



56th
annual meeting
of the American Rhinologic Society

September 25, 2010

Boston Park Plaza Hotel, 50 Park Plaza at Arlington Street, Boston, MA



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PROGRAM AT-A-GLANCE

September 25, 2010

IMPERIAL BALLROOM A

7:00am - 8:00am

Breakfast Symposium

Supported by Entellus Medical

***The Nose-Inside and Outside -
Functional and Aesthetic
Considerations for the Surgeon.***

Moderator: Michael Setzen, MD

Panelists: Daniel Becker, MD, Minas
Constantinides, MD, Paul Toffel, MD,
Dean Toriumi, MD

8:00am - 8:07am

Welcome

8:07am - 8:37am

Practical Allergy for the Rhinologist

Jack Krouse, MD.

**Moderators: Bradley Marple, MD,
Richard Orlandi, MD**

8:37am - 8:43am

*Rhinitis, allergic and non-allergic and
asthma: an epidemiological study from
Finland, Elina Toskala, MD, PhD*

8:43am - 8:49am

*Allergic rhinitis is associated with
decreased expression of toll-like receptor
9 by sinonasal epithelial cells*
Thuy-Anh Melvin, MD

8:49am - 8:55am

*Discussion & Audience Response
Questions*

**Moderators: Marc Dubin, MD,
Samer Fakhri, MD**

8:55am - 9:01am

*Clinic versus OR - A Comparative
Analysis of Ostial Dilatation for CRS -
Jeffrey Cutler, MD*

9:01am - 9:07am

*Lateral surgical access to the frontal
sinus after Modified Endoscopic Lothrop -
Dan Timperley, MD*

9:07am - 9:13am

*The Effectiveness of Preemptive
Sphenopalatine Ganglion Block on
Postoperative Pain and Functional*

*Outcomes after Functional Endoscopic
Sinus Surgery - Do-Yeon Cho, MD*

9:13am - 9:19am

*Discussion & Audience Response
Questions*

**Moderators: Stacey Gray, MD, Chris
Melroy, MD**

9:19am - 9:25am

*Factors associated with CT status in
patients presenting with a history of CRS
- Leah Abrass, B.S.*

9:25am - 9:31am

*Socioeconomic Status: a Disease
Modifier of Chronic Rhinosinusitis?
- Dakheel AlMutairi, MD*

9:31am - 9:37am

*Adherence to Clinical Practice
Guidelines for Adult Sinusitis
- Ilaaf Darrat, MD*

9:37am - 9:43am

*Characterizing Patterns of Nasal
Inspiration
- Catherine E. Rennie, MD*

9:43am - 9:49am

*Discussion & Audience Response
Questions*

9:49am - 10:04am

Awards Presentation

10:04am - 10:34am

***6th Annual David W.
Kennedy Lectureship***
***"Rhinology Rules: OK!" -
Professor Valerie Lund***

10:34am - 10:54am

***Break with Exhibitors - Imperial
Ballroom B***

**Moderators: Rakesh Chandra, MD,
Martin Desrosiers, MD**

10:54am - 11:00am

*Can Bottle Design Prevent Bacterial
Contamination of Nasal Irrigation
Bottles? - Andrew Foreman, MD*

11:00am - 11:06am

Temporospatial Quantification of Fluorescein Labeled Sinonasal Irrigation Delivery - Benjamin Bleier, MD

11:06am - 11:12am

A Comparative Study of the Distribution of Normal Saline Delivered by Large Particle Nebulizer vs. Large Volume/Low Pressure Squeeze Bottle
- Yuri Michael Gelfand, MD

11:12am - 11:18am

Discussion and Audience Response Questions

Moderators: H. Peter Doble, MD, Ralph Metson, MD

11:18am - 11:24am

Radiological localization of Schneiderian Papillomas: Is Osteitis Sign Reliable?
- Yahya Al Badaai, MD

11:24am - 11:30am

Inverted Papilloma: Location, Location, Location
- Mark Schneyer, MD

11:30am - 11:36am

Metalloproteinases and catenin in inverted papilloma tissue
- Ramin Naim, MD, PhD

11:36am - 11:42am

Discussion and Audience Response Questions

Moderators: Donald Lanza, MD, Kathleen Yaremchuk, MD

11:42am - 11:48am

Fellowship Training in Rhinology: ARS Survey of US Graduates
- Pete Batra, MD

11:48am - 11:54am

Development and Validation of an Endoscopic Sinus Surgery Skills Training Model - Scott D. Burge, BS

11:54am - 12:00pm

Discussion and Audience Response Questions

12:00pm - 12:15pm

Business Meeting - ALL ARS MEMBERS INVITED

12:00pm - 1:00pm Lunch Break/Exhibit Hall

IMPERIAL BALLROOM B

Moderator: Ralph Metson, MD

1:00pm - 2:00pm

Panel: "When Surgery Fails: Medical Management of the Difficult Sinus Patient"

Moderators: David Conley, MD, Jay Dutton, MD

2:00pm - 2:06pm

Endoscopic Anatomy of the Postganglionic Pterygopalatine Parasympathetic Innervation of the Posterolateral Nasal Mucosa: A New Perspective - Benjamin Bleier, MD

2:06pm - 2:12pm

The Medial Optico-Carotid Recess (MOCR) as a Keyhole for Endoscopic Endonasal Approaches to Paraclinoid Cerebral Aneurysms - Adam Zanation, MD

2:12pm - 2:18pm

Assessment of Frontal Recess Fracture Patterns Using Triplanar CT Images - Seth Isaacs, MD

2:18pm - 2:24pm

Discussion & Audience Response Questions

2:24pm - 2:44pm

Break with Exhibitors - Imperial Ballroom B

Moderators: Andrew Lane, MD, Adam Zanation, MD

2:44pm - 2:50pm

Management of unilateral skull base tumors via endoscopic hemi- anterior skull base resection - Belachew Tessema, MD

2:50pm - 2:56pm

Endoscopic Cerebrospinal Fluid Leak Closure in an Infected Field - Amy K. Hsu, MD

2:56pm - 3:02pm

Discussion & Audience Response Questions

Moderators: Seth Brown, MD, Stephanie Joe, MD

3:02pm - 3:08pm

Identification of Fungus in Pediatric Chronic Rhinosinusitis
- Andrew Terrell, MD

3:08pm - 3:14pm

Development of a sheep model for the study of fungal biofilm in rhinosinusitis: Fungal and bacterial synergy - Sam Boase, MD

3:14pm - 3:20pm

Tissue remodeling in the allergic fungal sinusitis mouse model
- Nathan Sautter, MD

3:20pm - 3:26pm

A meta analysis of topical amphotericin B for the treatment of chronic rhinosinusitis
- Seth Isaacs, MD

3:26pm - 3:32pm

Discussion & Audience Response Questions

Moderators: Stilianos Kountakis, MD, Belachew Tessema, MD

3:32pm - 3:38pm

The Efficacy of Hemostatic Techniques in the Sheep Model of Endoscopic Carotid Artery Injury - Rowan Valentine, MD

3:38pm - 3:44pm

Office-based sclerotherapy for recurrent epistaxis due to hereditary hemorrhagic telangiectasias - Holly C. Boyer, MD

3:44pm - 4:00pm

Discussion & Audience Response Questions

Moderators: Jivianne Lee, MD, Douglas Reh, MD

4:00pm - 4:06pm

Effect of Point of Care CT Scan on Management of the Chronic Sinusitis Patient with Normal Nasal Endoscopy - Bruce Tan, MD

4:06pm - 4:12pm

Variability of Radiation Exposure with In-Office Sinus CT Examinations - Alexander Stewart, MD

4:12pm - 4:18pm

Impact of intraoperative CT imaging on endoscopic sinonasal and skull base surgery: A prospective analysis - Pete Batra, MD

4:18pm - 4:24pm

Multi-Modal Non-Rigid Registration for Image Guided Head and Neck Surgery - Joseph Han, MD

4:24pm - 4:30pm

Discussion & Audience Response Questions

Moderators: Spencer Payne, MD, Sarah Wise, MD

4:30pm - 4:36pm

Beyond the Pituitary: Prospective Clinical Trial of Nasal Healing, Sinonasal Quality of Life and Olfaction in Expanded Endonasal Skull Base Surgery
- Adam Zanation, MD

4:36pm - 4:42pm

Quality of life and sinonasal outcomes following fully endoscopic transphenoidal skull base surgery - Amanda Munoz, MD

4:42pm - 4:48pm

Comparative Analysis of Cost of Minimally Invasive Pituitary Surgery and Sublabial-transseptal Approaches to the Pituitary - Charles Ebert, MD

4:48pm - 4:54pm

Sinonasal Quality-of-Life before and after Endoscopic, Endonasal Minimally Invasive Pituitary Surgery
- Thomas A. Suberman, BA

4:54pm - 5:00pm

Discussion & Audience Response Questions

5:00pm - 6:00pm

Break with Exhibitors - Imperial Ballroom B

6:00pm - 7:00pm

Moderator: Brad Marple, MD
ARS/AAOA Joint Symposium
"Non FDA Approved Treatment of Sinusitis"

PLAZA BALLROOM

Moderators: Karen Fong, MD, Mark Zacharek, MD

1:00pm - 1:06pm

Novel Effects of Statins in Enhancing Efficacy of Chemotherapy in Nasopharyngeal Cancer - Weihua Wang, MD

1:06pm - 1:12pm

Sinonasal epithelial cells express 1 α -hydroxylase and can synthesize active vitamin D augmenting host innate immune function - Babar Sultan, MD

1:12pm - 1:18pm

Polyhydrated Ionogen Enhances Postoperative Sinonasal Ciliated Remucosolization - Noam Cohen, MD, PhD

1:18pm - 1:24pm

Discussion & Audience Response Questions

Moderators: Robert Kern, MD, Brad Woodworth, MD

1:24pm - 1:30pm

Inflamed sinus mucosa has different cytokine profile than nasal polyps in patients with chronic rhinosinusitis - Amber Luong, MD, PhD

1:30pm - 1:36pm

Variations in expression of matrix metalloproteinase-9 (MMP-9) and tissue inhibitor of metalloproteinase-1 (TIMP-1) in nasal mucosa of aspirin sensitive versus aspirin tolerant patients with nasal polyposis - Pamela Mudd, MD

1:36pm - 1:42pm

Are bacterial biofilms chemotactic to inflammatory cells in chronic rhinosinusitis? - Andrew Wood, MD

1:42pm - 1:48pm

Dysregulated microRNAs in Chronic Sinusitis - Do-Yeon Cho, MD

1:48pm - 1:54pm

Discussion & Audience Response Questions

1:54pm - 2:24pm

"Outcomes in Rhinology" - Timothy Smith, MD

2:24pm - 2:44pm

Break with Exhibitors - Imperial Ballroom B

Moderators: Eric Holbrook, MD, Rodney Schlosser, MD

2:44pm - 2:50pm

Expression of mucosal epithelial barrier and water membrane permeability protein receptors in chronic rhinosinusitis with and without nasal polyps - Alan Shikani, MD

2:50pm - 2:56pm

Chloride ion transport of the nasal ciliated epithelial cell - Masato Miwa, MD

2:56pm - 3:02pm

Evaluation of Topical Surfactant Solution on Sinonasal Respiratory Cilia Function - Noam Cohen, MD

3:02pm - 3:08pm

Discussion & Audience Response Questions

Moderators: James Hadley, MD, Peter Hwang, MD

3:08pm - 3:14pm

Safety and Efficacy of a Novel Bioabsorbable, Steroid Eluting Sinus Stent - Andrew Murr, MD

3:14pm - 3:20pm

Gel Rhinotopic therapy for chronic rhinosinusitis that is refractory to oral antibiotics - Ian Shikani, MD

3:20pm - 3:26pm

The use of zileuton for treatment of chronic rhinosinusitis in Samter's triad - Justin Antisdell, MD

3:26pm - 3:32pm

Discussion & Audience Response Questions

Moderators: Noam Cohen, MD, Amber Luong, MD

3:32pm - 3:38pm

Epithelial cell innate antiviral effector expression is up-regulated in chronic rhinosinusitis with polyps - Stella Lee, MD

3:38pm - 3:44pm

Do viruses have a role in the pathogenesis of chronic rhinosinusitis? - Andrew Wood, MD

3:44pm - 3:50pm

Discussion & Audience Response Questions

Moderators: Alexander Chiu, MD, Steven Schaefer, MD

3:50pm - 3:56pm

Trends in MRSA Incidence and Sensitivity from Nasal Cultures at a Single Tertiary Care Institution - Valin Rujanavej, MD

3:56pm - 4:02pm

The etiology of sinonasal Staphylococcus Aureus following surgery for Chronic Rhinosinusitis - Joshua Jarvis-Bardy, MD

4:02pm - 4:08pm

Discussion & Audience Response Questions

Moderator: Andrew Lane, MD

4:08pm - 5:00pm

“The Great Debate: Origins of Sinusitis”

POSTERS: PLAZA BALLROOM

#1A - A Novel Approach for Treatment of Nasal Septal Arteriovenous Malformation

Naveen Bhandarkar, MD

#1B - A Systematic Assessment of the Quality of Reporting of Randomised Control Trials in the Management of Chronic Rhinosinusitis

Sonna Ifeachó

#2A - An Update on Attitudes and Usage of Image Guidance

Jeb Justice, MD

#2B - Applicability of the Traditional Chinese Version of the University of Pennsylvania Smell Identification Test in Patients with Chronic Rhinosinusitis

Rong-San Jiang, MD

#3A - Bilateral Olfactory Fossa Respiratory Epithelial Adenomatoid Hamartomas: Case Report and Review of the Literature

Jean Eloy, MD

#3B - Cadaver Study Comparing Various Methods of Endoscopic Reconstruction of Anterior Cranial Fossa Defects

Marc Tewfik, MD

#4A - Chondrosarcoma of the Nasal Cavity

Henry Barham, MD

#4B - Community-Acquired Methicillin-Resistant Staphylococcus aureus in Nasal Vestibular Abscess: A Case Series

Marisa Earley, MD

#5A - Comparison of NK/T cell Lymphoma and B Cell Lymphoma of the Sino-nasal Tract

Bong-Jae Lee, MD

#5B - Cusum Analysis to Evaluate the Learning Curves of Residents at Performing Fiberoptic Endoscopy

Gaurang Dalal, MD

#6A - Delayed Onset Sinus Atelectasis Following Rhinoplasty

Mohsen Naraghi, MD

#6B - Double Flap Technique for Reconstruction of Anterior Skull Base Defects After Craniofacial Tumor Resection

Jean Eloy, MD

#7A - Dural Penetration of Angiofibromas: Do Intradural Approaches Increase Safety?

Mohsen Naraghi, MD

#7B - Ectopic Odontoma of the Nasal Cavity

Brandon Musgrave, MD

#8A - Endoscopic and 3D radiographic imaging of the Pterygopalatine and Infratemporal Fossa

Joseph Han, MD

#8B - Endoscopic Endonasal Removal of Dentigerous Cysts in the Bilateral Maxillary Sinus

Go Takahashi, MD

#9A - Endoscopic Transnasal Septotomy for Contralateral Orbital Apex Lesion Resection and Decompression

Kim Murray, MD

#9B - Endoscopic Transsphenoidal Surgery for ACTH Secreting Tumors

Nathan Deckard, MD

#10A - Endoscopic Verification of the Sphenoid Sinus

Richard Orlandi, MD

#10B - Epidemiology of Methicillin-Resistant Staphylococcus aureus (MRSA) in Chronic Rhinosinusitis and Current Management Dilemmas

Deya Jourdy, MD

#11A - Ethmoid Skull Base Height: A Clinically Useful Classification Scheme

Vijay Ramakrishnan, MD

#11B - Expression of Cyclin D1 in Nasal Polyps

Victor Scapa, MD

#12A - Extended Outcomes in Endoscopic Sphenopalatine Artery Ligation

Richard Orlandi, MD

#12B - Eye phones - Rapid Assessment of Visual Acuity in Orbital Complications of Rhinosinusitis

Claire Hopkins

#13A - Feasibility of Paired Utilization of Robotic Surgery with Image Guidance For Endonasal Surgery

Kibwei McKinney, MD

#13B - Frontal Sinus Osteomas Associated with Orbital and Intracranial Complications

Rohit Garg, MD

#14A - Health Impact of Hurricane Ike on Patients with Chronic Rhinosinusitis

Tracy Byerly II, MD

#14B - Human Glycated Albumin Induces the Release of IL-8 and Modified the Ciliary Activity in Primary Cultures of Human Adenoids

Claudio Callejas, MD

#15A - Increased Sensitivity of Lateral Imaging to Detect Changes in Nasal Polyp Size Following Bi-directional Delivery of Fluticasone Propionate

Per Djupesland, MD, PhD

#15B - Intrinsic Differences in Ciliary Activity Between Upper and Lower Respiratory Cultures

Ke Qing Zhao, MD

#16A - Long Term Sinonasal Polyp Recurrence in Patients with Samter's Triad After Endoscopic Sinus Surgery

Matthew Bowen, MD

#16B - Management of Seronegative Sinonasal Wegener's Granulomatosis: A Clinical Challenge

Justin Wudel, MD

#17A - Nasal Nitric Oxide and Sinonasal Disease: A Meta-analysis of Published Evidence

P. Seamus Phillips, MD

#17B - Nasal Septal Cyst: A Unique Delayed Presentation

Cheryl Gustafson, MD

#18A - Office-based Surgical Procedures in Rhinology: A Cost-effective and Well-tolerated Alternative to Operative Treatment

Oswaldo Henriquez, MD

#18B - Outcome Validation of External Septoplasty

P. Seamus Phillips, MD

#19A - Peroxisome Proliferator-Activated Receptor #947; Regulates Allergic Rhinitis by Induction of Regulatory T Cells in Mice

Weihua Wang, MD

#19B - Prospective Evaluation of a Novel Powered Nasal Irrigator Device in the post-FESS Cadaver Model

Richard Manes, MD

#20A - Pseudolymphoma of the Clivus Presenting as an Abducens Nerve Palsy: Case Report and Review of the Literature

Sachin Gupta, MD

#20B - Quality of Life Comparison in Common Rhinologic Surgeries

Mohsen Naraghi, MD

#21A - Rhinitis, Sinusitis and Epistaxis During Pregnancy

Gregg Goldstein, MD

#21B - Role of Open Approaches to Sino-Nasal Mucocoeles in the Endoscopic Era: A 24-year Experience

Devyani Lal, MD

#22A - Sausage Roll Rhinoplasty - A Novel use of Permacol in Augmentation Rhinoplasty

Claire Hopkins

#22B - Sinonasal Undifferentiated Carcinoma: Case Report of Recurrence in the Mandible and Review of the Literature
Dowin Boatright, MD

#23A - Skull Base Defect in a Patient with History of Ozena Undergoing Dacryocystorhinostomy: A Case Report and Review of the Literature
Mark Friedel, MD

#23B - Solitary Fibrous Tumors of the Nasal Cavity
Kevin Lollar, MD

#24A - Surgical Techniques on Augmentation Rhinoplasty of the Nasal Dorsum A Systematic Review
Garyfalia Lekakis

#24B - Treatment of Nasopharyngeal Papillomatosis with Coblation
Geoffrey Peters, MD

#25A - Upregulation of Cp110, a Negative Modulator of Ciliogenesis, in Chronic Rhinosinusitis
Yinyan Lai, MD

#25B - Urgent Endoscopic Approach for the Management of Pituitary Apoplexy
Alla Solyar, MD

Officers



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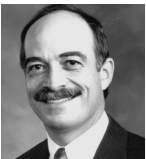
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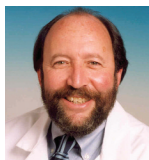
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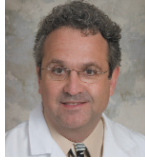
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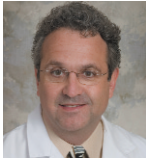


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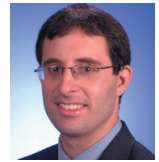
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2008 - 2009	James Stankiewicz, MD
2009 - 2010	Stilianos Kountakis, MD

*Deceased

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1975 - 1980	Glenn H. Drumhiller, MD
1970 - 1975	Ralph H. Riggs, MD

Business/ACCME

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.

Educational Objectives

1. Learn the newest cutting edge information on the medical management of patients with rhinosinusitis and other rhinologic diseases
2. Learn the newest information regarding the surgical management of patients with rhinosinusitis
3. Become familiar with the current research in the pathogenesis and pathophysiology of chronic rhinosinusitis and other rhinologic diseases
4. Become familiar with recent surgical advances in etiology and management of skull base lesions
5. Become familiar with olfactory disorders and their management
6. Review the appropriate relationship between clinicians and industry

Goal

The goal of this activity is to provide recent and cutting edge information in the areas of patient care and research in the field of Rhinology which will expand physician's knowledge base and capabilities in care of patients.

Outcomes

1. The practitioner should be able to choose appropriate therapy for the different subtypes of chronic rhinosinusitis.
2. The practitioner should be able to incorporate surgical techniques to manage patients with anterior skull base defects.

Target Audience

Otolaryngologists in training, practicing otolaryngologists, allied health care professionals

Purpose

The American Rhinologic Society's mission is to serve, represent and advance the science and ethical practice of rhinology leading to the improvement in professional competence, performance and ultimately patient outcomes.

Accreditation

Physicians

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

AMA PRA Statement

ARS designates this educational activity for a maximum of 15.5 AMA PRA Category 1 Credit(s)[™]. Physicians should only claim credit commensurate with the extent of their participation in the activity.

Conflict of Interest Policy

The “Conflict of Interest Disclosure Policy” of the American Rhinologic Society requires that faculty participating in any CME activity disclose to the audience any relationship(s) with a pharmaceutical or equipment company. Any presenter whose disclosed relationship prove to create a conflict with regard to their contribution to the activity, or who refuses to provide all their conflict of interest information will not be permitted to present.

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These will be reviewed by the CME Committee Chair and the committee members.

If there is a question about the potential for a real conflict of interest, then the ARS Conflict of Interest Committee will contact the faculty and either satisfactorily resolve the potential conflict of interest, so as to allow the faculty to make a presentation by either clarification of the potential COI, or modification of the COI, or not permit the faculty to present at the CME activity, should the COI be real and irresolvable.



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Murray Kopelow, MD, MS, FRCPC

Date of Decision November 30, 2007

Expiration of Term November 2011

Oral Presentations

September 25, 2010

Imperial Ballroom A

7:00am

Breakfast Symposium (Supported by Entellus Medical AND LifeCell)

The Nose-Inside and Outside - Functional and Aesthetic Considerations for the Surgeon

Moderator - Michael Setzen, MD

Panelists - Daniel Becker, MD, Minas Constantinides, MD, Paul Toffel, MD, Dean Toriumi, MD

8:00am

Welcome

Stilianos Kountakis, MD

8:07am

Practical Allergy for the Rhinologist

Jack Krouse, MD

Moderators: Bradley Marple, MD/Richard Orlandi, MD

8:37am

Rhinitis, Allergic and Non-allergic and Asthma: An Epidemiological Study from Finland

Elna Toskala, MD, Hille Suojalehto, MD, Maritta Kilpeläinen, MD, Harri Alenius

Introduction:

A postal survey of 10667 Finnish university students aged 18-25 years was carried out to study risk factors for asthma and atopic diseases in year 1995.

Methods:

12 years after first survey a questionnaire developed for population studies with validated questions on asthma and allergic rhinitis was resent in year 2007. The incidence of physician-diagnosed asthma and allergic rhinitis (AR) were calculated from population at risk excluding subjects reporting physician diagnosed asthma and AR at baseline.

Results:

Total of 6042 subjects (56.5%) aged 30 to 37 years of the baseline

study participants responded the questionnaire. 2167 (35.9%) were men and 3875 (64.1%) women. In 12-year follow-up the prevalence of doctor-diagnosed asthma increased from 4.6 to 8.7 % and doctor-diagnosed allergic rhinitis from 20.0 to 31.2 %. Prevalence of non-allergic rhinitis (long standing rhinitis excluded allergic rhinitis) increase from 15% to 19,6%. A total incidence of physician-diagnosed asthma was 4.1 %, being 3.4 % in men and 4.5 % in women (p=0.028). A total incidence of physician-diagnosed allergic rhinitis was 17.9 %, being 19.8 % in men and 16.8 % in women (p=0.003).

Conclusions:

Asthma and allergic rhinitis are commonly diagnosed in young adulthood. They is significant increase in incidence from 20+ yrs old to 30+ yrs old in Finnish population. The future follow-up studies of this cohort will show is the peak before 40 yrs or does the increase of incidence continue.

8:43am

Allergic Rhinitis is Associated with Decreased Expression of Toll-like Receptor 9 by Sinonasal Epithelial Cells

Thuy-Anh Melvin, MD, Andrew Lane, MD, Mai-Tien Nguyen, Sandra Lin, MD, Baltimore, MD

Introduction:

Toll-like receptors are innate immune molecules that play an important role in sinonasal mucosal immunity. Previous studies demonstrate that sinonasal epithelial cell (SNEC) TLR9 expression is reduced in Th2 cytokine-predominant chronic rhinosinusitis with nasal polyps (CRSwNP) while increased in Th1-dominant cystic fibrosis. Additionally, in vitro application of Th2 cytokines down-regulates TLR9 expression in SNEC. To further investigate in vivo modulation of TLR9 by the local cytokine environment, this study examines SNEC from patients with and without active allergic rhinitis (AR).

Methods:

SNEC were gathered via endoscopic-guided middle meatal brushings from 8 controls and from 8 AR subjects who were skin test positive to environmental allergens in-season at the time of study. Flow cytometry was utilized to compare TLR9 expression in SNEC derived from AR and normal sinonasal mucosa.

Results:

Flow cytometry revealed that TLR9 expression by SNEC in the AR group was significantly reduced compared to normal controls (32% ± 20% versus 76% ± 10%, p=0.0005).

Conclusions:

Similar to observations in eosinophilic chronic rhinosinusitis, this study shows that active AR is associated with decreased SNEC TLR9 expression. Taken together, these findings are consistent with the concept that Th2 cytokines suppress expression of TLR9 and other innate immune genes. It is likely that multiple endogenous and microbial factors modulate sinonasal innate immunity to maintain homeostasis and prevent infection in AR. Dysregulation of these balancing pathways may contribute to persistent inflammation in chronic rhinosinusitis.

