos with lively discussion by a panel of experts.

Guest Speaker

10th Annual Kennedy Lecture – Claus Bachert, MD
"Endotypes of Chronic Rhinosinusitis and Therapeutic Consequences"

And more:

- Internationally renowned rhinologists, discussing their personal pearls and pitfalls with a variety of medical and surgical treatments.
- Interactive format, video presentations, and insightful lively discussions, about new technogical innovations, and discoveries.
- The latest in cutting-edge research from around the globe.
- Explore the exhibits and latest technological advancements with of our industry partners.