American Rhinologic Society

2012 COSM

PROGRAM & ABSTRACTS

April 19-20, 2012

Manchester Grand Hyatt, San Diego, CA

www.american-rhinologic.org

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.

Continuing Medical Education

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

The ARS designates this live activity for a maximum of 11.75 AMA PRA Category 1 Credit(s)TM. Physicians should claim only the credit commensurate with the extent of their participation in the activity.

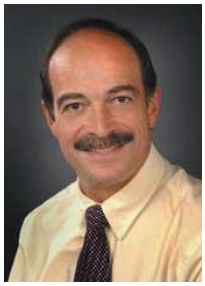
Learning Objectives:

- Learn the newest information on the medical management of patients with Rhinosinusitis and other rhinologic diseases
- Learn the newest information regarding the surgical management of patients with rhinosinusitis
- Become familiar with the current research in the pathogenesis and patho physiology of chronic rhinosinusitis and other rhinologic diseases
- Become familiar with the management of complex sinus patients who have failed endoscopic sinus surgery
- Become familiar with the Topical application of drugs post endoscopic Sinus surgery
- Become familiar with the best treatment remedies in Rhinology based on evidenced based practice
- Become familiar with patients with facial pain and headache and how to handle these patients.

Activity Outcomes & Goal:

- The practitioner should be able to choose appropriate therapy for the different subtypes of chronic rhinosinusitis to improve outcomes
- The practitioner should be able to choose appropriate therapy for the patient with rhinosinusitis and allergic rhinitis to improve outcomes
- The practitioner should be able to optimally manage patients with facial pain and headache
- The practitioner should be able to optimally manage patients with complex sinus patients who have failed endoscopic Sinus surgery

Target Audience: Otolaryngologists in training, practicing otolaryngologists, allied health care professionals



Michael Setzen, MD, FACS
ARS President

Presidential Welcome to the 2012 ARS Meeting at COSM

On behalf of the Board of Directors of the American Rhinologic Society, it gives me great pleasure to welcome you to the 2012 ARS Meeting at COSM. What could be more enjoyable than to sit back and relax in the comfort of the Manchester Grand Hyatt in sunny San Diego in April?

I want to thank our Program Chair, Todd Kingdom and the Program Committee for putting together a world-class meeting.

During this 2 day conference attendees will have the opportunity to learn from the leading experts in Rhinology and Skull base surgery. We will be exposed to some of latest research opportunities on the horizon, hear pros and cons during panel debates and listen to special topics of interest to be delivered by invited key note speakers.

This year I am happy to announce that ARS will participate on a Panel with AAFPRS on a topic entitled the *"Functional Rhinoplasty-A Delicate Balance of Function and Form".*

This conference will provide an opportunity to meet with old friends and colleagues and build or renew relationships. To our residents and fellows I welcome you all to this meeting and hope the stimulation is such that you will join the ARS as members when you complete your training.

The meeting is designed to stimulate the interests of both academic and community based rhinologists and otolaryngologists. Please visit with our Exhibitors, see their latest products and thank them for their support.

A special thank you to Wendi Perez, ARS administrator and her team for their hard work and effort in putting together this meeting.

Please help me make this meeting a memorable one and enjoy your stay here in San Diego.

Michael Setzen MD,FACS
President, American Rhinologic Society

Todd Kingdom, MD,FACS
ARS President Elect/ Program Chair

Welcome to the ARS COSM 2012

I would like to welcome you to the 2012 ARS Scientific Meeting in San Diego.

Once again the ARS is proud to part of the 115th meeting of COSM and we look forward to a wonderful program serving our members, all otolaryngologists, and allied health care providers from throughout the United States, North America, and the world.

This year the ARS will host three half-day sessions: a full day on Thursday, April 19 and an afternoon session on Friday, April 20. Over 150 scientific abstracts were submitted to the Program Committee for consideration. This resulted in 40 oral presentations and over 100 poster presentations selected to be a part of this exciting program.

In addition, I have invited 3 experts in the field of rhinology to deliver keynote lectures and arranged for 4 expert panels to explore some of the clinical challenges we face in our practices.

Finally, collaboration is a major priority for ARS. To this end 2 of our panels are jointly sponsored with the AAOA & AAFPRS. It is my sincere hope that there is "something" in this program for every attendee.

Thank you for your attendance and your support of the ARS and COSM.

Todd T. Kingdom, MD
ARS President-Elect & Program Chair

Program Review Committee

Todd Kingdom, MD
Program Chair

Nithin Adappa, MD
Christopher Church, MD
David Conley, MD
Subinoy Das, MD
Greg Davis, MD
Charles Ebert, MD
Parul Goyal, MD
Joseph Han, MD
Eric Holbrook, MD
Devyani Lal, MD
Richard Orlandi, MD
David Poetker, MD
Vijay Ramakrishnan, MD
Douglas Reh, MD
Nathan Sautter, MD
Ameet Singh, MD
Timothy Smith, MD
Michael Stewart, MD
Jeffrey Suh, MD
Kevin Welch, MD
Sarah Wise, MD

Floor Plans

GROUND LEVEL

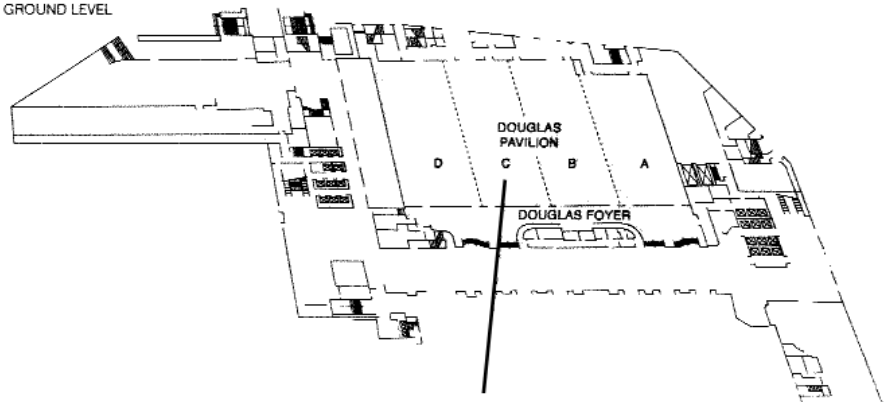
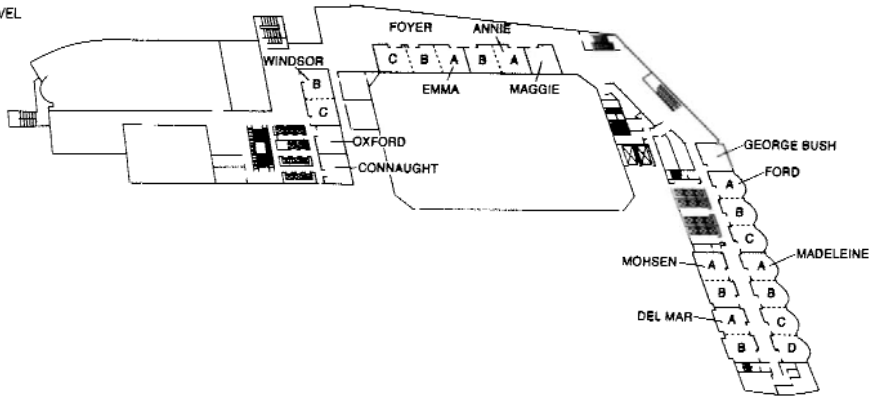
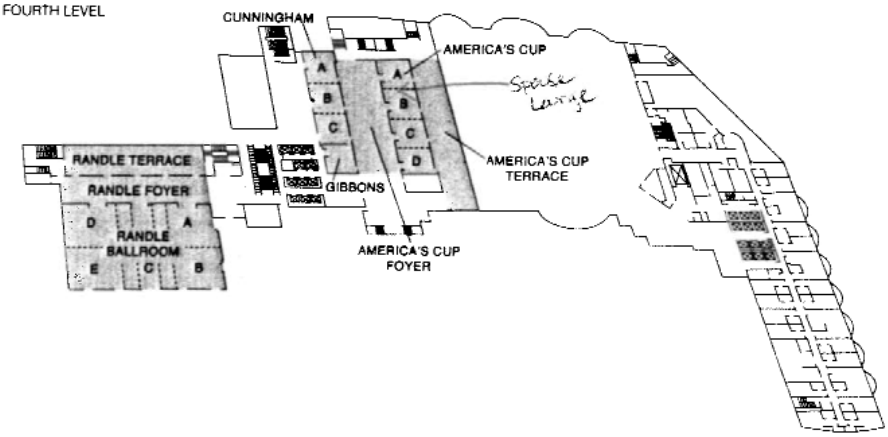


EXHIBIT HALL

THIRD LEVEL



FOURTH LEVEL



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ACCME Footnotes:
BS - *Basic Science* A - *Advanced*
F - *Fellows* C - *Clinical*

COSM 2012
Thursday, April 19, 2012

7:50am
Welcome
Todd Kingdom, MD - Program Chair

Moderators: Jeffrey Suh, MD & David Conley, MD

8:00am
Is Nasal Packing Necessary After Septoplasty?: A Meta-Analysis (C)
Sarfaraz M. Banglawala, MD

8:06am
The Endoscopic Modified Lothrop Procedure Reduces Systemic Steroid Requirements in Chronic Rhinosinusitis with Nasal Polyposis (A)
Mohammad Aloulah, MD

8:12am
One-year Outcomes and Ostial Patency Following Treatment with a Multi-function, Multi-sinus Balloon dilation Tool (C)
David Brodner, MD

8:18am
In-Office Balloon Dilatation: Results of a Prospective Multicenter Study in 203 Patients (A)
Boris I. Karanfilov, MD

8:24am
Discussion/Audience Response

Moderators: Kevin Welch, MD & Nithin Adappa, MD

8:30am
Corticosteroid Nasal Irrigations after Endoscopic Sinus Surgery in the Management of Chronic Rhinosinusitis (C)
Kornkiat Snidvongs, MD

8:36am
Antibiotics and Chronic Rhinosinusitis: an Evidenced-based Review with Recommendations (C)
Zachary Soler, MD

8:42am
Efficacy of Targeted Middle Meatal Antibiotics After Functional Endoscopic Sinus Surgery (C)
Rohan Wijewickrama, MD

8:48am
Postoperative Debridement After Endoscopic Sinus Surgery: A Randomized Controlled Trial (C)
Brian Rotenberg, MD

8:54am
Discussion/Audience Response

9:00am
Presidential Address
Michael Setzen, MD, ARS President

9:10am
Invited Speaker - The Role of Cilia in Microbial Detection and Clearance: From Genetics to Biofilms (BS)
Noam Cohen, MD

9:35am
Break with Exhibitors

Moderators: Rick Chandra, MD & Doug Reh, MD

10:00am
Microbiome and S. Aureus in Chronic Rhinosinusitis (BS)
Vijay Ramakrishnan, MD

10:06am
Impact of Intraoperative Mupiricon Rinses on Staphylococcus Aureus (BS)
Kristin Seiberling, MD

10:12am
Photodynamic Therapy of Antibiotic Resistant Biofilms in a Maxillary Sinus Model (BS)
Merrill Biel, MD, PhD

10:18am
Disinfection of Rigid Nasal Endoscopes Following in-vitro Contamination with Staphylococcus Aureus, Streptococcus Pneumonia, Pseudomonas Aeruginosa and Haemophilus Influenzae (C)
Benjamin Bradford, BA

10:24am
Discussion/Audience Response

Moderators: Charles Ebert, MD & Anne Getz, MD

10:30am
Comparison of Disease-specific Quality-of-life Instruments in the Assessment of Chronic Rhinosinusitis (C)
Lourdes Quintanilla-Dieck, MD

10:36am
What Rhinologists and Allergists Should know About the Medico-Legal Implications of Corticosteroid Use: A Review of the Literature (C)
David Poetker, MD

10:42am
Identifying Clinical Symptoms for Improving the Specificity of the Chronic Rhinosinusitis Diagnosis (C)
Bruce Tan, MD

10:48am
Validation of a Novel Sino-Nasal Endoscopy Scoring System: the DIP Score (C)
Megan Durr, MD

10:52am
Discussion/Audience Response

10:58am
Panel: ARS-AAFPRS
Functional Rhinoplasty: A Delicate Balance of Function and Form (C)
Scott Tatum, MD - Moderator

Panelists:
Jay Dutton, MD; Sam Most, MD; John Rhee, MD; Michael Setzen, MD

12:00pm
Lunch with Exhibitors

1:00pm
Welcome
Todd Kingdom, MD - Program Chair

Moderators: Chris Church, MD & Subinoy Das, MD

1:05pm
Effect of a Dexamethasone Carboxymethylcellulose Middle Meatal Spacer on Endoscopic Sinus Surgery Outcomes in Patients with Chronic Rhinosinusitis without Nasal Polyposis: A Randomized, Double-Blind, Placebo-controlled Trial (C)
Luke Rudmik, MD

1:11pm
Middle Meatal Spacers for the Prevention of Synechiae Following Endoscopic Sinus Surgery - A Systematic Review and Meta-Analysis of Randomized Controlled Trials (C)
John Lee, MD

1:17pm
Basal Lamella Relaxing Incision: A Novel Technique for Increasing Middle Meatal Access During Endoscopic Sinus Surgery (C)
Anne Getz, MD

1:23pm
Discussion/Audience Response

Moderators: Joe Han, MD & David Poetker, MD

1:30pm
Intravenous Tranexamic Acid and Intraoperative Visualization During Functional Endoscopic Sinus Surgery: A Double-Blind Randomized Controlled Trial (C)
Morgan Langille, MD

1:36pm
Meta-Analysis and Literature Review of Techniques to Achieve Hemostasis in Endoscopic Sinus Surgery (C)
Akhil Khosla, BBA

1:42pm
Emergency Management of Internal Carotid Artery Hemorrhage During Endoscopic Surgery (A)
Harry Wright, MD

1:48pm
Discussion/Audience Response

1:54pm
Panel: Allergy Evaluation & Treatment for Improving Rhinologic Outcomes: What is the Evidence? (C)

Moderator: Sarah Wise, MD

Panelists:
Sandra Lin, MD; Chris McMains, MD; Richard Orlandi, MD; Rod Schlosser, MD

3:00pm
Break with Exhibitors

Moderators: Devyani Lal, MD & Naveen Bhandarkar, MD

3:25pm
Quality-of-Life Outcomes Following Multiple Revision Endoscopic Sinus Surgery (C)
John Clinger, MD

3:31pm
Inter-rater Agreement of Nasal Endoscopy for Revision Endoscopic Sinus Surgery (C)
Edward McCoul, MD

3:37pm
Computed Intranasal Spray Penetration: Comparisons Before and After Nasal Surgery (BS)
Dennis Frank, MD

3:43pm
Discussion/Audience Response

3:49pm
Invited Speaker: Surgical Navigation: Past, Present, & Future (C)
Martin Citardi, MD

Moderators: Greg Davis, MD & Raj Sindwani, MD

4:15pm
The Impact of Epstein Barr Virus (EBV) and Helicobacter Pylori (HP) on Developing Nasopharyngeal Carcinomas (NPC) (BS)
Mohammad Shayaninasab, MD

4:21pm
Altered Mucin Release in Nasal Epithelium of Chronic Rhinosinusitis and Cystic Fibrosis (BS)
Do-Yeon Cho, MD

4:27pm
Epithelial Permeability Alterations in an In Vitro Air-Liquid Interface Model of Allergic Fungal Rhinosinusitis (BS)
Kyle Den Beste, BS

4:33pm
Rapid Sinonasal Gas Exchange and Flow: A Paradigm Shift in our Understanding of the Functional Sinonasal Interface (BS)
Anil Gungor, MD

4:39pm
Discussion/Audience Response

Moderators: Eric Holbrook, MD & Nate Sautter, MD

4:45pm
Cost-Effectiveness of MRI in Patients with Idiopathic Dysosmia (C)
Jennifer Decker, MD

4:51pm
The Effect of Two Sphenoidotomy Approaches on the Sense of Smell: Superior Turbinate Intact vs. Superior Turbinate Resection (C)
Andrew Thamboo, MD

4:57pm
Assessing the Efficacy of Endoscopic Office Olfactory Biopsy Sites to Produce Neural Progenitor Cell Cultures for the Study of Neuropsychiatric Disorders (C)
Bozena Wrobel, MD

5:03pm
Discussion/Audience Response

5:10pm
Closing Remarks & Meeting Adjourned
Todd Kingdom, MD, Program Chair

COSM 2012
Friday, April 20, 2012

1:00pm
Welcome
Todd Kingdom, MD - Program Chair

1:05pm
Invited Speaker: Innovation in Rhinology (C)
Richard Orlandi, MD

Moderators: Vijay Ramakrishnan, MD & Sarah Wise, MD

1:30pm
Olfactory and Sinonasal Outcomes in Endoscopic Skull Base Surgery (A)
Leigh Sowerby, MD

1:36pm
Olfactory Outcomes following Endoscopic Pituitary Surgery With or Without Septal Flap Reconstruction: A Randomized Controlled Trial (A)
Samantha Tam, MD

1:42pm
Determining the Best Graft-Sealant Combination for CSF Leak Repairs in an Ex Vivo Porcine Model (A)
Marcela Fandino, MD

1:48pm
Accuracy of Intra-operative Frozen Margins for Sinonasal Malignancies and its Implications for Endoscopic Resection of Sinonasal Melanomas (A)
Alexander Chiu, MD

1:54pm
Discussion/ Audience Response

2:00pm
Panel: Endoscopic Skull Base Surgery: Where Do We Stand? (A)

Moderator: James Palmer, MD

Panelists:
Nithin Adappa, MD; Benjamin Bleier, MD; Richard Harvey, MD; James Palmer, MD; Vijay Ramakrishnan, MD; Brent Senior, MD

3:00pm
Break with Exhibitors

Moderators: Abtin Tabaee, MD & Steven Pletcher, MD

3:25pm
Eosinophilic Inflammatory Mediators in Chronic Rhinosinusitis (BS)
Matthew Lam

3:31pm
Is the Inflammatory Effect in Chronic Rhinosinusitis Eosinophilic or Neutrophilic? (BS)
Eric Meen, MD

3:37pm
Utilization of Nasopharyngeal Culture to Determine Appropriateness of Antibiotic Therapy in Acute Bacterial Rhinosinusitis (C)
Stella Lee, MD

3:43pm
Mometasone Furoate Nasal Spray Is Effective Against Acute Rhinosinusitis Regardless of Allergic History (C)
Bruce Prenner, MD