8:49am

Discussion & Audience Response Questions

Moderators: Marc Dubin, MD/Samer Fakhri, MD

8:55am

Clinic Versus OR - A Comparative Analysis of Ostial Dilatation for CRS

Jeffrey Cutler, MD, Washington, DC

Introduction:

Endoscopic sinus surgery (ESS) and balloon sinus dilation are routinely performed safely under general anesthesia. Recently, a new tool has been introduced to treat chronic inflammation of the maxillary and anterior ethmoid sinuses in the clinic using only local anesthesia.

Methods:

Subjects with medically refractory chronic rhinosinusitis (CRS) underwent baseline evaluation including CT imaging and symptom assessment using the Sino-Nasal Outcome Test (SNOT 20). Subjects underwent de novo surgery via trans-antral balloon dilation of the maxillary sinus ostium and ethmoid infundibulum. Technical success, surgical parameters, post-treatment bleeding, pain and recovery time were reported. Long-term outcomes were evaluated through 12-month follow-up.

Results:

Seventy-one subjects underwent treatment and 93% completed follow-up through 12 months. Nineteen (27%) underwent balloon sinuplasty in the clinic. Balloon sinuplasty procedure times and procedural success were similar, but total clinic time was significantly less for the clinic cohort ($p < 0.01$). All (100%) clinic patients were discharged within 2 hours of the procedure as compared with 82% of the surgery center cohort. There was no significant difference in post-treatment bleeding, overall recovery time and post-treatment pain medication use. Similarly, symptomatic improvement at 3, 6, and 12 months post-procedure was similar between both cohorts and the magnitude of improvement from baseline to follow-up was both statistically significant and clinically meaningful.

Conclusion:

Trans-antral balloon sinuplasty can be performed under local anesthesia in the clinic with similar safety and effectiveness as compared to procedures performed in an ambulatory surgery setting.

9:01am

Lateral Surgical Access to the Frontal Sinus after Modified Endoscopic Lothrop

*Daniel Timperley, MD, Paul Seamus Phillips, MD, Richard Harvey, MD
George Marcells, MD, Australia*

Introduction:

The modified endoscopic Lothrop (MELP) or Draf III procedure can provide extended endoscopic access to the frontal sinus. In tumor surgery it is often necessary to drill the bone at the base of the lesion. However there is little published data to predict access to this area.

Methods:

MELP was performed in cadaver heads. Access was defined as the ability to contact the bone under vision with the head of a 70-degree diamond burr. Access was assessed in three areas: orbital roof, anterior frontal sinus wall and posterior frontal sinus wall. The endpoint was defined as accessible distance in mm from ipsilateral medial orbital wall; accessible orbital roof quartile zone was also noted.

Results:

20 cadaver sinuses (10 heads) were assessed. Complete lateral access was possible anteriorly and posteriorly in 95% of sinuses (mean 15.5 ± 7.8 mm and 15.4 ± 7.7 mm respectively). Access to the orbital roof was limited (10.3 ± 4.6 mm). For sinuses pneumatized beyond the mid-orbital point, only 10% of lateral orbital roofs were contacted. Orbital roof access correlated with AP distance between olfactory fossa and outer periostium of frontal beak ($r=0.6$, $p<0.01$).

Conclusions:

Lateral endoscopic access to the walls of the frontal sinus is excellent except for the sinus floor. Access to the orbital roof is reliable in the medial quarter only and minimal lateral to the midorbital point. For lesions between these points, the AP distance between the olfactory fossa and outer periostium of the frontal beak may help to define which lesions are amenable to endoscopic access.

9:07am

The Effectiveness of Preemptive Sphenopalatine Ganglion Block on Postoperative Pain and Functional Outcomes after Functional Endoscopic Sinus Surgery

Do-Yeon Cho, MD, David Drover, MD, Vladimir Nekhendzy, MD, Peter Hwang, MD, Stanford, CA

Introduction:

The sphenopalatine ganglion block (SPGB) with local anesthetic is used to treat facial pain and headache of various etiologies and has been widely used during functional endoscopic sinus surgery (FESS). The purpose of this study was to investigate whether preemptive SPGB may positively impact postoperative pain and functional outcomes after FESS.

Methods:

A prospective, double-blind randomized placebo-controlled study was performed. 60 patients (18 to 70 yrs), undergoing general anesthesia for bilateral FESS, were randomly assigned to receive SPGB with either 2 ml 0.25% bupivacaine with epinephrine 1:100,000 (BP, treatment group) or normal saline (NS, control

group). SPGB was performed preemptively 10 min before the start of surgery. Pre- and post operative (day#0, day#7, day#30) visual analogue pain scale, SNOT-20, CT & Endoscopic scores were compared between the two groups.

Results:

27 patients were enrolled in NS and 29 in BP. 3 patients withdrew from the study and 1 was withdrawn by the investigator due to severe hypertension after induction of anesthesia. There were no differences in patient demographic characteristics between the study groups. On day#7, the mean visual analogue pain scales were 1.12 ± 0.3 in NS and 0.48 ± 0.23 in BP ($p = 0.053$). There were no statistical differences in other outcome measures (SNOT-20, CT & Endoscopic scores) between the two groups.

Conclusion:

There was no significant reduction in postoperative pain after FESS when local anesthetic was used compared with infiltration with NS. Preemptive SPGB does not appear to offer significant postoperative benefits for patients undergoing FESS.

9:13am

Discussion & Audience Response Questions

Moderators: Stacey Gray, MD/Chris Melroy, MD

9:19am

Factors Associated with CT Status in Patients Presenting with a History of CRS

*Leah Abrass, MS, Rakesh Chandra, MD, Bruce Tan, MD
Robert Kern, MD, Chicago, IL*

Background:

The diagnosis of chronic rhinosinusitis (CRS) is based upon symptomatic criteria confirmed by objective evidence, obtained most commonly via nasal endoscopy. Patients with a positive history for CRS but negative endoscopy remain a diagnostic dilemma. We investigated the utility of point of care CT (POC-CT) in resolving this issue.

Methods:

The study group consisted of a simple random sample of 100 patients presenting with active CRS symptoms and negative endoscopies who underwent POC-CT at initial presentation. Presenting symptoms and co-morbidities were correlated with CT scan result (positive/negative) using uni- and multivariate logistic regression models.

Results:

POC-CT was positive in 49% of patients. Univariate analysis revealed that patients complaining nasal obstruction were significantly more likely to have a positive scan (OR 2.74, $p=0.047$), while those with postnasal drip (OR 0.44, $p=0.047$) or cough (OR 0.17, $p=0.03$) were less likely to have positive scan results. Patients with positive smoking history were also less likely to have a positive CT (OR 0.17, $p=0.03$). The multivariate model revealed that only smoking history correlated with scan status, where smokers were less likely to manifest scan positivity (OR 0.2, $p=0.05$). Patients with positive CT scans were more likely to be receive prescriptions for antibiotics, oral steroids, or nasal steroids.

Conclusion:

Less than 50% of patients with negative endoscopy despite active CRS symptoms manifested sinus disease radiologically. Other etiologies must be considered in the differential for those presenting with cough or postnasal drip as primary symptoms. POC-CT averted unnecessary antibiotics in these patients.

9:25am

Socioeconomic Status: A Disease Modifier of Chronic Rhinosinusitis?

Dakheel AlMutairi, MD, Stephanie Johnson, MD, Ted McDonald, MD, Shaun Kilty, MD, Canada

Introduction:

Studies have already shown a poor correlation between self-reported chronic rhinosinusitis (CRS) data and the Lund-MacKay score (LMS). Given these results, our purpose was to determine if there is a statistically significant correlation between socio-economic status

(SES) and CRS severity and if there is an association between depression symptoms and the severity of CRS using the LMS.

Methods:

Patients diagnosed with CRS in a tertiary rhinology clinic were recruited. They completed a sinonasal assessment questionnaire (SNAQ-11), the Patient Health Questionnaire (PHQ-9) for depression, and we collected information on each patient's education level, family income, and smoking behavior. The sinus CT scan was scored using the LMS. The data was analyzed using ordinary least squares (OLS) regression techniques.

Results:

Having a university degree was associated with lower SNAQ-11 scores (coef -10.26, p-value 0.03). Daily smokers had higher SNAQ-11 scores than non-smokers (coef 7.50, p-value 0.02). There was no significant relationship between educational attainment, financial income or daily smoking and sinus CT score. Depression scores were positively and significantly related to the SNAQ-11 score (coef 1.04, p-value 0.00). There was no significant positive relationship between the depression score and LMS.

Conclusions:

There is poor correlation between subjective and objective measures of CRS which questions the value of self-reported disease severity. SES status is a modifying factor of subjective CRS severity and was found to be negatively associated with education and financial income but not the LMS. There is no association between the LMS and symptoms of depression.

9:31am

Adherence to Clinical Practice Guidelines for Adult Sinusitis

Ilaaf Darrat, MD, Kathleen Yaremchuk, MD, Spencer Payne, MD, Michelle Nelson, BS, Detroit, MI

Introduction:

The purpose of this study is to determine if physicians in Otolaryngology adhere to the American Academy of Otolaryngology/Head and Neck Surgery (AAO/HNS) clinical practice guideline for adult sinusitis.

Methods:

A retrospective chart review study of patients seen for the first time with a diagnosis of sinusitis was conducted to determine if there was adherence to AAO/HNS clinical practice guideline for adult sinusitis. Different aspects of the guidelines were scored regarding intervention, treatment and prevention.

Results:

For acute bacterial rhinosinusitis, 7 clinical practice metrics were evaluated with individual physician adherence scores of 0-41%. For acute viral rhinosinusitis, 3 clinical practice metrics were evaluated with individual physician adherence scores of 0%. For chronic rhinosinusitis without nasal polyposis and with nasal polyposis, 7 clinical practice metrics were evaluated with individual physician scores of 5-87% and 0-93% adherence, respectively.

Conclusion:

Greater adherence to evidence-based clinical guidelines is critical to improving U.S. health care. Adults receive only about half of the right care at the right time. One third to one half of physicians admit to utilizing evidence based clinical practice guidelines in their practice. To change physician culture, beliefs and habits, data collection and data sharing are essential. While there is much debate about the value of public reporting of physician quality measures and outcomes there is agreement that allowing a physician to compare practice data practice to that of their peers is extremely effective in fostering adherence to guidelines.

9:37am

Characterising Patterns of Nasal Inspiration

*Catherine Rennie, MD, Kevin Gouder, Donal Taylor, MD
Denis Doorly, MD, London*

Introduction:

This study investigates and quantifies inspiratory airflow profiles for different modes of inspiration, namely: normal breathing, smelling (e.g. olfactory detection) and sniffing (e.g. drug delivery), both pre- and post-decongestion. This research aims to provide a better understanding of nasal physiology, and is expected to contribute to areas such as modeling of nasal respiration and pharmacological

drug delivery, and could also be used as a clinical tool (i.e. as an indicator to identify underlying respiratory pathologies).

Methods:

A group of 10 healthy individuals volunteered for inclusion in this study and their inspiratory patterns were analysed using hot-wire anemometry (to determine inspiratory flow rate waveforms, acquired at 5000Hz), peak nasal inspiratory flow measurements, acoustic rhinometry (to establish the gross airway anatomy and hence, identify the impact of decongestion) and the sino-nasal outcome test (SNOT-22, to ensure all volunteers were non-symptomatic). Different scents (lemon oil and ammonia) were introduced to allow volunteers to naturally adapt their inspiratory profile to optimise the olfactory detection of samples, thus maintaining the realism of the measurements.

Results:

Consistent characteristic patterns of inspiration were observed for each mode of inspiration, even between volunteers. Decongestion of volunteers was found to alter the magnitude of inspiration but resulted in the same characteristic profiles.

Conclusions:

Nasal inspiratory flow patterns have been investigated in far greater detail than previously studied (using high frequency measurements and multiple complementary modalities) and identified characteristic patterns of different modes of inspiration in a systematic way.

9:43am

Discussion & Audience Response Questions

9:49am

Awards Presentation

10:04am

6th Annual David W. Kennedy Lectureship Rhinology Rules: OK!

Valerie Lund, FRCS

10:34am

Break with Exhibitors (Imperial Ballroom B)

Moderators: Rakesh Chandra, MD/ Martin Desrosiers, MD

10:54am

Can Bottle Design Prevent Bacterial Contamination of Nasal Irrigation Bottles?

*Andrew Foreman, MD, Peter-John Wormald, MD
Woodville, SA*

Introduction:

Saline nasal irrigation is a mainstay in the medical management of Chronic Rhinosinusitis (CRS) with proven efficacy. However bacterial contamination of irrigation bottles has recently been reported and this may contribute to recurrent infections. Sterilization is effective but could a change in bottle design obviate the need for regular sterilization?

Method:

20 stable CRS patients were given an irrigation bottle to use regularly for one week. This bottle incorporates a one-way valve to prevent irrigant regurgitation. Swabs were taken from their sinonasal cavity and three sites on the bottle- nozzle, valve and inner surface.

Results:

This study cultured a range of organisms from all sites of the bottle. These organisms included water-avid organisms and common CRS pathogens such as *S. aureus*, *P. aeruginosa* and *E. coli*. Whilst the bottle's inner surface had the lowest bacterial recovery rate, the frequent culture of organisms at this site suggests a one-way valve cannot completely prevent irrigant reflux. The high rate of organism detection on the nozzle and valve of the bottle is concerning as bacteria at this site may be transported during nasal douching.

Conclusions:

Saline irrigation will continue to be an essential component of CRS management. However, nasal irrigation bottles become contaminated with bacteria, irrespective of the presence of a valve. Simple sterilization procedures are effective in rendering irrigation bottles bacteria-free. This study reaffirms the importance of focused patient education, rather than relying on bottle design, to prevent irrigant contamination. This approach may reduce the recurrent infections that characterize CRS.

11:00am

Temporospatial Quantification of Fluorescein Labeled Sinonasal Irrigation Delivery

Bleier Benjamin, MD, Indranil Debnath, MD, Richard Harvey, MD, Rodney Schlosser, MD, Charleston, SC

Introduction:

Effective treatment of sinonasal disease is predicated on the successful delivery and adequate retention of the agent at the desired location. Despite multiple prior radiologic, cadaveric, and endoscopic distribution studies, there remains a need for a method capable of objectively quantifying not only the site and amount of agent deposition but the rate of clearance as well.

Methods:

IRB approved study of five healthy volunteers who underwent blue light filtered endoscopic image capture of 3 anatomic subsites over a 15 minute period following fluorescein dyed topical irrigation using a squeeze bottle, nasal saline spray, or nasal gel spray. Both area and intensity of fluorescein staining were quantified using a graphics editing program. Total intensity scores between sites, time points, and delivery methods were compared using a student's t-test.

Results:

The squeeze bottle was the only method demonstrating delivery to the oropharynx($37\pm 22\text{mm}^2$). The nasal gel resulted in the greatest coverage of the middle turbinate region($10\pm 15\text{mm}^2$) while the nasal saline spray resulted in the greatest inferior turbinate coverage($75\pm 31\text{mm}^2$). No significant differences in clearance rates were found between delivery methods at any subsite.

Conclusions:

The described method is capable of objectively quantifying both the area and intensity of fluorescein deposition using a variety of delivery methods. While small variations in subsite coverage were noted, all methods resulted in significant internal valve deposition. Despite differences in delivery volume and viscosity, all methods resulted in similar rates of fluorescein clearance.

11:06am

A Comparative Study of the Distribution of Normal Saline Delivered by Large Particle Nebulizer vs. Large Volume/Low Pressure Squeeze Bottle

*Yuri Gelfand, MD, Samer Fakhri, MD, Amber Luong, MD
Martin Citardi, MD, Houston, TX*

Introduction:

Rhinologists are increasingly recommending the topical administration of therapeutic agents after endoscopic sinus surgery. In theory, a large particle nasal nebulizer (LPNN) device offers more effective drug delivery into open sinuses.

Methods:

A blinded panel of four rhinologists assessed the distribution of dilute fluorescein-saline solution and by a large volume low pressure (LVLP) squeeze bottle using a 4-point scale at 5 anatomic sites in 10 post-operative sinus surgery patients (18 sides).

Results:

Fluorescein staining was higher than baseline for both LPNN and LVLP devices. No difference between LPNN and LVLP was noted, but a trend favoring LVLP at the frontal recess/sinus was observed. For LVLP, a fixed concentration produced statistically significant greater fluorescein staining at all sites. For a fixed amount of dye, LPNN scored better than the LVLP at the ethmoid sinus.

Conclusions:

Both LPNN and LVLP delivered dye to all sites. The LPNN may offer advantages in the delivery of high concentrations of drug in relatively small volumes. LVLP may provide greater drug delivery at the frontal recess/sinus. The practical significance of these observations is unclear, but further investigation seems warranted.

11:12am

Discussion and Audience Response Questions

Moderators: H. Peter Doble, MD / Ralph Metson, MD

11:18am

Radiological localization of Schneiderian Papillomas: Is Osteitis Sign Reliable?

Yahya Al Badaai, MD, Jeffrey Chankowsky, MD, Nadine Yammine, MD, Mark Samaha, MD

Objectives:

It has been recently reported that the site of attachment of Schneiderian papillomas can be predicted with high accuracy on preoperative CT scans using bony osteitic change as an indicator. The purpose of this study was to confirm these findings in a blinded fashion.

Methods:

A retrospective cohort study of patients who underwent endoscopic surgical resection for inverting or cylindrical papilloma between September 2002 and September 2009 in a tertiary care rhinology centre was carried out. The pre-operative sinus CT-Scans were collected and reviewed by a fellowship-trained and experienced Head and neck radiologist who was blinded to the intra-operative findings. The radiologist attempted to identify and grade bony osteitic changes in the sinuses. The radiological findings were then correlated with the actual site of attachment reported by the surgeon intra-operatively.

Results:

A total of 34 patients were evaluated. Six (18%) patients had a single site of osteitis and 28 (82%) patients were found to have multiple sites of osteitis. The sensitivity of the radiological prediction based on the degree of osteitis was 72% (CI 46.5%-90.3%) and the specificity was 0% (CI 0%-17%). Regression model analysis showed no significant correlation between the degree of osteitis and the actual site of tumor attachment ($p=0.3$).

Conclusions:

Osteitic changes are very common non-specific findings on CT-scan of patients with Schneiderian papillomas and their presence as well as the degree of osteitis did not allow localization of tumour attachment. Intraoperative confirmation of site of attachment of inverting papilloma continues to be the principal tool determining the extent of surgical resection.

11:24am

Inverted Papilloma: Location, Location, Location

*Mark Schneyer, MD, Benjamin Milam, BS, Spencer Payne, MD
Charlottesville, VA*

Introduction:

Inverted papilloma is a benign sinonasal tumor arising from a localized attachment site. The literature does not contain an evaluation of the distribution of specific attachment sites within the nasal cavity and sinuses.

Objective:

To determine the specific distribution of attachment sites in patients with sinonasal papilloma.

Methods:

Retrospective analysis of adult patients with sinonasal papilloma presenting to the University of Virginia between 1999-2010. These patients were reviewed and compared to historical controls with regard to histologic subtype and pedicle attachment site.

Results:

83 patients were identified with 90 sites of attachment, including 64 patients with inverted/cylindrical papilloma. For inverted/cylindrical papilloma, sites of attachment included the maxillary sinus (42%), ethmoid sinus (18%), nasal cavity (15%), middle and superior turbinates (12%), frontal sinus (10%), sphenoid sinus (1.5%), and cribriform plate (1.5%). Specific sites of attachment within each group were identified, including 5 at the infraorbital nerve. The distribution of attachment sites differed significantly from historical controls resected via an open approach ($p = 0.001$), but did not differ significantly from historical controls endoscopically resected ($p = 0.696$). A comparison of more specific sites of attachments could not be performed due to the lack of this information in the literature.

Conclusions:

The distribution of attachment site in patients with sinonasal papilloma has changed as the endoscope has enabled more detailed identification of pedicle attachment, which has implications for management.

11:30am

Metalloproteinases and Catenin in Inverted Papilloma Tissue

Ramin Naim, MDPHd, Matthias Gieringer, MD, Karl Hormann, MDPHd, Jan Gosepath, MDPHd, Deutschland

Inverted papilloma (IP) is a lesion of the mucosal membrane of the nasal cavity and paranasal sinus. It is a benign epithelial growth in the underlying stroma. IP has a tendency to recur if incompletely removed. In addition, it has a significant malignant potential. Invasive and proliferative activity is dependent on cell-cell-adhesion factors. In these experiments, metalloproteinases-2 and -9 as well as beta-catenin were investigated. 13 specimens were collected from patients with IP. 15 biopsies from CRS patients and 13 biopsies from healthy inferior turbinates were also collected. In a first step, histopathological examination of all specimens was performed after hematoxylin and eosin staining. The specimens were also incubated with MMP-2/-9 and beta-catenin antibodies. In all IP-specimens, beta-catenin had a strong expression in the basal layers of the epithelium which was located at the membranes. The expression of beta-catenin faded towards the surface part of the IP-epithelium. In the controls, beta-catenin showed positive staining throughout the epithelial layers. MMP-2 and MMP-9 were positive throughout the layers, however, in control, the suprabasal layers revealed weak reactivity. The homogeneous reactivity against MMP-2 and -9 as well as the diminishing reactivity of beta-catenin in the suprabasal layers show a distinct and altered tissue biology in IP. It was reported that diminished beta-catenin expression and high content of metalloproteinases were found in malignant tissue which was linked to increased invasive growth and proliferation. This observation may represent the clinical behavior and the aggressive character of the IP-formation.

11:36am

Discussion & Audience Response Questions

Moderators: Donald Lanza, MD/Kathleen Yaremchuk, MD

11:42am

Fellowship Training in Rhinology: ARS Survey of US Graduates

*Pete Batra, MD, Todd Kingdom, MD, Martin Citardi, MD
Dallas, TX*

Introduction:

The past 5 years have witnessed the introduction of numerous rhinology fellowships which may have altered education of individuals electing to pursue postgraduate training. The objective of this study was to evaluate the rhinology fellowship experience and its possible impact on current practice patterns of US fellowship-trained rhinologists.

Methods:

A 27-item web-based survey was conducted under the purview of the ARS Fellowship Committee between November 2009 and January 2010. The target group included 112 rhinologists trained between 1990 and 2009.

Results:

Sixty-two fellows (55.4%) completed the survey. The respondents represented all regions of the country, with most common being southeast (25%) and south central (18%). The most common type of clinical practice was academics in 68%, followed by single specialty group (19%), multi-specialty (6.5%), and solo practice (6.5%). Rhinology entailed >75% and 50-75% of clinical practice for 61% and 24% of respondents, respectively. The primary reasons for selecting a rhinology fellowship was career in academics (64%) and interest in rhinologic procedures (31%). Overall fellowship experience was rated as excellent and good by 84% and 16%, respectively. The mean number of rhinologic procedures during fellowship were >200 in 59% and 151-200 in 27% of respondents. Allergy training exposure was reported by 59% during training. Clinical and basic science research exposure was rated as excellent or good by 90% and 44%, respectively.

Conclusions:

The rhinology fellowship experience to date appears to be well-regarded by majority of respondents. Future dialogue should focus on identification of deficiencies in the current rhinology fellowship educational process.

11:48am

Development and Validation of an Endoscopic Sinus Surgery Skills Training Model

*Scott Burge, BS, Leonid Bunegin, BS, Erik Weitzel, MD
Kevin McMains, MD, San Antonio, TX*

Performing endoscopic sinus surgery (ESS) requires a trainee surgeon to develop both thorough anatomic understanding and new physical skills. Traditionally, these skills were learned in the operating room setting. In an era of simulation, this introduces ethical concerns about exposing patients to additional risks in the process of surgical skills development. Additionally, tightening educational budgets make cost-effective training increasingly important. To address this, a low-cost, intermediate-fidelity ESS training model was developed which assessed both speed and accuracy of task completion. Preliminary data were collected on 7 medical student and 4 resident (PGY-2,3) level learners. Distinct tasks were performed and repeated 5 times on the initial day of testing. Tasks were repeated after 2 weeks to assess intermediate-term skills retention. Statistically significant improvement in time was noted between the first two iterations of each task for both groups. This effect remained significant for subsequent iterations on the initial day of testing. Retention of skills was also demonstrated after 2 weeks. Similarly, by the 4th iteration, statistically significant improvement was seen for accuracy relative to the initial attempt. This remained significant through the 5th repetition. Improvement for errors approached but did not achieve significance relative to the initial iteration ($p=0.06$). Notably, no statistical increase in errors was seen at 2 weeks. Residents performed better on all tasks compared with students. Preliminary data supports improved ESS skills as measured by speed and accuracy for both medical students and residents using this low-cost, intermediate-fidelity model. Further, improvement in speed is maintained at 2 weeks.

11:54am

Discussion & Audience Response Questions

12:00pm

Business Meeting - All ARS Members Welcomed

12:00pm

Exhibit Hall - Imperial Ballroom B

Moderator: Ralph Metson, MD

1:00pm

Panel

When Surgery Fails: Medical Management of the Difficult Sinus Patient

Panelists: Stacey Gray, MD, Daniel Hamilos, MD, Raj Sindwani, MD, Timothy Smith, MD

Moderators: David Conley, MD/Jay Dutton, MD

2:00pm

Endoscopic Anatomy of the Postganglionic Pterygopalatine Parasympathetic Innervation of the Posterolateral Nasal Mucosa: A New Perspective

Benjamin Bleier, MD, Rodney Schlosser, MD, Charleston, SC

Introduction:

Vidian neurectomy is an effective yet nonselective procedure for vasomotor rhinitis (VR) with resultant morbidities including dry eye and proximal reinnervation. Recent anatomic studies have redefined the parasympathetic pathway suggesting that individual rami project from the pterygopalatine ganglion (PPG) to innervate the nasal mucosa via multiple small nerve fascicles. The purpose of this study is correlate these anatomic descriptions with endoscopic findings, to define the pattern and location of the posterolateral neurovascular rami, and to develop a rational approach for a selective postganglionic pterygopalatine parasympathectomy (SP3).

Methods:

Eight cadaver heads were obtained from the Department of Anatomy at MUSC for a total of 16 individual sides. A lateral nasal wall submucosal flap was elevated while preserving all neurovascular bundles perforating through the underlying bone. All nerves were traced proximally to confirm their origin.

Results:

Excluding the sphenopalatine foraminal contents, additional posterolateral neurovascular rami were noted in 87.5% (14/16) of specimens, 50% (7/14) of which contained greater than one. All nerves could be traced directly to the PPG or Greater Palatine Nerve. Of

the 25 accessory nerves identified, the most common location was posterosuperior to the horizontal attachment of the inferior turbinate(40%, 10/25) however 28%(7/25) were noted anteroinferior to this attachment.

Conclusion:

This endoscopic study supports prior work suggesting that neurons project from the PPG via multiple individual postganglionic rami to supply the nasal mucosa. This new anatomic insight may be exploited to selectively and completely lesion these nerve fascicles in patients with VR to improve outcomes while avoiding the morbidities associated with vidian neurectomy.

2:06pm

The Medial Optico-Carotid Recess (MOCR) as a Keyhole for Endoscopic Endonasal Approaches to Paraclinoid Cerebral Aneurysms

Adam Zanation, MD, Anand Germanwala, MD, Chapel Hill, NC

Background:

Endoscopic skull base surgery has expanded beyond the sella and pituitary surgery to advanced intradural pathologies such as cranio-pharyngioma and meningioma. Data regarding these expanded dissections are beginning to show promise in outcomes data with reduced morbidity and improved quality of life. There is limited data regarding the endonasal corridor for intradural vascular lesions. We present the first report of an endonasal clipping of two unsecured paraclinoid cerebral aneurysms and discuss the importance of the MOCR as an anatomic keyhole to the paraclinoid spaces.

Methods:

Anatomic studies the MOCR and endonasal approaches to the cerebral vascular structures.

Results:

The anatomy of the medial optico-carotid recess and endonasal cerebral vascular structures are illustrated and discussed. The first report two endonasal clippings of a ruptured and un-ruptured cerebral aneurysm is presented to illustrate the clinical application of this anatomy. One-year follow-up is shown that shows complete obliteration of the aneurysms.

Conclusion:

The MOCR is an important anatomic consideration for expanded endonasal surgery for intradural paraclinoid pathology. It provides the surgeon simultaneous access to the optical nerve, the carotid artery and medical cavernous sinus, and the anterior cranial vault via the planum. The MOCR is the most important anatomic landmark for accessing paraclinoid aneurysms. Lastly, endonasal surgical treatment of very selected cerebral aneurysms can be done safely, effectively, and one can treat multiple aneurysms in a single setting.

2:12pm

Assessment of Frontal Recess Fracture Patterns Using Triplanar CT Images

Stephanie J. Herrera, MD, Amber Luong, MD, Martin Citardi, MD, Samer Fakhri, MD, Houston, TX

Introduction:

The patency of the frontal recess (FR) is critical for the functional drainage of the frontal sinus. Current management of frontal sinus fractures focuses on the severity of anterior and posterior table displacement. **Objectives:** Assess the patterns and severity of frontal recess fractures associated with frontal sinus trauma using triplanar CT images.

Methods:

Retrospective review of 100 patients with frontal sinus fractures at a Level 1 Trauma center between 2003 and 2004. Triplanar CT images were reviewed in order to evaluate fracture patterns through the frontal sinus proper and FR. The area of the FR was calculated from the width and depth assuming elliptical geometry.

Results:

Fracture of the anterior FR decreases the average cross sectional area from 52.4mm² to 25.8mm². Anterior table, posterior table, and posterior frontal recess fractures did not significantly alter the dimensions of the FR. 46% of anterior table fractures were associated with anterior FR fractures. Two-thirds of the patients with ante-

rior FR fractures also had a naso-orbitoethmoid (NOE) fracture, narrowing the FR mean area to 29.2mm² and resulting in bony obstruction of the FR in 82% of these patients.

Conclusions:

Fractures of the anterior table of the frontal sinus are associated with a high rate of anterior FR disruption. This results in significant narrowing of the FR and may compromise the proper functioning of the frontal sinus. Analysis of triplanar CT images is critical for the accurate assessment of the patterns and severity of frontal recess fractures.

2:18pm

Discussion & Audience Response Questions

2:24pm

Break with Exhibitors (Imperial Ballroom B)

Moderators: Andrew Lane, MD/Adam Zanation, MD

2:44pm

Management of Unilateral Skull Base Tumors via Endoscopic Hemi- anterior Skull Base Resection

Amy Anstead, MD, Tessema Belachew, MD, Jean Eloy Anderson, MD, Roy Casiano, MD, Miami, FL

Background:

The open anterior skull base (ASB) resection was first described in 1963 by Ketchum. In 2001 Casiano brought this procedure into the 21st century by describing the totally endoscopic approach to the ASB. This study introduces the formal totally endoscopic hemi-ASB resection as a new technique to control unilateral ASB sinonasal tumors.

Methods:

A retrospective chart review of all endoscopic ASB resections completed between Jan 2000 - Jan 2010 was performed. Only patients who underwent a formal totally endoscopic hemi-ASB resection were included in the study. Information regarding clinical presentation, demographics, comorbidities as well as the operative technique, clinical outcomes, olfactory function and complications were reviewed.

Results:

Nine patients were identified who underwent formal endoscopic hemi-ASB resection. The mean age was 62.6 years with cases evenly distributed among men and women with significant preponderance of diabetes, hypertension, smoking history and coronary artery disease. Histopathologic diagnoses included three esthesioneuroblastomas, four hemangiopericytomas, one fibrosarcoma and one unclassified sinonasal tumor. Mean operative blood loss was 630ml. Reconstruction of the skull base defect was performed using acellular dermal graft inlay with free mucosal only when necessary. Lumbar drains were not used. Average postoperative inpatient stay was 3.5 days. There were no postoperative CSF leaks or meningitis. Two major complications included one post operative blood transfusion due to shortness of breath and post operative mortality on day two from myocardial infarction in a patient one year status post coronary artery bypass surgery. Post operative adjuvant radiotherapy was given to the three patients with esthesioneuroblastoma. There was no evidence of recurrence or metastatic disease with a mean follow up of 30 months.

Conclusions:

Totally endoscopic hemi-anterior skull base resection is a viable option for patients with limited unilateral skull base tumors. Lumbar drains are not necessary in the management of these patients. A variety of pathologies can be addressed with preservation of olfactory function and oncologic control.

2:50pm

Endoscopic Cerebrospinal Fluid Leak Closure in an Infected Field

Amy Hsu, MD, Ameet Singh, MD, Vijay Anand, MD, Ashutosh Kacker, MD, New York, NY

Introduction:

Sinonasal cerebrospinal fluid (CSF) leak during an active infection presents the unique challenge of preventing spread of infection without compromising integrity of the closure. We describe the technique and clinical course of patients undergoing endoscopic CSF repair in an actively infected field.

Methods:

Retrospective chart review of patients with sinonasal CSF leaks that were endoscopically repaired during an acute infection.

Results:

Nine patients were identified. Etiologies of CSF leak were iatrogenic following endoscopic sinus surgery (n=5, 55.6%) or revision craniopharyngioma resection (n=1, 11.1%), spontaneous (n=1, 11.1%), anterior skull base meningocele with CSF leak (n=1, 11.1%), and post-traumatic (n=1, 11.1%). The locations of the leak were ethmoid in 5 patients, frontoethmoid in 3 patients, and sphenoid in 2 patients. Seven patients had acute sinusitis (22.2%) and two patients had meningitis (77.8%) at the time of closure. Two patients (22.2%) had failure of previous CSF leak closure. All leaks were repaired in a multi-layered fashion with multiple graft types including septal or conchal cartilage, temporalis fascia, fascia lata, fat, medpor, and tissue sealant. Three patients additionally had mucosal flaps or grafts. Patients were treated with an average of 4.8 days (range: 1-10) of antibiotics. The mean follow up time was 7.7 months (range: 0.4-19.3), and the average hospital stay was 4.1 days (range: 2-7). No patients experienced recurrence of CSF leak or post-operative complication or infection.

Conclusion:

CSF leak closure was successfully performed in nine patients during acute infections without complications, recurrent infection, or need for revision CSF leak closure. Endoscopic CSF leak repair in an infected field appears to be safe and effective in patients with active infection.

2:56pm

Discussion & Audience Response Questions

Moderators: Seth Brown, MD/Stephanie Joe, MD

3:02pm

Identification of Fungus in Pediatric Chronic Rhinosinusitis

Andrew Terrell, MD, Hassan Ramadan, MD, Morgantown, WV

Introduction:

Fungus can be identified in sinus samples from adults with chronic rhinosinusitis (CRS). While its presence in pathologic samples is clear, its role in the etiology of CRS is controversial. The presence and role of fungus in pediatric CRS has not previously been studied.

Methods:

Tissue samples from children ages 2-12 who underwent endoscopic sinus surgery were stained with hematoxylin and eosin to assess the number of eosinophils per high-powered-field (hpf). They were also stained with gomori methenamine silver (GMS) stain and a fluorescent fungalase stain to assess for the presence of fungus. Clinical data including age, CT score, asthma, allergy, and smoke exposure were collected in a prospective fashion. Multi-variate logistic regression analysis was used to assess for associations between tissue eosinophilia, fungus, and the clinical data. Results: Thirty patients met inclusion criteria. Mean age was 7.6 (SD 2.4), mean CT score was 10.2 (SD 4.2), and mean eosinophils per hpf was 2.6 (4.2). Five samples (17%) of the GMS and 18 (62%) of the fungalase slides had evidence of fungus. There was a significant association between fungalase positive samples and high eosinophilia ($p=.04$). Neither fungalase staining or tissue eosinophilia had significant associations with age, CT scores, asthma, and allergy. High tissue eosinophilia was associated with smoke exposure ($p=.0001$).

Conclusions:

Fungus can be identified in tissue samples from children with CRS. Fluorescent fungalase staining is more sensitive than GMS staining. More research is needed to determine the role of fungus in the etiology of pediatric CRS.

3:08pm

Development of a sheep model for the study of fungal biofilm in rhinosinusitis: Fungal and bacterial synergy.

*Sam Boase, MD, Lor Wai Tan, MD, Peter-John Wormald, MD
Australia*

Introduction:

The role of fungi in the pathogenesis of chronic rhinosinusitis is debated. The role of systemic fungal allergy too, is controversial. However, in the most recalcitrant group of CRS patients - those with eosinophilic mucus - fungus and staphylococcus aureus predominate. We have developed a large animal model of fungal sinusitis to investigate factors which permit fungal biofilm formation in the sinuses.

Methods:

Thirty merino sheep underwent endoscopic sinus surgery to access the frontal sinus ostia. Sheep were subsequently sensitized to either *Aspergillus fumigatus*(Af) antigen, *Alternaria alternata*(Aa) antigen, or control via intraperitoneal or subcutaneous injection. Type I hypersensitivity to fungi was determined by skin prick testing. Frontal ostia were endoscopically occluded and fungi (Af or Aa) were inoculated. 10 sheep were co-inoculated with fungi and *Staphylococcus aureus*. At day 10, the presence of fungal and bacterial biofilm was determined using fluorescence in situ hybridization (FISH), confocal scanning laser microscopy, and scanning electron microscopy.

Results:

40/8(0%) of controls and 10/22(45%) experimental sheep showed IgE mediated allergy following sensitization. 1/12(8%) sinuses instilled with fungus showed evidence of fungal biofilm formation. 8/10(80%) sinuses co-inoculated with fungi and staphylococcus aureus showed evidence of fungal biofilm formation. Skin prick positivity to fungal antigen had no relationship to fungal biofilm formation.

Conclusion:

We present the first animal model of fungal sinusitis in aerated sinuses. There was no significant fungal biofilm formation in sheep inoculated with fungus alone. When co-inoculated with staphylococcus aureus, fungal biofilm formation was florid. This synergy between fungal and staphylococcus aureus biofilms raises many questions including whether fungi are disease modifying or simply saprophytic bystanders in CRS. Mucosal defences may be abrogated by *S. aureus* allowing fungal proliferation. Future investigations will address the role of antifungal and antibacterial therapies using this disease model.

3:14pm

Tissue Remodeling in the Allergic Fungal Sinusitis Mouse Model

Nathan Sautter, MD, Katherine Delaney, BS, Dennis Trune, PhD, Portland, OR

Background:

Osteogenesis and fibrosis are prominent pathologic features of chronic rhinosinusitis (CRS), and may increase symptomatology and surgical difficulty. Members of the Bone Morphogenetic Protein (BMP), Fibroblast Growth Factor (FGF) and Matrix Metalloproteinase (MMP) cytokine families regulate tissue remodeling in other disease processes, but their role in sinonasal inflammation remains undefined.

Methods:

The mouse model of allergic aspergillus sinusitis using Balb/c mice, as described by Lindsay, et al., was utilized. Histologic changes consistent with allergic sinonasal inflammation were observed. Mice were sacrificed at 6 hours, 24 hours, 7 days and 21 days (n=8 for each time point) following initial intranasal challenge. The snouts were processed using standard RT-PCR techniques. Up- and down-regulation of mRNA expression of BMP1 through 10, FGFr1 & 2, FGF1 through 10 and MMP2, 3, 7, 8, 9, 12 and 14 was quantified and compared to untreated controls.

Results:

Up-regulation of MMP8 was observed in the 6 h, 24h, 1 week and 3 week groups, and down-regulation of MMP3 and 14 was noted in the 1 week group ($p<0.05$). BMP1, 3, 5 and 7 were down-regulated in the 1 week group ($p<0.05$). Up-regulation of FGFr1, FGF3, 4, 5 and 8 was observed in the 1 week group ($p<0.05$).

Conclusion:

Allergic sinonasal inflammation results in altered expression of several tissue remodeling cytokines in the allergic sinusitis mouse model. These alterations may contribute to sinonasal osteogenesis, scarring and fibrosis in CRS.

3:20pm

A Meta Analysis of Topical Amphotericin B for the Treatment of Chronic Rhinosinusitis

Seth Isaacs, MD, Amber Luong, MD, Samer Fakhri, MD, Martin Citardi, MD, Houston, TX

Introduction:

Chronic rhinosinusitis (CRS) is an inflammatory condition of unknown etiology. The role of microorganisms in CRS is still unclear. Fungal species have been implicated in the pathophysiology of chronic inflammation and nasal polyposis. Topical antifungal therapy with Amphotericin B (AMB) has become widely used, however its efficacy has not been unanimously supported by the literature.

Methods:

A comprehensive review of the English-language literature on the role of topical AMB therapy in CRS treatment was performed. Search criteria included placebo-controlled trials between the years of 2000 and 2009. Only those studies that reported objective outcomes based on computed tomography (CT) and nasal endoscopy (NE) were included.

Results:

Three published studies reported CT outcomes. After pooling patients from these three studies, meta analysis revealed no significant difference between AMB-treated and control groups ($p = 0.07$). Four studies reported NE outcomes, in which of central tendency (mean or median), and variance were identified. Among these four studies, combining AMB-treated patients did not reveal any significant effect when compared to the small control group ($p=0.53$).

Conclusion:

A systematic review of the literature does not support the use of topical Amphotericin B for the treatment of chronic rhinosinusitis.

3:26pm

Discussion & Audience Response Questions

Moderators: Stilianos Kountakis, MD / Belachew Tessema, MD

3:32pm

The Efficacy of Hemostatic Techniques in the Sheep Model of Endoscopic Carotid Artery Injury

Rowan Valentine, MD, Sam Boase, MD, Josh Jervis-Bardy, MD, Peter-John Wormald, MD, Australia

Introduction:

The most dramatic complication in endonasal surgery is inadvertent injury to the internal carotid artery (ICA) with massive bleeding. Nasal packing is the favored technique for control, however this often causes complete carotid occlusion or carotid stenosis contributing to the morbidity and mortality of the patient. The aim of this study is to compare the efficacy of endoscopically applied hemostatic techniques that maintain vascular flow in an animal model of carotid artery injury.

Methods:

Twenty sheep underwent ICA dissection/isolation followed by the placement of the artery within a modified SIMONT model. A standardized 4 mm carotid artery injury was created endoscopically. Randomization of sheep to receive 1 of 5 hemostatic techniques was performed (FloSeal, oxidised regenerated cellulose, Chitosan gel, Muscle patch, or the U-Clip anastomotic device). Specific outcome measures were time to hemostasis, duration of time MAP >55 mmHg, blood loss and survival time.

Results:

Muscle patch hemostasis and the U-Clip anastomotic device were significantly more effective at achieving primary hemostasis rapidly, reducing total blood loss, survival time and time MAP >55 mmHg than FloSeal, oxidised regenerated cellulose and Chitosan gel, $p < 0.05$. Additionally, all muscle patch and U-Clip device treated sheep achieved primary hemostasis and reached the endpoint of observation, whilst maintaining vascular patency. FloSeal and oxidised regenerated cellulose failed to achieve hemostasis in any animal with all animals exsanguinating prematurely.

Conclusion:

In the sheep model of endoscopic ICA injury, the muscle patch and

U-Clip anastomotic device significantly improved survival, reduced blood loss, and achieved primary hemostasis whilst maintaining vascular patency.

3:38pm

Office-based Sclerotherapy for Recurrent Epistaxis due to Hereditary Hemorrhagic Telangiectasias

*Holly Boyer, MD, George Goding, MD, David Hunter, MD
Patricia Fernandez, DDS, Minneapolis, MN*

Introduction:

The aim of this report is to evaluate office-based sclerotherapy using sodium tetradecyl sulfate (STS) for epistaxis due to hereditary hemorrhagic telangiectasias (HHT). Patients with HHT suffer from unpredictable, recurrent, severe nasal bleeding necessitating emergency care, nasal packing, blood transfusions and invasive procedures.
Methods: In this prospective study 7 patients (mean age 58 years) with a history of treatment for recurrent epistaxis due to HHT in the nasal mucosa, were treated in an office-based setting with intralesional injection of STS. The results of the treatment were evaluated using a questionnaire. All patients had undergone multiple procedures attempting to control epistaxis prior to the definitive procedure described.

Results:

Patients had an average of 5 sclerotherapy treatments for HHT. Mean follow-up period between treatments was 3.4 months. Patients were treated using topical and/or local anesthesia. No patients reported discomfort. Bleeding requiring intervention did not occur during the procedures. After the procedure all patients (100%) reported significantly less frequent and less severe nasal bleeding. Eighty three percent of patients reported that their need for nasal packing had reduced significantly after the treatment. All patients were willing to undergo the same treatment again. No complications such as perforation, crusting or foul smell were reported.

Conclusion:

This is the first clinical experience demonstrating that office-based sclerotherapy with STS is a useful alternative for the treatment of

epistaxis due to HHT. It is well tolerated, safe and should be a therapeutic option for this disease.

3:44pm

Discussion & Audience Response Questions

Moderators: Jivianne Lee, MD/Douglas Reh, MD

4:00pm

Effect of Point of Care CT Scan on Management of the Chronic Sinusitis Patient with Normal Nasal Endoscopy.

*Bruce Tan, MD, Rakesh Chandra, MD, Robert Kern, MD
David Conley, MD, Chicago, IL*

Background:

Recent consensus statements on the diagnosis of CRS now require endoscopic or radiographic evidence of paranasal sinus inflammation. The timing of point of care (POC) computed tomography (CT) scan in the workup of these patients remains to be elucidated, particularly when endoscopy is negative. Objective: To prospectively evaluate two algorithms for the initial management of symptomatic CRS patients who manifest a normal nasal endoscopic examination.

Methods:

Forty such patients were randomized to one of two pathways: POC CT at the initial visit followed by medical therapy based upon CT results (preCT group; n=20), or empiric medical therapy followed by POC post-treatment CT if symptoms persisted (EMT group; n=20).

Results:

The two groups were demographically and symptomatically similar with regard to 2008 Task Force major criteria. Otolaryngology follow-up was recommended in 10/20 preCT patients, all of whom (100%) returned. In contrast, only 10/20 EMT patients (50%) followed-up as instructed (p<0.05). Radiographic evidence of CRS was found in 8/20 preCT patients, while only 2/9 EMT patients had evidence of CRS (p=0.61). EMT patients received more antibiotic prescriptions (RR:2.50; 95%CL=1.46-4.27), while preCT patients received more CT scans (RR:2.22, 95%CL=1.37-3.61). Overall pre-

scriptions costs were slightly higher in the EMT group (\$203 v. \$169; $p=0.37$), while overall otolaryngology evaluation and management costs were similar.

Conclusions:

In patients with symptoms of CRS but negative endoscopy, POC at initial presentation results in substantially less unnecessary antibiotic prescriptions and significantly greater compliance with otolaryngology care.

4:06pm

Variability of Radiation Exposure with In-Office Sinus CT Examinations

Alexander Stewart, MD, Winston Vaughan, MD, Atherton, CA

Background:

More and more patients seeking care by an otolaryngologist are undergoing CT examinations via in-office CT scanners. Many otolaryngologists and patients are not fully aware of the effective radiation dosages delivered and the approximate relative risks of radiation-induced pathophysiology. A recent study of the most common CT examinations demonstrated significant variability in radiation dosages for similar studies between different facilities. Despite the relatively low dose associated with sinus CT scans, recent widely publicized studies have generated a renewal of physician, public and regulatory agency awareness and concern regarding radiation exposure associated with CT examinations.

Methods:

The radiation dosage reports and parameters from sinus CT scans performed by a large otolaryngology private practice group in California were reviewed and compared. This included different types of CT scanners, different manufacturers and both limited and image-guidance protocols.

Results:

There were significant differences in effective radiation exposure from sinus CT examinations from the different CT scanners utilized by one large otolaryngology group. Notable differences also existed from the same scanners, but default sinus protocols.

Conclusions:

A significant amount of variability exists in effective radiation dosages from sinus CT scans. There is a need for increased awareness and understanding among otolaryngologists and their patients regarding single and cumulative radiation exposure from CT imaging. All otolaryngologists need to constantly consider the required regulatory principle of ALARA (As Low As Reasonably Achievable) and cumulative radiation dose in their clinical decision making process. Shielding, pediatric protocols and other dosage reduction measures should be utilized whenever possible.

4:12pm

Impact of Intraoperative CT Imaging on Endoscopic Sinonasal and Skull Base Surgery: A Prospective Analysis

*Pete Batra, MD, Peter Manes, MD, Matthew Ryan, MD
Bradley Marple, MD, Dallas, TX*

Introduction:

Image-guided surgery has been widely employed to improve outcomes in endoscopic sinus surgery (ESS). The objective of this study was to prospectively evaluate the clinical impact of intraoperative computed tomography (CT) imaging on endoscopic sinonasal and skull base procedures.

Methods:

44 patients were enrolled after informed consent from December 2009 to May 2010. Patients underwent intraoperative volume CT imaging at the conclusion of their proposed surgery.

Results:

The mean age was 49.2 years with male:female ratio of 1.1:1. Surgical procedures included revision or primary ESS (32), endoscopic benign or malignant tumor resection (10), and endoscopic mucocele drainage (2). The mean Lund-Mackay (L-M) score was 10.8 (range 1 - 21). Indications for intraoperative CT included extent of surgical dissection (77.3%), tumor resection (22.7%), mucocele drainage (6.8%), and frontal stent position (4.5%). Average acquisition time was 5.3 minutes. CT quality was deemed

excellent in 54.5%, good in 34.1%, and fair in 11.4%. Additional interventions were performed in 8 cases (18%) based on the intra-operative CT dataset. Analysis of predictive factors for additional intervention, including L-M score, presence of polyps, presence of tumor, previous surgery, use of image guidance, and CT quality did not reach statistical significance.

Conclusions:

Real-time update of the CT dataset afforded by intraoperative CT scanning may hold important utility in the endoscopic surgical paradigm with additional interventions being performed in 18% of cases. Future clinical trials should include a multi-institutional design to better delineate variables predictive of need for intraoperative imaging.

4:18pm

Multi-Modal Non-Rigid Registration for Image Guided Head and Neck Surgery

*Joseph Han, MD, Michael Weissberger, MS, Yixun Liu, MS
Nikos Chrisochooides, PhD, Norfolk, VA*

Objective:

Endoscopic skull base or cranial procedures can cause brain shift. Currently useful intra-operative soft tissue information is obtained via intraoperative MRI (iMRI). Intraoperative CT (iCT) has been introduced but soft tissue information is limited. Therefore our objective is to determine if non-rigid registration (NRR) between iCT images and pMRI images is possible for intraoperative soft tissue movement.

Methods:

Patients with skull base pathology with compression of soft tissue were recruited. pCT and pMRI images were obtained. Segmentation of the radiographic images was performed to create a tetrahedral volume mesh. Anatomic features were identified for "block matching". iCT images were acquired and rigid registration (RR) for iCT to pCT and pMRI were performed. Block matching between the iCT and the pCT was executed solving for the dense deformation field. NRR was achieved with the pMRI according to the dense deformation field. Matching and registration error were calculated and compared between RR and NRR.

Results:

Six patients were identified for the study. Segmentation, mesh generation, point selection, block matching, and dense deformation field estimation was successfully performed. The NRR accuracy improved on an average of 4.14 times compared to RR. The registration accuracy for acquired deformation improved by 19% for NRR over that of RR.

Conclusion:

This is the first study evaluating the NRR of iCT with pMRI. NRR is possible between the pCT and iMRI. Successful application of this technique would allow iCT to become a pseudo-iMRI at a fraction of the cost, however clinical application has not been determined.

4:24pm

Discussion & Audience Response Questions

Moderators: Spencer Payne, MD/Sarah Wise, MD

4:30pm

Beyond the Pituitary: Prospective Clinical Trial of Nasal Healing, Sinonasal Quality of Life and Olfaction in Expanded Endonasal Skull Base Surgery

Adam Zanation, MD, Stephen Wheless, BS, Kibwei McKinney, MD, Brent Senior, MD, Chapel Hill, NC

Background:

The expanded endoscopic approach to the skull base offers potential advantages such as no facial incisions, no craniotomy, no brain retraction, and excellent visualization and magnification using the endoscope. While the technical aspects and reconstructive aspects of endoscopic skull base surgery have continued to advance; there are no prospective published studies regarding the morbidity, healing, or quality of life (QOL) outcomes.