3:49pm
Discussion/Audience Response

3:55pm
Panel: Sleep and the Nose (C)
Moderator: Mickey Stewart, MD

Panelists:
Michael Friedman, MD; Eric Kezirian, MD; Brent Senior, MD

5:00pm
Closing Remarks and Adjournment
Todd Kingdom, MD, Program Chair

COSM 2012
POSTERS
Poster Reception - Elizabeth Foyer
5:30 - 7:00pm on 4/19/12

Poster #113: A Case of Respiratory Epithelial Adenomatoid Hamartoma with Extension to the Cribiform Plate
Kyle J. Chambers, MD

Poster #114- A Case Report of Intra-Operative Retroorbital Fluid Dissection After Frontal Minitrephine Placement
Jamie N. Andrews, MD

Poster #115- A Novel Chitosan-PEG Nasal Packing
Nadim Bikhazi, MD

Poster #116- A Novel Endoscopic Approach to the Sella: The Intraseptal Approach
Majestic Tam, MD

Poster #117- A Novel Finding on Computed Tomography in the Diagnosis and Localization of Cerebrospinal Fluid Leaks
R. Peter Manes, MD

Poster #118 - Withdrawn

Poster #: 1-119- A Rare Case of a Large Solitary Enchondroma of the Nasal Cavity: Case Report and Review of the Literature
Victor M. Duarte, MD

Poster #120- A Unique Case of Rhinocerebral Mucormycosis: With Review of Literature for Current Treatment of Acute Invasive Fungal Rhinosinusitis
Nathan Deckard, MD

Poster #121- Abducens Nerve Palsy Following Lumbar Drain Placement: Case Report and Systematic Literature Review
Rachel B. Cain, MD

Poster #122- An Anatomic Study of an Endoscopic Transnasal Transorbital Approach to the Lateral Orbital Apex
Bianca M. Kenyon, MS

Poster #123- Angiomyolipoma of the Nasal Cavity: A Case Report and Review of the Literature
Ayaka J. Iwata, MS

Poster #124- Assessing for Differences in Skull Base Height in Posterior Ethmoid Inflammation
Philip G. Chen, MD

Poster #125- Bilateral Juvenile Nasopharyngeal Angiofibroma: Report of a Case
Edward C. Wu, BS

Poster #126- Blood Transfusion Requirements for Endoscopic Sinonasal Inverted Papilloma Resections
Mr. Al-Rahim R. Habib

Poster #127- CD8+ Cytotoxic Lymphocyte Infiltration of the Sinus Mucosa is Reduced in CD8+-Deficient Patients
Saud R. Alromaih, MD

Poster #128- Choice of Nasal Packing Following Skull Base Reconstruction: Analysis by Subsite
Jonathan Y.Ting, MD

Poster #129- Chromosomal Loci in Cystic Fibrosis and Chronic Sinusitis
Bharat B. Yarlagadda, MD

Poster #130- Complete Endoscopic Resection of a Solitary Fibrous Tumor of the Nasal Cavity Arising From the Cribriform Plate
Roheen Raithatha, MD

Poster #131- Contemporary Management of Frontal Sinus Mucoceles: A Meta-analysis
Andrew M. Courson, MD

Poster #132- Controlled Clinical Trial using Chitosan Membrane for Nasal Packing
Maria Ivette Muciño-Hernandez, Ph. D

Poster #133- Effect of Antimicrobial Photodynamic Therapy on Ciliated Respiratory Mucosa
Merrill A. Biel, MD, PhD

Poster #134- Endoscopic Management of an Ethmoid Schwannoma
Rohit Garg, MD

Poster #135- Endoscopic Management of Dento-Alveolar Lesions: A Shift in Paradigm
Devyani Lal, MD

Poster #136- Endoscopic Partial Medial Maxillectomy with Mucosal Flap for Treatment of Postoperative Maxillary Sinus Mucoceles
Megan Durr, MD

Poster #137- Endoscopic Repair of Patulous Eustachian Tube - A Prospective Series
Brian W. Rotenberg, MD

Poster #138 (Withdrawn)

Poster #139- Endoscopic Skull Base Surgery: Review of Recent Experiences
Jack Russo, MD

Poster #140- Endoscopic Transsphenoidal Surgery for Petrous Apex Cholesteatoma: Technical and Other Unique Considerations
Devyani Lal, MD

Poster #141- Endoscopic Vidian Neurectomy as a Treatment of Facial Neuralgia Caused by Vidian Nerve Xanthoma
Marcelo B. Antunes, MD

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Mr. Jay Ching-Chieh Wang

Poster #143 - Withdrawn

Poster #144- Health Care Utilization in Patients with CRS
Rakesh Chandra, MD

Poster #145- Histopathological Evaluation of Chronic Rhinosinusitis: A Critical Review
Nancy Jiang, MD

Poster #146- IL-17A Contributes to Develop and Regulate Allergic Inflammation in a Murine Allergic Rhinitis Model
Woo Hyun Lee, MD

Poster #147- Incidence of Neoplasia in Clinically Suspicious Nasal Lesions and the Value of CT Imaging in Diagnosis
Asimakopoulos Panagiotis, MD

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Qiu Zhong, MD

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Nancy Jiang, MD

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Michael Wiebel, MD

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Kyle Hatten, MD

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Mr. Rounak B.Rawal

Poster #154 - Management of Severe Epistaxis Following Young's Procedure
Jonathan Y. Ting, MD

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Thomas S. Higgins, MD

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Jean Anderson Eloy, MD

Poster #157 - Nasal Epithelial Repair and Regeneration in a Novel SO2 Volatile Agent Exposure Model
Dawn Bravo, MD

Poster #158 - Nasal Gout Presenting as Nasal Obstruction
Paul E, Kwak, MD

Poster #159 - Nasal Septal Perforation Associated with Pyoderma Gangrenosum
Brook E. McConnell, MD

Poster #160 - New Treatment and Monitoring Procedures for Nasal NK/T-cell Lymphoma, Intra-maxillary Arterial Chemotherapy and Analysis of Serum EBV DNA
Yasuaki Harabuchi, MD

Poster #161 - Novel Modifications of the Middle Turbinate Hinge Flap
Jonathan Liang, MD

Poster #162 - Olfactory Neuroblastoma Treated Using Endoscopic Endonasal Surgery
Yasuyuki Hinohira, MD

Poster #163 - Osseous Metaplasia Found Within Bilateral Inverted Papilloma: A Case Report and Review of the Literature
Anthony G. Del Signore, MD

Poster #164 - Outcomes Analysis in Epistaxis Management: Development of an Evidence-Based Therapeutic Algorithm
Josef Shargorodsky, MD

Poster #165 - Oxidative Stress Induces Differential Regulation of Multiple Genes Involved in PAO1 Biofilm fFrmation
John J. Chi, MD

Poster $166 - Paranasal Sinus Cholesterol Granuloma: Diagnostic and Management Aspects
Aditya Durgam, MSII

Poster #167 - Paranasal Sinuses Computerized Tomography (CT) Images Algorithmic Interpretation
Mohammed I. Almohizea, MBBS

Poster #168 - Pediatric Allergic Fungal Sinusitis (AFS): Is it a More Severe Disease than Adult AFS?
Deepak R. Dugar, MD

Poster #169 - Pre-Morbid Conditions Preceding Physician Diagnosed Chronic Rhinosinusitis
Bruce K. Tan, MD

Poster #170 - Radiographic Density of Sinus Opacification Informs Computed Tomography-Based Staging of Chronic Rhinosinusitis
Ahmad R. Sedaghat, MD, PhD

Poster #171 - Recent Changing Trends in Rhinologic Surgery
Alkis James Psaltis, MD

Poster #172 - Renal Cell Carcinoma Presenting As Epistaxis: Case Presentation and Review of the Literature
Anthony G. Del Signore, MD

Poster #173 - Revision Endoscopic Modified Lothrop
Deya Jourdy, MD

Poster #174 - Sarcoidosis of the Upper Respiratory Tract: Analysis of Pulmonary Function, Chest Radiography Staging, and Clinical Outcome
Giant C. Lin, MD

Poster #175 - Schneiderian (sinonasal) Papillomas: Comparison of Exophytic (fungiform), Cylindrical Cell (oncocytic), and Inverted Types
Darshni Vira, MD

Poster #176 - Schneiderian Papillomas Revisited
Luke A. Donatelli, MD (Presented by Roheen Raithatha, MD)

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Joseph Zenga, BA

Poster #178 - Sinonasal Manifestations of Sarcoidosis: A Single Institution Experience with 38 Cases
Mohammad O. Aloulah, MD

Poster #179 - Sinonasal Osteoma, An Enigmatic Lesion
Akaber Halawi, MD

Poster #180 - Sinusitis in SCID Patients
Victor M. Da Costa, MD

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Kelli Crabtree, MD

Poster #182 - Spindle Cell Carcinoma of the Nasal Cavity: A Case Report and Review of the Literature
Sachin Gupta, MD

Poster #183 - Systematic Review of Endoscopic Reconstruction Techniques in the Era of Endoscopic Endonasal Skull Base Surgery
Ethan Soudry, MD

Poster #184 - Techniques and Limitations for Reducing Nasoseptal Flap Donor Site Morbidity Following Endoscopic Skull Base Surgery
Adam Kimple, PhD

Poster #185 - The Accessory Posterolateral Nerve- An Immunohistologic Characterization
Benjamin S. Bleier, MD

Poster #186 - The Effect of Balloon Size in Eustachian Tube Dilatation Procedures
Jeffrey C. Bedrosian, MD

Poster #187 - The Management of the Silent Sinus Continuum in the Endoscopic Era
Amy E. Lawrason, MD

Poster #188 - The Role of Season, Temperature and Humidity on the Incidence of Epistaxis in Alberta, Canada
Leigh J. Sowerby, MD

Poster #189 - Transnasal Endoscopic Approach for Odontoidectomy
Giridhar Venkatraman, MD

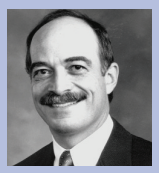
Poster #190 - Treatment of Anosmia Caused by Chronic Sinusitis
Taketoshi Nogaki, MD

Poster #191 - Uncinectomy Improves Accuracy of Maxillary Cannulation during Transnasal Balloon Sinuplasty
Wesley M. Abadie, MD (Presented by Joseph Rohrer, MD)

Poster #192 - Withdrawn

Poster #193 - Use of Computed Tomography to Determine Variance in the Three Dimensional Anatomy of the Ethmoid Roof
Michael I. Orestes, MD

American Rhinologic Society Officers - 2012



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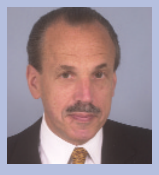

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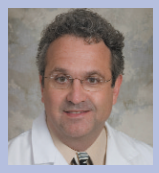

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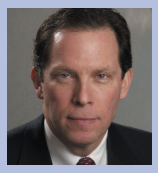
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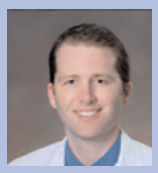

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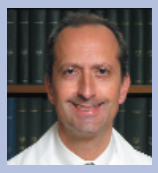

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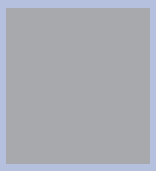

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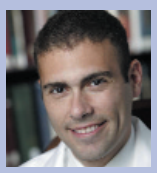

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COSM 2012
Thursday, April 19, 2012
Abstracts

7:50
Welcome
Todd Kingdom, MD - Program Chair

Moderators: Jeffrey Suh, MD & David Conley, MD

8:00am
Is Nasal Packing Necessary After Septoplasty? : A Meta-Analysis
Sarfaraz M Banglawala, MD, Mandeep Gill, MD, Doron Sommer, MD, Michael Gupta, MD
Hamilton, Ontario Canada

Objective:
Nasal packing is routinely used after septoplasty as it is believe to decrease risk of post-operative bleeding, hematomas and adhesion rates. However, multiple studies have shown that there are numerous complications of nasal packing. The purpose of this paper was to perform a meta-analysis on the existing literature to evaluate the need for nasal packing after septoplasty.

Method:
Two independent reviewers conducted a literature search using EMBASE, OVID, Medline, PubMed, Google scholar, Cochrane Library and reference list review from 1966 to August 2010 to identify studies assessing nasal packing after septoplasty. All papers were reviewed for study design, results and assigned an Oxford level of evidence grade, Detsky and MINORs score.

Results:
Sixteen studies were identified that met the inclusion criteria. Eleven papers were randomized control trials, 3 were prospective and 2 were retrospective studies. Nasal packing did not show benefit in post-operative bleeding, hematomas, septal perforations rate, adhesion and residual deviated nasal septum. Two studies using fibrin products as nasal packing showed decreased bleeding rate.

Conclusion:
Nasal packing after septoplasty does not show any post-operative benefits. Fibrin products show a possibility of decreasing post-operative bleeding. Routine use of nasal packing after septoplasty is not warranted. This is the first meta-analysis conducted on this topic.

8:06am
The Endoscopic Modified Lothrop Procedure Reduces Systemic Steroid Requirements in Chronic Rhinosinusitis with Nasal Polyposis
Mohammad O Aloulah, MD, Peter R Manes, MD, Yuk H Ng, MBBS, Bradley F Marple, MD, Matthew W Ryan, MD, Pete S Batra, MD
Dallas, TX, USA

Introduction:
Sarcoidosis is a chronic disease process characterized by non-caseating granulomatous inflammation, usually involving the lower respiratory tract. Given the rarity of rhinologic involvement, the objectives of the present study were: (1) to describe clinical features; and (2) to review outcomes of rhinologic surgery for sinonasal sarcoidosis.

Methods:
Retrospective analysis was performed of 132 patients with sarcoidosis referred to otolaryngology at a tertiary care referral center between January 2006 and July 2011.

Results:
Sinonasal involvement was evident in 38 cases (28.8%). The mean age was 52 years with female:male ratio of 2.8:1. The most common presenting symptoms included nasal obstruction (65.8%), crusting (29.9%), and epistaxis (18.4%). Most frequent endoscopic findings included crusting (55.3%), mucosal thickening (44.7%), and subcutaneous nodules (21%). CT imaging demonstrated turbinate or septal nodularity (21%), osteoneogenesis (15.8%), and bone erosion (10.5%). Medical management was typically comprised of saline irrigations (73.3%), topical nasal steroids (68.4%), and oral steroids (63.2%). Refractory sinus symptoms required sinonasal surgery in 9 cases (23.6%), including FESS (77.8%), FESS with septoplasty (11.1%) and nasal biopsy (11.1%). Overall symptom improvement was noted in 39.5% at mean follow-up of 16.2 months.

Conclusion:
Sinonasal involvement is noted in approximately 30% of patients with known sarcoidosis presenting to an otolaryngology clinic. Rhinologic morbidity is high with significant number of patients presenting with nasal symptoms and endoscopic evidence of crusting and mucosal thickening. Medical therapy with irrigations and topical/oral steroids suffices in majority of patients, with surgery for refractory symptoms being required in a small subset of cases.

8:12am

One-year Outcomes and Ostial Patency Following Treatment with a Multi-function, Multi-sinus Balloon Dilation Tool

David Brodner, MD
Boynton Beach, FL USA

Background:
A multi-center prospective study was conducted to assess the safety and sustained effectiveness of a new tool possessing multi-functionality as an ostium seeker, suction-irrigator, and malleable balloon-dilator indicated for the treatment of multiple sinuses.

Methods:
Endoscopic balloon-only and hybrid-balloon procedures involving dilation of the frontal recess, maxillary ostium, and/or sphenoid sinus ostium was performed in 175 patients. One-month follow-up was required for all patients. The first 50 patients enrolled also consented to one-year follow-up. Complications and sinus symptom severity were assessed at the one-month visit. Symptom severity and ostial patency of the treated sinuses were evaluated at the one-year visit.

Results:
A total of 496 balloon dilations (279 frontal, 138 sphenoid, 79 maxillary) were performed in 175 patients. Over 96% (478/496) of the attempted sinus dilations were successfully completed while 18 dilations were converted to traditional dissection due to an inability to access or dilate the targeted anatomy. A total of three (1.7%) non-serious adverse events were reported and two were unrelated to the device or the procedure. Forty-six out of 50 patients in the extended follow-up cohort completed one-year follow-up. Sinus symptom improvement in this group improved significantly from an average severity of 1.9±1.1 to 0.8±0.7 ($p<0.0001$) and one-year patency rate per ostium was 90% (80/89). One revision surgery (2.2%) was performed.

Conclusion:
These results indicate that a multi-functional, malleable-tipped device can be safely and successfully used to treat multiple sinuses with sustained ostial patency and symptom improvement and through one-year.

8:18am

In-Office Balloon Dilatation: Results of a Prospective Multicenter Study in 203 Patients

Boris I Karanfilov, MD, Stacey Silvers, MD, Raza Pasha, MD, Ashley Sikand, MD, Alan Shikani, MD, Michael Sillers, MD
Dublin, Ohio USA

Introduction:
Balloon Sinus Dilation (BSD) is an increasingly used tool in Endoscopic Sinus Surgery (ESS). The tissue-sparing nature of the instrumentation allows for properly selected patients to undergo office-based procedures under local anesthesia.

Methods:
This was an IRB-approved, prospective, 14-site trial. Patients requiring ESS for medically refractory chronic sinusitis underwent transnasal BSD treatment in an office setting under local anesthesia. Safety, tolerability, technical success, clinical efficacy (SNOT-20) and radiographic outcome (Lund MacKay (LMK)) of ESS with BSD in the office setting were assessed. Patients were followed at 2, 8 and 24 weeks.

Results:
541 total sinuses were dilated in 203 patients; 48% maxillaries, 45% frontals and 7% sphenoids. 37% of patients were revisions of prior ESS. The mean number of sinuses dilated per subject was 2.7. Technical dilation success was 93%, 90%, and 92% for maxillary, sphenoid and frontal sinuses, respectively. SNOT-20 data and LMK CT scoring showed clinically and statistically significant improvement ($p<0.001$) at 24 weeks follow-up. 83% of patients reported the procedure as tolerable or highly tolerable. There were 0.17 post-operative debridements/patient and the majority of patients returned to normal activity within 48 hrs. One (0.5%) procedure-related adverse event related to periorbital swelling was reported, which spontaneously resolved shortly after the procedure without further sequelae.

Conclusions:
Performance of ESS with BSD in the office under local anesthesia is feasible, well-tolerated, safe, and effective. Twenty-four week follow-up demonstrates clinical and statistical improvement in patient quality of life and radiographic outcomes.