Methods:

Prospective clinical trial of sinonasal morbidity, QOL and olfactory outcomes in expanded endonasal skull base surgery. Standard pitu-

itary approaches were excluded. Data was collected for all patients pre- and at short and long-term post-operative time points. Paired absolute differences in pre and postoperative data were compared across the entire cohort and results were stratified by approach and nasoseptal flap reconstruction.

Results:

The first twenty expanded endoscopic skull base patients in our clinical trial are presented. RSOM 31 data shows significant QOL reduction in the first 2-4 weeks; however, by 8 weeks the RSOM 31 shows improved QOL compared to pre-operatively. Sinonasal healing and mucosalization is inversely related to exposed bone and extent of dissection. Septal flap stratified mucosalization data is presented. Mucosalization is graded as complete by 8 weeks in most patients. Radiation treatment significantly reduces mucosalization rates. PEA olfactory threshold morbidity is short-term in most patients except those with transcribriform approaches.

Conclusion:

Expanded endonasal skull base surgery has significant short-term sinonasal morbidity and QOL decreases. However, these effects are limited to 6-8 weeks in most patients. Patients with radiation treatment should expect much longer sinonasal morbidity.

4:36pm

Quality of Life and Sinonasal Outcomes Following Fully Endoscopic Transphenoidal Skull Base Surgery

*Amanda Munoz, MD, Visish Srinivasan, Griffith Harsh, MD
Peter Hwang, MD, Stanford, CA*

Introduction:

Endoscopic transphenoidal skull base surgery (ETS) for resection of sellar and parasellar lesions is known to be advantageous over open approaches, resulting in decreased operative time and shorter hospital stay. However, there are limited data regarding perioperative quality of life and sinonasal outcomes.

Methods:

Retrospective review of 153 patients who underwent ETS for a vari-

ety of lesions between 2006-2009. SNOT-20 questionnaires were administered at pre-op visits and at multiple post-op evaluations; scores were compared between time points. The incidence of sinonasal complications was recorded.

Results:

The mean pre-op SNOT-20 score was 1.01 (range 0-2.95). Post-op scores were, on average, 0.62 points higher than pre-op scores. The mean score at the first post-op visit (< 30 days, mean 11.8 days postop) was significantly higher than at the second post-op visit (1.36 vs 1.08, $p=0.04$, postop days: mean 128, median 60). Higher SNOT-20 scores were not associated with epistaxis or intra-op placement of nasal packing, but were associated with revision surgery. Interestingly, patients with secreting pituitary tumors also had higher average scores than those with non-secreting tumors. 17 patients had epistaxis (8.7%), 5 had sinusitis (2.9%), 2 developed a fungal sinus infection (1.2%) and 1 had a septal perforation (0.6%).

Conclusion:

Patients undergoing ETS experience mild sinonasal disability in the immediate post-operative period, as measured by post-op SNOT-20 scores. However, this appears to resolve by the second post-op visit. The minimal impact on sinonasal QOL is an additional advantage of the endoscopic approach to resection of parasellar lesions.

4:42pm

Comparative Analysis of Cost of Minimally Invasive Pituitary Surgery and Sublabial-transseptal Approaches to the Pituitary

Charles Ebert, MD, Nadine Oosmanally, MSPH, Adam Zanation, MD, Brent Senior, MD, Chapel Hill, NC

Introduction:

Two surgical approaches to the pituitary are commonly used: the sublabial-transseptal (SLTS) approach using microscopy and the endonasal endoscopic minimally invasive (MIPS) approach. Although outcomes are similar for both procedures, MIPS has become increasingly prevalent over the last 15 years. Limited cost analysis data comparing the two alternatives are available.

Methods:

A retrospective analysis of cost and volume data was performed using data from the published literature, national datasets, UNC Hospitals, and surgeon interviews. A sensitivity analysis of the parameters was used to evaluate the uncertainty in parameter estimates. A Monte Carlo simulation of 1,000 trials was run using the parameters included in the model to determine the savings from using the less costly alternative.

Results:

The total cost is \$10,713 and \$14,045 per patient per procedure for MIPS and SLTS, respectively, with a cost difference of \$3,332 per patient per procedure. The results of the sensitivity analysis indicate that the total cost for MIPS is most sensitive to the (1) length of stay, (2) nursing cost, and (3) procedure cost while the total cost for SLTS is most sensitive to (1) nursing cost, (2) length of stay, and (3) procedure cost. MIPS is less costly than SLTS 85% of the time. The expected value of a decision made using perfect information is \$4,154 per procedure.

Conclusions:

The results indicate that MIPS is less costly than SLTS. The cost-savings per MIPS procedure may offset the additional training costs in endoscopy in a short period of time.

4:48pm

Sinonasal Quality-of-Life before and after Endoscopic, Endonasal Minimally Invasive Pituitary Surgery

*Thomas Suberman, BA, Adam Zanation, MD, Brent Senior, MD
Charles Ebert, Jr., MD, Chapel Hill, NC*

Background:

Studies have shown minimally invasive pituitary surgery (MIPS) to be a safe and efficacious union of the endoscope to the transsphenoidal approach. To date, there is little data that assesses the health-related quality-of-life (QoL) of those undergoing minimally invasive pituitary surgery (MIPS). Furthermore, no study has investigated sinonasal-specific outcome measures. Our hypothesis was that patients undergoing MIPS would not have significantly different

sinus disability or change in quality-of-life after surgery compared to prior to surgery.

Methods:

This is a retrospective review of patients undergoing MIPS between the years 2002 and 2009. Inclusion criteria required that patients complete a pre- and post-operative Rhinosinusitis Disability Index (RSDI) form, a validated questionnaire. RSDI scores, patient demographics, tumor characteristics, surgical outcomes, and intra-operative/post-operative complications were recorded. Pre- and post-operative mean RSDI scores and the mean absolute change in RSDI were calculated with 95% confidence intervals. One-way analysis of variance (ANOVA) compared RSDI scores between different tumor subgroups.

Results:

Fifty patients completed the RSDI pre- and post-operatively. The length of follow-up ranged between 0 and 92 months. Analyses revealed no significant difference between pre- and post-operative scores across all domains ($P = 0.84$). When the cohort was stratified into functional versus nonfunctional tumor types there was no significant difference between the two groups ($P = 0.88$). A trend showed similar or lower RSDI scores post-operatively in all groups but the patients with Rathke's cleft cysts.

Conclusions:

Minimally invasive endonasal endoscopic pituitary surgery with appropriate post-operative care results in little or no long-term sinonasal quality of life defects.

4:54pm

Discussion & Audience Response Questions

5:00pm

Break with Exhibitors

Imperial Ballroom B

Moderator: Bradley Marple, MD

ARS / AAOA Joint Symposium

Non FDA Approved Treatment of Sinusitis

September 25, 2010

Plaza Ballroom

Moderators: Karen Fong, MD/ Mark Zacharek, MD

1:00pm

Novel Effects of Statins in Enhancing Efficacy of Chemotherapy in Nasopharyngeal Cancer

Do-Yeon Cho, MD, Weihua Wang, MD, Peter Hwang, MD

Daya Upadhyay, MD, Stanford, CA

(Presented by Weihua Wang, MD)

Background:

The treatment of nasopharyngeal cancers (NPC) has evolved since the introduction of combined modality treatment. However, despite advances in therapeutic regimens, the mortality continues to remain high. Recent identification of a novel property of a commonly used agent, Cholesterol-lowering Statins, raises a promising hope that concurrent use of these agents may enhance the efficacy of single drug chemotherapy in NPC. Statins block the biosynthesis of biologically active mediators causing immunomodulatory, anti-inflammatory, antiangiogenic and anti-proliferative effects in vitro in various human cancer cells. However, the effects of Statins have not been studied before in NPC. In this study, we examine the effects of Statins on NPC apoptosis and investigate the mechanism that enhance efficacy of single agent in induced apoptosis.

Methods:

Primary human NC cells (CCL-30) were treated with simvastatin and cisplatin concurrently, and the effects on cell proliferation, cell cycle and apoptosis were determined.

Results:

Simvastatin effectively reduced the number of viable NPC cells, inhibited proliferation and increased apoptosis in a dose-dependent manner in NPC. Simvastatin induced caspase-dependent apoptosis via the activation of a proapoptotic Bim mediated pathway. Statins caused decrease in cyclin D1 and CDK4, and increase in p27, resulting in cell cycle arrest in G1 in NPC. Further, these effects were completely blocked by Statin pathway inhibitor mevalonate, suggesting that Statins induce these effects.

Conclusions:

Statins enhance the efficacy of chemotherapy in NPC.

1:06pm

Sinonasal Epithelial Cells Express 1 α -hydroxylase and can Synthesize Active Vitamin D Augmenting Host Innate Immune Function

Babar Sultan, MD, Joan Lee, BA, Murugappan Ramanathan, MD, Andrew Lane, MD, Baltimore, MD

Background:

Vitamin D, long recognized for its role in bone metabolism and calcium homeostasis, has been increasingly shown to play a key role in innate immunity. 1 α -hydroxylase, the enzyme responsible for the synthesis of active vitamin D has been shown to have extra-renal expression in multiple cell types. This potential for local production of active vitamin D has important implications for vitamin D-responsive genes involved in innate immunity.

Methods:

Human sinonasal epithelial cells were isolated from patients undergoing sinus surgery and grown in an air-liquid interface allowing for differentiation. These cells were exposed to 25-dihydroxyvitamin D3 or active 1,25-dihydroxyvitamin D3 with and without poly-IC, a synthetic analog of dsRNA. Gene expression was assessed by real-time polymerase chain reaction and protein expression was assessed by immunocytochemistry.

Results:

Sinonasal epithelial cells constitutively express the enzyme 1 α -hydroxylase allowing for local production of active vitamin D. Cells exposed to inactive vitamin D had a significant eight-fold increase in cathelicidin expression when compared to controls. Poly-IC in conjunction with active vitamin D further augmented cathelicidin expression. Immunocytochemistry verified intracellular cathelicidin protein expression and showed increased fluorescence in Vitamin D stimulated cells.

Conclusion:

Sinonasal epithelial cells can generate active vitamin D and upon stimulation with vitamin D significantly increase expression of the antimicrobial peptide cathelicidin. Local nasal application of vitamin D may be a useful adjuvant in the setting of sinonasal infection.

1:12pm

Polyhydrated Ionogen Enhances Postoperative Sinonasal Ciliated Remucosolization

Noam Cohen, MD, PhD, David DePoortere, MD, Jennifer Kofonow, MS, Philadelphia, PA

Introduction:

Remucosolization of the sinonasal cavity following sinus surgery is critical for successful outcomes. Recently a novel antiprotease compound, Polyhydrated Ionogen (PHI) with Mg²⁺/Br²⁺, has demonstrated improved dermal wound healing. We set out to demonstrate accelerated postoperative paranasal sinus remucosolization by daily irrigations with PHI Mg²⁺/Br²⁺.

Methods:

Twenty-four New Zealand white rabbits underwent bilateral medial wall maxillary mucosal stripping followed by placement of an indwelling irrigation catheter. In a randomized fashion one side received 3cc normal saline (NS) daily, while the contralateral side received PHI Mg²⁺/Br²⁺. Following a 14 day therapeutic trial, snouts were harvested and remucosolization was assessed by hematoxylin and eosin (H&E) staining and immunohistochemistry for type IV β -tubulin, a marker of motile cilia. A semiquantitative grading of reciliation was used [0 = no cilia, 1 = < 30% cilia, 2 = 30 - 60% cilia, 3 = > 60% cilia]. A Chi-square test was used to compare the distributions in each group and determine significance.

Results:

H&E staining comparison demonstrated NS treated sinuses (n=24) had substantial bare areas with predominant ciliation scores under 30%. The PHI Mg²⁺/Br²⁺ treated group (n=24) achieved a statistically significant improvement in ciliary density (>60%) when compared with NS (p<0.01). These results were confirmed with Type IV β -Tubulin staining (p<0.01).

Conclusion:

Poor healing of the sinonasal mucosa following surgery with loss of ciliary function results in adverse clinical outcomes. In a rabbit model of sinonasal mucosal healing, daily irrigation for 14 days with

PHI Mg²⁺/Br²⁺ enhanced ciliated remucosalization compared to saline.

1:18pm

Discussion & Audience Response Questions

Moderators: Robert Kern, MD/Brad Woodworth, MD

1:24pm

Inflamed Sinus Mucosa has Different Cytokine Profile than Nasal Polyps in Patients with Chronic Rhinosinusitis

*Amber Luong, MD, PhD, Joanne Shaw, PhD, Samer Fakhri, MD
Martin Citardi, MD, Houston, TX*

Introduction:

Nasal polyps have traditionally been used to characterize cytokine tissue expression in chronic rhinosinusitis with nasal polyps (CRSwNP). The cytokine profile of inflamed non-polyp sinus mucosa has not been previously analyzed. We hypothesize that the different gross appearance of the inflamed mucosa and nasal polyp may reflect a differential genetic expression profile between these two tissues.

Methods:

Messenger RNA expression levels of representative Th1 (IFN- γ ; IL-10, and TNF- α ;) and Th2 (IL-4, IL-5 and IL-13) cytokines were determined by quantitative reverse transcription-polymerase chain reaction from 3 different sinonasal mucosa sites of 10 CRSwNP patients. For each patient, mucosa was obtained from the inferior turbinate, inflamed ethmoid sinus and nasal polyp.

Results:

Expression levels for most cytokines were notably different between the nasal polyps and inflamed non-polyp ethmoid mucosa. Specifically, higher mRNA levels of IL-5, IL-13 and IL-10 were observed from inflamed ethmoid tissue. Interferon- γ was expressed at lower levels in the inflamed mucosa. The remaining cytokines had similar expression levels between inflamed mucosa and nasal polyps.

Conclusion

Prior studies characterizing the tissue expression of cytokines in CRSwNP patients have often focused on the nasal polyps. This study demonstrates differential expression levels of inflammatory mediators between inflamed ethmoid mucosa and nasal polyps.

1:30pm

Variations in Expression of Matrix Metalloproteinase-9 (MMP-9) and Tissue Inhibitor of Metalloproteinase-1 (TIMP-1) in Nasal Mucosa of Aspirin Sensitive Versus Aspirin Tolerant Patients with Nasal Polyposis

Pamela Mudd, MD, Todd Kingdom, MD, Rohit Katial, MD, Aurora, CO

Objective:

To determine expression of MMP-9 and its inhibitor, TIMP-1, in nasal mucosa of distinct patient populations presenting with nasal polyposis.

Study design:

Retrospective study, Immunofluorescence.

Subjects and Methods:

The expression of MMP-9 and TIMP-1 was investigated in nasal polyp tissue from 6 aspirin sensitive and 6 aspirin tolerant patients undergoing endoscopic sinus surgery. Nasal mucosa from patients with chronic rhinosinusitis without nasal polyposis was used as control. MMP-9 and TIMP-1 expression was measured using an immunofluorescence method. Hematoxylin-eosin staining as well as patient clinical profile was also compared.

Results:

Expression of TIMP-1 was found to be significantly reduced in patients with nasal polyps and aspirin sensitivity when compared to both aspirin tolerant and control groups ($p < 0.001$). In addition the MMP/TIMP ratio was significantly increased in patients with nasal polyposis and aspirin sensitivity ($p < 0.001$). MMP-9 expression was not significantly different between study and control groups.

Conclusion:

Our results continue to support the importance of the balance of

MMP-9 and TIMP-1 in nasal polyp formation. The decreased expression of TIMP-1 in aspirin sensitive patients may lead to further understanding of resistance to treatment in this group of patients, and may lead to exploration of future treatments for nasal polyposis.

1:36pm

Are Bacterial Biofilms Chemotactic to Inflammatory Cells in Chronic Rhinosinusitis?

Andrew Wood, MD, Simon Swift, MD, John Fraser, MD, Richard Douglas, MD, New Zealand

Introduction:

Bacterial biofilms have been identified on the sinonasal mucosa of patients with chronic rhinosinusitis (CRS) but also on mucosa from normal controls. The aim of this study was to evaluate the role of biofilms in the pathogenesis of CRS by determining whether they are chemotactic to inflammatory cells.

Methods:

Mucosal samples were collected from 7 patients with nasal polyps (CRSwNP), 5 patients with CRS without polyps (CRSsNP) and 5 normal subjects undergoing endoscopic sinus surgery. Mucosal samples were fixed in Carnoy's fixative and sectioned approximately perpendicular to the mucosal surface. Bacteria on the mucosal surface were identified using Gram and Giemsa stains. Inflammatory cells were identified by histology and immunohistochemistry. The morphology of the epithelium was graded and the number of local inflammatory cells was recorded in areas both colonized with and free from bacteria. Biofilms were considered adherent if they were directly opposed to the mucosal surface. Large bacterial colonies that were not clearly attached to the surface epithelium were described as associated.

Results:

Both morphologically normal and disrupted epithelium was seen below biofilms. In CRS patients, adherent biofilms were surrounded by significantly higher numbers of T lymphocytes ($p=0.033$), macrophages ($p=0.031$) and eosinophils ($p=0.049$). Surface colonies that were merely associated with the mucosal surface were not significantly chemotactic to T lymphocytes ($p=0.27$), B lymphocytes

($p=0.61$), macrophages ($p=0.34$) or eosinophils ($p=0.94$).

Conclusions: Our results are consistent with adherent biofilms being chemotactic to inflammatory cells in CRS. This observation suggests that biofilms may be playing a pathogenic role.

1:42pm

Dysregulated microRNAs in Chronic Sinusitis

Do-Yean Cho, MD, Wei Le, MD, Peter Hwang, MD, Daya Upadhyay, MD, Stanford, CA

Background:

Chronic airway inflammation frequently presents as rhinosinusitis affecting millions of patients worldwide. Sino-nasal epithelium is directly exposed to the environment. It plays a critical role in maintaining homeostasis of the airways as well as in the pathogenesis of airway diseases. Previously, by using PCR microarrays, we demonstrated a role of CCL5, CCL11 and IL13RA in mediating inflammation. Recent reports show that disrupted cell-specific microRNAs (MiRNA) are involved in mediating allergic airway inflammation. Particularly, miRNAs-21 was shown to regulate IL13RA in allergic inflammation. Therefore we designed a study to identify dysregulated miRNAs involved in chronic rhinosinusitis.

Method:

We use ex-vivo sinus tissues removed by clinically indicated surgical excision from human subjects to identify miRNAs. By using microarray, PCR arrays, real time PCR based miRNA expression profile and functional assays, we examined miR-21, miR-146a, miR-513c, miR-513b, miR-923, miR-494, miR-379, miR-338-5p and miR-155, since many of these miRNAs are known to regulate Th1 and Th2 mediated inflammation.

Results:

Our data show significant upregulation of miR-155, miR-21, miR-220, miR-220c in patients with chronic sinusitis tissue as compared to control. The miRNA expression pattern correlated to that of the expression of miRNAs in cell free serum in same individuals. The microarray data were validated by using quantitative RTqPCR. The findings were consistently seen in patients with both allergic and non-allergic rhinosinusitis.

Conclusion:

Our study characterizes the signature miRNAs involved in rhinosinusitis and sets a stage for future possibilities of miRNA and/or miRNAi-based therapies.

1:48pm

Discussion & Audience Response Questions

1:54pm

Outcomes in Rhinology

Timothy Smith, MD

2:24pm

Break with Exhibitors (Imperial Ballroom B)

Moderators: Eric Holbrook, MD/Rodney Schlosser, MD

2:44pm

Expression of Mucosal Epithelial Barrier and Water Membrane Permeability Protein Receptors in Chronic Rhinosinusitis With and Without Nasal Polyps

*Alan Shikani, MD, Randall Basaraba, PhD, Jeff Leid, PhD
Venkataramana Sidhaye, MD, Baltimore, MD*

Objectives:

To evaluate the differential expression of mucosal epithelial barrier and water membrane permeability proteins in chronic rhinosinusitis (CRS), in nasal polyps and in normal human nasal mucosa.

Methods: Ethmoid sinus mucosa was obtained from 10 subjects undergoing endoscopic sinus surgery for CRS, 10 others with nasal polyposis, and compared to the mucosa from 10 control subjects undergoing septoplasty. Mucosal samples were collected and examined by H&E, immunohistology and real-time PCR (rt-PCR).

The expression of barrier proteins (including E-cadherin, and occludin, as well as Septin-2) and aquaporins (AQPs) was evaluated using western blotting, reverse transcriptase real-time PCR (rtPCR) and immunohistochemistry. Importantly, rtPCR analysis measures levels of gene expression in tissue and immunohistochemistry can analyze orientation of these gene products in explanted tissue. For gene expression studies in tissue, RNALater

is often employed because it stabilizes the tissue RNA such that expression can be analyzed in the laboratory setting. Aquaporins are water-specific membrane channel proteins that affect trans-epithelial water permeability and participate in a wide array of physiologic processes.

Results:

Mucosal epithelial barrier and water membrane permeability proteins were stronger in the nasal polyps than in the normal nasal mucosa. The baseline AQP5 abundance in CRS mucosa was higher in CRS patients compared to control. These results were confirmed by rtPCR analysis of explanted tissue and by immunohistochemistry on sinonasal samples.

Conclusion:

We confirm the previously suggested hypothesis that altered barrier function is implicated in the pathophysiology of CRS and nasal polyps.

2:50pm

Chloride ion Transport of the Nasal Ciliated Epithelial Cell

*Masato Miwa, MD, Matsuaki Go, MD, Takuya Hachisu, MD
Kensuke Watanabe, MD, Japan*

Introduction:

Origins of nasal secretion are generally thought to be composed of seromucous glands, goblet cells, transudation from capillaries secretions and cell debris from leukocytes. The participation of nasal ciliated epithelial cells in secretion is still obscure. On the other hand, there is growing evidence that macrolide antibiotics have many beneficial effects in chronic rhinosinusitis not only by killing bacterial pathogens but also by their anti-inflammatory mechanisms. Significant clinical efficacy of macrolide antibiotics on suppressing the hypersecretion from the airway epithelia has been reported, although its mechanism remains unclear. We tried to examine the Cl⁻ conductance activated by β -adrenergic, cholinergic, purinergic stimulants and macrolides on ciliated epithelial cells isolated from guinea pig airway using the patch clamp technique.

Methods:

The epithelial cells of nasal mucosa were extracted from Hartley guinea pigs. Whole-cell patch-clamp recording on ciliated epithelial cells on glass coverslips was performed in various conditions.

Results:

Cl⁻ channels in the ciliated airway epithelial cells were readily activated by β -adrenergic, cholinergic and purinergic stimulants. We also demonstrated that roxithromycin; one of typical 14-membered macrolides; could partially block of β -adrenergic, cholinergic and purinergic agonists-activated Cl⁻ currents.

Conclusion:

The periciliary layer with low viscosity in which cilia beat may be formed by the ciliated epithelial cell itself. It is also noteworthy that the possibility of the cholinergic epithelial secretion was speculated through this study. Furthermore, the suppressive effects of macrolides to airway hypersecretion may be due to their inhibitions of activated Cl⁻ channels.

2:56pm

Evaluation of Topical Surfactant Solution on Sinonasal Respiratory Cilia Function

Noam Cohen, MDPhD, Bei Chen, MD, Philadelphia, PA

Background:

A common complaint of chronic rhinosinusitis is thickened inspissated nasal secretions and concomitant post nasal drip. Recently, the use of diluted, commercially available, chemical surfactant (baby shampoo) demonstrated modest improvement in these complaints. Removal of hair specific ingredients, such as thickeners, lubricants, and fragrances, and addition of a humectant as well as optimization of mucoactive ingredients generated a novel sinonasal topical surfactant solution. The objective of this study was to evaluate the effect of this solution on respiratory cilia function.

Methods:

Murine nasal septal explants (n=3) as well as murine nasal septal air liquid interface cultures (n=3) were visualized under differential interference contrast (DIC) microscopy in a temperature regulated

perfusion chamber. Using high speed video microscopy and image analysis software, baseline ciliary beat frequency was established for 3 minutes followed by addition of the surfactant solution. Continuous ciliary beat frequency was recorded every 30 seconds for 15 minutes.

Results:

Addition of the sinonasal surfactant solution diluted in bicarbonate buffered isotonic saline resulted in no perturbation of ciliary beat frequency in murine nasal septal explants (n=3) or mature air liquid interface cultures (n=3).

Conclusion:

Respiratory mucosal explants as well as air liquid interface cultures demonstrate robust ciliary beating and represent two model systems for screening topical agents for ciliotoxicity. In both systems, apical application of the novel sinonasal surfactant solution did not alter ciliary beat frequency over a 15 minute period.

3:02pm

Discussion & Audience Response Questions

Moderators: James Hadley, MD/Peter Hwang, MD

3:08pm

Safety and Efficacy of a Novel Bioabsorbable, Steroid Eluting Sinus Stent

Andrew Murr, MD, Timothy Smith, MD, Peter Hwang, MD, Neil Bhattacharyya, MD, San Francisco, CA

Introduction:

Middle turbinate lateralization, adhesions and inflammation are causes of sub-optimal outcomes following surgery. A bioabsorbable, drug-eluting stent was evaluated for its ability to preserve sinus patency and to provide controlled steroid delivery to the sinus mucosa.

Objective:

To assess the safety and efficacy of a steroid-eluting sinus stent when used following FESS in patients with Chronic Rhinosinusitis (CRS).

Methods:

Prospective, multi-center, randomized, double-blind trial enrolling 43 patients in two groups. One group (n=38) used an intra-patient control design comparing drug-eluting stent to non-drug eluting control placed in the ethmoid cavity post-FESS. The other (n=5) received bilateral drug-eluting stents to assess systemic safety. Weekly endoscopic follow-up was performed to 60 days. Primary endpoints included ability to place device, inflammation reduction and local tissue response.

Results:

The stent was successfully deployed in all 86 sinuses. The drug-eluting stent provided statistically significant reduction in ethmoid sinus inflammation at Days 21 to 45 ($p<0.003$) compared to the control stent. The drug-eluting stent reduced frequency of middle turbinate lateralization, significant adhesions, polypoid changes and increased frequency of sinus patency. Reduction in adhesions and polyp formation were statistically significant ($p<0.04$). There were no device-related adverse events. Eluted steroid was undetectable by plasma assay and mean cortisol concentrations over time showed no evidence of adrenal suppression.