8:24am

Discussion/Audience Response

Moderators: Kevin Welch, MD & Nithin Adappa, MD

8:30am

Corticosteroid Nasal Irrigations after Endoscopic Sinus Surgery in the Management of Chronic Rhinosinusitis

Kornkiat Snidvongs, MD, Elenor Pratt, David Chin, MD, Raymond Sacks, MD, Peter Earls, MD, Richard John Harvey, MD
Sydney, NSW Australia

Introduction:
Inflammatory dysfunction is considered an important part of chronic rhinosinusitis (CRS). Corticosteroid therapy has been widely used in CRS. Effective topical delivery has been previously problematic. The post endoscopic sinus surgery (ESS) corridor is essential for adequate topical drug access. Devices delivering large volume with positive pressure allow better distribution to sinus mucosa. The objective of this study is to evaluate the efficacy of post-operative topical sino-nasal steroid irrigations for CRS.

Methods:
Patients with CRS undergoing ESS after failing previous medical therapy were recruited. Structured histopathology reporting including markers of eosinophilia was performed. After surgery, patients received either budesonide 1mg or betamethasone 1 mg delivered in a 240 mL squeeze bottle daily. The outcomes were symptom improvement by Sino-Nasal Outcome Test 22 (SNOT-22) and endoscopy scores.

Results :
112 patients (age 49.9± 13.7, 41.1% female) were reviewed. Mean follow up was 43.88 ± 29.9 weeks. Pre and post therapy SNOT-22 (2.2±1.1 versus 0.94±0.8,) and endoscopy scores (6.67±3.0 versus 2.51±2.0) revealed significant improvement ($p<0.001$). Patients with high tissue eosinophilia (>10/HPF) performed as well as less eosinophilic patients by SNOT22 ($p=0.42$) and with similar symptom endpoints ($p=0.17$). This subgroup also had significantly more improvement on endoscopy score, $p=0.01$.

Conclusion:
The philosophical approach to ESS in CRS is evolving. Topical therapies, when used appropriately, are highly effective for the most challenging eosinophilic patients. Although corticosteroid is a blunt tool, it is effective when effectively delivered.

8:36am

Antibiotics and Chronic Rhinosinusitis: an Evidenced-based Review with Recommendations

Zachary M. Soler, MD, Samuel L. Oyer, MD, Robert C. Kern, MD, Timothy L. Smith, MD
Charleston, South Carolina USA

Introduction:
Despite widespread use of antibiotics for chronic rhinosinusitis (CRS), available treatment guidelines offer little direction regarding applied antibiotic strategies. The purpose of this study was to review the published literature to evaluate the efficacy of antibiotics for patients with CRS.

Methods:
A systematic literature review was performed while following the Clinical Practice Guideline Manual, Conference on Guideline Standardization, and the Appraisal of Guidelines and Research Evaluation instrument recommendations. Both antibacterial and antifungal antibiotics, as well as formulations for oral, topical, and intravenous routes of administration were reviewed for adult populations.

Results:
Out of 1100 identified literature abstracts, a total of 49 studies met inclusion criteria for review. Focused summary tables of the literature and, when possible, recommendations are provided based on the supporting evidence for each antibiotic strategy, as well as duration of therapy for oral antibacterial antibiotics.

Conclusion:
The available evidence is not strong enough to explicitly recommend specific antibiotic strategies for CRS. Considering the balance of benefit versus harm, short courses (< 3 weeks) of antibacterial antibiotics, prolonged (> 3 months) courses of macrolide antibacterial antibiotics, and topical antibacterial antibiotics should be considered treatment options for CRS. For typical cases of CRS, recommendations are against using intravenous antibacterial antibiotics and all formulations of antifungal antibiotics. These evidence-based recommendations should not necessarily be applied to all patients with CRS and clinical judgment, in addition to evidence, is critical to determining the most appropriate care.

8:42am

Efficacy of Targeted Middle Meatal Antibiotics After Functional Endoscopic Sinus Surgery

Rohan C Wijewickrama, MD, Seth N Willen, MD, Rahul C Gupta, MD, Meir Warman, MD, Yogesh More, MD, Peter J Catalano, MD
Boston, MA USA

Introduction:
Postoperative infection remains a significant comorbidity of endoscopic sinus surgery (delayed healing, synechia formation, etc). The objective of this study was to compare the incidence of postoperative infection following endoscopic sinus surgery in patients receiving conventional post-operative oral antibiotics versus a synthetic bio-absorbable antibiotic soaked nasal sponge used in the middle meatus in lieu of oral antibiotics.

Methods:
A prospective randomized multi-center trial included 288 chronic rhinosinusitis patients undergoing endoscopic sinus surgery who received either 7-days of oral antibiotics and a saline-soaked bio-absorbable middle meatus sponge (control group), or no oral antibiotics and the placement of a Bacitracin-soaked bio-absorbable sponge in the middle meatus (study group). Evaluations performed at baseline, 3-weeks and 3-months post-operatively included Sinonasal Outcome Test (SNOT-20) and nasal endoscopic examination.

Results:
The 3-week postoperative infection rate was not significantly different between the study (n=160) and control groups (n=128); 5.6% versus 1.6%; p>0.05. In addition, there was no significant difference between the two patient groups on evaluation of middle meatal granulations, synechia, middle turbinate lateralization, or sponge retention.

Conclusions:
Antibiotic-soaked synthetic bio-absorbable middle meatus sponges demonstrate equivalent efficacy in controlling post-FESS infections compared to conventional post-operative oral antibiotics. Topical antibiotic delivery to the middle meatus via bio-absorbable sponges may reduce the need for post-operative systemic antibiotics and thereby eliminate the issues of antibiotic side-effects, drug-drug interactions, and compliance in the post-operative setting.

8:48am

Postoperative Debridement After Endoscopic Sinus Surgery: A Randomized Controlled Trial

Brian W Rotenberg, MD, Hussain Alsaffar, MD, Leigh Sowerby, MD
London, Ontario Canada

Objectives/Hypothesis:
Post-operative care to optimize outcomes after endoscopic sinus surgery varies significantly from surgeon to surgeon. A particularly controversial subject is that of debridement. The objective of this study was to determine the effect of weekly versus no debridement on outcome and patient inconvenience.

Methods:
A prospective randomized controlled trial was conducted. Patients with chronic rhinosinusitis with polyposis undergoing endoscopic sinus surgery were randomized to weekly debridements versus no debridements and assessed at 4 weeks with the Lund-Kennedy Endoscopic Scoring System (LKES), the Sino-Nasal Outcome Test-21 (SNOT-21), as well a VAS scale for pain and a novel scoring system for post-operative inconvenience (Post-Operative Inconvenience Scale - POIS). All patients were given instructions to use saline rinses twice daily and a 3 week tapered course of prednisone.

Results:
28 patients fulfilled criteria and completed the study. At 4 weeks, both groups had LKES of 0, with no synechiae noted in either group. Both also groups demonstrated a significant improvement in SNOT score but no difference was present between groups (debridement pre-op 77.1, post-op 7.9; control pre-op 80.3, post-op 6.1). Differences were however noted in both post-operative pain (intervention VAS = 32mm vs. control VAS = 21mm, p=0.014) and inconvenience (POIS) score (17.1 for intervention group vs. 7.9 for control group, p = 0.002).

Conclusions:
Debridement remains an option available to clinicians. However, the absence of debridement does not result in worse clinical outcomes. Patients undergoing debridement have worsened post-operative pain and clinical inconvenience.

8:54am

Discussion/Audience Response

9:00am
Presidential Address
Michael Setzen, MD

9:10am
Invited Speaker - The Role of Cilia in Microbial Detection and Clearance: From Genetics to Biofilms
Noam Cohen, MD

9:35am
Break with Exhibitors

Moderators: Rick Chandra, MD & Doug Reh, MD

10:00am
Microbiome and S. Aureus in Chronic Rhinosinusitis
Vijay R Ramakrishnan, MD, Leah Feazel, MS, Leah Abrass, MD, Daniel Frank, PhD
Aurora, CO USA

Objectives/Hypothesis.
The aim of this study was to use microbiological culture-based and culture-independent methodologies for pathogen identification in chronic rhinosinusitis (CRS) patients. We hypothesized that (a) bacterial culture and DNA sequencing would yield largely concurrent results, though sequencing would detect greater bacterial diversity, and that (b) the relative abundance of certain pathogens would vary between patient populations with and without asthma.

Study Design/ Methods.
Prospective, observational study. Middle meatus swabs of CRS patients were collected during endoscopic sinus surgery and analyzed by clinical culture, broad-range 16S rRNA gene pyrosequencing and/or by duplex quantitative PCR (QPCR) for universal bacteria and Staphylococcus aureus.

Results.
Microbiome Results: Swab samples from 15 CRS patients and 5 non-CRS controls were analyzed. All subjects had positive bacterial cultures, with a mean of 2.8 isolates per subject. By pyrosequencing, specimens generated an average of 1,485 sequences, with >30 genus-level identifications. In most cases, culture results represented the most abundant DNA sequence types.

Quantitative PCR for S. aureus: Swabs from 50 CRS patients were analyzed. The prevalence of S. aureus was similar in CRS patients with and without asthma, 60% (9/15) and 51% (18/35), respectively. When present, the mean relative abundance of S. aureus was 50.1% in CRS with asthma, versus 20.5% in non-asthmatics ($p = 0.04$).

Conclusions.
DNA pyrosequencing revealed greater biodiversity than culture. The relative abundance of S. aureus in CRS patients with asthma is significantly higher than in CRS patients without asthma, possibly indicating a role for S. aureus in these patients.

10:06am
Impact of Intraoperative Mupiricon Rinses on Staphylococcus Aureus
Kristin A Seiberling, MD, Christopher A C, MD, Wilson Aruni, PhD, Shawn Kim, MS1
Loma Linda, CA USA

Introduction:
Antibiotic irrigations are occasionally used during endoscopic sinus surgery when there is evidence of gross mucosal infection. These are thought to flush out pathogenic bacteria and decrease the bacterial load within the mucosal surfaces. However, this has not been studied in vivo and it is unknown whether antibiotic rinses produce a quantitative reduction in pathologic bacteria within the sinus mucosa. The objective of this study was to quantify the amount of S. aureus within the maxillary sinus and to determine the impact of intraoperative mupiricon irrigation on bacterial count.

Methods
Ten patients with symmetric maxillary chronic rhinosinusitis were prospectively enrolled. After bilateral maxillary antrostomies, biopsies were taken of the maxillary sinus mucosa on both sides. In each patient, the right side then was irrigated with 240 cc of normal saline (NS) and the left side was irrigated with 240 cc of NS mixed with 30 mg mupirocin. Repeat maxillary sinus mucosal biopsies were then taken from each side 7-10 days post surgery. Each biopsy was analyzed using quantitative polymerase chain reaction to determine the presence and amount of S. aureus.

Results:
Mupiricon irrigations were found to significantly reduce the amount of S. aureus found within the maxillary sinus mucosa compared to NS alone. The average fold change between the pre and post-treatment biopsies on the right and left was 13.25 and 162.1 respectively ($p < 0.05$).

Conclusion:
Intraoperative mupirion irrigations significantly reduce the amount of S. aureus detected within the diseased sinus mucosa at up to 10 days post-op.

10:12am

Photodynamic Therapy of Antibiotic Resistant Biofilms in a Maxillary Sinus Model

Merrill A Biel, MDPhD, John Jones, MD, Lisa Pedigo, BS, Nicholas Loebel, PhD
Minneapolis, MN USA

Background:
Chronic recurrent sinusitis (CRS) is an inflammatory disease that affects 37 million Americans. There is a significant subpopulation of patients with CRS who remain resistant to cure despite surgery, allergy therapy and prolonged antibiotic therapy. Antimicrobial photodynamic therapy (aPDT) is a non-antibiotic broad spectrum treatment that has been demonstrated to reduce CRS antibiotic resistant polymicrobial biofilms by >99.9% after a single treatment. However, for aPDT to be considered as a therapeutic option for treatment of CRS its tissue safety must be determined.

Objective:
The objective of this study was to determine the effect of methylene blue (MB) aPDT treatment on the cilia and cellular structures of human ciliated respiratory epithelium.

Methods:
EpiAirway™, a human full thickness ciliated mucosa tissue model, was used for the histologic study. In addition to a no treatment control group, 25 µl of saline; 0.03%, 0.09% or 0.3% MB alone; or 0.03% MB and 670nm light administration was administered to the EpiAirway tissue. Following 11.5 minutes of exposure, the tissue was harvested atraumatically and fixed in 10% formalin. The samples were paraffin-embedded, sectioned, H &E stained and mounted. All samples were microscopically examined by a pathologist to assess any effect of MB or aPDT on the tissue, cilia or mucosal glands.

Results:
The photosensitizer and PDT demonstrated no histologic alteration of the cilia, cellular structure or mucosal glands as compared to the untreated control group.

Conclusions:
MB aPDT can safely and effectively treat CRS polymicrobial antibiotic resistant biofilms without any ciliary or tissue damage.

10:18am

Disinfection of Rigid Nasal Endoscopes Following in-vitro Contamination with Staphylococcus Aureus, Streptococcus, Pneumonia, Pseudomonas Aeruginosa and Haemophilus Influenzae

Benjamin D Bradford, BA, Francine E Park, BS, Jared C Hiebert, BS, Kristin A Seiberling, MD, Dennis F Chang, MD,
Loma Linda, CA USA

Introduction:
Rigid nasal endoscopes (RNEs) are commonly used on multiple patients in the outpatient and hospital setting. If not adequately cleaned, these scopes have the potential to cause cross contamination. The purpose of this study is to test the efficacy of various disinfective methods in reducing bacterial load on RNEs in vitro.

Methods:
Staphylococcus aureus, Streptococcus pneumoniae, Pseudomonas aeruginosa and Haemophilus influenzae contamination was separately induced on RNEs in vitro. The RNEs were disinfected using the following protocols: 10 and 5 minute soaks in Cidex OPA, isolated five minute soak in enzymatic soap solution, 30 second wipe with anti-bacterial soap (ABS) and water, 30 second wipe with isopropyl alcohol (IA), isolated 30 second rinse with tap water, 30 second wipe with ABS followed by 30 second scrub with IA, and 30 second wipe with germicidal cloth, all accompanied by pre and post cleaning rinse with 30 seconds of running tap water.

Results:
Most if not all cleaning methods were effective in eliminating S. aureus, S. pneumonia and H. influenzae from the scopes following experimental contamination. Continued growth of P. aeroginosa was found after several of the disinfective techniques including the 5 minute Cidex OPA, 5 minute soak in enzymatic soap and 30 second wipe with ABS and water.

Conclusion:
Various cleaning methods appear to properly disinfect RNEs after inoculation with H. influenzae, S. aureus and S. pneumoniae in an in vitro model. However it appears that disinfectants may be less effective in cleaning rigid scopes experimentally inoculated with P. aeruginosa.

10:24am

Discussion/Audience Response

Moderators: Charles Ebert, MD & Anne Getz, MD

10:30am

Comparison of Disease-specific Quality-of-life Instruments in the Assessment of Chronic Rhinosinusitis

Lourdes Quintanilla-Dieck, MD, Jamie R Litvack, MD MS, Jess Mace, MPH, Timothy L Smith, MD, MPH
Portland, OR USA

Many disease-specific quality-of-life (QOL) instruments exist for chronic rhinosinusitis (CRS), producing confusion about the appropriate application of each instrument. The Rhinosinusitis Disability Index (RSDI) was compared to two other commonly used QOL instruments: the Chronic Sinusitis Survey (CSS) and the Sinonasal Outcomes Test (SNOT-22). We hypothesized that these instruments would not precisely correlate in all domains, rather be complementary for QOL assessment. For the RSDI and CSS comparison, 792 patients from a multi-institutional prospective cohort study were examined. For the RSDI and SNOT-22 comparison, 100 patients from a single institution were assessed. Bivariate correlation coefficients were used to assess linear and nonlinear associations. A systematic literature review was performed using MEDLINE to explore available CRS-specific QOL instruments. Most RSDI domains showed little correlation with the CSS ($r<0.420$; $p<0.001$). In contrast, the RSDI demonstrated considerable correlation with the SNOT-22 ($r = 0.666$; $p<0.001$). With regard to comorbidity, patients with asthma or allergy reported significantly worse CSS scores than patients without asthma or allergy ($p<0.001$). These and other comorbidities had no impact on the RSDI or SNOT-22. Different disease-specific QOL instruments may measure different aspects of CRS impact. The RSDI and SNOT-22 are more sensitive to the emotional impact of CRS, whereas the CSS is more sensitive to medication use and symptoms. Therefore, these instruments play a complementary role in CRS evaluation. Comorbidities present in the study population appear to impact some QOL instruments. Systematic literature review found that the RSDI, CSS, and SNOT-20 are the most commonly utilized CRS-specific QOL instruments.

10:36am

What Rhinologists and Allergists Should know About the Medico-Legal Implications of Corticosteroid Use: A Review of the Literature

David M. Poetker, MD, Timothy L. Smith, MD
Milwaukee, WI USA

Background:
Corticosteroids are a mainstay of treatment in the management of sinonasal inflammatory disease. Despite their common use, many practitioners are not well versed in their potential complications or the medico-legal ramifications of their use. The objectives of this review were to outline the existing data of the medico-legal implications of oral steroids.

Methods:
An OVID search of the terms; corticosteroids or adrenal cortex hormones AND medico-legal, malpractice, jurisprudence, expert testimony, or informed consent was performed. This search was then narrowed to English language articles and the titles and abstracts were searched for relevance.

Results:
An OVID search identified 178 articles. This search was then narrowed, resulting in nine articles that were relevant and included in the current review. Five articles involved database reviews of litigation associated with medications. Steroids were found to be a common medication associated with litigation and the cost of the litigation involving steroid use can be very high. Common themes associated with the litigation include poor communication and lack of informed consent regarding steroid use. Several additional articles addressed single cases and many addressed lawsuit prevention.

Conclusion:
Lawsuits associated with steroids are disproportionately costly and most of the allegations stem from a lack of informed consent over the use of steroids. Open dialogue with patients is the key to informed consent. Ideally, clinicians should discuss the rationale for steroid use, the risks, expected benefits, and alternatives of the steroid therapy. Document this discussion and consider providing educational material for the patient to read and review.

10:42am

Identifying Clinical Symptoms for Improving the Specificity of the Chronic Rhinosinusitis Diagnosis

Bruce K Tan, MD, Wayne Hsueh, BS
Chicago, IL USA

Background:
The symptom criteria for identifying patients with Chronic Rhinosinusitis (CRS) has poor specificity. This limits the non-specialist's ability to identify patients with CRS.

Objective:
To identify items drawn from disambiguating the Rhinosinusitis Task Force criteria, the International Headache Society (IHS) criteria as well as symptom exacerbating triggers that differentiate CRS patients from those with CRS-symptoms but no evidence of inflammation (non-CRS). A Lund-Mckay score >4 was used as the diagnostic gold standard.

Methods:
A retrospective case-control pilot study of 70 patients (35 with CRS, 35 non-CRS) who met symptomatic criteria for CRS. All patients were interviewed prior to endoscopy and CT using a standardized symptom inventory. The two groups were compared, with an a priori 90% power to detect a 40% difference in proportions.

Results:
The most prevalent symptoms in both the CRS and non-CRS groups were nasal congestion, facial pressure and post-nasal drip which were present at similar rates. Of the Task Force major and minor symptoms, only hyposmia predicted CRS (OR 5.7 95%CI 1.7-19.4) while facial pain (OR: 0.3 95%CI 0.1-0.8) predicted non-CRS. Self reported acute symptom exacerbation by aeroallergen (OR: 0.2 95%CI 0.1-0.7) and vasomotor triggers (OR 0.2 95%CI 0.1-0.6) predicted non-CRS. Only 46% of CRS patients and 76% of non-CRS patients reported facial pain thus limiting the power to detect differences using IHS symptoms.

Conclusion:
Hyposmia and the absence of facial pain and symptom exacerbations by vasomotor and aeroallergen exposure increases the pre-CT suspicion for CRS. Further studies are needed to characterize CRS-associated facial pain.

10:48am
Validation of a Novel Sino-Nasal Endoscopy Scoring System: the DIP Score
Megan L Durr, MD, Steven D Pletcher, MD, Andrew N Goldberg, MD, Andrew H Murr, MD
San Francisco, CA USA

Introduction:
There is an increasing need for a validated grading system to assess sinusitis severity as observed on endoscopic examination. Existing endoscopy scales have limitations in complexity, validation, and/or applicability. We present a novel and straightforward endoscopic scoring system measuring discharge, inflammation, and polyps/edema (DIP). The aim of this study is to determine correlation of the DIP score with existing sinus endoscopy scoring systems, and to determine inter-rater and test-retest reliability.

Methods:
This retrospective cohort includes a total of 30 patients who underwent functional endoscopic sinus surgery (FESS) for chronic rhinosinusitis between 1/15/10 and 6/3/11. Sinus endoscopy video archives were queried and scored in a random and blinded fashion by three rhinologists (SDP, ANG, AHM) using the Lund-Kennedy Endoscopic Score (LKES), the Perioperative Sinus Endoscopy (POSE) score, and the DIP score. Pearson correlation coefficients, inter-rater reliability and test-retest reliability were determined.

Results:
The results of this study show that the DIP score correlates well ($p < 0.0001$) with the existing LKES and POSE (Pearson correlation coefficients of 0.780 and 0.902, respectively). The inter-rater reliability (intraclass correlation coefficient) is highest for the DIP score (0.861) followed by the POSE score (0.779) and the LKES (0.696). Test-retest reliability of the DIP score was high with a correlation coefficient of 0.903 ($p < 0.0001$).

Conclusion:
The DIP score is a novel and straightforward endoscopic sinus scoring system which shows good content validity in the post-FESS population. It demonstrates a high correlation with existing scoring parameters (LKES and POSE) and superior inter-rater reliability.

10:52am
Discussion/Audience Response

10:58am
Panel: ARS-AAFPRS
Functional Rhinoplasty: A Delicate Balance of Function and Form
Scott Tatum, MD - Moderator

Panelists:
Jay Dutton, MD; Sam Most, MD; John Rhee, MD; Michael Setzen, MD

12:00pm
Lunch with Exhibitors

1:00pm
Welcome
Todd Kingdom, MD - Program Chair

Moderators: Chris Church, MD & Subinoy Das, MD

1:05pm
Effect of a Dexamethasone Carboxymethylcellulose Middle Meatal Spacer on Endoscopic Sinus Surgery Outcomes in Patients with Chronic Rhinosinusitis without Nasal Polyposis: A Randomized, Double-Blind, Placebo-controlled Trial
Luke R Rudmik, MD, Jess Mace, MPH, Bradford D Mechor, MD
Calgary, Alberta Canada

Introduction:
Off-label drug eluting middle meatal spacers have shown promising results for improving clinical outcomes following endoscopic sinus surgery (ESS) for chronic rhinosinusitis (CRS). This study evaluates a dexamethasone Sinu-Foam™ spacer following ESS for CRS without nasal polyposis.

Methods:
Patients with CRS without nasal polyposis (n=36) were enrolled into a double-blind, placebo controlled trial and randomized into either a treatment arm (dexamethasone Sinu-Foam™ mixture; n=18) or placebo arm (Sinu-Foam™ alone; n=18). Therapeutic outcomes were evaluated at 1 week, 4 weeks, and 3 months using sinonasal endoscopy and graded using the Lund-Kennedy scoring system. Postoperative care included nasal saline irrigations and a short course of systemic steroids.

Results:
All patients completed the study follow-up period. Both study arms experienced significant improvement in endoscopic grading over the study duration ($p<0.001$). There was no difference in average endoscopic scores between the treatment and placebo groups at 1 week, 4 weeks, and 3 months (all $p>0.489$).

Conclusion:
This study demonstrated that an off-label drug eluting middle meatal spacer of dexamethasone and Sinu-Foam™ does not improve endoscopic outcomes in the early postoperative period following ESS when combined with postoperative saline irrigations and a short course of systemic steroids.

1:11pm
Middle Meatal Spacers for the Prevention of Synechiae Following Endoscopic Sinus Surgery - A Systematic Review and Meta-Analysis of Randomized Controlled Trials
John M Lee, MD, Amandeep Grewal, MD
Toronto, Ontario Canada

Background:
Middle meatal (MM) synechiae is the most common complication following endoscopic sinus surgery (ESS) for chronic sinusitis. To prevent synechiae formation, a variety of MM spacers have been employed with varying success in the reported literature. There remains a continued debate on whether MM spacers actually reduce the risk of synechiae following ESS.

Methods:
This was a systematic review of randomized controlled trials evaluating the effectiveness of MM spacers compared to no spacers in patients undergoing ESS. Where appropriate, a meta-analysis on outcome data using a random effects model was performed.

Results:
Eight randomized controlled trials were included in this systematic review. A pooled analysis on relevant trials found a non-significant trend favoring MM spacers compared to no spacers for the prevention of synechiae following ESS (RR 0.40, 95% CI: 0.14, 1.12). Subgroup analysis suggested that non-absorbable spacers (NAS) may be more effective than absorbable spacers (AS) for reducing the risk of synechiae compared to no spacers.

Conclusion:
MM spacers may be more effective than no spacers for the prevention of synechiae following ESS, especially when employing the use of a NAS. However, significant heterogeneity is observed amongst included trials and future studies are needed to further validate these findings.

1:17pm
Basal Lamella Relaxing Incision: A Novel Technique for Increasing Middle Meatal Access During Endoscopic Sinus Surgery
Anne E Getz, MD, Peter H Hwang, MD
St. Louis, MO U.S.A.

Introduction:
Lateralization of the middle turbinate causing occlusion of the middle meatus is a potential adverse outcome of functional endoscopic sinus surgery (FESS), and has been cited as one of the most common factors leading to FESS failure. The aim of this study is to describe a novel technique designed to increase operative area within the middle meatus during FESS.

Methods:
Twenty-nine middle turbinate medializations were prospectively evaluated in 18 consecutive patients undergoing primary endoscopic sinus surgery. Three intra-operative images of the middle meatus were obtained in the native position, after Freer medialization, and after basal lamella relaxing incision (BLRI). Measurements of middle meatal area were then calculated in a blinded and randomized fashion.

Results:
Distances measured from the middle turbinate to the lateral nasal wall for each position ranged from 0-8mm (median = 3.00) for the native position, 0.5-10mm (median = 5.00) for Freer medialization, and 3-21mm (median = 10.00) for BLRI. Friedman's ANOVA showed a significant difference between the three measurements, and the post-hoc Wilcoxon signed-ranks tests showed that BLRI distance [median=10, 95% CI (7 to 11.2)] was significantly larger than both Standard Freer [median=5, 95% CI (4 to 6.2)] and Native [median=3, 95% CI (2 to 3)] and that Standard Freer was significantly larger than Native (all p-values <0.001). There were no complications.

Conclusions:
BLRI is a safe, controlled technique that creates significantly greater operative space within the middle meatus compared to standard medialization techniques, thereby reducing the potential for adverse mucosal trauma and sequelae.

1:23pm
Discussion/Audience Response

Moderators: Joe Han, MD & David Poetker, MD

1:30pm
Intravenous Tranexamic Acid and Intraoperative Visualization During Functional Endoscopic Sinus Surgery: A Double -Blind Randomized Controlled Trial
Morgan A Langille, MD, Graeme Mulholland, David W.J. Cote, MD, Angelo Chiarella, MD, Erin D. Wright, MD
Edmonton, Alberta Canada

Introduction:
Tranexamic acid is an antifibrinolytic that is known to reduce operative bleeding. Bleeding during functional endoscopic sinus surgery (FESS) can hinder surgical progress and may be associated with increased complications.

Objectives:
The current study was designed to assess the effect of intravenous tranexamic acid on intra-operative bleeding, the quality of the surgical field, and surgical outcomes during ESS.

Methods:
A double -blind randomized controlled trial was designed. A power calculation determined that twenty-eight participants would be required for analysis. Patients undergoing ESS for the primary diagnosis of chronic rhinosinusitis with or without polyposis were included. Using block randomization, 14 participants received intravenous tranexamic acid and 14 received intravenous normal saline. The surgeon, anesthetist for the case, and patient were all blinded as to the intervention. Patients with hypertension were excluded from the study. Outcome measures included the Wormald grading scale to assess intraoperative surgical field, estimated blood loss, and ease of the surgical procedure.

Results:
Twenty-eight patients (average age: 46 years, range 23 - 80) were included in the study. Diagnoses included chronic rhinosinusitis (n=4), chronic rhinosinusitis with polyposis (n=23) and chronic rhinosinusitis with septal deviation (n=1). The use of the tranexamic acid was not associated with a significant decrease in estimated blood loss (200 vs. 231 ml; p = 0.60) nor Wormald grading scale (5.50 vs. 5.54; p = 0.95). There were no adverse events or complications during the study.

Conclusions:
Intravenous tranexamic acid does not improve visualization or the surgical field during endoscopic sinus surgery.

1:36pm
Meta-Analysis and Literature Review of Techniques to Achieve Hemostasis in Endoscopic Sinus Surgery
Akhil J Khosla, BBA, Francisco G Pernas, MD, Patricia A Maeso, MD
Lubbock, TX USA

Objective:
Functional Endoscopic Sinus Surgery (FESS) has been used as the standard of treatment for sinonasal disease in those whom medical therapy fails to ameliorate the disease. Intra-operative hemostasis is a crucial factor in FESS. Currently, ideal techniques for creating intra-operative hemostasis have yet to be determined and clarified amongst the literature. We sought to better understand what variables can affect intra-operative blood loss and therefore improve surgical field and outcomes.

Methods:
A literature search was conducted using pubmed, OVID,

and other research databases using keywords such as: FESS, intra-operative blood loss, hemorrhage, vasoconstriction, and others. The found articles were then analyzed and evaluated in regards to FESS patients on intra-operative blood loss, surgical grade, and operative time. Eleven review articles were cross referenced in the meta-analysis to determine the most statistically significant techniques in three main categories: general anesthetics, pre-operative steroids, and the use of epinephrine.

Results:
Within the three fields studied amongst all of the review articles, results indicate that TIVA (total intravenous anesthesia) is statistically more beneficial than BA (balanced anesthesia), the use of pre-operative steroids is statistically more beneficial than placebo, and the use of local anesthetics at a concentration of 1:200,000, and surgical positioning trended towards better hemostasis than placebo usage.

Conclusion:
Meta-analysis of 1148 patients concludes that hemostasis during FESS is best conducted under surgical conditions utilizing TIVA, pre-operative steroids, topical local anesthetic at a concentration of 1:200,000, and reverse Trendelenburg position.

1:42pm
Emergency Management of Internal Carotid Artery Hemorrhage During Endoscopic Surgery
Harry V. Wright, MD, Esther Kim, MD, Louise A. Mawn, MD, Rowan Valentine, MBBS, Peter-John Wormald, MD, Paul T. Russell, MD
Nashville, TN USA

Introduction:
Transnasal endoscopic surgery has increased in both frequency and breadth of application due to superior illumination, magnification and visualization. It is the treatment of choice for medically refractory sinusitis, and is useful in the diagnosis and treatment of disease of the skull base, orbit, and nasolacrimal duct. Major complications of endoscopic procedures include blindness, cerebrospinal fluid leak, meningitis, and intracranial penetration; however internal carotid artery (ICA) injury is the most feared and dramatic complication. We present the case of a patient who sustained iatrogenic ICA injury during endoscopic treatment of complex skull base disease (invasive fungal sinusitis), where hemorrhage was controlled expeditiously by muscle graft overlay technique.

Study design:
Case report.

Technique(s):
The muscle graft is rapidly harvested and, under endoscopic guidance, applied directly to the injured vessel. Graft sources include tongue, quadriceps, temporalis, and rectus abdominus muscle. As demonstrated, the tongue muscle is readily accessible during transnasal surgery, does not require the preparation of a separate sterile operative field, and donor site healing is reliable even in the immunocompromised. The donor site is closed primarily.

Results:
Iatrogenic ICA hemorrhage was controlled with muscle graft overlay. Intraoperative video is provided.

Conclusions:
In this case muscle graft overlay prevented mortality and minimized morbidity, and obviated the endovascular interventions endorsed in current treatment algorithms. Practitioners of endoscopic transnasal procedures should be aware of this technique, and muscle patch overlay should be considered in cases of arterial injury during endoscopic surgery. Current research is focused on elucidating the physiologic mechanism of action.

1:48pm
Discussion/Audience Response

1:54pm
Panel: Allergy Evaluation & Treatment for Improving Rhinologic Outcomes: What is the Evidence?
Moderator: Sarah Wise, MD

Panelists:
Sandra Lin, MD; Chris McMains, MD; Richard Orlandi, MD; Rod Schlosser, MD

3:00pm
Break with Exhibitors

Moderators: Devyani Lal, MD & Naveen Bhandarkar, MD

3:25pm

Quality-of-Life Outcomes Following Multiple Revision Endoscopic Sinus Surgery

John D Clinger, MD, Jess C Mace, MPH, TImothy L Smith, MD
Portland, OR USA

Introduction:
Although overall success rates of endoscopic sinus surgery (ESS) range from 76.0 - 97.5%, ongoing or recurrent symptoms may require revision surgery. Previous studies have shown that revision status is not a predictor of outcomes following ESS, but no distinction has been made between patients undergoing a single or multiple revision procedure. The purpose of this study was to compare quality-of-life (QOL) outcomes and associated risk factors of patients undergoing primary ESS, 1st revision, 2nd, 3rd, 4th, or 5th+ revision ESS.

Methods:
Demographic and risk factor data were collected from a multi-institutional prospective cohort of 552 patients undergoing primary and revision (n=331) ESS for chronic rhinosinusitis. Mean preoperative Lund-Mackay CT scan scores, pre-/post-operative Lund-Kennedy endoscopy scores, Rhinosinusitis Disability Index (RSDI), and Chronic Sinusitis Survey (CSS) outcomes were analyzed using Pearson's chi-squared and one-way analysis of variance.

Results:
Mean preoperative CT scores, RSDI, and CSS measurements were similar between primary ESS and all revision groups. Significantly more primary ESS patients met rigorous criteria for a minimally important difference in QOL improvement than revision ESS patients (73.8% vs. 61.6%; p=0.003). There was no significant difference in mean QOL improvement between revision groups (p>0.174) even when comparing patients with and without nasal polyposis (p>0.312).

Conclusions:
Generally patients undergoing primary, 1st revision, and multiple revision ESS showed post-operative improvement in QOL scores. More primary ESS patients had significant QOL improvement compared to revision ESS patients. There were no significant differences in mean QOL improvement between 1st, 2nd, 3rd, 4th, or 5th+ revision ESS.

3:31pm

Inter-rater Agreement of Nasal Endoscopy for Revision Endoscopic Sinus Surgery

Edward D McCoul, MD, Jess C Mace, MPH, Timothy L Smith, MD, Vijay K Anand, MD, Brent A Senior, MD, Peter H Hwang, MD
New York, NY USA

Objectives:
Nasal endoscopy is an important part of the clinical evaluation of chronic rhinosinusitis. However, its role in evaluating patients who have previously had sinus surgery has not been well studied. The primary aim was to determine the inter-rater agreement for nasal endoscopy performed in the setting of prior sinus surgery.

Methods:
Patients with a history of endoscopic sinus surgery for chronic rhinosinusitis were prospectively enrolled from a tertiary rhinology practice. Fourteen endoscopic nasal examinations were recorded using digital video capture software. Each patient also underwent computerized tomography (CT) and completed the Sinonasal Outcome Test (SNOT-22). Blinded review of inflammatory and anatomic findings for each video was independently performed by 5 academic rhinologists at separate institutions. Comparisons were performed using the unweighted Fleiss' kappa statistic (Kf) and the prevalence- and bias-adjusted kappa (PABAK).

Results:
There were no significant correlations between age, Lund-Mackay score or SNOT-22 score. Inter-rater agreement was variable across the characteristics studied. Mean PABAK was excellent for the assessment of polyps (Kf=0.886); moderate for the assessments of middle turbinate (MT) integrity (Kf=0.543), MT position (Kf=0.443), maxillary sinus patency (Kf=0.593) and ethmoid sinus patency (Kf=0.429); fair for discharge (Kf=0.314), synechiae (Kf=0.257) and middle meatus patency (Kf=0.229); and poor for MT mucosal changes (Kf=0.148) and uncinate process (Kf=0.126).

Conclusions:
The current study was notable for variability in the inter-rater agreement among the inflammatory and anatomic attributes that were examined. Further standardization of nasal endoscopy with regard to technique and interpretation may improve the reliability of this procedure in clinical practice.