Conclusions:

This study demonstrates safety and efficacy of a novel bioabsorbable, steroid-eluting stent for use in CRS patients. The steroid-eluting stent is effective in preserving sinus patency, reducing inflammation and minimizing adhesions via controlled local steroid delivery without measurable systemic exposure.

3:14pm

Gel Rhinotopic Therapy for Chronic Rhinosinusitis that is Refractory to Oral Antibiotics

*Alan Shikani, MD, Mary Jabra-Rizk, PhD, Randall Basaraba, PhD
Jeff Leid, PhD, Baltimore, MD*

Objective:

To determine the efficacy of rhinotopic therapy as strategy for treatment of refractory chronic rhinosinusitis (CRS) patients who are infected with bacteria that are resistant to oral antibiotic.

Methods:

This is a prospective open-label study involving 18 cases with refractory CRS infected mostly with MRSA and different Gram-negative bacteria (including *Pseudomonas aeruginosa* and *Serratia marcescens*), organisms that typically resist oral antibiotics. Patients were treated with gel rhinotopic therapy for a period of 6 weeks, consisting of daily nasal nebulization of mometasone and an antibiotic chosen based on naso-endoscopic guided cultures and sensitivity (such as vancomycin, mupirocin, or tobramycin), daily saline pressure hydrotherapy, weekly endoscopic sinus debridement and topical intra-sinus installation of a hydroxyl-ethylcellulose gel that releases mometasone and the same antibiotic. Clinical outcome was assessed using the Lund-Kennedy symptom and Lund-Kennedy endoscopic appearance scores. Bacterial elimination was assessed using naso-endoscopic guided cultures, colony forming units (CFUs) bacterial assay technique and immunohistology of explanted sinonasal tissue.

Results:

There was a statistically significant difference in the patients' Lund-Kennedy symptom and Lund-Kennedy endoscopic appearance score after 6 weeks of rhinotopic therapy. The improvement was sustained after stopping treatment, with a mild drop after a longer follow up. There was also statistically significant improvement in the CFUs mucosal bacterial count after therapy. By histology, explanted sinonasal tissue was analyzed for inflammation utilizing standard H&E, and for the presence of oxidative stress in the tissue, which can be associated with the presence of microbial pathogens. Naso-endoscopic guided cultures performed one month following rhinotopic therapy, showed resolution of the pathogenic organism(s) in 12/18 patients (67 %). No significant clinical adverse effects were experienced.

Conclusion:

Gel rhinotopic protocol is an effective and well tolerated treatment strategy for treatment of refractory CRS patients infected with bacteria that are resistant to oral antibiotics.

3:20pm

The Use of Zileuton for Treatment of Chronic Rhinosinusitis in Samter's Triad

*Justin Antisdell, MD, Nathan Smith, MS, James Wallace, PA
Stilianos Kountakis, MD, PhD, Saint Louis, MO*

Introduction:

Samter's triad (ST), also known as aspirin triad disease, is a clinical entity well known in otolaryngology. With patients having asthma, nasal polyposis, and aspirin intolerance; ST represents a difficult to treat type of chronic rhinosinusitis (CRS). By evaluating subjective and objective clinical data, as well as patient surveys, this study examines long term sinonasal outcomes as well as the effect of zileuton.

Methods:

Retrospective analysis of prospectively collected data from 19 patients was performed. All patients required functional endoscopic sinus surgery (FESS) after failing maximum medical therapy for CRS in the context of ST. CT scans were graded according to the Lund-Mackay grading scale and symptom scores were assessed using the Sino-Nasal Outcome Test (SNOT-20). Endoscopy was scored according to the Lund-Kennedy grading scale. All patients had a minimum 2-year follow-up. Verbal surveys regarding medication importance were obtained.

Results:

Preoperative CT scores were 20.9(3.5). Preoperative SNOT-20 scores were 32.3(8.2) and long term follow-up (average 37 months) SNOT-20 was 16.6(8.3). Preoperative endoscopy scores were 13.1(3.2) and the same interval long term score was 5.8(3.9). All patients used budesonide irrigations and 13 of 19 patients used zileuton. Patients reported zileuton as the medications which was most important and made the greatest change in their symptoms. No patient required revision FESS.

Conclusions:

Patients with ST do well long term with aggressive medical and surgical therapy. Addition of zileuton can increase interval between FESS compared to historical controls. Patients rate zileuton as most beneficial medication.

3:26pm

Discussion & Audience Response Questions

Moderators: Noam Cohen, MD / Rodney Schlosser, MD

3:32pm

Epithelial Cell Innate Antiviral Effector Expression is Up-regulated in Chronic Rhinosinusitis with Polyps

(Presented by: Stella Lee, MD)

Andrew Lane, MD, Joan Lee, BA, William Fischer, MD, Andrew Pekosz, MD, Baltimore, MD

Introduction:

Upper respiratory viral infections frequently exacerbate inflammation in CRSwNP. Although innate antimicrobial immune responses appear to be blunted in CRSwNP, epithelial cell antiviral innate immune function has not been explored. This study compares the expression of viperin, an important antiviral innate immune effector, in sinonasal epithelial cells (SNEC) derived from patients with and without nasal polyps, after infection with wild type influenza-A and the H1N1 strain.

Methods:

SNEC were collected from 12 patients during endoscopic sinus surgery and grown in culture at the air-liquid interface. Differentiated SNEC were infected with wild type influenza A, H1N1 strain, or TLR3 agonist. mRNA was extracted and analyzed by quantitative PCR for expression of viperin, RIG-I, and ISG15.

Results:

SNEC from CRSwNP patients expressed greater baseline levels of antiviral innate immune genes. Both influenza-A infection and TLR3 stimulation caused substantial increases in viperin expression, independent of the patient's polyp status. However, H1N1 infection specifically induced a significantly greater increase in viperin expression in CRSwNP SNEC than in non-CRSwNP controls. This increase was not observed with the antiviral genes RIG-I and ISG15.

Conclusion:

While viral infection clinically exacerbates CRSwNP, innate antiviral responses appear to be up-regulated in CRSwNP SNEC. In particular, CRSwNP SNEC react robustly to H1N1 infection with production of viperin, a disruptor of viral assembly. Hyperactive sinonasal innate antiviral responses are consistent with worsening of local chronic inflammation. Future studies will examine if SNEC antiviral

responses activate pro-eosinophilic mediator expression. Whether CRSwNP confers resistance to severe H1N1 infection is worthy of further investigation.

3:38pm

Do Viruses Have a Role in the Pathogenesis of Chronic Rhinosinusitis?

*Andrew Wood, MD, Hanna Antoszewska, MD, John Fraser, MD
Richard Douglas, MD, New Zealand*

Background:

The pathogenesis of chronic rhinosinusitis (CRS) remains poorly understood but many patients describe an upper respiratory tract infection as the inciting event. Childhood infection with respiratory syncytial virus increases the possibility of an affected child developing asthma for at least a decade afterward and there is some evidence that this may be due to the persistence of virus particles within the mucosa. Viral infections have also been shown to produce obstruction of the osteo-meatal complex, an event considered critical to the development of CRS. We postulated that some of the inflammatory changes seen in CRS may be the consequence of viral infection, and sought to determine whether respiratory viruses could be detected within the nasal mucosa by using polymerase chain reaction (PCR) techniques.

Methods:

Five patients with nasal polyps (CRSwNP), 7 patients with CRS without polyps (CRSsNP) and 2 normal subjects, all of whom were undergoing endoscopic sinus surgery (ESS) were prospectively enrolled. Representative mucosal samples were taken and real-time PCR used to look for 12 common respiratory viruses (Parainfluenza 1, 2 and 3, Respiratory Syncytial Virus, Human metapneumovirus, Adenovirus, Rhinovirus, Coronavirus, Bocavirus, Cytomegalovirus and Influenza A and B).

Results:

Patients reported symptoms lasting a median of 4 years. The median Lund-MacKay score in the patients with CRS was 15. No viruses were detected in any of the mucosal samples.

Conclusions:

Persistence of viruses within the mucosa in CRS is unlikely to be a cause of ongoing inflammation. The possibility remains that a transient viral infection provokes the initial inflammatory changes.

3:44pm

Discussion & Audience Response Questions

Moderators: Alexander Chiu, MD/Steven Schaefer, MD

3:50pm

Trends in MRSA Incidence and Sensitivity from Nasal Cultures at a Single Tertiary Care Institution

Valin Rujanavej, MD, Niaz Banaei, MD, Peter Hwang, MD, Jayakar Nayak, MD, PhD, Stanford, CA

Introduction/Objectives:

To identify trends of community-acquired, methicillin-resistant *S. aureus* (MRSA) incidence and antimicrobial resistance in patients with acute or chronic sinusitis.

Methods:

All nasal/sinus cultures obtained by otolaryngologists at Stanford over a 20-year period (1990-2010) were retrospectively reviewed by mining the microbiology database. Nested searches were then made for all *S. aureus* and MRSA cultures. Patterns of incidence and changes in sensitivity were tabulated with statistical analysis performed.

Results:

Our search retrieved 10,387 positive nasal culture samples, with *S. aureus* found in 800 (7.7%), and MRSA comprising 110 (1.06%) of this subset. Between the years 1990-99, only 2/112 (1.7%) nasal cultures were positive for MRSA, with a sharp rise in incidence 86/606 (14.2%) between both 2000-05, and 2006-10 (22/82, 26.8%). There was a marked decline however in absolute numbers of *S. aureus* and MRSA-positive cultures, with a similar trend seen for *S. Pneumo* and *Pseudomonas* spp. Over the 20 year interval studied, the patterns of antibiotic sensitivities in MRSA remained unaltered, especially with regard to trimethoprim-sulfamethoxazole and vancomycin.

Conclusion:

Community-acquired *S. aureus* and MRSA positive nasal cultures contributing to rhinosinusitis, which were essentially absent prior to the year 2000, became more common earlier this decade. However, the relative incidence has sharply and unexpectedly declined from 2006 to the present. Additionally, there is no evidence of changes in antibiotic sensitivities for this pathogen over time. The implications of these findings are discussed.

3:56pm

The Etiology of Sinonasal Staphylococcus Aureus Following Surgery for Chronic Rhinosinusitis

*Joshua Jervis-Bardy, MD, Andrew Foreman, MD, PJ Wormald, MD
Australia*

Despite increasing evidence of a role for *S.aureus* biofilms in Chronic Rhinosinusitis (CRS), the etiology of this organism in the post-surgical sinonasal cavity had been unclear. Recently, we suggested that the increased culture rate of *S.aureus* following endoscopic sinus surgery (ESS) may be related to biofilm activity. This study, therefore, was designed to ascertain the etiology of early post-operative sinonasal *S.aureus* and assess the early post-operative outcomes in patients culture-positive for this organism.

Methods:

29 patients undergoing ESS for medically-recalcitrant CRS were prospectively enrolled. A comprehensive intra-operative *S.aureus* screening protocol was followed for all patients (including swabs for culture and tissue for FISH *S.aureus* biofilm analysis); early post-operative management included endoscopically-guided swabs for culture in all patients.

Results:

20/29 (69.0%) patients cultured *S.aureus* post-operatively, of which 17/20 (85.0%) were screen-positive at surgery. 7/11 (63.6%) intra-operatively biofilm-positive but culture-negative patients progressed to culture *S.aureus* post-ESS. *S.aureus* culture was associated with poorer objective and subjective early post-ESS outcomes.

Conclusions:

S.aureus persists in the sinonasal cavity despite ESS. Furthermore, the post-operative culture of sinonasal S.aureus in patients previously biofilm-positive but culture-negative demonstrates the dynamic ability of S.aureus to adapt in this setting and suggests the early post-operative sinonasal cavity to be a relatively S.aureus-friendly environment.

4:02pm

Discussion & Audience Response Questions

Moderator: Andrew Lane, MD

4:08pm

The Great Debate

Panelists: Robert Kern, MD, James Palmer, MD, Valerie Lund, FRCS, Andrew Lane, MD

Poster Presentations

#1A - A Novel Approach for Treatment of Nasal Septal Arteriovenous Malformation

Naveen Bhandarkar, MD, Nathan Sautter, MD, Portland, OR

Introduction:

Hereditary hemorrhagic telangiectasia (HHT) is characterized by mucosal and cutaneous telangiectasias and cranial and pulmonary arteriovenous malformations (AVMs). Although 90% of HHT patients have epistaxis due to mucosal telangiectasias, nasal septal AVM occurring concurrently is a previously unreported event and results in relatively severe, high-volume epistaxis.

Methods:

Case report

Results:

A 65-year-old female with HHT presented for first evaluation of recent onset frequent episodes of high volume (>0.5 L per occurrence), transfusion-dependent epistaxis. She responded partially to 2 endoscopic nasal cautery procedures but relapsed within several weeks. During a subsequent cautery procedure, corresponding friable vascular lesions were noted on both sides of the anterior nasal septum. The suspicion for AVM was confirmed by angiography. Concomitant embolization of both internal maxillary arteries did not result in improvement due to persistent contribution from the left anterior ethmoid artery, and the patient opted for surgery. Due to the anterior location of the AVM, septectomy would have resulted in a large septal perforation and saddle-nose deformity. Therefore, the AVM was bilaterally cauterized, other telangiectasias ablated, and bilateral anterior septodermoplasty performed. The patient has not had any further severe epistaxis or transfusions and exhibits no cosmetic deformity after 9 months of follow-up.

Conclusion:

Nasal septal AVM occurring in HHT is a previously undescribed phenomenon that presented with high volume epistaxis not amenable to standard surgical ablative techniques. Cautery and concurrent septodermoplasty should be considered as an alternative to septectomy as definitive treatment.

#1B - Systematic Assessment of the Quality of Reporting of Randomised Control Trials in the Management of Chronic Rhinosinusitis

Sonna Ifeacho, Olakunle Ajayi, Saiful Hannan, London

Background:

Evidence-based medicine guides clinical practice. It is therefore of utmost importance that reports of clinical trials are of high quality. The Consolidated Standards for Reporting Trials (CONSORT) statement is a guideline on reporting of trials first published in 1996 and revised in 2001.

Objective:

To assess the quality of reporting of randomised control trials conducted on the management of chronic rhinosinusitis following publication of the Consolidated Standards for Reporting Trials (CONSORT) statement. A review of randomised control trials was undertaken from January 2002 to May 2010. Trials were identified by searching PubMed. The quality of the reports was systematically assessed using a checklist derived from the Consolidated Standards for Reporting Trials (CONSORT) statement.

Results:

Seventy trials were identified. 54 met the eligibility criteria. Trials were excluded if randomisation could not be established. Globally there was poor reporting for most of the criteria. Only a third of reports stated how random allocation was achieved. Sample size determination was reported in a third of the trials evaluated. Only a quarter of reports stated the rate of adverse events or side effects encountered.

Conclusion: There is room for improvement in the reporting of randomised control trials in the management of chronic rhinosinusitis. Reporting must be comprehensive and accurate, as it is relied upon when assessing the validity and reliability of the trial results. Increased attention to this matter is to be encouraged amongst authors of reports of trials.

#2A - An Update on Attitudes and Usage of Image Guidance

Jeb Justice, MD, Richard Orlandi, MD, Salt Lake City, UT

Background:

The aim of this study was to compare current access to, usage of, and attitudes toward image guidance (IGS) for endoscopic sinus surgery and anterior skull base surgery to those in 2005. Methods: A mail survey of American Rhinologic Society members was performed in January 2010. Results were compared to results from the same survey mailed in January 2005.

Results:

Significantly more respondents in 2010 had access to IGS compared to 2005 (94.6% vs. 86%, $p = 0.002$). Compared to 2005, IGS is used in a greater percentage of cases in 2010 ($p < 0.0001$). More respondents in 2010 felt that IGS is indicated for primary anterior ethmoidectomy, revision anterior ethmoidectomy, primary total ethmoidectomy, Lothrop procedure, CSF leak repair, tumor surgery, orbital decompression, and optic nerve decompression (all $p < 0.05$). Similar to 2005, region, residency completion date, and availability of IGS in residency had no measureable effect on attitudes towards IGS. As in 2005, availability of IGS was associated with a greater feeling of its necessity in 2010.

Conclusions:

IGS availability has grown significantly and nearly all ARS members now have access. Estimates of use by respondents have also increased over the last 5 years, particularly for ethmoid and advanced procedures. Revision surgery and advanced procedures continue to be chief indications for IGS use. As in 2005, the results of this survey reflect the opinion of the respondents, and do not necessarily reflect the views of the American Rhinologic Society or of practicing otolaryngologists in general.

#2B - Applicability of the traditional Chinese version of the University of Pennsylvania Smell Identification Test in patients with chronic rhinosinusitis

*Rong-San Jiang, MD, Kai-Li Liang, MD, Shang-Heng Wu, MD
Taiwan*

Objectives:

To evaluate the olfactory function of patients with chronic rhinosinusitis (CRS) using the traditional Chinese version of the

University of Pennsylvania Smell Identification Test as compared with smell threshold test.

Methods:

The olfactory function of CRS patients was evaluated by the phenyl ethyl alcohol (PEA) odor detection threshold test and traditional Chinese version of the University of Pennsylvania Smell Identification (UPSIT-TC). Normal subjects whose PEA thresholds were below -6 and patients with traumatic anosmia whose PEA thresholds were -1 were also enrolled for comparison. CRS patients whose PEA thresholds were between -4 and -6, between -2 and -4 or -1 were included and divided into these 3 groups.

Results:

Thirty subjects were collected in each group. UPSIT-TC scores ranged from 21 to 38 (mean: 30.7) in normal subjects, from 9 to 36 (mean: 24.4) in CRS patients whose PEA thresholds were between -4 and -6, from 13 to 35 (mean: 23.5) in CRS patients whose PEA thresholds were between -2 and -4, from 8 to 25 (mean: 13.2) in CRS patients whose PEA thresholds were -1, and from 7 to 25 (mean: 12) in patients with traumatic anosmia. The UPSIT-TC scores were significantly higher in normal subjects than those in CRS patients with impaired olfactory function, and were also significantly higher in hyposmic CRS patients than those in anosmic CRS patients.

Conclusion:

UPSIT-TC was suitable to evaluate the olfactory function of Taiwanese CRS patients, but it needed to be used with threshold test to evaluate olfactory function more comprehensively.

#3A - Bilateral Olfactory Fossa Respiratory Epithelial Adenomatoid Hamartomas: Case Report and Review of the Literature.

Jean Eloy, MD, Mark Friedel, MD, James Liu, MD, Newark, NJ

Background:

Respiratory epithelial adenomatoid hamartoma (REAH) is a rare and benign nonneoplastic sinonasal lesion that usually presents unilaterally. We present an unusual case of bilateral olfactory fossa REAH mimicking an olfactory neuroblastoma and emanating from the superior aspect of the middle turbinates.

Methods:

Case report and review of the literature.

Results:

A 71 year-old male presented with right-sided epistaxis. Nasal endoscopy revealed bilateral sinonasal masses in the olfactory fossae. Radiographic imaging including CT and MRI revealed bilateral olfactory fossa masses with superior septal thinning and an intact skull base. Endoscopic biopsy was consistent with bilateral REAH. Endoscopic surgical resection was performed. The point of attachment of each lesion was at the superior medial aspect of the middle turbinates.

Conclusion:

REAH is a rare, nonneoplastic lesion that can occur in the sinonasal cavity. Although benign in nature, they can often mimic more aggressive pathologic entities and lead to overly aggressive surgical resection. This is even more significant in this case due to the presentation with epistaxis and the bilateral location in the olfactory fossa. Rhinologists and skull base surgeons should be aware of this exceedingly rare entity to prevent unnecessary radical surgical interventions.

#3B - Cadaver Study Comparing Various Methods of Endoscopic Reconstruction of Anterior Cranial Fossa Defects

*Marc Tewfik, MD, Rowan Valentine, MD, Andrew Foreman, MD
Peter-John Wormald, MD, Canada*

Introduction:

Adequate closure of the surgical defect is crucial to the success of endoscopic skull base surgery. Resections involving the anterior cranial fossa (ACF) are particularly at risk of postoperative cerebrospinal fluid (CSF) leak due to migration of the graft material used to reconstruct the dural defect. Several methods of securing the reconstructive material have been proposed, including the use of surgical adhesives, suturing through rivet holes in the cranial base, and the use self-knotting U-clips for dural closure. This study aims to compare techniques.

Methods:

A standardized osteotomy was performed in the ACF floor of 9 cadaver heads, and temporalis fascia was harvested bilaterally.

The cadavers were then randomised into groups for fascial reconstruction using 3 different methods, including sutures, U-clips, or duraseal alone. Once reconstructed, a craniotomy was performed to evaluate the quality of the reconstruction with respect to water-tightness, as well as resistance to displacement. Data pertaining to the duration of surgery and technical difficulty of the reconstruction were also collected.

Results:

The duration of surgery was significantly shorter for unsecured technique than for the sutures or U-clips (23.3 min vs. 45.7 min and 51.3 min, respectively). U-clips were the most technically challenging method. There were no significant differences in leak rates or resistance to displacement between all 3 methods.

Conclusion:

All 3 methods examined represent viable alternatives for closure of ACF skull base defects, each with their own advantages and disadvantages. A discussion of these along with technical points garnered during the study will be presented.

#4A - Chondrosarcoma of the Nasal Cavity

Henry Barham, MD, Todd Kingdom, MD, Aurora, CO

Introduction:

Chondrosarcoma accounts for 10-20% of malignant primary bone tumors, with 5-10% located in the head and neck region. Chondrosarcoma of the nasal cavity is a very rare finding with less than 60 reported cases in the world's literature.

Method:

Report of a case and review of the current literature.

Results:

We present a rare case of chondrosarcoma arising from the nasal septum. A 56 year-old female presented with a several year history of moderate to severe nasal congestion, noted worse on the left. Symptoms progressed rapidly over a 2 month period prior to her presentation. Computed tomography demonstrated an expansile mass with erosion of the nasal septum and possibly the floor of the nasal cavity. Endoscopic resection with gross-total removal of tumor was performed. Frozen section analysis was non-diagnostic but final interpretation confirmed a low-grade chondrosarcoma. A more radical endoscopic resec-

tion then followed with control of surgical margins. Patient remains free of disease based on endoscopy and imaging 5 months after definitive resection.

Conclusion:

Chondrosarcoma of the Nasal Cavity is a rare finding that may be very aggressive. Histological analysis is required for diagnosis but can be challenging and surgical resection is required for curative intent. We present a case of chondrosarcoma of the nasal septum and review of the literature. We discuss the challenges in making an accurate diagnosis and review the optimal approach to management.

#4B - Community-Acquired Methicillin-Resistant Staphylococcus aureus in Nasal Vestibular Abscess: A Case Series

Marisa Earley, MD, Mark Friedel, MD, Jean Eloy, MD, Satish Govindaraj, MD, Newark, NJ

Introduction:

Community-acquired methicillin-resistant Staphylococcus aureus (MRSA) is a recognized entity of increasing frequency for skin and soft tissue infections. However, historically, it is not the usual pathogen isolated in nasal vestibular abscess.

Methods:

We present a series of 10 consecutive patients presenting to a tertiary care center with nasal vestibular or upper lip abscess over a 2 year time period.

Results:

All abscesses were cultured and 100 percent (10/10) grew S. aureus. Of the S. aureus isolates, 90 percent (9/10) were MRSA. Antibiotic susceptibilities of the MRSA isolates were as follows: 100 percent were susceptible to rifampin, trimethoprim-sulfamethoxazole, and tetracycline, 78 percent to fluoroquinolones, 67 percent to clindamycin, and 22 percent to erythromycin.

Conclusion:

MRSA is an increasingly important pathogen in the community. It is therefore critical to be aware of its predominance in nasal vestibular abscess. Clinicians should obtain culture, modify antibiotic therapy as warranted, and initiate empiric therapy to include MRSA coverage for nasal vestibular abscess.

#5A - Comparison of NK/T cell lymphoma and B cell lymphoma of the sino-nasal tract

Bong-Jae Lee, MD, Jin-Young Min, MD, In Ryu, MD, Korea

There are two main histologic subtypes of Non-Hodgkin's lymphoma (NHL) including NK/T cell lymphoma and B cell lymphoma. The aim of this study was to compare the clinical features of the two types and revealed the prognostic factors. Patients diagnosed with NHL between 1993 to 2008 were divided into two groups based on the histologic subtypes. Their demographic and clinical characteristics including symptoms, involve site, level of serum LDH, ECOG performance status, international prognostic indices (IPI), Ann Arbor stages (AAS), outcome and the survival rates were reviewed retrospectively. Multivariate analyses of survival were performed to identify the prognostic factors. Of 61 patients, 47 patients were classified as NK/T cell lymphoma and 14 patients as B cell lymphoma. NK/T cell lymphoma patients were more likely to present with nasal symptoms, B symptoms and elevated serum LDH levels and involve nasal cavity. There were no significant differences in AAS and ECOG performance between NK/T cell lymphoma and B cell lymphoma groups. Without regard to the treatment modality, there were significant differences in outcome, 5-year overall survival and failure free survival in favor of the B cell lymphoma ($P < 0.05$). The predictive factors for poor survival were of AAS III-IV, IPI greater than 3 and relapse in multivariate analysis. NK/T-cell lymphoma is more common than B-cell lymphoma in sino-nasal tract. In clinical features, significant difference is founded between NK/T-cell lymphoma and B-cell lymphoma. B-cell lymphoma demonstrate the better prognosis than NK/T cell lymphoma and AAS, IPI, relapse are considered as prognostic factors.

#5B - Cusum Analysis to Evaluate the Learning Curves of Residents at Performing Fiberoptic Endoscopy

Gaurang Dalal, MD, Priti Dalal, MD, Leonard Pott, MD, Bosseau Murray, MD, Hershey, PA

Study Background:

The changes in the working pattern of residents have implications on the hours spent in learning and assessing a resident's performance at technical skills such as fiberoptic endoscopy. In this study, we have used the cusum analysis to evaluate the learning curves of resident at performing fiberoptic endoscopy.