3:37pm

Computed Intranasal Spray Penetration: Comparisons Before and After Nasal Surgery

Dennis O Frank, MD, Julia S Kimbell, MD, Daniel E Cannon, MD, John S Rhee, MD
Chapel Hill, NC USA

Introduction:
Quantitative methods for comparing intranasal drug delivery efficiencies pre- and post-operatively have not been fully utilized. The objective of this study is to use computational techniques to evaluate aqueous nasal spray penetration efficacies before and after surgical correction of intranasal anatomic deformities.

Methods:
Ten paired computational fluid dynamics (CFD) models of the nasal cavities were created from pre- and post-operative computed tomography scans in five subjects. Spray simulations were conducted using a particle size distribution ranging from 10-110μm, a spray speed of 3m/s, plume angle of 68o, and with steady state, resting inspiratory airflow present. Statistical analysis was conducted using Student T test for matched pairs.

Results:
Simulation results showed that correcting nasal anatomic deformities improved overall nasal spray penetration past the anterior region. Posterior deposition after surgery increased by 9% and was statistically significant (p-value=0.036), while anterior deposition decreased by 12% and was also statistically significant (p-value=0.020). The fraction of aerosol particles that bypassed the entire nasal cavity either pre- or post-operatively was less than 5%. Posterior deposition differences between symptomatic and less symptomatic sides of the nasal passages were 113% and 30% for pre- and post-surgery, respectively.

Conclusions:
CFD simulations predicted that surgical correction of nasal anatomic deformities can improve intranasal spray penetration beyond the anterior nose to areas where medications can have greater effect. In addition, particle deposition patterns between both sides of the airways are more evenly distributed after surgery. This implies that correcting anatomic deformities may improve medication delivery in patients with sinonasal conditions.

3:43pm

Discussion/Audience Response

3:49pm

Invited Speaker: Surgical Navigation: Past, Present, & Future

Martin Citardi, MD

Moderators: Greg Davis, MD & Raj Sindwani, MD

4:15pm

The Impact of Epstein Barr Virus (EBV) and Helicobacter Pylori (HP) on Developing Nasopharyngeal Carcinomas (NPC)

Mohammad Shayaninasab, MD; M. Hajilooi, MD, Azam Alizamir, MD, S. Torabian, MD
Hamedan, Iran

Introduction:
Nasopharyngeal Carcinoma is a disease with distinct ethnic and geographic distribution. The reasons for these variations may include combination of host genetics, EBV strain variations, and environmental factors such as Helicobacter Pylori. HP infection is very common in human populations and is considered as type one carcinogen. In this study, we examine the existence of EBV and HP infections in nasopharyngeal biopsies using Polymerase Chain Reaction technique.

Methods:
The study was conducted on 120 nasopharyngeal biopsy paraffin blocks. After deparaffinization, DNAs were extracted and PCR was performed to detect Epstein Barr virus (EBER1) and HP infections (urease C gene). The results were collected to test the hypothesis using statistical methods.

Results:
Out of 120 samples, 76 were male (63.3%) and 44 were female (36.7%). The mean age was 38.5 years with standard deviation of 20.9 years. According to our findings, the frequency of EBV infection was 94 (78.3%) with odds ratio 2.832 for NPC, and the frequency of HP was 25 (20.8%) with odds ratio 2.063 for NPC. We observed only two cases (3.6%) which were HP-negative and EBV-negative, with odds ratio 10.946 for NPC.

Conclusion:
The frequency of EBV and HP infections among NPC biopsies is high. This suggests that EBV and HP are necessary for the formation of NPC, and can be considered as risk factors for this disease. Our study indicates that the odds of developing NPC are almost 11 times less in patients without HP and EBV compared to those who have EBV and/or HP.

4:21pm

Altered Mucin Release in Nasal Epithelium of Chronic Rhinosinusitis and Cystic Fibrosis

Do-Yeon Cho, MD, Horst Fischer, PHD, Peter H Hwang, MD, Jayakar Nayak, MD
Stanford, CA USA

Introduction:
Goblet cells in epithelium produce mucin polysaccharides MUC5AC and MUC5B as part of host defense function. Mucin hypersecretion/overproduction, along with airway inflammation, are pathophysiological characteristics of chronic rhinosinusitis (CRS) and cystic fibrosis (CF). The conversion from healthy to pathologic mucin is hypothesized to reflect an altered balance in the production of MUC5AC and MUC5B, and is poorly understood. We analyzed human nasal specimens to assess mucin expression and regulatory cytokines.

Methods:
Human nasal secretions and tissue from three groups (normal, CRS and CF) were collected. We assayed for mucin regulatory cytokines IL-8 and IL-13 using the Luminex assay. H&E staining of the nasal epithelium, as well as immunofluorescence microscopy and qPCR (MUC5AC and MUC5B) of tissue specimens were performed.

Results:
Significantly higher IL-8 levels were detected in CRS ($p=0.01$) compared to controls. mRNA expression for MUC5AC was higher in CRS, whereas mRNA for MUC5B was significantly lower in CRS compared to normal. The ratio of MUC5AC to MUC5B was significantly reduced in controls compared to both CRS and CF. Polarized localizations of MUC5AC (luminal) and MUC5B (basal) were found within the epithelium by immunofluorescence microscopy. CF with G551D genotype demonstrated significant hyperplasia of mucin producing cells in epithelium.

Conclusion:
MUC5AC and MUC5B are expressed in human nasal epithelium, and are present in distinct ratios between control versus patients with CRS and CF. Regulatory cytokines are associated with up-regulation of MUC5AC and down-regulation of MUC5B in particular settings. Altered mucin production may contribute to the pathogenesis of sinonasal disease.

4:27pm

Epithelial Permeability Alterations in an In Vitro Air-Liquid Interface Model of Allergic Fungal Rhinosinusitis

Kyle A Den Beste, BS, Elizabeth K Hoddeson, MD, Charles A Parkos, MD, PhD, Asma Nusrat, MD, Sarah K Wise, MD
Birmingham, AL USA

Background:
Chronic rhinosinusitis (CRS) is an inflammatory upper-airway disease with numerous potential etiologies. Patients with a characteristic subtype of CRS, allergic fungal rhinosinusitis (AFRS), display increased expression of Th2 cytokines and antigen-specific IgE. Various sinonasal inflammatory conditions are associated with alterations in epithelial barrier function. The aim of this study was to compare epithelial permeability and intercellular junctional protein expression amongst cultured primary sinonasal cells from AFRS patients versus non-inflammatory controls.

Methods:
Epithelial cells isolated from paranasal sinus mucosa of AFRS and non-inflammatory control patients were grown to confluence on permeable supports and transitioned to air-liquid interface (ALI). Trans-epithelial resistance (TER) was measured with a horizontal Ussing chamber to characterize the functional permeability of each cell type. After TER recordings were complete, a panel of intercellular junctional proteins was assessed by Western blot and immunofluorescence labeling followed by confocal microscopy.

Results:
After 12 samples were measured from each group, we observed a 41% mean decrease in TER in AFRS cells (296 ± 89 ohms x cm2) compared to control (503 ± 134 ohms x cm2, $P=0.002$). TER deficits observed in AFRS were associated with decreased expression of the tight junction proteins occludin and junction adhesion molecule-A, and increased expression of a leaky tight junction protein claudin-2.

Conclusions:
Cultured sinonasal epithelium from AFRS patients displayed increased epithelial permeability and altered expression of intercellular junctional proteins. Given that these cells were not incubated with inflammatory cytokines in vitro, the cultured AFRS epithelial alterations apparently represent a retained modification in protein expression from the in vivo phenotype.

4:33pm

Rapid Sinonasal Gas Exchange and Flow: A Paradigm Shift in our Understanding of the Functional Sinonasal Interface

Anil Gungor, MD
Shreveport, LA USA

Introduction:
Previous research on computational and physical models of sinonasal flow and gas exchange has asserted that the modes of transport including diffusion and convection which are in turn based on ostium size and gas concentrations, are insufficient to account for a rapid exchange. Based on these physical and computational models, sinus ventilation was calculated to be very slow through the small ostia. However, sinonasal gas exchange has to be rapid and high volume to support the role of nitric oxide (NO) as an inhaled, aerocrine messenger that regulates ventilation-perfusion matching at the alveolar level. Computational and physical models of the sinonasal cavities, and more importantly the sinonasal interface, are far from reproducing the oscillating, vibrating, soft, moist channels that have different dynamics during different phases of respiration. An in vivo human model documenting sinonasal gas exchange dynamics is presented with surprising new data and surgical implications.

Methods:
Direct, real-time maxillary, sphenoid and frontal sinus NO measurements obtained with a chemiluminescence analyzer from healthy adult volunteers during quiet respiration and respiratory maneuvers such as humming and breath-holding.

Results:
Rapid and high volume sinonasal gas exchange is documented in maxillary, frontal and sphenoid sinuses. The exchange is synchronized with the respiratory phase.

Conclusions:
The lateral nasal wall dynamically provides for a sophisticated and rapid sinonasal gas exchange, supporting the role of NO as an aerocrine messenger. This presents surgeons with a challenging paradigm shift dictating the preservation of the natural anatomy, topography and elasticity of the sinonasal interface to maintain function.

4:39pm

Discussion/Audience Response

Moderators: Eric Holbrook, MD & Nate Sautter, MD

4:45pm

Cost-Effectiveness of MRI in Patients with Idiopathic Dysosmia

Jennifer R. Decker, MD, Eric Meen, MD, Robert C. Kern, MD, Rakesh K. Chandra, MD
Chicago, IL USA

Introduction:
Intracranial causes of dysosmia are uncommon. Nonetheless, the gravity of missed diagnoses can be substantial. Cost-effectiveness of MRI in the workup of this condition has not been elucidated. We hypothesize MRI scan performed for idiopathic dysosmia will demonstrate positive findings frequently enough to justify the cost.

Methods:
Records over a 10-year period from a university otolaryngology clinic were queried by ICD-9 code for smell and taste disturbance. One-hundred-twenty cases were identified where the patient underwent MTI because etiology remained unclear following history and endoscopy. Each MRI was reviewed for findings to account for the dysosmia, incidence of neoplasms, and for common incidental findings.

Results:
Among the 120 MRIs, 51(42.5%) were normal, 27(22.5%) demonstrated causes to which the dysosmia was attributed, and 42(35%) had positive but unrelated findings. The common causal finding was fronto-ethmoid sinusitis (18.3%). The most common incidental finding was small vessel white matter disease (19.2%). Neoplasms were observed in 5/120 (4.2%), including two olfactory meningiomas and three benign tumors unrelated to the dysosmia. Therefore, twenty-four MRIs are required in order to diagnose one neoplasm, Using Medicare rates for MRI with gadolinium ($2400), this results in a cost of $57,600 per tumor diagnosed. In contrast, average out of court malpractice settlement approximates $500,000, and average jury award is substantially higher ($4,500,000),

Conclusions:
MRI yielded useful information in nearly a quarter of cases. Although diagnoses such as sinusitis may have been observed by CT, the implications of missing a neoplasm justify the cost of MRI.

4:51pm

The Effect of Two Sphenoidotomy Approaches on the Sense of Smell: Superior Turbinate Intact vs. Superior Turbinate Resection

Andrew Thamboo, MD, Brent Chang, MD, Al-Rahim Habib, MD, Vishnu Sunkaraneni, MD, Iain Hathorn, MD, Amin Javer, MD
Vancouver, BC Canada

Objective:
To evaluate objectively and subjectively the effect of the superior turbinate resection (STR) technique to the superior turbinate intact (STI) technique for sphenoid sinusotomy on olfactory function.

Methods:
Prospective analysis of 36 patients with comparable sinus disease underwent primary sphenoidotomy via STR versus STI technique between October 2010 and November 2011. The patients had their olfaction measured objectively with Sniffin' Sticks pre-operatively and at 5 weeks post-op. Patients also were assessed with a visual analogue scale (VAS) to measure subjective olfactory function. STI (n=25) and STR (n=11) groups were compared using a students t-test. A p-value less than 0.05 was considered significant.

Results:
Objective scores from the Sniffin' sticks provide a Threshold, Discrimination and Identification (TDI) score out of 45. The TDI change (post-operative TDI score minus pre-operative score) was 3.18 +/- 1.6 and 1.18 +/- 3.6 for STI and STR approaches respectively (p = 0.56). Subjectively, patients had a VAS score of 0.73 +/- 0.54 and 1.28 +/- 0.9 for STI and STR approaches respectively (p = 0.58).

Conclusion:
If the STR technique is done meticulously, olfactory fibers along the superior turbinate are spared and patients have the same olfactory relief, objectively and subjectively, as those undergoing the STI technique.

4:57pm

Assessing the Efficacy of Endoscopic Office Olfactory Biopsy Sites to Produce Neural Progenitor Cell Cultures for the Study of Neuropsychiatric Disorders

Bozena B Wrobel, MD, Jill Mazza, MD, Oleg V Evgrafov, PhD, James A Knowles, MD
Los Angeles, CA USA

Introduction:
The olfactory region is capable of continuous neurogenesis. Situated on the cribriform plate and segments of the superior septum and both superior and middle turbinates, it is accessible through office-based biopsy and can be used to generate neural progenitor cells to study molecular abnormalities associated with neuropsychiatric disorders. The purpose of the study was to evaluate the efficacy of the endoscopic office olfactory biopsy from the middle turbinate and superior-posterior septum to produce the neural progenitor cells.

Methods:
Endoscopic office-based biopsy samples were collected and cultured neuronal cells derived from olfactory neuroepithelium (CNON) were established from 40 healthy individuals and 40 schizophrenia patients. All patients underwent biopsies of both the middle turbinate and the superior-posterior septum. Specific culture conditions promoted the growth of neural progenitor cells from these biopsy sites. CNON cultures were established from such outgrowing neuronal cells. The study was IRB approved and informed consent was obtained.

Results:
CNON cultures were successfully developed from 98.8% of participants. No complications were observed. The single unsuccessful specimen lacked growth of all cell types, suggesting that perhaps the sample was mishandled during transport or inappropriately preserved. Overall, we have observed no significant difference in the effectiveness of biopsy from middle turbinate and superior-posterior septum to produce neural progenitor cells.

Conclusions:
The middle turbinate biopsies contain viable neural progenitor cells capable of generating neuronal cell cultures. Thus less risky and technically more simple biopsy of the middle turbinate can be used to propagate neural progenitor cells.

5:03pm

Discussion/Audience Response

5:10pm

Closing Remarks & Meeting Adjourned

Todd Kingdom, MD, Program Chair

Friday, April 20, 2012

Abstracts

1:00pm
Welcome
Todd Kingdom, MD, Program Chair

1:05pm
Invited Speaker: Innovation in Rhinology
Richard Orlandi, MD

Moderators: Vijay Ramakrishnan, MD & Sarah Wise, MD

1:30pm
Olfactory and Sinonasal Outcomes in Endoscopic Skull Base Surgery
Leigh J Sowerby, MD, Menachem Gross, MD, Robert Broad, MD, Erin D Wright, MD
Edmonton, Alberta Canada

Introduction:
Trans-sphenoidal endoscopic skull base surgery has been previously reported to cause a significant deterioration in olfactory function. The objective of this study was to determine the effect of a unilateral middle turbinate-sacrificing approach on olfactory function and sinonasal outcome.

Study Design:
Prospective cohort study comparing olfaction, endoscopic appearance, and subjective sinonasal outcomes pre- and post-transphenoidal skull base surgery.

Method:
Olfaction was measured prospectively using the University of Pennsylvania Smell Identification Test (UPSIT) and by self-reporting of olfactory function. Sinonasal outomes were assessed subjectively via a modified Sino-Nasal Outcome Test (SNOT), and objectively via the Lund-Kennedy Endoscopic Score (LKES). The results were analyzed using paired t-tests.

Results:
To date, thirty patients have been enrolled in the study. In patients who have completed all data acquisition, the mean preoperative UPSIT score was 34.1 and the mean postoperative UPSIT value was actually increased at 35 (p=NS). The average change in score was -0.3, with scores ranging from -3 to +3. When examined categorically, 94% of patients maintained their pre-operative olfactory function classification. There was no significant difference in pre- and post-operative SNOT scores and no patients reported persistent subjective olfactory disturbance. A small increase in the LKES was noted, from a mean of 0.5 to 3 one month post-operatively.

Conclusions:
No significant difference was noted in pre- and post-operative UPSIT scores or olfactory disturbance. SNOT scores were likewise unaffected. This is contrary to several reports in the literature and may be secondary to differences in surgical approach.

1:36pm
Olfactory Outcomes following Endoscopic Pituitary Surgery With or Without Septal Flap Reconstruction: A Randomized Controlled Trial
Samantha Tam, MD, Brian W Rotenberg, MD, Neil Duggal, MD
London, Ontario Canada

Introduction:
Olfaction is an often overlooked complication of endoscopic pituitary surgery. Current evidence suggests olfaction is significantly impaired following surgery. However, the impact of raising a vascularized septal flap has not been quantified. This study aims to investigate this difference.

Method:
This is a single-blinded, randomized controlled trial. Patients undergoing pituitary surgery underwent computerized randomization. Those randomized to the septal flap group had Hadad-Bassagasteguy vascularized septal flaps raised to cover the defect. Those in the no flap group underwent reconstruction with synthetic or non-autologous materials. Subjects were reassigned to the flap group if surgeons deemed the defect too large to forego septal flap reconstruction. University of Pennsylvania Smell Identification Test (UPSIT) was administered pre-operatively and 3 months postoperatively. Results were input into a database and analyzed using t-tests.

Results:
At the time of this abstract, a total of 16 patients were recruited, and 14 completed follow-up. Eight were randomized to receive septal flap. Pre-operatively, UPSIT scores were not significantly different (p=0.077). Pre vs. post comparisons between subjects were significant for a decrease in scores in both groups post-operatively (no flap $p < 0.001$; flap p=0.003). The group undergoing septal flap reconstruction had a significantly worse UPSIT scores post-operatively (p=0.007).

Conclusions:
Our preliminary data indicates that pituitary surgery results in significantly decreased olfaction with or without septal flap. However, septal flap causes a significantly greater decrease in olfaction post-operatively. Considerations should be made regarding long-term olfactory outcomes of using a septal flap and should be discussed with the patient.

1:42pm

Determining the Best Graft-Sealant Combination for CSF Leak Repairs in an Ex Vivo Porcine Model

Marcela Fandino, MD, Kristian I Macdonald, MD, Ian Witterick, MD
Toronto, Ontario Canada

Objectives:
To compare the absolute breaking strength of various cerebrospinal (CSF) leak repairs in an in vitro porcine model.

Methods:
The authors performed an experimental animal study. A burst pressure (BP) testing system was designed using an axial loading force to create hydraulic pressure. Defects measuring 0.5 x 0.5 cm were created in fascia lata samples. Defects were repaired using various grafts (pericranium, Alloderm®, Durasis®) measuring 1.0 x 1.0 cm to cover the deficient area. Grafts were further reinforced onto the fascia background with either Tisseel or Duraseal. Each experiment was conducted 6 times.

Results:
The mean (+/-SD) BP were: Duraseal-Alloderm 12.5+/-5.8 mmHg; Duraseal-Durasis 21.8+/-20.7 mmHg; Duraseal-pericranium 44.7+/-30.1 mmHg; Tisseel-Alloderm 30.6+/-26.3 cmH2O; Tisseel-Durasis 15.8+/-18.6 mmHg; Tisseel-pericranium 95.5+/-86 mmHg. One-way analysis of variance showed that the strongest type of repair was Tisseel-pericranium when adjusting for the others ($p<0.0001$). The difference in mean BP of repairs with duraseal versus Tisseel was not statistically significant ($p=0.22$). The use of Alloderm® and Durasis® decreased the strength of the repair compared to pericranium ($p<0.0001$). Bonferoni comparisons showed a significant difference between pericranium and Alloderm ($p<0.05$) and between pericranium and Durasis ($p<0.05$) but not between Alloderm and Durasis ($p>0.05$).

Conclusion:
The use of pericranium graft improves the biomechanical strength of CSF leak repair compared to Alloderm® and Durasis®. In this model, the strongest type of repair (pressure 6 times higher than normal intracranial pressure) was the combination of Tisseel-pericranium. Our data will help guide surgeons who repair CSF leaks to choose the best graft-sealant.

1:48pm

Accuracy of Intra-operative Frozen Margins for Sinonasal Malignancies and its Implications for Endoscopic Resection of Sinonasal Melanomas

Alexander Chiu, MD, Yue Ma, BS
Tucson, AZ USA

Introduction:
Over the past decade the relative indications for endoscopic resection of sinonasal tumors has increased. Tenets of endoscopic tumor surgery remain similar to open approaches with the goal being the resection of the entire tumor with clear margins. Endoscopes offer the advantage of directed tumor resection and accurate margins in areas adjacent to critical structures. What is not uniformly agreed upon is the optimal margin of resection as well as the reliability of intra-operative frozen margins for the varied histologic subtypes seen in sinonasal malignancies.

Methods:
Retrospective review of malignant sinonasal tumors resected endoscopically by one surgeon at two institutions between 2007 and 2011.

Results:
Thirty patients with mixed histologies were identified with the most common being squamous cell cancer (7/30) and mucosal melanoma (7/30). The overall false negative rate for intra-operative frozen margins was 6.7% with both false negatives associated with mucosal melanoma. The false negative margin rate for mucosal melanoma was 28.6% (2/7). All other sinonasal histologies had a false negative margin rate of 0% (0/28).

Conclusion:
Intra-operative frozen margins for sinonasal tumors are reliable with the exception of those for sinonasal mucosal melanomas. This has implications for the size of margins needed for the resection of sinonasal melanomas as they may need to be larger than those for other sinonasal histologies. Additional research is needed to identify a more reliable and time-efficient method for intra-operative margin analysis for mucosal melanoma.

1:54pm

Discussion/ Audience Response

2:00pm
Panel: Endoscopic Skull Base Surgery: Where Do We Stand?
Moderator: James Palmer, MD

Panelists:
Nithin Adappa, MD; Benjamin Bleier, MD; Richard Harvey, MD; James Palmer, MD; Vijay Ramakrishnan, MD; Brent Senior, MD

3:00pm
Break with Exhibitors

Moderators: Abtin Tabaee, MD & Steven Pletcher, MD

3:25pm
Eosinophilic Inflammatory Mediators in Chronic Rhinosinusitis
Matthew Lam, MD, Laura Hull, Miss, Rohan McLachlan, Mr, Ray Sacks, MD, William Sewell, MD, Richard J Harvey, MD
West Pennant Hills, New South Wales Australia

Introduction:
Chronic Rhinosinusitis (CRS) is a heterogeneous disease and its pathophysiology poorly understood. Inflammatory cell predominance varies from neutrophilic to eosinophilic. The latter is associated with the T helper cell (Th)2 inflammatory response, nasal polyps, greater clinical severity and higher recurrence of disease. Recent immunological studies have implicated three epithelial-derived cytokines (IL-25, IL-33 and TSLP) in the initiation of Th2 inflammation and eosinophilia. This project compared their expression with clinical, histopathological and genetic markers to investigate factors which may drive eosinophilia in CRS.

Method:
Sinus mucosal samples from CRS patients undergoing sinus surgery were analysed for IL-25, IL-33 and TSLP mRNA expression by quantitative PCR. Tumour patients undergoing surgery transnasally with normal sinus mucosa were controls. Gene expression was compared to CRS phenotype, histopathological measures and degree of eosinophil chemoattractant eotaxin-3 mRNA expression.

Results:
39 patients (mean age: 48±15 years, 15 female) 13 CRS with Nasal Polyps (CRSwNP), 20 CRS without Nasal Polyps (CRSsNP) and 7 controls were recruited. IL-25 and IL-33 were significantly overexpressed in eosinophil-dominated CRS compared to lymphocytic/lymphoplasmocytic-dominated inflammation ($p<0.01$ & $p<0.01$) and controls ($p<0.05$ & $p<0.05$). Expression was significantly associated with degree of tissue eosinophilia ($p<0.01$ & $p<0.01$), eotaxin-3 expression ($p<0.05$ & $p<0.01$) and overall inflammatory severity ($p<0.05$ & $p<0.05$). No associations for TSLP were found.

Conclusion::
The overexpression of IL-25 and IL-33 links epithelium-mediated dysfunction with eosinophilia observed in CRS, providing an insight into the aetiology and heterogeneity in CRS. These cytokines and their target receptors and cells may present novel therapeutic opportunities.

3:31pm
Is the Inflammatory Effect in Chronic Rhinosinusitis Eosinophilic or Neutrophilic?
Eric K Meen, MD, Robert C Kern, MD, Rakesh K Chandra, MD, Bruce K Tan, MD, Robert P Schleimer, PhD, David B Conley, MD
Chicago, IL USA

Introduction:
Current paradigms that characterize the dysfunctional inflammation in chronic rhinosinusitis (CRS) suggest a TH1 vs. TH2 polarization in non-polypoid (CRSsNP) and polypoid (CRSwNP) disease respectively. Along these lines, it would be expected that either neutrophils or eosinophils predominate in each subtype. Eosinophilic Cationic Protein (ECP) and Human Neutrophil Elastase (HNE) are markers for activated eosinophils, and neutrophils, respectively. The aim of this study is to evaluate both ECP and HNE levels in the mucus of CRS patients to determine if these products are differentially or exclusively expressed.

Methods:
Nasal washings were collected from 13 patients with CRSsNP, 13 with CRSwNP, and 15 healthy controls. ECP and HNE levels were determined using ELISA.

Results:
Both ECP and HNE were higher in CRSwNP patients compared to controls ($p<0.05$). CRSsNP patients did not exhibit statistically elevated levels of either marker. In all groups combined, there was a weak positive correlation between ECP and HNE levels ($p<0.05$). In subgroups, there were trends towards positive correlations between ECP and HNE in both CRSwNP and control groups, but these were not statistically significant.

Conclusion:
ECP and HNE are both elevated in the nasal lining fluid of CRSwNP patients as compared to CRSsNP patients and controls. With all patients considered together, there

was a positive correlation between ECP and HNE levels. This indicates that the expression of ECP and HNE in nasal mucus is not mutually exclusive. The inflammatory response in CRS does not appear to be characterized by a simple bimodal eosinophil vs. neutrophil predominance.

3:37pm

Utilization of Nasopharyngeal Culture to Determine Appropriateness of Antibiotic Therapy in Acute Bacterial Rhinosinusitis

Stella Lee, MD, Kristin Woodbury, DO, Berrylin J Ferguson, MD
Pittsburgh, PA USA

Introduction:
Rhinosinusitis is one of the top five diagnoses for which an antibiotic is prescribed, often without a clear bacterial etiology. This study evaluated whether nasopharyngeal culture and gram stain could serve as a surrogate for endoscopically-obtained middle meatal cultures in directing appropriate therapy for acute rhinosinusitis (ARS). This study also investigated the utility of a rapid sinus test screen in differentiating bacterial from non-bacterial ARS.

Methods:
Thirty one adult patients met inclusion criteria for ARS. Samples were obtained from both the middle meatus and nasopharynx for gram stain and culture. Nasal mucous samples were further tested with a rapid sinus test screen measuring pH, levels of protein, nitrites, and leukocyte esterase.

Results:
61% of nasopharyngeal and 48% of middle meatal samples grew pathogenic bacteria. The concordance rate was 80% between the two sites. The following pathogenic organisms were detected: Haemophilus influenza, Moraxella catarrhalis,Pseudomonas aeruginosa, Staphylococcus aureus, and Streptococcus pneumoniae. For nasopharyngeal samples reliance on gram stain alone exhibited a sensitivity of 33% and specificity of 100%, and similarly for middle meatus samples, 47% and 93% respectively. The rapid sinus test revealed a sensitivity of 83% and specificity of 7%.

Conclusions:
Nasopharyngeal cultures and gram stain exhibited high concordance with pathogenic bacteria present in the middle meatus in ARS. This may represent a viable diagnostic method especially pertinent in a primary care setting for determining the appropriateness of antibiotic therapy. The rapid sinus test's lack of specificity precluded its utility in the differentiation of bacterial from non-bacterial ARS.

3:43pm

Mometasone Furoate Nasal Spray Is Effective Against Acute Rhinosinusitis Regardless of Allergic History

Bruce M Prenner, MD, David Bernstein, MD
San Diego, CA USA

Introduction:
Acute rhinosinusitis (ARS) is an inflammatory disease triggered by viral or, uncommonly, bacterial infection, causing symptoms for =12 weeks. The effects of mometasone furoate nasal spray (MFNS) vs amoxicillin and placebo on ARS symptoms in patients with or without history of allergic rhinitis (AR) was investigated.

Methods:
A double-blind, parallel-group, placebo- and active-controlled 15-day study randomly assigned patients aged =12 years to MFNS 200 µg BID, MFNS 200 µg QD, amoxicillin 500 mg TID, or placebo to assess AM/PM major symptom score (MSS; sum of rhinorrhea, postnasal drip, congestion, sinus headache, facial pain). Patients were required to have baseline rhinosinusitis MSS of 5-12 points (of maximum 15) and symptoms of 7-28 days duration.

Results:
In a post-hoc analysis of patients without AR history, AM/PM MSS averaged over days 2-15 (n=646) was 3.77 for MFNS BID, 4.07 for MFNS QD, 4.06 for amoxicillin, and 4.55 for placebo; P<0.001, P=0.031, and P=0.025 for MFNS BID, MFNS QD, and amoxicillin, respectively, vs placebo. In patients with AR history, AM/PM MSS over days 2-15 (n=323) was 4.00 for MFNS BID, 4.49 for MFNS QD, 4.87 for amoxicillin, and 4.66 for placebo; P=0.050 and P=0.012 for MFNS BID vs placebo and amoxicillin, respectively (other comparisons NS).

Conclusions:
MFNS BID significantly improved ARS symptoms vs placebo in patients with and without AR history. MFNS monotherapy may be an effective treatment for ARS in addition to its known efficacy against AR.

3:49pm

Discussion/Audience Response

3:55pm
Panel: Sleep and the Nose
Moderator: Mickey Stewart, MD

Panelists:
Michael Friedman, MD; Eric Kezirian, MD; Brent Senior, MD,

5:00pm
Closing Remarks and Adjournment
Todd Kingdom, MD, Program Chair

COSM 2012
Posters
Poster Reception, Elizabeth Foyer - Thursday, April 19, 5:30 - 7:00pm

Poster Number: 1-113
A Case of Respiratory Epithelial Adenomatoid Hamartoma with Extension to the Cribiform Plate
Kyle J. Chambers, MD, Ahmad R. Sedaghat, MD, Ph.D, Daniel S. Roberts, MD,Ph.D, Linda Lee, MD, David S. Caradonna, MD,DMD
Boston, MA USA

Introduction:
Respiratory epithelial adenomatoid hamartomas (REAH) of the sinonasal tract are characterized by disorganized proliferation of cellular components from the Schneiderian epithelium that is self-limited and benign. Patients commonly present with symptoms of a nasal mass: obstruction, chronic rhinosinusitis, epistaxis, and/or hyposmia/anosmia. In cases arising from the olfactory cleft, controversy exists over whether subtotal versus total resection should be performed. We present a case report illustrating bilateral nasal REAH arising from the olfactory recess.

Methods:
This is a case report of a 56-year-old woman with anosmia and obstructing nasal masses arising from the superior nasal cavity.

Results:
A CT-scan demonstrated opacification of the anterior ethmoid air cells and marked demineralization of the cribiform plate. MRI demonstrated enhancing masses in both nasal passages extending from the cribiform plate. The patient underwent biopsy and sub-total resection of the masses, with histopathology revealing respiratory epithelial adenomatoid hamartoma. Post-operatively, this patient remains disease- and symptoms-free. Pre- and post-operative imaging and histopathology are presented and pertinent literature is reviewed.

Conclusions:
Subtotal and total resection are the two current treatment strategies for symptomatic respiratory epithelial adenomatoid hamartomas when the olfactory cleft is involved. Available outcomes data do not support aggressive surgical management of olfactory cleft REAH. This case demonstrates that subtotal resection alone may safely provide improvement in patient symptoms. We emphasize the significance of awareness for and correct identification of REAH as it may spare the patient from aggressive surgical resection or post-operative corticosteroid exposure that is reserved for other clinical entities on the differential.

Poster Number: 1-114
A Case Report of Intra-Operative Retroorbital Fluid Dissection After Frontal Minitrephine Placement
Jamie N Andrews, MD, Erik Weitzel, MD
San Antonio, TX USA

Objective:
To present a previously unreported complication of minitrephine placement and irrigation of the frontal sinus outflow tract.

Methods/Results:
A 24-year-old male with advanced allergic fungal sinusitis (AFS), and bony erosion of the left lamina papyracea underwent bilateral, complete sphenoethmoidectomies and frontal sinus minitrephine placement. Image guidance confirmed the placement of the trephine into the left frontal sinus and flourescin stained dye was noted to emerge from the frontal outflow tract endoscopically. During irrigation of the frontal sinus, significant proptosis was noted of the left eye. It was immediately apparent that the orbital contents had massively expanded pushing the globe forward, from a retro-orbital fluid dissection. Immediately, a lateral canthotomy with cantholysis, and orbital floor decompression was performed. Ophthalmology consultation was obtained and the patient incurred no long-term vision complications. The patient subsequently underwent a Draf III procedure and exploration of the superior orbit without further complications.

Conclusions:
This case report stresses the importance to pre-dissect

the frontal outflow tract, until minitrephination irrigation can be performed without any additional pressure being applied to the plunger. One must also use special caution in cases where there is clear orbital dehiscence in the frontal sinus caused by mucoceles or advanced sinus disease. If fluid fails to emerge from the frontal outflow tract or the eye becomes tense upon palpation, further irrigation should immediately stop and attention should be directed toward management of a retro-bulbar fluid dissection.

Poster Number: 1-115
A Novel Chitosan-PEG Nasal Packing
Nadim Bikhazi, MD, Michael Scheuller, MD, Michael Catten, MD
Ogden, UT USA

Introduction:
The optimal form of nasal packing after endoscopic sinus surgery still remains elusive. The goal of packing is adequate hemostasis, adhesion control by tissue separation, and patient comfort. This study presents results of preliminary evaluations of a novel chitosan-polyethylene glycol (PEG) derivative designed to combine tamponade with inherent hemostatic capability, to provide a durable stenting effect during healing, and to elicit desirable degradation characteristics relative to commercially available dressings.

Methods:
Sterile samples were fabricated and evaluated on the bench-top for their ability to swell upon exposure to fluid to stent or maintain spacing between two surfaces under load, for hemostatic potential, for degradation performance, and to examine the morphology of the materials as they degrade under simulated physiologic conditions.

Results:
The samples absorbed an average of 43.2 fold of the dry mass when immersed in a saline solution for one minute. Fully hydrated samples maintained a measureable separation between two surfaces under a 50 gram load for 8 days. The samples transitioned from a hydrated sponge to a viscous, mucus-like gel, and finally to a water-soluble solution at full degradation.

Conclusion:
The novel chitosan-PEG hydrogel of the study has potential to address many of the shortcomings of currently used pack materials by combining inherent hemostatic control with tamponade, providing significant swelling and material turgidity to maintain tissue separation during wound healing, and having favorable degradation characteristics to improve patient comfort.

Poster Number:1-116
A Novel Endoscopic Approach to the Sella: The Intraseptal Approach
Majestic Tam, MD, Harry VanLoveren, MD, James T May, MD, Justin Sweeney, MD, Siviero Agazzi, MD, Mark H Tabor, MD
Tampa, FL USA

Introduction:
The pedicled nasoseptal flap (NSF) has become a valuable reconstructive option following endoscopic skull base surgery. Completely endoscopic resection of pituitary and sellar tumors using a bi-nostril technique generally requires posterior septectomy, compromising the NSF. The flap must be raised at the onset of the operation if it is to be preserved. Routine elevation of this flap is excessive; therefore we describe a novel endoscopic approach to the sella which allows for flap preservation without initial mobilization.

Methods:
The endoscopic septoplasty approach is initially used to expose the sphenoid rostrum. Bilateral endoscopic sphenoidotomy is performed. The endoscope is held beneath the septal flap while the tumor is removed via the contralateral nostril. Should the NSF be required, superior and inferior incisions are made and the flap is rotated to cover the defect. Twenty consecutive patients underwent the intraseptal approach to the sella by the same surgeon (MHT).

Results:
Of 20 cases using the intraseptal approach, the NSF was mobilized in 12/20 (60%) patients to cover exposed arachnoid or close a cerebrospinal fluid leak. One of the 20 (5%) patients had a post-operative leak which was subsequently repaired. There were no other operative morbidities.

Conclusions:
The intraseptal approach is a novel and safe technique for completely endoscopic resection of sellar and parasellar lesions preserving the NSF without initial mobilization.