Method:

Following IRB approval, 16 novice anesthesia residents were enrolled in the study. The study participants performed nasal fiberoptic laryngoscopy on the high fidelity simulator for 20 -30 minutes every week for a period of two months. Each attempt was designated a pass or fail respectively based on the study participants ability or inability to visualize the carina in 60 seconds and with 5 collisions with the mucosal wall.

Results:

A total of 16 novice residents participated in the study. The mean number of attempts was 46.79.03 (32 °C 64), mean time to visualization of carina was 50.6936.2 (12 °C 539) seconds, mean number of collisions 1.121.4 (0 °C 14) and mean red out time 0.231.16 (0 °C 13) seconds. There were 3 classical patterns of the cusum trends observed in the overall performance of the study subjects, based on the cusum analysis: proficient (n=7), nearly proficient (n=3) and not proficient (n=6).

Conclusion:

The training of the residents to achieve proficiency at advanced psychomotor skills such as fiberoptic endoscopy should be tailored to each individual's needs. This performance tracking should be routinely incorporated in the residency training programs that require high skills performance such as anesthesia, otolaryngology, emergency medicine, pulmonology and gastroenterology etc.

#6A - Delayed Onset Sinus Atelectasis Following Rhinoplasty

Mohsen Naraghi, MD, Shabnam Mortazavi, MD, Massoud Boroojerdi, MD, Iran

Saline nasal irrigation is a mainstay in the medical management of Chronic Rhinosinusitis (CRS) with proven efficacy. However bacterial contamination of irrigation bottles has recently been reported and this may contribute to recurrent infections. Sterilization is effective but could a change in bottle design obviate the need for regular sterilization?

Method:

20 stable CRS patients were given an irrigation bottle to use regularly for one week. This bottle incorporates a one-way valve

to prevent irrigant regurgitation. Swabs were taken from their sinonasal cavity and three sites on the bottle- nozzle, valve and inner surface.

Results:

This study cultured a range of organisms from all sites of the bottle. These organisms included water-avid organisms and common CRS pathogens such as *S. aureus*, *P. aeruginosa* and *E. coli*. Whilst the bottle's inner surface had the lowest bacterial recovery rate, the frequent culture of organisms at this site suggests a one-way valve cannot completely prevent irrigant reflux. The high rate of organism detection on the nozzle and valve of the bottle is concerning as bacteria at this site may be transported during nasal douching.

Conclusions:

Saline irrigation will continue to be an essential component of CRS management. However, nasal irrigation bottles become contaminated with bacteria, irrespective of the presence of a valve. Simple sterilization procedures are effective in rendering irrigation bottles bacteria-free. This study reaffirms the importance of focused patient education, rather than relying on bottle design, to prevent irrigant contamination. This approach may reduce the recurrent infections that characterize CRS. This abstract confirms that all nasal irrigation bottles can become contaminated. This is important information for physicians to pass on to their patients. In addition focused patient education to ensure all patients are sterilizing their irrigation bottles after every use is critical. Simple techniques are effective in this regard. Making patients aware of the risks of bottle contamination will lead to a reduction in acute sinonasal infections. Physicians should be encouraging the use of saline irrigations, given their proven benefit, but with the caveat that the bottles need to be regularly sterilized, regardless of design, to prevent bacterial contamination. The information in the abstract will highlight the potential for irrigation bottles to become contaminated, regardless of the presence of a one-way valve. The efficacy of saline nasal irrigation in CRS is very well established. But the potential for harm from irrigation bottles is less well understood. This area of research is quite new and many physicians may not be aware that irrigation bottles can become infected. Whilst this research isn't intended to cast doubt on the role of nasal irrigation, it does highlight a secondary issue that physicians need to be aware of. Improving physicians' knowl-

edge of this topic will enable them to improve their clinical skills by addressing this issue with all patients who rinse their nose and sinuses.

#6B - Double Flap Technique for Reconstruction of Anterior Skull Base Defects After Craniofacial Tumor Resection

Jean Eloy, MD, Dare Ajibade, BS, Lana Christiano, MD, James Liu, MD, Newark, NJ

Background:

Successful reconstruction of large anterior skull base (ASB) defects after craniofacial resection of malignant skull base tumors is paramount for preventing cerebrospinal fluid (CSF) fistulas. The vascularized pedicled pericranial flap has been the gold standard for repair. However, flap necrosis and delayed CSF leaks can occur after adjuvant radiation therapy. We describe a 'double flap' repair where the pericranial flap is augmented inferiorly by a secondary vascularized nasoseptal flap (NSF) that is harvested and rotated using an endonasal endoscopic approach. This technique is illustrated in a patient who underwent resection of a large sinonasal malignancy with significant intracranial extension.

Methods:

This 62 year-old male presented with headaches and confusion from a large sinonasal teratocarcinosarcoma that extended intracranially into the left frontal lobe with brain invasion and edema. The tumor was removed via a combined bifrontal transbasal and endonasal endoscopic approach. After primary repair of the dural defect with a free patch graft, the ASB defect was repaired with a vascularized pericranial flap from above and augmented with a NSF from below.

Results:

Postoperatively, the patient was neurologically intact without evidence of CSF leakage, meningitis, or tension pneumocephalus. After subsequent radiation therapy, the double flap repair remained intact at 3, 6, and 9 months postoperatively. Conclusion: The double flap technique provides an additional barrier of pedicled vascularized tissue to prevent CSF leakage, meningitis, tension pneumocephalus, and post-radiation necrosis. This technique is a viable option if a combined transcranial and transnasal endoscopic tumor resection is performed and postoperative radiation is anticipated.

#7A - Dural Penetration of Angiofibromas: Do Intradural Approaches Increase Safety?

Mohsen Naraghi, MD, Hooshang Saberi, MD, Massoud Boroojerdi, MD, Iran

Introduction:

Dura plays an important role in prevention of tumor penetration into the brain. However some extensive angiofibromas could penetrate dura, necessitating its removal via combined approaches. In this paper we present two cases of extensive dural penetration of angiofibromas.

Methods:

The first case was a 17 years old male patient who presented with proptosis of the left eye. The second case was a 16 years old male patient with severe nasal obstruction and epistaxis since 6months ago. CT revealed extensive intracranial extension into the middle fossa, particularly the left side, in both cases.

Results:

Two cases underwent combined transnasal, transmaxillary and craniotomy approaches with assistance of image guided surgery and enhanced visualization by microscope and endoscopes. Craniotomy preceded transmaxillary approach in one, in which after incision of dura, the intradural component was meticulously dissected free from brain and internal carotid artery. CSF leak and skull base defect was repaired by temporalis muscle flap and pericranial flap. The course was uneventful in both cases.

Conclusions:

The intradural intracranial extensions of tumor require meticulous approach in terms of surgery, because of their greater risk for complications during the dissection. Carotid rupture and brain damage are two catastrophic complications which should kept in mind. In cases with extensive intradural involvement of the middle cranial fossa by angiofibroma, craniotomy with intradural approach could help to decrease complications by direct vision to the adjacent vital components.

#7B - Ectopic Odontoma of the Nasal Cavity

Brandon Musgrave, MD, Vanessa Schweitzer, MD, Livonia, MI

Introduction:

Odontomas are the most common odontogenic tumor, containing both epithelial and mesenchymal elements such as enamel, dentin, pulp and cementum. They are classified into two different categories: compound and complex. Odontomas of the nasal cavity are extremely rare, and we present a case report of ectopic odontoma of the inferior turbinate. A 54 year-old female presented with unilateral nasal obstruction and malodorous discharge. On physical exam, there appeared to be a bony concretion in the floor of the right nasal cavity, impinging against the septal wall.

Methods:

A CT scan of the sinuses was obtained which showed an expansile, centrally calcified lesion within the right nasal cavity involving the inferior turbinate and obstructing the inferior meatus. There was no bony destruction; however, there was thinning and possible erosion of the septum. There appeared to be no association to the underlying maxillary alveolar bone. The patient underwent endoscopic removal of the calcified mass.

Results:

The histopathology of our specimen showed fragments of dentin as it was removed piecemeal. Her presenting symptoms completely resolved with no complications from the surgery.

Conclusion:

No prior documentation of an odontoma involving a turbinate was found in the literature. Odontomas in the sinuses or nasal cavity can be asymptomatic, or can manifest as rhinorrhea, malodor, nasal obstruction, or rhinosinusitis. Endoscopic resection should be attempted when an odontoma involves the nasal cavity, but should be decided on a case-by-case basis due to the rarity of isolated involvement in the nose.

#8A - Endoscopic and 3D Radiographic Imaging of the Pterygopalatine and Infratemporal Fossa

*Joseph Han, MD, Lucas Bryant, MD, Craig Goodmurphy, MD
Norfolk, VA*

Objectives:

The purpose of this study is to characterize reliable endoscopic landmarks of the pterygopalatine fossa (PPF) and infratemporal fossa (ITF).

Methods:

Eleven cadavers were dissected endoscopically. CT, 3D reconstruction, and endoscopic video were used to measure and analyze the regions of interest. The relationship of the maxillary artery to the ITF muscles was demonstrated via CT images, endoscopic visualization, and gross dissection.

Results:

CT and 3D reconstruction measurements were made between the lateral border of the pterygoid canal and the medial border of foramen rotundum. The average distance was 5.09 mm (3D) and 4.36 mm (CT). The distance from the anterolateral edge of the pterygoid process to the anterior border of foramen ovale was 17.1 mm using 3D reconstruction of the ITF. A newly described bony ridge (pterygoid ridge) runs along the anterior face of the pterygoid process, between foramen rotundum and pterygoid canal. The average distance of the ridge was 7.84 mm. 23% of the cadaver had the sphenopalatine (SPA) artery divide into the septal and lateral nasal branches prior to exiting the SPA foramen. The PPF ganglion was consistent in 91% of the specimens. The site of PPF entry by the maxillary artery was found posterior to the temporalis tendon and anterior to the lateral pterygoid muscle.

Conclusions:

The newly described bony and soft tissue landmarks as well as the distance measurements within the PPF and ITF may assist in allowing for a safe and effective endoscopic surgical approach and resection of PPF and ITF tumor.

#8B - Endoscopic Endonasal Removal of Dentigerous Cysts in the Bilateral Maxillary Sinus

*Go Takahashi, MD, Yasuyuki Hinohira, MD, Hidenori Kanai, MD
Harumi Suzuki, MD, Japan*

Introduction:

The dentigerous cyst is one of the odontogenic cyst, and frequently originated from the mandible. We experienced the rare case of the dentigerous cyst existing in the bilateral maxillary sinus, respectively. The cysts were successfully removed using endoscopic endonasal approach, and the recurrence was never seen. The profile of the case was described, and the surgical approach was demonstrated using movies.

Case:

A 42-year old female was referred to our department, complaining of bilateral cheek pain and purulent nasal discharge. The CT showed the total opacification of the all sinuses, and indicated the dentigerous cyst in the bilateral maxillary sinus, respectively. Endoscopic endonasal sinus surgery (ESS) was performed under general anesthesia. Following supplementary septoplasty, the left ESS was performed. The dentigerous cyst existed on the posterior wall of the maxillary sinus. The cyst was opened, and then the tooth was removed using a cupped forceps. The tooth in the right maxillary sinus had been buried in the angle of inferior medial wall of the maxillary sinus. A chisel was required for total removal using the combined approach of the middle and the inferior anrostomies. No surgical complication was seen, nor was recurrent lesion identified postoperatively.

Conclusion:

This rare case of the bilateral maxillary sinus dentigerous cysts was successfully treated using endoscopic endonasal sinus surgery.

#9A - Endoscopic Transnasal Septotomy for Contralateral Orbital Apex Lesion Resection and Decompression

Kim Murray, MD, Evelyn Kalyoussef, MD, Paul Langer, MD, Jean Eloy, MD, Newark, NJ

Background:

Tumors of the orbital apex region are traditionally difficult to approach surgically due to key anatomic structures found in this highly crowded region. We present a case of progressively enlarging orbital apex capillary hemangioma treated with a novel endoscopic transnasal septotomy technique. We highlight the key steps to this approach, as well as specific landmarks necessary to achieve a safe and successful procedure.

Methods:

Case report and review of the literature.

Results:

A 43-year-old man with a history of facial trauma presented with severe progressive left retroorbital pain. Contrast enhanced CT scan showed a 1.8 cm hyperdense left orbital apex lesion and a large left anterior lamina papyracea defect with protrusion of orbital contents into the anterior ethmoid cavity. Gadolinium enhanced MRI confirmed the CT findings. Due to the obstructive dehiscence in the anterior lamina papyracea, the patient underwent partial resection and decompression of the orbital apex lesion via a contralateral endoscopic transnasal septotomy approach with preservation of vision.

Conclusion:

Orbital apex lesions represent a surgical challenge due to the potential morbidity associated with accessing and dissecting in this highly crowded and complex anatomic region. Many different techniques are currently being used with different degree of success. The endoscopic transnasal septotomy route provides a direct pathway to this anatomic target. When used with adequate anatomic knowledge and proper endoscopic microsurgical techniques, this novel surgical approach provides for a safe and excellent exposure for resection of select tumors at this site.

#9B - Endoscopic Transsphenoidal Surgery for ACTH Secreting Tumors

*Nathan Deckard, MD, Jay Jagannathan, MD, Adam Folbe, MD
Murali Guthikonda, MD, Detroit, MI*

Background:

Although published reports have described the effectiveness of endoscopic transsphenoidal surgery for nonfunctioning pituitary macroadenomas, few have documented its efficacy in treating secretory tumors. These can be particularly challenging to resect, are often microadenomas not seen on MRI, tend to invade the suprasellar and cavernous sinus structures, and have a remission rate as low as 70% after microscopic resection. Endoscopic treatment has the added benefits of a panoramic surgical view, angled lenses to visualize lateral invasion, and decreases damage to nearby structures. This paper examines our five-year experience using the pure endoscopic transsphenoidal approach for the treatment of pituitary adenomas in Cushing's Disease.

Materials and Methods:

A retrospective review from a prospectively acquired database of patients who underwent pure endoscopic transsphenoidal surgery. All patients were followed pre- and post-operatively by a dedicated neuro-endocrine team.

Results:

Twenty patients had endoscopic treatment for Cushing's Disease during the study period. Pathology was consistent with ACTH-secreting adenoma in all cases. Nine patients (45%) had evidence of either cavernous sinus or suprasellar extension. Sixteen patients (80%) were able to achieve clinical hypo/eucortisolemia postoperatively. Of those patients without signs of invasion preoperatively, 91% were able to achieve this goal. Mean follow-up was 17 months, (Range: 3-45mos).

Conclusions:

Remission rates achieved by endoscopic resection match and exceed the traditional microscopic transsphenoidal resection technique. Major post-operative morbidity is low and comparable to existing reports in the literature for both microscopic and endoscopic approaches to resection. Endoscopic transsphenoidal surgery is a safe and effective treatment for ACTH-secreting pituitary adenomas.

#10A - Endoscopic Verification of the Sphenoid Sinus

*Richard Orlandi, MD, Brett Smith, BS, Lubdha Shah, MD
Richard Wiggins, III, MD, Salt Lake City, UT*

Introduction:

Differentiating between posterior ethmoid and sphenoid sinuses can be difficult endoscopically. Anatomic relationships should guide surgery, irrespective of the ability to verify them with image guidance. The authors sought to verify an anatomic landmark found to be useful during endoscopic sinus surgery, the ability to see the sphenoid floor with a 0° nasal endoscope.

Methods:

The angle formed by the trajectory of a nasal endoscope placed during surgery and the sphenoid floor at the level of the sphenoid ostium was measured in 93 sphenoid sinuses radiologically. Angles of view of three common endoscopes were directly measured and compared to the radiologic measurements.

Results:

The angle to the most inferior aerated portion of the sphenoid sinus averaged 113.6° with a range of 77° to 145°. The angle of view of the three endoscopes was found to be 38.1°, 46.7°, and 44.4°. With these angles of view, the most inferior aerated portion of 100% of the radiologically assessed sinuses could not be seen with these endoscopes.

Conclusions:

Inability to see the floor of the sphenoid sinus with a 0° nasal endoscope appears to be a reliable finding. Individual variations such as hypoplastic or severe mucosal edema should be identified preoperatively on imaging. In their absence, the inability to see the floor of an entered sinus with a 0° nasal endoscope provides another reliable clue to the position of the sphenoid sinus during endoscopic sinus surgery.

#10B - Epidemiology of Methicillin-Resistant Staphylococcus Aureus (MRSA) in Chronic Rhinosinusitis and Current Management Dilemmas

Deya Jourdy, MD, Madeleine Schaberg, MD, Vijay Anand, MD, Joseph Krespi, MD, New York, NY

Introduction:

The rising prevalence of Methicillin-resistant Staphylococcus aureus (MRSA) colonization and the incidence of invasive MRSA infections are concerning. Patients with chronic rhinosinusitis (CRS) are at a distinct risk for MRSA infection due to the chronic nature of their disease. Despite this fact, the role for screening and eradicating MRSA carriers among patients with CRS, the appropriate steps in the diagnosis and treatment of patients with MRSA sinusitis remains ill defined.

Methods:

We review the current literature with regards to the utility of and methods that exist for screening for MRSA carriage, the role of decolonization in patients with CRS, and the different eradication strategies that exist. Furthermore, we examine the current treatment strategies for MRSA sinusitis, and retrospectively review our own experience with parenteral treatment, proposing an algorithm for the diagnosis and management.

Results:

We have treated six patients for MRSA sinusitis, each with a six week course of culture directed IV antibiotics on an outpatient basis through a peripherally inserted central catheter. The antibiotics used included cefepime, clindamycin, and daptomycin. The average follow-up time has been eight months (range six months to five years) and all six patients have been culture negative for MRSA since the antibiotic course.

Conclusions:

The rising prevalence of MRSA sinusitis will undoubtedly continue to lead to changes in our approach to patients with CRS. Despite the wealth of information on MRSA that exists in the literature, it is clear that effective management strategies for patients with MRSA carriage and MRSA sinusitis are essential.

#11A - Ethmoid Skull Base Height: A Clinically Useful Classification Scheme

Vijay Ramakrishnan, MD, Jeffrey Suh, MD, David Kennedy, MD, Aurora, CO

Introduction:

Iatrogenic CSF leak and intracranial injury are among the major complications that may occur during endoscopic sinus surgery. The Keros classification scheme has been used to describe the ethmoid skull base configuration, however this scheme is only partially sufficient to address the ethmoid skull base.

Methods:

Coronal CT scans were reviewed for 200 patients undergoing sinus surgery at a tertiary care institution. The Keros classification, maxillary sinus:ethmoid height ratio, and the skull base height:orbital height ratio were recorded for each patient.

Results:

The Keros classification scheme, 42% of patients were in class I, 50% class II, and 8% class III. In maxillary sinus to ethmoid height ratio, 58% were 1:1, 37% were 2:1, and 5% were >2:1. In the skull base to orbit ratio, 65% were in class I, 18% class II, and 16% in class III. The Keros classification did not correlate with ethmoid skull base height according to either of the other two classification schemes, suggesting that height of the cribriform is independent of ethmoid skull base height. 46% of CT scans were discordant between the Keros classification and the maxillary sinus:ethmoid height ratio, and 55% were discordant between the Keros classification and the orbit:skull base height ratio.

Conclusions:

The importance of the Keros classification lies primarily in the avoidance of iatrogenic injury to the cribriform region. To avoid penetration of the fovea ethmoidalis, the ethmoid skull base height must be separately examined in relation to the orbit and total vertical dimension of the sinuses.

#11B - Expression of Cyclin D1 in Nasal Polyps

Victor Scapa, MD, Vijay Ramakrishnan, MD, Todd Kingdom, MD, Aurora, CO

Introduction:

Nasal polyps in patients with cystic fibrosis (CF) are believed to be phenotypically different than polyps affecting non-CF, aspirin-tolerant patients and non-CF aspirin-sensitive patients.

Preliminary data from our lab has suggested differences in cell cycle regulatory proteins across these patient groups. The objective of this study was to further examine Cyclin D1 expression in an effort to confirm preliminary findings. Multiple techniques were utilized to characterize Cyclin D1 expression in nasal polyps.

Methods:

Nasal polyps were prospectively obtained from CF and non-CF patients. The Sigma Panorama Protein Microarray was used to identify differences in protein expression between the two polyp groups. Western blot analysis was employed to evaluate Cyclin D1 expression in CF and non-CF polyps. Immunohistochemical staining was performed on archived tissue to further investigate Cyclin D1 expression. Following review by a pathologist, slides were digitized using an Aperio ScanScope XT system and staining intensity was quantified with the Positive Pixel Count algorithm. The mean staining intensities for the polyp groups were compared.

Results:

The protein microarray suggested a greater than two-fold downregulation of Cyclin D1 in CF polyps relative to non-CF, aspirin-tolerant polyps. Western blot analysis suggested a possible downregulation of Cyclin D1 in CF polyps as well. However, comparison of quantitative immunohistochemical staining intensity between polyp groups did not demonstrate any statistically significant difference ($p > 0.05$).

Conclusion:

Through multiple modalities of protein investigation, we have demonstrated Cyclin D1 expression in multiple groups of patients with nasal polyposis. While our early investigations suggested a possible downregulation of this cell cycle protein in CF polyps, immunohistochemical staining does not support this finding.

#12A - Extended Outcomes in Endoscopic Sphenopalatine Artery Ligation

Richard Orlandi, MD, Ryan VanWoerkom, MD, Salt Lake City, UT

Introduction:

Sphenopalatine artery (SPA) ligation is an appropriate first line treatment for posterior epistaxis. It is associated with improved patient satisfaction, decreased morbidity, and lower costs. However, little data exist examining the long-term efficacy and complications of SPA ligation. There were two objectives for this study: (1) determine the long-term bleeding recurrence rate and (2) describe any complications involving the paranasal sinuses or nose associated with endoscopic SPA ligation.

Methods:

Patients who had undergone endoscopic SPA ligation by the senior author were retrospectively identified. A telephone survey was conducted to determine the incidence of any further epistaxis after their SPA ligation and also to assess any nasal or sinus complaints. This study was approved by the University of Utah Institutional Review Board.

Results:

Nine patients completed the telephone questionnaire. Average time of follow-up from the date of procedure was 46.5 months. One (11%) patient had repeat posterior epistaxis requiring arterial embolization 31 months after the initial SPA ligation. One patient with minor anterior recurrences and a family history of bleeding had a negative hematologic work-up. No other patients required further medical intervention for epistaxis. Two (22%) patients reported mild or intermittent nasal obstruction following the procedure.

Conclusions:

Complications from SPA ligation are infrequent and minor. Long-term recurrence of posterior epistaxis following the procedure is low over but may occur many months later. These data highlight the importance of long-term follow-up to determine success in the treatment of posterior epistaxis.

#12B - 'Eye' Phones - Rapid Assessment of Visual Acuity in Orbital Complications of Rhinosinusitis

Claire Hopkins, Gemma Pilgrim, James Earnshaw, David Roberts, London

There has been a rapid growth in usage of iPhones, and an explosion of associated applications. We present the use of downloadable Ishihara charts and Snellen charts to facilitate urgent assessment of visual acuity when formal ophthalmological is unavailable. Increasingly, in order to meet restrictions of the European Working Time Directive, hospitals are merging and providing cross-cover over disparate geographical sites out-of hours. ENT frequently attend to neurosurgical patients in a unit with no on site ophthalmology support. Occasionally, the need for urgent surgical management of both intracranial and intraorbital complications of sinusitis precludes waiting for formal ophthalmological assessment. We have found both the available tests on the 'eye phone' useful in assessing visual acuity pre-operatively. We present a cases where the 'EYE' Phone has been a useful addition to clinical care. While this is no replacement for formal assessment, it is a useful tool in an emergency situation.

#13A - Feasibility of Paired Utilization of Robotic Surgery with Image Guidance For Endonasal Surgery

Kibwei McKinney, MD, Stephen Wheless, BS, Adam Zanation, MD, Chapel Hill, NC

Objectives:

A surgical system has been used to minimize post-operative morbidity in pelvic, abdominal and recently transoral surgery. This study seeks to demonstrate feasibility in utilizing the Surgical System and a paired CT image guidance system for endonasal and skull base surgical applications. Methods: Anatomic study of cadaveric skulls to determine the accuracy of arm positioning of the daVinci robot relative to defined areas of the skull, orbit, and nasal cavity. Robotic image guidance pairings were compared in the same model system with the standard image guidance pointing instruments over 5 different anatomic sub-sites. The distal tips of the arms of the robot contacted these anatomic sites at angles of zero, 20, 40, and 60 degrees relative to the neutral position.

Results:

Our model system approximated <1mm accuracy with the standard image guidance instruments and with 0 degree robotic arm positioning. When the tips were flexed from angles 20 to 60 degrees, there were significant increases in error in achieving the known and estimated tip positions ($p < 0.05$). These correlations as well as potential solutions for these errors are discussed. The role and limitations of the current robotic systems for endonasal surgery are also outlined.

Conclusion:

The existing CT image guidance systems may feasibly be used in concert with the daVinci surgical system. Future studies will continue to merge these technologies to optimize robotic treatment in areas of the nasal cavity, orbit, and anterior skull base. Accuracy is optimized by limiting deviation of the instrument tip from neutral position.

#13B - Frontal Sinus Osteomas Associated with Orbital and Intracranial Complications

*Rohit Garg, MD, Joseph Brunworth, MD, Terry Shibuya, MD
Jivianne Lee, MD, Orange, CA*

Introduction:

Osteomas are benign, slow growing bone tumors which commonly affect the frontal sinuses. Although often asymptomatic and found incidentally; some patients develop chronic rhinosinusitis, headache, and/or mucocele formation warranting treatment. Frontal sinus osteomas associated with orbital and intracranial complications are particularly rare.

Methods:

We present three cases of large (1-grade III, 2- grade IV), symptomatic frontal sinus osteomas presenting with concurrent orbital and/or intracranial involvement. The clinical presentation, radiographic features, surgical approach, intraoperative findings, treatment, and outcomes of each of the cases were examined.