Poster Number: 1-117

A Novel Finding on Computed Tomography in the Diagnosis and Localization of Cerebrospinal Fluid Leaks

R. Peter Manes, MD, Matthew W Ryan, MD, Bradley F Marple, MD
New Haven, CT USA

Objective:
To describe a clinical and radiographic pattern of findings that helps localize the site of spontaneous cerebrospinal fluid (CSF) leaks.

Study Design:
Retrospective review of CSF leaks treated at the University of Texas Southwestern Medical Center from 2000 to 2009. Data collected included demographics, nature of presentation, imaging findings, intraoperative location of skull base defect and clinical follow-up.

Results:
46 patients' charts were reviewed. Among these patients, 15 did not show a bony skull base defect on high resolution CT scan. They did, however, each show a small area of opacification in the olfactory cleft. In each case, this area of opacification correlated with the site of the CSF leak. Intrathecal fluorescein was not utilized, except in two instances. Successful repair was noted in all patients on follow up, without evidence of recurrence at the repair site.

Conclusions:
In the absence of a clearly identifiable bony skull base defect, opacification of the olfactory cleft is a localizing sign in some cases of spontaneous CSF rhinorrhea. Such a finding should direct endoscopic repair, and may serve as the only marker for the specific leak site.

Poster Number: 1-118 - Withdrawn

Poster Number: 1-119

A Rare Case of a Large Solitary Enchondroma of the Nasal Cavity: Case Report and Review of the Literature

Victor M. Duarte, MD, Ali Sepahdari, MD, Jeffrey D. Suh, MD, Scott D. Nelson, MD
Los Angeles, CA USA

Objective:
Participants should be able to have a better understanding of the clinical course, pathology, and treatment of sinonasal enchondromas.

Methods:
Case report with literature review.

Results:
A 10 year-old male presented with a two-year history of progressive upper airway obstruction. CT imaging showed a mass filling the right nasal cavity, inseparable from the nasal septum, extending to the left cribriform plate, with scattered areas of calcification in a rings and arcs pattern, with expansion into the oral cavity through the hard palate. MRI demonstrated a hypointense, 53 mm x 67 mm expansile lesion with remodeling of the right hard palate and lateral nasal wall extending to the contralateral left cribiform plate. Gross excision of the tumor was performed via an endonasal endoscopic approach. Pathology was diagnostic for enchondroma. There was no infiltration by the tumor and no mitoses were evident.

Conclusion:
Enchondromas are benign intramedullary tumors composed of nodules of hyaline cartilage. They represent a distinct histological entity from chondromas, which occur in the soft tissues. Unlike chondromas, which are more frequently encountered sinonasal tumors, this is the first reported case in the literature of a solitary sinonasal enchondroma. Local recurrences are uncommon after gross total resection based on review of patients who have had surgery for multiple enchondromas. More data to conclude whether solitary enchondromas can transform to malignant tumors, as has been reported with patients with multiple enchondromas such as in Mafucci's and Ollier's disease.

Poster Number: 1-120

A Unique Case of Rhinocerebral Mucormycosis: With Review of Literature for Current Treatment of Acute Invasive Fungal Rhinosinusitis

Nathan Deckard, MD, Varun Bhandarkar, BS, Tyson Fisher, MD, Mahdi Shkoukani, MD
Detroit, Michigan USA

Background:
Acute invasive fungal rhinosinusitis (AIFRS) results from the rapid spread of fungi in the nasal cavity mucosa and sinuses to extranasal sites such as the orbit, vasculature, and brain. At our institution we encountered a unique case of a 59-year-old gentleman presenting with rhinocerebral mucormycosis secondary to diabetic ketoacidosis with extensive invasion of the brain parenchyma, notably bilateral frontal lobes with minimal nasal/paranasal disease. During endoscopic evaluation there were no suspicious areas for mucormycosis by exam, nor by frozen sections. This prompted a review of the literature regarding current medical and surgical treatment regimens and the utility of intra-operative frozen sections.

Methods:
We present the symptomatology and course of a case of rhinocerebral mucormycosis, followed by a literature review on the treatment options, and the utility and benefit of intra-operative frozen section to guide debridement.

Results:
Current management involves intravenous administration of amphoterecin B with aggressive surgical debridement. Recent literature also demonstrates clinical benefit of adding echinofungin. In our case all frozen sections were returned as negative and final pathology identified mucormycosis on only one septal biopsy. After complete treatment, the patient has survived and is improving neurologically despite the extensive neurological involvement at his initial presentation.

Conclusion:
AIFRS is a rapidly progressive disease with high mortality rates. Aggressive medical therapy with amphoterecin B and adjunctive echinofungin, as well as surgical debridement improved the prognosis for this patient despite severe disease. Literature has shown high predictive value for frozen sections taken intra-operatively, which may be used to guide debridement.

Poster Number: 1-121
Abducens Nerve Palsy Following Lumbar Drain Placement: Case Report and Systematic Literature Review
Rachel B Cain, MD, Naresh P Patel, MD, Devyani Lal, MD
Phoenix, AZ USA

Objectives:
To study reports and causes of abducens nerve palsy following dural puncture procedures

Methods:
A systematic literature review was conducted (Pubmed, 1950-September 2011; Key words: abducens, sixth-nerve palsy, lumbar, puncture, cerebrospinal fluid, drain, dural, intracranial hypotension, transsphenoidal)

Results:
We report a case of abducens nerve paralysis following lumbar drain placement for endoscopic transsphenoidal pituitary macro-adenoma resection. Lumbar drain placement and surgery were uneventful. The drain was kept closed intra-operatively. Left-sided abducens nerve palsy was noted immediately postoperatively. Postoperative CT and MRI revealed no injury to the abducens nerve, cavernous sinus, orbital apex, petrous apex or orbit. The patient recovered sixth nerve function completely in 6 weeks. Traction/ ischemic nerve injury due to lumbar drain placement was therefore concluded to be cause of palsy. A systematic literature review conducted for cases of abducens nerve palsy following dural puncture procedures found 23 studies (21 case reports and 2 case series). Twenty-nine patients with temporary or permanent abducens nerve palsy were reported. The reported procedures included diagnostic lumbar puncture, spinal anesthesia, intra-thecal catheterization and shunting. Traction and local ischemia due to sudden intracranial hypotension at the petroclival junction were proposed as causes of palsy.

Conclusions:
Lumbar puncture procedures carry a rare risk of abducens nerve palsy from ischemic or traction injury. Routine use of lumbar drain during endoscopic skull base surgery is not without risk, and need for its placement should be carefully determined. Knowledge of such rare complications is helpful in risk-benefit analysis as endoscopic skull base techniques gain popularity with Otolaryngologists.

Poster Number: 1-122
An Anatomic Study of an Endoscopic Transnasal Transorbital Approach to the Lateral Orbital Apex
Bianca M Kenyon, Ms, Jastin Antisdel, MD
Saint Louis, MO USA

Objectives:
Current literature suggests that lesions of the lateral and superior orbital apex should not be approached via an endoscopic transnasal technique. In this study, we performed an anatomic dissection to investigate the feasibility of an endoscopic transnasal approach to the lateral orbital apex.

Design:
Five cadavers with no prior history of sinus surgery were studied bilaterally. Karl Storz 0- and 30-degree rigid rod-lens endoscopes and standard surgical instruments were utilized for the dissections. Uncinectomy, maxillary antrostomy, ethmoidectomy and sphenoidtomy were performed to gain access to the orbit.

Results:
The inferior aspect of the lamina papyracea and the medial portion of the orbital floor are resected. The periorbita is incised from posterior to anterior along the inferomedial aspect of the orbit, and enough orbital fat is removed to gain a satisfactory view of the surgical field. The medial and inferior rectus muscles are dissected and retracted to allow visualization of the optic nerve. By dissecting inferior to the optic nerve and utilizing a 30-degree endoscope, the lateral orbital apex could be accessed without damage to the optic nerve.

Conclusions:
In patients whose vision is irreparably damaged, endoscopic approaches to lesions of the lateral and superior orbital apex are feasible. For patients with intact vision, endoscopic approaches to the superior orbital apex are still counterindicated, as important neurovascular structures are present in the surgical path. However, we found that lesions of the lateral orbital apex can safely be accessed by an endoscopic approach inferior to the optic nerve.

Poster Number: 1-123
Angiomyolipoma of the Nasal Cavity: A Case Report and Review of the Literature
Ayaka J Iwata, MS, David R Friedmann, MD, Jeffrey Kaplan, MD, Beverly Wang, MD, Richard A Lebowitz, MD
Seattle, WA USA

Introduction:
A 67 year old man with past medical history remarkable only for recurrent right-sided epistaxis was found to have an angiomyolipoma (AML) of the nasal cavity. AMLs are rare benign tumors that occur most frequently in the kidneys or the liver, but may present in the head and neck.

Methods:
Prior to referral, biopsies from the right inferior turbinate revealed chronic inflammation and focal squamous metaplasia. Fiberoptic nasopharyngoscopy demonstrated a submucosal mass in the right nasal cavity indistinct from the inferior turbinate. A sinus CT revealed a soft tissue mass in the anterior nasal cavity, without aggressive features. A complete endoscopic resection of the mass was performed.

Results:
Pathology of the 1.6x0.5x1.3 cm specimen demonstrated smooth muscle cells, mature adipose cells, and thick-walled vessels consistent with AML, a benign mesenchymal tumor composed in varying proportions of these three tissue types. AMLs may occur in association with the tuberous sclerosis complex (TSC), or occur sporadically, as in this case.

Conclusions:
AMLs of the nasal cavity are uncommon, and may present with recurrent epistaxis and a visible mass on nasal endoscopy. These lesions should be included in the differential diagnosis of benign nasal masses. Management includes complete surgical excision with pathologic confirmation. Unlike the more frequent renal and hepatic AMLs associated with tuberous sclerosis, reported AMLs of the head and neck have not been seen in association with TSC. In fact, so called mucocutaneous AMLs of the nasal cavity and skin constitute a histologically distinct entity from AML of other organs.

Poster Number: 1-124
Assessing for Differences in Skull Base Height in Posterior Ethmoid Inflammation
Philip G Chen, MD, Kaelyn Krook, BS, Spencer C Payne, MD
Charlottesville, VA USA

Introduction:
One surgical landmark in ethmoidectomy is the transition point (TP) from the horizontal to vertical basal lamella of the middle turbinate, with normal values recently described. We sought to find differences in the location of the TP with regards to the angle from the vestibule, distance from the floor, and distance from the skull base between patients with and without posterior ethmoid sinus inflammation.

Methods:
Retrospective review of our surgical database was performed for CT scans of patients who underwent primary surgery over a 40 month period. Two independent reviewers. Exclusion criteria included age under 18 years, prior surgery, poor quality imaging, or tumor.

Results:
71 CTs met inclusion criteria. Angle from the nasal floor to TP was 48.20 (right) and 48.44 (left) degrees. Vertical distance from the floor to TP was 29.28 (SD = 3.34) and 28.89 mm (SD = 3.18 mm) on the right and left, respectively. Distance from TP to ethmoid roof was 17.20 (SD = 3.34) on the right and 17.32 mm (SD = 3.41 mm) on the left. Pearson correlation demonstrated inter-rater reliability of approximately 0.80. The angle differed between control and diseased subjects (t-test $p < 0.05$ left, $p = 0.08$ right).

Conclusion:
This method has good inter-rater reliability. A significant decrease in the angle from the palate to TP in patients with ethmoid inflammation was identified on the left and trended towards significance on the right. No difference existed regarding height from palate to TP and TP to ethmoid roof.

Poster Number: 1-125
Bilateral Juvenile Nasopharyngeal Angiofibroma: Report of a Case
Edward C Wu, BS, Michael A German, MD, Davin W Chark, MD, Joseph D Brunworth, MD, Terry Y Shibuya, MD, Naveen D Bhandarkar, MD
Orange, CA USA

Background:

Juvenile nasopharyngeal angiofibroma (JNA) is the most common benign neoplasm of the nasopharynx. Almost always unilateral on diagnosis, JNAs are locally invasive and may extend across the midline, giving a false bilateral appearance; as such, true bilateral JNA is exceedingly rare. We present a recent case of true bilateral JNA.

Methods:
Single case report of a patient with bilateral JNA, including clinical presentation, diagnosis, and management.

Results:
The patient presented with unilateral nasal obstruction and recurrent epistaxis. Computed tomography and magnetic resonance imaging demonstrated bilateral, non-contiguous masses. Angiography revealed independent vascular supplies from each respective side with no bilateral supply noted. The patient underwent preoperative embolization followed by endoscopic surgical removal; no complications were noted.

Conclusion:
The vast majority of JNAs are unilateral, though invasive growth to the contralateral side may appear "bilateral" in presentation. True bilateral JNA is difficult to diagnose clinically but must be considered and properly evaluated for.

Poster Number: 1-126
Blood Transfusion Requirements for Endoscopic Sinonasal Inverted Papilloma Resections
Al-Rahim R Habib, San Sunkaraneni, MD, Iain Hathorn, MD, Aviva Srubiski, Ms, Amin R Javer, MD
Vancouver, BC Canada

Introduction:
Endoscopic resection of sinonasal Inverted Papilloma (IP) tumors has been shown to reduce intra-operative blood loss and recovery time compared to open approaches. We set out to investigate the incidence of blood transfusion for endoscopic sinonasal IP surgeries.

Methods:
A retrospective analysis of endoscopic sinonasal IP surgeries over a 10-year period was performed. Age, sex, pre-existing co-morbidity, use of anti-coagulants, tumor type and stage, time of surgery, estimated blood loss and the requirement for blood transfusion were recorded.

Results:
82 patients were included (57 males, 25 females). 4 (5%) Stage 1, 7 (8.5%) Stage 2, 62 (75.5%) Stage 3 and 9 (11%) Stage 4 IP tumors were identified according to the Krouse staging system. 3 (4%) patients required blood transfusion, all of whom had Krouse Stage 4 tumors. 3 of the 9 (33%) Stage 4 tumors therefore required blood transfusion. Stage 4 tumors were significantly associated with blood transfusion ($p < 0.05$). Higher staged tumors were associated with greater blood loss ($p < 0.05$) than lower staged cases. No other tumor stage required blood transfusion and no other pre-operative variable was associated with requirement for blood transfusion.

Conclusion:
Endoscopic sinonasal IP resections rarely require blood transfusions. No pre-operative factor other than tumor stage is associated with the requirement for blood transfusion. We would therefore suggest that only Stage 4 IP tumors require pre-operative type and screen.

Poster Number: 1-127
CD8+ Cytotoxic Lymphocyte Infiltration of the Sinus Mucosa is Reduced in CD8+-Deficient Patients
Saud R Alromaih, MD, Sawsan Al-Mot, Leandra Mfuna Endam, Martin Desrosiers, MD
Montreal, Quebec Canada

Introduction:
Immunodeficiency is increasingly suspected as a contributing factor in refractory chronic rhinosinusitis (RCRS.). We recently described the novel finding that low circulating CD8+ (Cytotoxic T-lymphocytes) was frequent (12.8%) in patients with RCRS (Alromaih, 2011), and associated with a more severe form of CRS. We wished to verify 1) Whether circulating CD8+ level influenced CD8+ infiltration of the sinus mucosa and 2) Whether CD8+ level at the mucosal level impacted evolution of CRS.

Methods:
Endoscopic sampling of the sinus mucosa using protected cytology brushing was performed in post-ESS CRS patients (5 with low systemic CD8+ levels and 10 consecutive unselected CRS patients). Cytology slides were prepared using the Cytospin technique and immunocytochemistry (ICC) used to quantify CD8+ T-lymphocyte infiltration.

Results:
Mucosal CD8+ T-lymphocyte count was lesser in CRS patients with low systemic CD8+ than in unselected CRS cases (6.6 vs. 3.8 cells per high-powered field (HPF); p=0.39). When patients were assessed according to clinical status, there was a trend towards lower mucosal CD8 levels in patients with uncontrolled CRS, however this did not attain statistical significance (7.0 vs. 4.0 cells/HPF; p=0.18);

Cconclusion:
In CRS patients, low levels of circulating CD8+ T-lymphocytes are associated with reduced infiltration of CD8+

lymphocytes in the sinus mucosa as well. As CD8+ cytotoxic lymphocytes are responsible for clearing diseased cells infected with intracellular pathogens, reduced CD8+ lymphocyte captivity may contribute to the persistence of intracellular microorganisms recently described in CRS.

Poster Number: 1-128
Choice of Nasal Packing Following Skull Base Reconstruction: Analysis by Subsite
Jonathan Y Ting, MD, Arthur W Wu, MD, Eric H Holbrook, MD, Stacey T Gray, MD, Ralph B Metson, MD, Benjamin S Bleier, MD
Boston, MA USA

Introduction:
Endoscopic reconstruction of skull base defects relies on multilayer grafting techniques in order to achieve a water-tight closure. Given the current lack of effective tissue sealants, prevention of CSF leak requires post-operative packing to maintain adequate tonic pressure on the repair site in the acute post-operative period. The goal of this study is to determine whether the pressure exerted by two common forms of nasal packing differs by defect subsite.

Methods:
We performed a cadaveric study in two specimens following complete skull base dissection from clivus to posterior frontal table and limited posterior septectomy. Controlled skull base defects were created subtending the cribiform plate and sella/clival recess. A pressure transducer was placed within both defects and coupled to a manometer. Packing consisting of a 30cc anterior balloon or two expandable polyvinyl acetate(PVA) sponges were placed and the subsequent pressure developed at the defect site was measured in cmH2O. Results were compared using a 2-tailed Student's t-test.

Results:
Both packing methods provided measurable tonic pressure at either defect site. No significant differences were noted between subsites. The balloon pack provided 3.67 times greater pressure at both subsites as compared to two PVA sponges (5.5+/-0.57cmH2O vs. 1.25+/-0.50cmH20, $p<0.05$).

Conclusions:
The pressure provided by PVA sponge and balloon packing does not significantly differ between anterior cribiform and intra-sphenoidal defects. The balloon packing method provides significantly greater tonic pressure at both sites suggesting that this method may be preferable in the setting of high flow CSF leaks or elevated intracranial pressure.

Poster Number: 1-129
Chromosomal Loci in Cystic Fibrosis and Chronic Sinusitis
Jonathan Y Ting, MD, Arthur W Wu, MD, Eric H Holbrook, MD, Stacey T Gray, MD, Ralph B Metson, MD, Benjamin S Bleier, MD
Boston, MA USA

Introduction:
Endoscopic reconstruction of skull base defects relies on multilayer grafting techniques in order to achieve a water-tight closure. Given the current lack of effective tissue sealants, prevention of CSF leak requires post-operative packing to maintain adequate tonic pressure on the repair site in the acute post-operative period. The goal of this study is to determine whether the pressure exerted by two common forms of nasal packing differs by defect subsite.