Results:

All 3 patients initially presented with either ophthalmologic (diplopia, visual field deficit, proptosis) and/or neurologic (headache, altered mental status, syncope, ataxia, cerebrospinal fluid leak) complaints. Radiographic imaging revealed

the presence of a frontal sinus osteoma with intracranial (2) and/or orbital (3) involvement. Pneumocephalus and expansion of the diploic space were also evident in 2 patients. One case was successfully managed with an exclusively endoscopic (frontal sinusotomy) approach, while the remaining 2 required a combined open (osteoplastic flap)/endoscopic procedure. Complete resolution of symptoms was ultimately achieved in all cases, and there were no recurrences after a mean follow-up of 24 months.

Conclusion:

With the advent of more advanced endoscopic instrumentation, larger frontal sinus osteomas have become increasingly more amenable to endoscopic removal. Lesions with associated orbital and/or intracranial complications may still necessitate an external approach depending upon degree of extension; however, this may change in the future as endoscopic techniques continue to progress.

#14A - Health Impact of Hurricane Ike on Patients with Chronic Rhinosinusitis

*Tracy Byerly II, MD, Martin Citardi, MD, Amber Luong, MD, PhD
Samer Fakhri, MD, Houston, TX*

Objective:

Assess the impact of Hurricane Ike on sinonasal health and quality of life of patients with chronic sinonasal disease.

Methods:

Retrospective review of established patients with the diagnosis of chronic rhinosinusitis who were assessed at least once in the weeks prior to Hurricane Ike in 2008 and then re-assessed in the 3 month following the hurricane landfall. Sino-Nasal Outcome Test 20 (SNOT-20), Rhinosinusitis Disability Index (RSDI) scores, endoscopic exam scores and medication use were compared pre- versus post-hurricane. Setting: Academic tertiary referral rhinology center.

Results:

39 patients were included in the study. The first post-hurricane visit occurred on average 37.6 ± 3.6 days after the hurricane. Compared to their last pre-hurricane visit, patients showed significant deterioration in SNOT-20 ($p=0.001$), RSDI scores ($p=0.0001$) and endoscopic mucosal stage at the first post-hurricane

cane visit ($p=0.001$). In addition, there was a significant increase in the number of patients started on oral antibiotics at the first post-hurricane visit ($p=0.002$).

Conclusions:

Hurricane Ike was associated with a significant deterioration in sinonasal health, objective disease burden and quality of life in patients with CRS. Physicians and patients living in hurricane risk zones should be educated about the adverse impact of hurricanes on chronic sinonasal disease. This should also be included in disaster preparedness plans of health care facilities.

#14B - Human Glycated Albumin Induces the Release of IL-8 and Modified the Ciliary Activity in Primary Cultures of Human Adenoids

Claudio Callejas, MD, Claudia González, MD, Daniela Carreño Manuel Villalón, PhD

Introduction:

Glycated albumin (GA) is found in normal human serum, but when it leaves the plasma compartment it increases the production of a series of pro inflammatory cytokines including IL-8. In the airways mucosa, IL-8 synthesis is increased in inflammatory diseases like cystic fibrosis; however the effect of IL-8 on ciliary beat frequency (CBF) in humans is unclear. Our objective was to determine production of IL-8 induced by GA and study its effect on CBF in human adenoids cultures.

Methods:

Primary cultures of human ciliated cells were obtained from adenoids of children undergoing surgery due to tissue hypertrophy ($n=18$, mean age: 3.9 years). IL-8 production induced by GA 2mg/ml was measured by ELISA from cultures collected medium. CBF changes induced by GA 2mg/ml or IL-8 10nM were determined by microphotodensitometry. Human albumin 2mg/ml was used as control.

Results:

After 180 minutes exposure to GA we measured a significantly increase in the production of IL-8 compared to the control ($p<0.05$). GA increases CBF up to 25% after 140 minutes of exposure; while IL-8 added directly increases CBF up to 10% after 30 minutes. No changes in CBF were detected in cultures incubated with human albumin.

Conclusions:

GA induces synthesis of IL-8 and increases CBF; however a smaller increase is observed when IL-8 is added directly to the culture. Our results indicate that IL-8 is one of the mediators involved in the effect of GA on CBF and suggest that GA may be involved in inflammatory diseases of the airways.

#15A - Increased Sensitivity of Lateral Imaging to Detect Changes in Nasal Polyp Size Following Bi-Directional Delivery of Fluticasone Propionate

Per Djupesland, MD, PhD, Ingrid Vlckova, MD, Graeme Hewson, MD

Introduction:

Accurate assessment of nasal polyp size during endoscopic examination is necessary to evaluate the efficacy of new treatments. The Lidholdt's scale report polyp size in unequal steps, whereas lateral imaging (LI) offers a linear two-dimensional assessment. We compared the sensitivity of LI and the Lidholdt's scale for detecting changes in nasal polyp size following bi-directional delivery of fluticasone.

Methods:

A post-hoc analysis of results from a recently published study that used a bi-directional delivery device for intranasal administration of fluticasone propionate (Opt-FP) was used to investigate the sensitivity of LI and Lidholdt's scale in detecting changes in nasal polyp size in 109 patients with mild-to-moderate bilateral polyposis. The scoring system for staging the nasal polyps with the lowest p value was considered to have the highest sensitivity.

Results:

For all patients, the p-value for the difference between active and placebo was lower for LI ($p < 0.0001$) compared to Lidholdt ($p = 0.0019$) after 4 weeks treatment. There was also a larger relative reduction in percentage terms for LI compared to Lidholdt in the total population. Patients with bilateral grade 2 polyps at baseline showed a greater sensitivity of LI at 4 and 8 weeks compared with Lidholdt. In patients with grade 1 polyps at baseline, however, the sensitivity assessed by LI was less than for Lidholdt despite a greater relative reduction.

Conclusions:

Lateral imaging was more sensitive at detecting changes in polyp size in the total population and in the sub-group with larger polyps at baseline at an earlier timepoint than the Lildholdt's scale.

#15B - Intrinsic Differences in Ciliary Activity between Upper and Lower Respiratory Cultures

Ke Qing Zhao, MD, Andrew Cowan, MD PhD, James Kreindler, MD, Noam Cohen, MDPHD, China

Introduction:

Respiratory cilia clear mucus and debris from the respiratory passages by beating in a coordinated manner. Compensatory mechanisms, such as a cough or sneeze, are recruited when mucociliary clearance is compromised. The goal of this project was to develop a reproducible artificial sneeze and compare ciliary activity of the lower and upper respiratory epithelium before and after sneezing.

Methods:

Utilizing a pico-puffer a "puff" of air was applied to the apical surface of murine septal or tracheal respiratory epithelial cultures grown at an air liquid interface (ALI). Cilia beat frequency (CBF) analysis was performed before and after administration of the in vitro sneeze.

Results:

The baseline CBF in septal cultures was $7.58\text{Hz} \pm 3.53$ ($n=7$), while the trachea was $14.76\text{Hz} \pm 1.67$ ($n=5$) ($p<0.01$). Region of interest analysis demonstrated a bimodal distribution of basal CBF in septal cultures with two distinct populations of cells, 2Hz and 7Hz, while tracheal cultures demonstrated a Gaussian distribution with a median of 14Hz. Maximal ciliary stimulation by the "sneeze" was inversely proportional to the resting CBF eliciting a $210\% \pm 12\%$ response in the septal cultures ($n=3$) while only $121\% \pm 5\%$ in the tracheal cultures ($n=4$) ($p<0.01$).

Conclusion:

Dynamic ciliary activity is critical for proper host defense. We demonstrate differences in ciliary activity between the lower and upper airway at rest and following a sneeze. Furthermore, we demonstrate the presence of a reserve population of ciliated cells in the upper airway responsive to a sneeze stimulus that is absent in the lower airway.

#16A - Long Term Sinonasal Polyp Recurrence in Patients with Samter's Triad after Endoscopic Sinus Surgery

Matthew Bowen, MD, Devyani Lal, MD, James Stankiewicz, MD, New Orleans, LA

Background:

Samter's triad (ST) is a rare, recalcitrant disease comprising of nasal polyposis, asthma and aspirin sensitivity. Data regarding long-term treatment results are scarce. Serial endoscopic exams to determine earliest polyp recurrence following surgery can optimize timing of adjunctive therapy such as aspirin desensitization.

Aims:

1. Compare polyp recurrence in ST patients with aspirin-tolerant nasal polyposis patients. 2. Determine time when polyps first recur.
Study Design: Case control study.

Methods:

Thirty patients with ST were compared to a control group of 29 aspirin-tolerant patients with nasal polyposis. All patients underwent endoscopic surgery with minimum follow-up of 12 months. Primary outcomes were polyp recurrence, and time to recurrence.

Results:

Mean follow-up was 57 months for both groups. Polyp recurrence was significantly higher in the study (ST) group compared to control group (90% vs. 66%; $p = 0.045$). A significantly shorter mean time to polyp recurrence was noted in ST patients (12.1 vs. 32.3 months; $p = 0.012$). Polyps recurred as early as 2 weeks. More ST than control patients had prior ESS (46.7% vs. 35.4%, $p = 0.025$). Mean blood loss during surgery was significantly greater in the ST group (330 cc vs. 202 cc; $p = 0.012$).

Conclusions:

Nasal polyps recur significantly earlier in ST patients compared to aspirin-tolerant nasal polyposis. Although an average window of 12 months is available when patients are free of polyps, polyps may recur in weeks. Adjunctive therapy (aspirin desensitization) should be planned to start within weeks of surgery.

#16B - Management of Seronegative Sinonasal Wegener's Granulomatosis: A Clinical Challenge

Justin Wudel, MD, Roberta Gray, PA, Todd Kingdom, MD, Aurora, CO

Background:

The purpose of this study was to examine the treatment dilemma that exist for the otolaryngologist who encounters a patient with clinically suspected sinonasal Wegener's granulomatosis in the setting of negative serologic markers and non-confirmatory histology.

Methods:

A retrospective review was performed on all patients who received a diagnosis of Wegener's granulomatosis at a tertiary referral medical center from June 2007 to June 2010. A chart review was completed to assess for clinical presentation, serology, radiology, and histology. All patients who had positive serologic markers or biopsy confirmed Wegener's granulomatosis were excluded from the study. Three patients were identified who were given a diagnosis of Wegener's granulomatosis and treated with immune modulating medication despite negative serology and non-confirmatory histology.

Results:

All patients who were identified underwent a diagnostic workup to rule out other autoimmune, infectious, or idiopathic etiologies. After this workup was completed the patients went on to receive immune modulating therapy. All patients showed improvement in their symptoms after initiating medical therapy for Wegener's granulomatosis.

Conclusions:

Seronegative Wegener's granulomatosis is a complicated disorder given the diagnostic dilemma it presents as well as the implications associated with initiating immune modulating treatment. However, in the setting of highly suspicious clinical findings the disease may warrant proactive treatment despite negative serology and non-confirmatory biopsy results to prevent other associated sequela of the disease process.

#17A - Nasal Nitric Oxide and Sino-nasal Disease: A Meta-analysis of Published Evidence

Paul Seamus Phillips, MD, Richard Harvey, MD, Australia

Objectives:

Systematically review the use of nasal Nitric Oxide (nNO) in the published literature. Assess the usefulness of nNO in rhinological conditions by meta-analysis of papers measuring nitric oxide in the diagnosis and assessment of those conditions.

Method:

The Cochrane Library, Register of Clinical Trials, EMBASE (1950 - Feb 10th 2010) and MEDLINE (1980- Feb 10th 2010) databases were searched for controlled and uncontrolled trials in which nNO was used in the diagnosis, prognostication or evaluation of interventions for chronic sino-nasal conditions. The trials were grouped based on the disease, surgical state of the sinuses, use of nNO and treatment intervention. The relationship to other measurements of disease was collected. The data was pooled where possible.

Results:

The literature search found 1088 studies with 472 trials focused on nNO in upper airway disease. 21% of these (101) were reviews, 10% (46) addressed technical aspects of nNO measurement, 36% (169) related to basic science of nNO, and 33% (156) related to nNO as diagnostic, prognostic or treatment outcome. 5% (24) allowed nNO and other disease measurements to be compared. Meta-analysis of pooled compatible nNO data showed that no significant differences existed between normal nasal nitric oxide levels, and those measured in allergic rhinitis, acute rhinosinusitis, chronic rhinosinusitis, or nasal polyposis.

Conclusions:

Measurable nNO difference can be detected in health and disease. However, evidence for the use of nNO as a clinical indicator of treatment effect, marker of severity or a surrogate for clinical symptoms is very weak.

#17B - Nasal Septal Cyst: A Unique Delayed Presentation

Cheryl Gustafson, MD, Scott Stringer, MD, MS, Jackson, MS

Introduction:

Septoplasty is a commonly performed rhinological procedure. Well-recognized complications include: hemorrhage, infection, septal hematoma, and external nasal deformity. On the contrary, development of nasal septal cyst is an extremely rare complication.

Objectives:

To discuss a unique, delayed presentation of nasal septal cyst. In previously reported cases, the onset of nasal septal cysts ranged from 2 months to 10 years following septoplasty. Unlike these prior cases, the nasal septal cyst we describe did not arise until approximately twenty years following septoplasty. Furthermore, the cyst mimicked a tumor. In addition to presenting this unique case, we will discuss the postulated etiologies, histopathology, and surgical management of nasal septal cysts. Moreover, we will describe how nasal septal cysts may potentially be differentiated from other nasal masses, particularly neoplasms of the nasal cavity, using imaging studies.

Case Report:

We report a case of an expanding, nasal septal mass that appeared nearly twenty years after septoplasty. The patient underwent drainage and marsupialization of the mass via nasal endoscopy. Following the surgery, the patient reported immediate, improvement in his breathing with complete resolution of nasal obstruction and anosmia.

Conclusion:

Although every surgical procedure has well-recognized complications, it is critical that physicians be aware of rare sequelae. When evaluating a patient with a nasal mass, one should consider the possibility of nasal septal cysts when forming his/her differential diagnosis, especially when the patient has previously undergone septoplasty.

#18A - Office-based Surgical Procedures in Rhinology: A Cost-effective and Well-Tolerated Alternative to Operative Treatment

Oswaldo Henriquez, MD, John DelGaudio, MD, Atlanta, GA

Objectives:

Improved visualization has led to less invasive management of sinus pathology, including office management of limited pathologies. We evaluated success and patient satisfaction with office sinus surgeries.

Methods:

This is a retrospective review of our experience with office-based surgeries in a tertiary care center. We evaluated success and performed phone interviews to assess satisfaction.

Results:

Eighteen patients underwent twenty office surgeries (2 were bilateral). Diagnoses included: polypoid inferior turbinate hypertrophy, mucocoeles of the frontal, ethmoid, sphenoid, maxillary sinuses, and concha bullosa, and maxillary and sphenoid sinus recirculation. All procedure were performed using topical and local anesthesia. Eleven patients (61%) had a previous of nasal surgery. Mean follow up was 11 weeks. No immediate complications were seen and no patients required nasal packing. There was one recurrence of a mucocoele, with the patient choosing OR revision. One patient had incomplete drainage of a complex spenoethmoid mucocoele. No procedures needed to be aborted. Patient rated level of procedural was a mean of 3 of 10, with only one patient reporting any pain after the procedure. Given the choice of undergoing the procedure again, all chose the office over the operating room. Patients reported less than 1 day to full recovery. Cost savings was significant compared to the operating room.

Conclusions:

In patients with isolated sinonasal pathologies office-based surgeries are preferred and well-tolerated by patients, with a high success rate, shorter recovery, and lower costs compared to operating room treatment.

#18B - Outcome Validation of External Septoplasty

Paul Seamus Phillips, MD, Richard Harvey, MD, Raymond Sacks, MD, George Marcells, MD, Australia

Introduction:

The external septoplasty is an important surgical technique to manage severe septal deviation, caudal deformities and mid-dorsal abnormalities when a simple endonasal approach will not suffice. The procedure is technically more demanding, longer in duration and draws on more resources than endonasal septoplasty. The external approach is commonly associated with cosmetic surgery but is equally warranted for functional surgery. The outcome reporting of external septoplasty is important to provide evidence of benefit for both patients and healthcare providers.

Method:

Prospective assessment of consecutive patients undergoing external approach septoplasty at a tertiary centre. Pre- and post-operative nasal peak inspiratory flow (NPIF), symptom scores, Sinonasal Outcome Test (SNOT-22), and Short Form 36 (SF-36) quality of life scores were assessed.

Results:

28 patients (mean age 40 ± 16.7 , 39% female) were assessed with a mean follow-up of 7.5 ± 4.7 months. Mean NPIF improved from 92.2 ± 33.8 to 141.1 ± 46.1 ($p < 0.01$) Nasal obstruction score improved from 3.5 ± 1.3 to 0.9 ± 1.4 ($p < 0.01$). SNOT-22 improved from 32.7 ± 17.9 to 9.8 ± 10.9 ($p < 0.01$). 93% of patients improved symptomatically.

Conclusions:

When clinically indicated, the external approach to the deviated nasal septum is an operation that produces significant improvements in subjective and objective nasal health measures, and is an appropriate approach warranting the extra resource for the severely deviated nasal septum.

#19A - Peroxisome Proliferator-Activated Receptor γ ; Regulates Allergic Rhinitis by Induction of Regulatory T Cells in Mice

Weihua Wang, MD. China

Background:

Peroxisome proliferator-activated receptor (PPAR) γ ; plays a critical role in the control of airway inflammation. Recently, regulatory T cells (Tregs) have been found to be implicated in many immune and inflammatory responses. However, no data are available concerning the effect of PPAR γ ; on Tregs production in airway inflammatory diseases. In this study, we used a mouse model of allergic rhinitis to evaluate the effect of PPAR γ ; agonist, pioglitazone (PIO), on Tregs induction in allergic airway disease.

Methods:

BALB/c mice received ovalbumin (OVA) sensitization followed by OVA intranasal challenge. Mice in treatment group received intragastric administration with PIO (30 mg/kg) and GW9662, a PPAR γ ; antagonist, before each OVA challenge.

Results:

After OVA challenge, mice developed the typical pathophysiological features of allergic rhinitis. PIO reduced eosinophils infiltration and the expression of IL-5 and IgE in OVA exposed mice. Cotreatment with GW9662, in addition to PIO, reversed the anti-inflammatory effects seen with PIO alone. PIO significantly increased the expression of Foxp3 mRNA and induced production of Tregs in spleen. In addition, the inductive effects of PPAR γ ; agonist on Foxp3 mRNA and Tregs were abrogated by administration of GW9662. **Conclusion:** PPAR γ ; agonist attenuates allergic airway inflammation and reverses the pathophysiological features of AR in a PPAR γ ;-dependent fashion, and the beneficial effects of PIO on allergic inflammation are mediated by induction of Tregs.

#19B - Prospective Evaluation of a Novel Powered Nasal Irrigator Device in the post-FESS Cadaver Model

Richard Manes, MD, Pete Batra, MD, Dallas, TX

Introduction:

The objective of this study was to evaluate the distribution of aerosol delivered via a powered nasal irrigator device in 5 fresh frozen-cadaver heads (10 total sides).

Methods:

The nasal irrigator was used to deliver 10 ml of saline stained with 0.1 ml of 10% fluorescein solution. Aerosol distribution was assessed in 3 clinical trials: (1) unoperated nose; (2) post endoscopic sinus surgery (ESS); and (3) post ESS with endoscopic modified Lothrop procedure (EML). Two independent observers rated the distribution of the fluorescein-dyed saline in the anterior nasal cavity (ANC), olfactory cleft (OC), middle meatus (MM), sphenoethmoid recess (SER), nasopharynx (NP), maxillary sinus (MS), ethmoid cavity (EC), sphenoid sinus (SS), frontal sinus (FS) and frontal neo-ostium (F-NEO).

Results:

The irrigator consistently delivered aerosolized saline to the ANC, MM/EC and SER/SS across the 3 trials. A statistically significant increase in delivery was noted in the MS+EC compared to the MM ($p=0.044$) post ESS. In addition, a statistically significant increase in delivery to the F-NEO was noted relative to the FS post EML ($p=0.001$). Multiplicity adjustment done for the ESS group showed statistical superior delivery to the EC vs OC ($p=0.031$) and FS ($p=0.02$) and the SS vs FS (0.031). Multiplicity adjustment after EML improved delivery to the FS resulting in no statistical difference in aerosol delivery between F-NEO and EC or SS.

Conclusions:

The novel irrigator device consistently delivered aerosolized saline to multiple nasal subsites, with improvement in delivery seen to the F-NEO after EML. This has important implications for the delivery of topical medications to the paranasal sinuses and frontal neo-ostium.

#20A - Pseudolymphoma of the Clivus Presenting as an Abducens Nerve Palsy: Case Report and Review of the Literature

*Sachin Gupta, MD, Cameron Budenz, MD, Herman Yee, MD
Richard Lebowitz, MD, New York, NY*

Introduction:

A case report of pseudolymphoma of the clivus is presented, together with a literature review of pseudolymphoma presenting in the head and neck.

Methods:

A 25-year-old female presented with diplopia due to a left abducens nerve palsy. MRI and CT were obtained which demonstrated a destructive lesion of the clivus with extension in to the sphenoid sinus. Endoscopic biopsy of the soft tissue in the sphenoid sinus and transsphenoidal biopsy of the clivus were also performed.

Results:

Endoscopic biopsy of soft tissue within the sphenoid sinus, followed by transsphenoidal biopsy of the clivus, were consistent with pseudolymphoma. Following biopsy, the patient's diplopia and abducens palsy spontaneously resolved.

Conclusions:

To the authors' knowledge, this represents the first case report of pseudolymphoma of the clivus. Accurate diagnosis is key to management of these lesions, as differentiation of pseudolymphoma from malignant lymphoma helps determine the appropriate treatment. Pseudolymphoma can resolve spontaneously or with treatment of an underlying etiology, while malignant lymphoma requires more aggressive therapy.

#20B - Quality of Life Comparison in Common Rhinologic Surgeries

Mohsen Naraghi, MD, Behrooz Amirzargar, MD, Alipasha Meysamie, MPH, Iran

Objective:

To compare quality of life (QOL) in four common rhinologic surgeries include functional endoscopic sinus surgery, septoplasty, septorhinoplasty and septoplasty with turbinoplasty and to describe changes in quality of life of patients 6 months postoperatively.

Materials and Methods:

This is a prospective interventional before-after study. Preoperative and 6 months postoperative evaluation were performed with a unique comprehensive questionnaire that is a combination of Kramer's study questionnaire and SNOT22 questionnaire to cover all needed QOL aspects based on the definition QOL. It included 33 items in 6 subgroups (nasal, sleep, headache, nonnasal, practical and emotional problems).

Results:

From two hundred and two patients that completed the questionnaire before the surgeries, one hundred forty six patients (72% of all patients) who interviewed 6 months after surgeries were enrolled in this study. Comparing preoperative data between followed up patients and missed patients showed no statistically difference between surgeries (P value=0.90). Comparing patient's pre- and postoperative QOL showed significant improvement in global QOL and in all questionnaire items ($P < 0.0001$ in all comparisons). Comparing QOL changes before and after surgery between different surgeries revealed that there was no statistically difference between the surgeries (P value=0.282).

Conclusion:

Our data showed significant improvement in each surgery and no difference in therapeutic effect of the different surgeries on patients' QOL were seen.

#21A - Rhinitis, Sinusitis and Epistaxis During Pregnancy

Gregg Goldstein, MD, Satish Govindaraj, MD, New York, NY

Introduction:

The diagnosis and treatment of rhinitis, sinusitis and epistaxis during pregnancy present unique challenges to the otolaryngologist. Poorly controlled sinonasal disease may have significant adverse effects on the mother's quality of life and pregnancy outcomes and the lack of adequately controlled safety data limits the clinician's ability to make informed decisions about management. At the conclusion of this presentation, the participants should become familiar with the available literature and evidence-based guidelines regarding the safety and indications for radiographic imaging, clinical testing, medical intervention and surgical treatment of sinonasal disease.

Results:

A review of pertinent guidelines regarding the management of gestational rhinitis, sinusitis and epistaxis will be discussed, including the diagnostic and therapeutic limitations and physiologic changes specific to pregnancy. A study population of five patients will also be discussed to highlight the steps of management. Two patients with epistaxis and three patients with rhinosinusitis with ages ranging from 27 years to 38 years of age and between 16 to 35 weeks gestation will be reviewed.

Conclusion:

Many patients are reluctant to treat sinonasal disease during pregnancy and the otolaryngologist must be knowledgeable of all the medical evidence and guidelines that are available. An accurate and early diagnosis is paramount to optimize pregnancy outcomes and all of the risks, benefits and alternatives of treatment should be discussed with the patient. When the severity of disease precludes the possibility of delaying treatment, the clinician should provide a limited intervention that optimizes the mother's health without placing the fetus at significant risk.

#21B - Role of Open Approaches to Sino-Nasal Mucoceles in the Endoscopic Era: A 24-year Experience

Devyani Lal, MD, James Stankiewicz, MD, Stanford, CA

Objectives:

Study indications and role of open surgical approaches for sino-nasal mucoceles

Background:

Most sino-nasal mucoceles are managed endoscopically, but open surgical approaches are often still warranted. It is crucial to recognize circumstances that limit the role of endoscopic techniques.

Methods:

Charts of mucocele patients treated between 1985-2008 were reviewed.

Results:

206 patients operated for 269 mucoceles, open techniques (including combined open-endoscopic) were used in 23 patients (11.5%) for 21 frontal and 2 sphenoid mucoceles. Exclusively open approaches were used in 6 patients (2.9%). These included 4 frontal sinus obliterations (FSO), 1 medial maxillectomy for pterygomaxillary space extension, and an external sphenoidectomy with optic nerve decompression for acute blindness. Three FSOs were performed between 1991-1994, and the fourth for a lateral frontal mucocele. Combined approaches were used in 17 patients (8.6%); 11 underwent FSO during 1988-1998. Indications included previous FSO, severe frontal recess injury and intra-operative posterior frontal wall cerebrospinal fluid leak. External trephination with endoscopic surgery was performed in 2 patients with frontal recess neo-osteogenesis. Open technique use declined with availability of image guidance in 1995. Recurrence was 16.7% with open surgery, 11.7% with combined approach, and 5.8% with endoscopic surgery.

Conclusions:

In the largest reported series of mucoceles, we find a significant residual role of open surgical procedures. Even with advances in image guidance, certain circumstances (lateral frontal mucoceles, previous FSO, frontal recess injury or neo-osteogenesis) may warrant open techniques. As familiarity with these declines, it becomes important to recognize their specific indications.

#22A - Sausage Roll Rhinoplasty - A Novel use in Augmentation Rhinoplasty

Claire Hopkins, Hunter Ben, David Robert, London

Introduction:

Augmentation of a deficient nasal dorsum can be a challenge to the rhinoplasty surgeon. A range of both autologous and non-autologous grafts are available for such augmentation. We have previously reported excellent long term results using a cellular porcine dermal collagen and elastin, a sheet of acellular cross-linked porcine dermal collagen and its constituent elastin fibres. We now describe a novel modification of our technique.

Methods:

A 'sausage roll' is created by rolling a sheet of Permacol to the required width and thickness, and securing the roll with PDS sutures. It is easily trimmed to the correct length, and can be sited via open or closed rhinoplasty approach.

Results:

We have used the 'sausage roll' rhinoplasty technique in 8 patients, with a minimum of a 1 year follow-up. Indications include trauma, inflammatory conditions, and revision rhinoplasty. The procedure has achieved excellent smooth augmentation of the dorsum, with recreation of a pleasing dorsal aesthetic line. There has been no infection or extrusion of the grafts, and one year follow-up reveals no loss of volume. There has been an improvement in Rhinoplasty Outcome evaluation scores following surgery.

Discussion:

Although a porcine based product may not be acceptable to all patients, we have found it provides excellent long-term augmentation of the nasal dorsum. The technique is simple, and suitable for open or closed approaches. It is readily available, relatively inexpensive and associated with a low complication rate and high patient satisfaction rates.

Conclusion:

We believe this to be the ideal graft material and technique to achieve augmentation of the nasal dorsum.

#22B - Sinonasal Undifferentiated Carcinoma: Case Report of Recurrence in the Mandible and Review of the Literature

*Dowin Boatright, MD, Matthew Johnson, BS, John Song, MD
Aurora, CO*

Objectives:

1) Understand the presenting symptoms and histopathologic diagnosis of SNUC. 2) Review the evolution of therapy for SNUC and the impact of multimodal therapy on patient survival.

3) Demonstrate newly reported area of recurrence of SNUC to the mandible.

Introduction: Sinonasal undifferentiated carcinoma (SNUC) is a rare malignancy first described by Frierson in 1986. Most patients present with advanced disease involving spread to the orbits or anterior cranial fossa and 10% to 30% have clinically positive lymph nodes. Although survival rates historically averaged 12 months, survival outcomes have improved with the implementation of multimodal treatment including craniofacial resection and chemo-radiation.

Methods:

The authors present a case of a 51 year old Caucasian man who presented to a tertiary care clinic with a four-month history of facial pain and anosmia, who was found to have a left ethmoidal SNUC. Patient underwent multimodal therapy consisting of preoperative chemo-radiation therapy, craniofacial resection, and postoperative radiotherapy. Patient remained disease free for seven years after which he was found to have a left mandibular mass consistent with recurrent SNUC.

Results:

The patient underwent a left composite hemimandibulectomy, left selective neck dissection, tracheotomy, and osteocutaneous fibular free flap reconstruction of the composite mandible defect. Pathology showed immunohistochemical findings consistent with recurrent SNUC.

Conclusion:

SNUC is a rare sinonasal malignancy. Although the disease process is aggressive, multimodal therapy has increased survival significantly. Because of the increased survival following treatment, Otolaryngologists must be vigilant in the surveillance for metastasis in patients with a history of SNUC.

#23A - Skull Base Defect in a Patient with History of Ozena Undergoing Dacryocystorhinostomy: A Case Report and Review of the Literature

Mark Friedel, MD, Marisa Earley, MD, Jean Eloy, MD, Newark, NJ

Introduction:

Ozena, which is often used interchangeably in the literature with atrophic rhinitis or empty nose syndrome, is a progressive and chronically debilitating nasal disease that results in atrophy of the nasal mucosa, nasal crusting, fetor, and destruction of submucosal structures. Although the etiology is not completely understood, infection with *Klebsiella ozaenae* is widely believed to contribute to the destructive changes.

Case Report:

We present a case of a patient with ozena secondary to *K. ozaenae* with extensive destruction of bony structures of the nasal cavity undergoing elective dacryocystorhinostomy (DCR). An extensively thinned skull base secondary to the disease process resulted in an unforeseen complication in which the defect in the skull base was entered leading to a cerebrospinal fluid leak.

Conclusions:

Patients with known history of ozena or atrophic rhinitis often have extensive destruction of nasal turbinates, ethmoid sinuses, and skull base secondary to progression of disease.

Submucosal destruction of these bony structures mandates the need for extreme caution when planning on performing endoscopic intervention at or near the skull base. If physical exam or nasal endoscopy is suspicious for atrophic rhinitis or a patient has a known history of infection with *K. ozaenae*, we recommend preoperative imaging for surgical planning with careful attention to skull base anatomy.

Key words:

Ozena, atrophic rhinitis, skull base, *Klebsiella ozaenae*, endoscopic sinus surgery, DCR, empty nose syndrome, cerebrospinal fluid leak.

#23B - Solitary Fibrous Tumors of the Nasal Cavity

Kevin Lollar, MD, David Chang, MD, Columbia, MO

Introduction:

Solitary fibrous tumors are rare mesenchymal-derived neoplasms that are derived from serosal membranes, most commonly from pleural origin. However, a wide variety of extrapleural locations have been described. Twenty-two cases originating in the nasal cavity and paranasal sinuses have been reported. We present a case report of a 49-year-old female with a solitary fibrous tumor of the left nasal cavity, as well as a review of the literature with recommendations of peri-operative management.

Methods:

We present a case report of a 49-year-old female who presented with left-sided epistaxis, nasal airway obstruction, and nasal cavity mass. A current review of the literature revealed twenty-two previously reported cases.

Results:

To date, twenty-three cases of solitary fibrous tumors of the nasal cavity and paranasal sinuses have been reported. The mean age of presentation was 51 years (range 30-71). 15 patients were women and 8 were men. Most patients presented with epistaxis and nasal obstruction. One case of malignancy in a 70-year-old male was reported.

Conclusion:

Solitary fibrous tumors of the nasal cavity and paranasal cavities are rare entities. Immunohistochemistry is required for diagnosis because pathologic features can often mimic other soft-tissue neoplasms found in the head and neck. The vast majority of cases behave in a benign manner and complete resectability remains the most important prognostic factor.

#24A - Surgical Techniques on Augmentation Rhinoplasty of the Nasal Dorsum a Systematic Review

Garyfalia Lekakis, David Roberts, Claire Hopkins, United Kingdom

Objectives:

The objective of this review is to critically evaluate the surgical treatment strategies and graft materials used for augmentation rhinoplasty of the nasal dorsum in the literature.

Methods:

A systematic review of studies on augmentation rhinoplasty of the nasal dorsum, using surgical methods, published from 1970 to 2010 was performed, searching PUBMED. The following outcome measures were sought: cosmetic outcome with photo documentation and patient satisfaction questionnaires, complication rates and satisfaction rates when recorded. The following were inclusion criteria: case series of at least 5 patients in each study, and a minimum follow up of 12 months.

Results:

Our search identified 140 papers, which were retrieved and analysed. Of these, 66 met the inclusion criteria. No randomised controlled trials exist; most studies were classed as level IV evidence with a few comparative studies providing level IIIb evidence. All studies were grouped into 5 categories: I) autologous cartilage graft II) autologous bone graft III) irradiated homologous cartilage graft IV) alloplastic implant and V) xenograft, depending on the graft utilised for augmentation. The complication rates were: Group I: 5.2%, Group II) 13%, Group III) 15%, Group IV) 7% and Group V) 4.4%. In 23 of the 66 studies (35%), satisfaction rates are presented. The satisfaction rates per group are: I) 85% II) 90% III) 89% and IV) 94%.

Conclusions:

A variety of surgical techniques are described regarding dorsal augmentation of the nose. We could find no randomised controlled trials on augmentation rhinoplasty. Research in the area of augmentation rhinoplasty is focused in technical description of surgical technique rather than the evidence of long term patient cosmetic benefit. The quest for the ideal graft continues judging from the different publications that we have encountered supporting one or another. Contrary to our expectations, the complications rates and satisfaction rates in all groups are comparable. This suggests that any graft can offer a good result, depending

on patient selection and experience of the surgeon. Key words: Augmentation rhinoplasty, dorsal augmentation, nasal augmentation

#24B - Treatment of Nasopharyngeal Papillomatosis with Coblation

*Geoffrey Peters, MD, Kevin McLaughlin, MD, Daniel Nuss, MD
New Orleans, LA*

Objective:

Recurrent respiratory papillomatosis and its treatment are well described in the literature. Papillomatae involving the nasopharynx is less common. Location in the nasopharynx presents unique treatment challenges. Access and visualization make treatment difficult. This is increased in the context of bleeding. We present a novel technique for nasopharyngeal papillomatae removal.

Methods:

A case series of three patients with nasopharyngeal papillomatae were treated with endoscopic transnasal coblation removal. Sites of papilloma included the posterior and lateral nasopharyngeal walls, fossa of Rosenmuller, choanae, and nasopharyngeal surface of the soft palate.

Results:

Complete removal of papillomatae was successful using coblation. There were no complications. One patient, who originally had florid circumferential nasopharyngeal papillomatosis, had a minor recurrence from the fossa of Rosenmuller. This was successfully re-excised with the same technique.

Conclusion:

Nasopharyngeal papillomatae can be difficult to excise. Previous studies have described a transoral approach using sharp excision, laser excision, and standard cauterization. Difficult access, bleeding, and poor visualization secondary to bleeding can be encountered with these techniques. These problems were not encountered with transnasal coblation. The malleable nature of the device permitted easy access to the entire nasopharynx. Furthermore, the absence of bleeding makes coblation preferable. Cauterization and laser excision can be slow and create eschar that when removed can be associated with bleeding. The absence of eschar, the decreased collateral thermal damage, and the increased speed of excision make coblation preferable to cauterization or laser excision.

#25A - Upregulation of Cp110, a negative modulator of ciliogenesis, in Chronic Rhinosinusitis

*Yinyan Lai, MD, James Palmer, MD PhD, Jianbo Shin, MD PhD
Noam Cohen, MD PhD, China*

Background:

Sinonasal mucociliary clearance (MCC) is greatly reduced in patients with Chronic Rhinosinusitis (CRS). A contributing factor do the delayed MCC in CRS is sinonasal mucosa devoid of functional motile cilia resultant from prolonged inflammation and/or infection. Recently, the centrosomeal protein Cp110 was demonstrated to prevent the terminal step in cilia maturation, i.e., elongation. Thus, we investigated the expression of Cp110 in sinonasal mucosa from chronic rhinosinusitis patients as well as control patients.

Methods:

Quantification of Cp110 mRNA was performed by SYBR Green quantitative PCR. Additionally, semi-quantitative western blot analysis was used to evaluate for protein expression. Lastly, to investigate exclusivity of expression air liquid interface (ALI) cultures were established from CRS patients, and Cp110 as well as Type-IV α -tubulin immunofluorescence was performed.

Results:

Quantitative PCR demonstrated that expression of Cp110 mRNA was 1.8 times higher in the CRS patients (n=28) compared to control patients (n=8). Additionally, semi-quantitative western blot analysis also showed that the expression of Cp110 in the sinonasal mucosa of CRS patients is higher than control patients. Lastly, in ALI cultures established from CRS patients, immunofluorescence demonstrated that Cp110 expression was mutually exclusive of Type-IV α -tubulin expression.

Conclusion:

Cp110 is upregulated in CRS mucosa and thus may contribute to the decreased ciliation observed in CRS sinonasal mucosa. Alternatively, this may reflect a higher turnover of ciliated cells. Nonetheless, regulation of Cp110 expression in CRS mucosa warrants additional investigation as it may offer a novel target in the management of chronic rhinosinusitis.

#25B - Urgent Endoscopic Approach for the Management of Pituitary Apoplexy

*Alla Solyar, MD, Alexis Jackman, MD, Patrick Lasala, MD
Marvin Fried, MD, Bronx, NY*

Objectives:

To review presentation, management and outcomes of patients with pituitary apoplexy that have been treated using the endoscopic transsphenoidal approach.

Methods:

A retrospective analysis of endoscopic management of patients with pituitary apoplexy presenting to Montefiore Medical Center from 2005 to 2009 was performed. Data analyzed included patient demographics, predisposing factors, clinical presentation, imaging data, and clinical outcomes.

Results:

Four patients presented with pituitary apoplexy during the above time period and were definitively managed with endoscopic transsphenoidal pituitary surgery. Clinical symptoms at presentation included headache, nausea and vomiting in three patients. Changes in visual acuity were present in all four patients. One patient presented with cranial nerve three and four palsies. Diagnosis and management of disease was based on clinical presentation in combination with radiological imaging. Time from presentation to surgery was one day in three patients, and four days in one patient. The only post-operative complication was a new onset cranial nerve six palsy in one patient. Complete resolution of visual deficits was achieved in three patients. Visual acuity was markedly improved but incomplete in one patient. Full resolution of ophthalmoplegia was achieved in the patient that presented with cranial nerve three and four palsies. Three patients required hormone replacement therapy post-operatively.

Conclusion:

Although this is a small series of patients that were treated with endoscopic transsphenoidal approach to pituitary resection, successful outcomes were achieved in all patients. Emergent endoscopic transsphenoidal pituitary surgery for pituitary apoplexy was shown to be a safe and feasible approach with prompt symptom improvement.

Dr. Maurice H. Cottle Honor Award

For Outstanding Clinical and Laboratory Investigation in Rhinology

First Place Gold Medal Winners

1978

The Nasal Cycle in the Laboratory Animal

Winston M. Campbell, MD, Mayo Clinic, Rochester, MN

Eugene B. Kern, MD, Mayo Clinic, Rochester, MN

1979

The Physiologic Regulation of Nasal Airway Resistance During Hypoxia and Hypercapnia

T.V. McCaffrey, MD, Mayo Clinic, Rochester, MN

Eugene B. Kern, M.D., Mayo Clinic, Rochester, MN

1980 (Two Awards Given)

Growth Patterns of the Rabbit Nasal Bone Region - A Combined Serial Gross Radiographic Study with Metallic Implants

Bernard C. Sarnat, MD, Los Angeles, CA

Abbee Selman, DDS, Los Angeles, CA

Sleep Disturbances Secondary to Nasal Obstruction

Kerry D. Olsen, MD, Mayo Clinic, Rochester, MN

Eugene B. Kern, MD, Mayo Clinic, Rochester, MN

Phillip R. Westbrook, MD, Mayo Clinic, Rochester, MN

1984

Nasal Problems in Wood Furniture Workers-A Study of Symptoms and Physiological Variables

Borje Drettner, MD, Sweden

Bo Wihlelnisson, MD, Sweden

1987

Eustachian Tube and Nasal Function During Pregnancy - A Prosepective Study

Craig S. Derkay, MD, Pittsburgh, PA

1988

The Effects of Kiebsiella Ozenae on Ciliary Activity in Vitro: Implications for Atrophic Rhinitis

Jonathan Ferguson, MD, Mayo Clinic, Rochester, MN

1990

The in Vivo and in Vitro Effect in Phnylephrine (Neo Synephrine) on Nasal Ciliary Beat Frequency and Mucoilliary Transport

P. Perry Phillips, MD, Mayo Clinic, Rochester, MN

1991

Ultrastructural Changes in the Olfactory Epithelium in Alzheimer's Disease

Bruce Jafek, MD, University of Colorado, Denver, CO

1992

A Scanning Electron Microscopic Study of Msoking and Age Related Changes in Human Nasal Epithelium

Steven Kushnick, MD, New York, NY

1993

Mucociliary Functionin Endothelins 1, 2 & 3

Finn Ambie, MD, Mayo Clinic, Rochester, MN

1996

Capsacin's Effect on Rat Nasal Mucosa Substance P Release

Frederick A. Kuhn, MD, Savannah, GA

1999

Subacute Effects of Ozone-Exposure on Cultivated Human Respiratory Mucosa

Joseph Gosepath, MD, D. Schaefer, MD, C. Broomer, MD, L. Klimek, MD, R.G. Amedee, MD, W.J. Mann, MD, Mainz, Germany

2000

Capsacin's Effect on Trigenonal Nuciens Substance P Release

Frederick A. Kuhn, MD, Savannah, GA

2002

Bioengineering of Cartilage Using Human Nasal Chondrocytes Propagated in Microcarrier Spinner Culture

Alan H. Shikani, MD, David J. Fink, Ph.D., Afshin Sohrabi, M.H.S., Phong Phan, BS, Anna Polotsky, MD, David S. Hungerford, MD, Carmelita G. Frondoza, Ph.D, San Diego, CA

2004

Composition Of Hyaluronan Affects Wound Healing In The Rabbit Maxillary Sinus

Matthew Proctor, M.D., Kery Proctor, M.D., Xian Zheng Shu, Ph.D., L.D. McGill, DVM, Ph.D., Glenn D. Prestwich, Ph.D., Richard R. Orlandi, M.D.

2005

Acoustic Rhinometry Predicts Tolerance of Nasal Continuous Positive Airway Pressure (nCPAP): A Pilot Study.

Luc G. Morris, MD, Jennifer Setlur, BS, Omar E. Burschtin, MD, David L. Steward, MD, Joseph B. Jacobs, MD, Kelvin C. Lee, MD

2006

Reversal of Chronic Rhinosinusitis Associated Sinonasal Ciliary Dysfunction

Bei Chen, MD, Marcelo B. Antunes, MD, Steven Eau Claire, James Plamer, MD, Alexander Chiu, MD, David W. Kennedy, MD, Noam Cohen, MD, Ph.D.

2007

Reversible Olfactory Loss Due to Inflammation in a Transgenic Mouse Model

Andrew Lane, M.D., Justin Turner, M.D., Lindsey May, BS, Randall Reed, Ph.D.

2009

Efficacy of a Novel Chitosan Gel on Hemostasis and Wound Healing Following ESS

Rowan Valentine, MD, Adelaide, Australia

Golden Head Mirror Honor Award For Meritorious Teaching in Rhinology

The Golden Head Mirror Honor Award was first given by Dr. Maurice Cottle to colleagues who were chosen because of “Meritorious Teaching in Rhinology”. The first pair of Golden Head Mirror Cuff Links was given by Dr. Cottle to Dr. George Fisher in 1948.

A

Vijay Anand, US
Pierre Arbour, US
Harold Arlen, US
Walter J. Aagesen, US
Tomas L. Aguara, Mexico

B

Pat A. Barelli, US
Fred W. Beck, US*
Carlos G. Benavidee, US
Michael Benninger, US
Bernard Blomfield, US*
Max Bornstein, US*

C

Jamie Carillo, Mexico*
James Chesson, US*
Maurice H. Cottle, US*

D

Efrain Davalos, Mexico
John Del Gaudio, US
H.A.E. van Dishoeck, The Netherlands*
George H. Drumheller, US*
Glen W. Drumheller, US
Larry E. Duberstein, US

F

George W. Facer, US
Anthony Faills, US*
George G. Fisher, US*
Douglas W. Frericha, US
Amos D. Friend, US*

G

Irwin E. Ganor, US
Norman E. Ginsberg, US*
Vernon D. Gray, US*
Charles Gross, US
Harvey C. Gunderson, US

H

James A. Hadley, MD
Richard B. Hadley, US*
Robert M. Hansen, US*
Edward W. Harris, US*
Raymond L. Hilsinger, US*
Kenneth H. Hinderer, US*
Leland R. House, US
Sandy Hoffman, US
Egbert Huizing, The Netherlands

J

Gerald F. Joseph, US
Joseph B. Jacobs, MD

K

Alvin Katz, US
 David Kennedy, US
 Eugene Kern, US
 John Kirchner, US
 Daniel D. Klaff, US*
 Zvonimir Krajina, Croatia
 Frederick A. Kuhn, US

L

Clifford F. Lake, US*
 Donald Lanza, US
 Donald Leopold, US
 Walter E.E. Loch, US*
 W. Kaye Lochlin, US
 Fausto Lopez-Infante,
 Mexico
 Roland M. Loring, US*
 Frank Lucente, US

M

Henry Merriman, US*
 Lewis E. Morrison, US

N

William J. Neidlinger, US*
 Roberto Neveus-Pinto,
 Brazil
 Leon Neiman, US

O

Joseph H. Ogura, US*
 Harold Owens, US

P

Charles J. Patrillo, US*
 Ivan W. Philpott, US*
 Loring W. Pratt, US

R

Frederico Reyes, Mexico
 Ralph H. Riggs, US
 Zvi Henry Rosen, Israel

S

Piefer H. Schmidt, The
 Netherlands
 Thomas C. Smersh, US
 Maynard P. Smith, US
 Pinckney W. Snelling, US*
 Carl B. Sputh, US
 Heinz Stammberger, Austria
 Albert Steiner, US*
 Sydney L. Stevens, US*
 Fred Stucker, US
 Giorgio Sulsenti, Italy
 Edward A. Swartz, US

T

William H. Tenny, US
 H. Ashton Thomas, US*
 Paul H. Toffel, US
 Richard Trevino, US
 Charles A. Tucker, US

W

Richard C. Webster, US*
 Alvin P. Wenger, US
 Joseph W. West, US*
 Manual R. Wexter, US*
 Henry L. Williams, US*
 Russell I. Williams, US
 Peter John Wormald,
 Germany

** Deceased*

New Investigator Award — (CORE)

2010 - Characterization of Human Sinonasal Intercellular Junctional Proteins

Sarah Wise, MD

2009 - Novel Flavonoid Compounds for Cystic Fibrosis Chronic Rhinosinusitis

Bradford Woodworth, MD

2009 - Mucin expression in Paranasal Respiratory Epithelium Cell Culture

David Poetker, MD

2008 - The Role of Epithelial Cells in Chronic Rhinosinusitis with Nasal Polyps

Bradley Otto, MD

2007 - Regulatory T Cells in Chronic Rhinosinusitis

Jayant Pinto, MD

2006 - Efficacy of Topical Lactoferrin and Antibiotics in an Animal Model of Sinusitis

Alexander Chiu, MD

2005 - Surfactant Proteins A and D In Chronic Sinusitis

Rodney J. Schlosser, MD

2004 - Assessment of Bacterial Biofilms in Sinusitis

James N. Palmer, M.D.

2002 - Characterization of Eosinophil Peroxidase-Induced Tissue Damage in Sinonasal Polyposis and Chronic Rhinosinusitis

Martin J. Citardi, MD

2002 - Influence of Estrogen on Maturation of Olfactory Neurons

Karen J. Fong, MD

2001 - Apoptosis in the Aging Olfactory Mucosa

David B. Conley, MD

Clinical Science Research Award

2010 (COSM) - Endoscopic Sinus Surgery Reduces Antibiotic Utilization in Rhinosinusitis

Naveen D. Bhandarkar, MD

2009 (Rhinology World) - The Comparative Disease Burden of Rhinosinusitis

Neil Bhattacharyya, MD

2008 (COSM) - Construct Validation of a Low-Fidelity Endoscopic Sinus Surgery Model

R Leung MD

2007 (COSM) - Demonstration of Biofilms in Chronic Sinusitis Using Light Microscopy

A. Bhatki, M.D., A. Goldberg, M.D., M. Gangar, M.D., G. Hradek, M.S.

2006 (COSM) - Impact of Depression on Disease-Specific Symptoms and Quality of Life in Patients with Chronic Rhinosinusitis

Rebecca Bransted, MD

Basic Science Research Award

2010 (Spring Meeting) - Presence of Dendritic Cells Expressing Pro-TH2 is Increased in AFRS

Jennifer Mulligan, MD

2009 (Annual Meeting) - TNF-Alpha Inhibits Olfactory Regeneration in a Transgenic Model of CRS-Associated Olfactory Loss

Justin Turner, MD

2009 (Rhinology World) - Treatment-Recalcitrant Chronic Rhinosinusitis with Polyps is Associated with Altered Epithelial cell expression of interleukin-33

Andrew Lane, MD

2008 (Annual Meeting) - Interleukin 1 Receptor-like 1 Gene is Associated with Chronic Rhinosinusitis

Roberto Castano, MD, Yohan osse, MD, Leandra Mfuna, MD, Martin Desrosiers, MD

2008 (Annual Meeting) - Olfactory Function and Disease Severity in Chronic Rhinosinusitis

Jamie Litvack, MD, Jess Mace, MPH, Kenneth James, PhD, Timothy Smith, MD

2008 (COSM) - Reversible Loss of Neuronal Marker Protein Expression in a Transgenic Mouse Model for Sinusitis-associated Olfactory Dysfunction

Justin Turner, MD, PHD, Lindsey May, BS, Randall Reed, PhD., Andrew Lane, MD

2007 (COSM) - Methods for Removing Bacterial Biofilms: In Vitro Study Using Clinical Chronic Rhinosinusitis Specimens

Martin Desrosiers, M.D., M. Myntti, Ph.D., G. James, Ph.D.

2006 (COSM) - Chronic Rhinosinusitis with Nasal Polyps is Associated with Decreased Expression of Epithelial Interleukin 22 Receptor

Murugappan Ramanathan, Jr., MD

2005 - Altered Expression Of Genes Associated With Innate Immunity In Recalcitrant Rhinosinusitis With Polyps.

Andrew P. Lane, M.D.

2004 - Superantigens and Chronic Sinusitis II: Analysis of T Cell Receptor VB Domain in Nasal Polyps

David B. Conley, MD, Anju Tripathi, MD, Kristin A. Seiberling, MD, Leslie C. Grammar, MD, Robert C. Kern, MD

2003 - Nitric Oxide and Collagen Expression in Allergic Upper Airway Disease

Marc A. Tewfik, CSc, Julio F. Bernardes, MD, Jichaun Shan, MD, Michelle Robinson, BSc, Saul Frenkiel, MD, David H. Eidelman, MD

2000 - An Animal Model for Allergic Fungal Sinusitis

Felicia Grisham, MD

Histologic Study of the Superior Turbinate

Donald Leopold, MD

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