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Conclusions:
The pressure provided by PVA sponge and balloon packing does not significantly differ between anterior cribiform and intra-sphenoidal defects. The balloon packing method provides significantly greater tonic pressure at both sites suggesting that this method may be preferable in the setting of high flow CSF leaks or elevated intracranial pressure.

Poster Number: 1-130
Complete Endoscopic Resection of a Solitary Fibrous Tumor of the Nasal Cavity Arising From the Cribriform Plate
Roheen Raithatha, MD, Aaron Pearlman, MD
New York, NY USA

Background/Methods:
Solitary fibrous tumor (SFT) was first described as a spindle-cell tumor of the pleura. It has since been described in extra-pleural locations. There have been approximately 30 cases of nasal SFT reported in the literature.

The patient is a healthy 48-year-old male who presented with a history of vertigo and chronic right- sided nasal obstruction. Nasal endoscopy showed a smooth, polypoid mass filling the right nasal cavity. CT and MRI were significant for a 6x2x4cm right nasal cavity mass displacing the septum to the left and extending posteriorly to the sphenoethmoidal recess. Superiorly, it extended to the skull base, with resultant thinning of the cribriform plate. In-office biopsy was consistent with solitary fibrous tumor. He was sent to neuro-interventional radiology for angiography; however, no significant feeding vessels were identified and no embolization was performed.

The patient underwent a purely endoscopic resection using a combination of the coblator, microdebrider, and cold instruments. The mass was attached to the anterior skull base along the cribriform plate. The mucosa was stripped centrally along the skull base to expose bone. As SFT is a benign tumor and the cribriform plate was thinned on CT scan, the medial tumor remnant that was adjacent to the exposed bone was widely cauterized, in effort to avoid a CSF leak that could be caused from blunt dissection.

Conclusion:
SFTs have been reported to cause bony destruction and the malignant potential is unclear. Though rare, it is important for Otolaryngologists to consider SFTs in the differential diagnosis of sinonasal neoplasms.

Poster Number: 1-131
Contemporary Management of Frontal Sinus Mucoceles: A Meta-analysis
Andrew M Courson, MD, James A Stankiewicz, MD, Devyani Lal, MD
Phoenix, AZ USA

Background:
Low evidence level (retrospective studies) supports surgical techniques for frontal mucoceles

Objectives:
1. Conduct meta-analysis of publications to build evidence level
2. Analyze contemporary management

Methods:
Systematic literature review was conducted. Studies with sufficient outcome data (specific approach, recurrence, complications) were included for meta-analysis. Recurrence, complications, and rationale for approach were compared between contemporary (2002-2011) and historic (1975-2001) studies. The authors' series was analyzed separately.

Results:
Twenty-nine studies (28 retrospective, 1 prospective) were included. Historic cases included 423 mucoceles from 11 studies (49 month follow-up). Contemporary cases comprised 489 mucoceles from 18 studies (56.5 month follow-up). Endoscopic techniques were used in 24.8% of historic versus 50.5% of contemporary cases. Recurrence was 4.7% (3.0% endoscopic; 5.6% external) in historic and 3.3% in contemporary studies (3.3% endoscopic; 3.6% external). Complication rate was 3.4% in historic (0.8% endoscopic; 5.4% external) versus 2.5% in contemporary studies (0.8% endoscopic; 4.0% external). Authors recommended endoscopic techniques in 46% of historic and 82% of contemporary studies. Indications for external approaches included unfavorable anatomy, lateral disease and scarring. In the authors' series, 94% of 133 mucoceles were treated endoscopically. Open approaches were used prior to image guidance availability, and for scarred lateral disease.

Conclusions:
Strong evidence supports surgical treatment of frontal mucoceles. Results from endoscopic and open approaches are comparable. In our experience, 94% were managed endoscopically. Contemporary authors advocate endoscopic management, with limited indications for more morbid open approaches However, open approaches continue to be employed frequently, perhaps reflecting expertise and equipment required for endoscopic techniques.

Poster Number: 1-132
Controlled Clinical Trial using Chitosan Membrane for Nasal Packing
Maria Ivette Muciño-Hernandez, Ph.D, Miguel Ricardo Ochoa-Plascencia, Ph.D, Hector Macias-Reyes, Ph.D, Luis Humberto Govea-Camacho, Ph.D, Alejandro Gonzalez-Ojeda, Ph.D, Jose Clemente Vasquez-Jimenez, Ph.D
Tlajomulco de Zuniga, Jal México

Background:
Nasal packs are placed posterior to nasal surgery to pre-

vent postoperative bleeding without damaging the mucous membrane of the nose and should provoke minimal tissue reaction. The properties and characteristics of the chitosan makes it a potentially usefull biodegradable material with healing and haemostatic properties.

Objective:
The aim of this study was to compare postoperative results between Chitosan and gauze nasal packs.

Material and Methods:
Twenty-four adults who underwent septoplasty were randomly assigned to have one side of their nose packed with 3% Chitosan membrane pack and the other with gauze. We measured the difference in pain levels and bleeding, using a visual analogue scale, both with the pack in situ and on removal.

Results:
The mean pain scores while the packs were in situ were 0.83± 0.38 for 3% Chitosan and 2.54 ± 0.51 for gauze ($p < 0.001$). The mean pain score on removal of the 3% Chitosan was zero and for the gauze was 3.12 ± 0.74, not comparable. Bleeding was similar with both during the first day, but at removal 3% Chitosan had better haemostatic effect 0.42 ± 0.50 vs 0.96 ± 0.75 with p 0.002.

Conclusions.
The 3% Chitosan packs are less painful and offer good postoperative haemostasis, without side effects or harm to nasal mucosa, compared with gauze packs.

Poster Number: 1-133
Effect of Antimicrobial Photodynamic Therapy on Ciliated Respiratory Mucosa
Merrill A Biel, MD, PhD, John Jones, MD, Lisa Pedigo, BS, Nicholas Loebel, PhD
Minneapolis, MN USA

Background:
Chronic recurrent sinusitis (CRS) is an inflammatory disease that affects 37 million Americans. There is a significant subpopulation of patients with CRS who remain resistant to cure despite surgery, allergy therapy and prolonged antibiotic therapy. Antimicrobial photodynamic therapy (aPDT) is a non-antibiotic broad spectrum treatment that has been demonstrated to reduce CRS antibiotic resistant polymicrobial biofilms by >99.9% after a single treatment. However, for aPDT to be considered as a therapeutic option for treatment of CRS its tissue safety must be determined.

Objective:
The objective of this study was to determine the effect of methylene blue (MB) aPDT treatment on the cilia and cellular structures of human ciliated respiratory epithelium.

Methods:
EpiAirway™, a human full thickness ciliated mucosa tissue model, was used for the histologic study. In addition to a no treatment control group, 25 µl of saline; 0.03%, 0.09% or 0.3% MB alone; or 0.03% MB and 670nm light administration was administered to the EpiAirway tissue. Following 11.5 minutes of exposure, the tissue was harvested atraumatically and fixed in 10% formalin. The samples were paraffin-embedded, sectioned, H &E stained and mounted. All samples were microscopically examined by a pathologist to assess any effect of MB or aPDT on the tissue, cilia or mucosal glands.

Results:
The photosensitizer and PDT demonstrated no histologic alteration of the cilia, cellular structure or mucosal glands as compared to the untreated control group.

Conclusions:
MB aPDT can safely and effectively treat CRS polymicrobial antibiotic resistant biofilms without any ciliary or tissue damage.

Poster Number: 1-134
Endoscopic Management of an Ethmoid Schwannoma
Rohit Garg, MD, Joseph Brunworth, MD, David Keschner, MD, Terry Shibuya, MD, Jivianne Lee, MD
Irvine, CA USA

Introduction:
Paranasal schwannomas are particularly uncommon lesions, accounting for less than 4% of all head and neck schwannomas. Few cases of ethmoid schwannomas have been reported in the literature, with the primary treatment modality being surgical excision via external approaches.

Methods:
We present a case of a schwannoma of the ethmoid cavity. The clinical presentation, radiographic features, surgical approach, intraoperative findings, treatment, and outcome of the case were examined.

Results:
A 43-year-old female presented with left facial pain and pressure for 9 months. Magnetic resonance imaging (MRI) revealed a left ethmoid mass that measured 2.5 cm x 1.0 cm x 2.6 cm. The patient had a history of prior transnasal excision of a left nasal mass in 2007 with pathologic findings consistent with schwannoma. She developed a cerebrospinal (CSF) leak postoperatively which required bifrontal craniotomy for repair. Nasal

endoscopy revealed a smooth pinkish mass at the site of a previous middle turbinate resection. The patient was successfully managed with an exclusively endoscopic approach with reconstruction of the anterior skull base with tensor fascia lata graft. Complete resolution of symptoms was achieved and there was no evidence of tumor recurrence or CSF leak after 12 months of follow-up.

Conclusion:
Sinonasal masses including schwannomas have become increasingly more amenable to endoscopic removal due to advances in surgical technique and instrumentation. Although lesions with associated orbital and/or intracranial complications may still necessitate an external procedure; this will likely change in the future as endoscopic approaches continue to progress.

Poster Number: 1-135
Endoscopic Management of Dento-Alveolar Lesions: A Shift in Paradigm
Devyani Lal, MD, Karel A DeLeeuw, DDS
Phoenix, AZ USA

Background:
Reports of endoscopic approach to maxillary dento-alveolar pathologies is sparse. We present novel techniques to illustrate advantages and technical feasibility…

Objectives:
Present novel techniques in endoscopic management of maxillary dento-alveolar lesions

Methods:
Case series of 4 patients

Results:
Two patients were treated for peri-apical pathology related to tooth # 14 and Tooth #15. Proliferative heterotopic bone associated with probable odontogenic versus neoplastic periapical pathology was noted on radiography. Biopsy to rule out neoplasia was performed through an endoscopic middle meatal maxillary antrostomy. Injury to the sinus mucosa and infra-orbital nerve from a traditional sublabial approach were minimized. The third patient had a recurrent odontogenic keratocyst (OKC) involving the posteromedial maxillary alveolus. A prior intra-oral approach had failed. Endoscopic medial maxillectomy was performed and the OKC was marsupialized into the maxillary sinus. The fourth patient presented with proptosis secondary to a large fibro-osseous mass arising from the maxillary alveolus and posterior wall displacing the orbital floor superiorly. A medial maxillectomy was performed. A mini-trephination through the canine fossa was then used to assist with control of hemostasis and dissection through a 4 handed technique. The medial maxillectomy approach afforded better illumination and magnification, and created an access tract for surveillance in both these patients. The traditional approaches would include a Lefort 1 osteotomy or a large transantral sublabial window.

Conclusions:
We describe novel endoscopic techniques to dento-alveolar pathology. This approach offers decreased morbidity, better visualization, preservation of dento-alveolar anatomy, preservation of sinus mucosa and function, and access for surveillance.

Poster Number: 1-136
Endoscopic Partial Medial Maxillectomy with Mucosal Flap for Treatment of Postoperative Maxillary Sinus Mucoceles
Megan Durr, MD, Andrew Goldberg, MD
San Francisco, CA USA

Introduction:
Postoperative maxillary sinus mucoceles are difficult to treat. The objective of this study is to describe a technique of endoscopic partial medial maxillectomy with mucosal flap for postoperative maxillary sinus mucoceles and to present a case series.

Methods:
This case series includes four subjects with postoperative maxillary sinus mucoceles who underwent endoscopic partial medial maxillectomy with a mucosal flap. We will discuss the clinical presentation, imaging characteristics, operative details, and outcomes.

Results:
All four subjects underwent endoscopic partial medial maxillectomy with mucosal flap. One subject (25%) had bilateral maxillary sinus mucoceles. Two (50%) had unilateral right sided mucoceles, and one (25%) had a unilateral left sided mucocele. All subjects had a history of multiple sinus procedures for chronic sinusitis including Caldwell-Luc procedures ipsilateral to the mucocele. Three (75%) underwent endoscopic middle meatal antrostomy for the postoperative mucocele and developed recurrence of symptoms and mucocele at an average of 12 months. All subjects underwent endoscopic partial medial maxillectomy without complication and were symptom free at the last follow up appointment, average 24 months after medial maxillectomy.

Conclusions:
Many postoperative maxillary sinus mucoceles can be difficult to treat via middle meatal antrostomy, especially when located inferiorly or posteriorly within of the maxillary sinus or when extra-sinus extension is present. For postoperative maxillary sinus mucoceles in locations that

are difficult to reach via the middle meatus antrostomy, we recommend endoscopic medial maxillectomy with mucosal flap. Our preliminary experience with four subjects demonstrates complete resolution of symptoms after this procedure.

Poster Number: 1-137
Endoscopic Repair of Patulous Eustachian Tube - A Prospective Series
Brian W Rotenberg, MD, Sumit K Agrawal, MD
London, Ontario Canada

Objective:
To review the authors' experience with endoscopic patulous Eustachian tube (pEt) surgery and demonstrate the surgical technique to the audience.

Methods:
Prospective data was collected on consecutive patients undergoing surgery for recalcitrant pEt. Data collected included demographics, pre/post-op audiogram details, post-operative complications, and subjective data on symptomatic changes.

Results:
Eleven patients underwent surgery for pEt between Jan 2008 and Feb 2011. All cases achieved symptomatic improvement, with 1 patient undergoing revision surgery and 1 patient electing to have both ears done. There were no complications either surgically or audiometrically at 6 months follow-up. The technique will be presented in detail via videos.

Conclusion:
Surgery for pEt is technically feasible and demonstrates sustained symptomatic improvement at at least 6 months out from surgery.

Poster Number: 1-138 (Withdrawn)

Poster Number: 1-139
Endoscopic Skull Base Surgery: Review of Recent Experiences
Jack Russo, MD, Joseph Paydarfar, MD, Kadir Erkmen, MD
Lebanon, NH United States

Background:
Endoscopic skull base surgery (ESBS) is a rapidly-evolving, multidisciplinary field with distinct advantages. We present our experience with ESBS at a rural, tertiary care medical center to add to the collective knowledge in this field.

Methods:
Cases of ESBS performed between 2008 and 2011 were included. Demographics, clinical features, and outcomes were tabulated and salient aspects of representative cases are presented.

Results:
Nineteen cases were included. Mean patient age was 55.6 years (SD 18.3, range 14-86 years) and 10 patients were male (53%). Surgery was performed for neoplasm in 13 cases (68.4%), and 5 (38.5%) of these tumors were malignant. A transnasal endoscopic approach was utilized in all cases with addition of a sublabial endoscopic approach in 3 cases (15.8%), external frontal sinusotomy in 2 cases (10.5%), and craniotomy in 1 case (5.3%). Dura was resected in 2 cases (10.5%). Vascularized tissue was used for reconstruction in 5 cases (26.3%), including pericranial, septal, and turbinate flaps. Abdominal fat grafts were used in 9 cases (47.3%) and DuraGen™ in 5 cases (26.3%). There were no significant intraoperative complications. Mean hospital length of stay was 4 days (SD 2.57, range 1-9 days). Four patients (21.1%) received postoperative chemoradiotherapy and 1 (5.3%) underwent subsequent open resection. The mean length of follow-up was 9.6 months (SD 9.4, range 0.6-28.4 months) and 16 patients (84.2%) had no evidence of disease at their most recent follow-up.

Conclusions:
ESBS is an effective technique for management of benign and malignant skull base pathology in appropriately-selected patients.

Poster Number: 1-140
Endoscopic Transsphenoidal Surgery for Petrous Apex Cholesteatoma: Technical and Other Unique Considerations
Devyani Lal, MD, Ryan L Kau, MD, Naresh P Patel, MD
Phoenix, AZ USA

Background:
Endoscopic transsphenoidal approach (ETA) to petrous apex lesions are well described, but only one case series (2 patients) has been described for PACs. In that report, resection of PAC matrix caused CSF leak and pontine stroke. While the endoscopic route is advantageous in cochleo-vestibular preservation, there are challenges unique to PAC surgery.

Objectives:
Highlight considerations in management of PAC by ETA

Methods:
Case report and technical notes

Results:
A large petroclival PAC was treated by ETA. The petrous apex and midline clivus was widely drilled from the level of the sellar floor (between paraclival ICA) toward the occipital condyles. Keratin debris was then removed. The matrix was tightly adherent to an exposed ICA and posterior fossa dura, and was left undisturbed. The patient was discharged on POD1 with intact hearing. The opening was stented for 3 weeks, and remains patent on follow-up.

Technical notes:
Radical removal of PAC matrix risks CSF leak, stroke, hemorrhage and death due to its adherence to the dura, ICA and basilar artery. CSF leak repair is difficult and risks trapping squamous epithelium. Marsupialization is therefore preferable to radical removal. Periodic debridements via the ETA may be more critical to long-term control than a patent marsupialization, as PAC debris is unlikely to self-cleanse. Indeed, communication into the sphenoid/ nasopharynx may be a potential conduit for matrix super-infection and patients must be closely followed.

Conclusions:
ETA to PAC offers hearing preservation and shorter hospitalization. Factors unique to PAC dictate modification to standard endoscopic petrous apex approaches.

Poster Number: 1-141
Endoscopic Vidian Neurectomy as a Treatment of Facial Neuralgia Caused by Vidian Nerve Xanthoma
Marcelo B Antunes, MD, Carol Yan, BS, Jason G Newman, MD
Philadelphia, PA USA

Introduction:
The vidian nerve, derived from the union of the greater deep and superficial petrosal nerves, provides parasympathetic innervation to the ipsilateral lacrimation apparatus and nasal mucosa. While rare, vidian neuralgia is a type of facial pain caused by compression or irritation of the vidian nerve that has yet been thoroughly characterized and the treatment for which remains ambiguous.

Methods:
Case report and review of the literature.

Results:
The authors report a case of a 23-year old male who presented with unremitting mid-facial pain refractory to medical treatment and subsequent functional endoscopic sinus surgery. Upon further examination, he was diagnosed with a xanthoma of the bone in the sphenoid sinus compressing the vidian nerve, and symptomatically improved with a vidian neurectomy and xanthoma resection.

Conclusion:
This is the first case report of a vidian neuralgia caused by a vidian nerve xanthoma that was successfully treated by an endoscopic vidian neurectomy.

Poster Number: 1-142
Evaluation of Domestic and Yucatan Swine Nasal Sinus Anatomy as a Model for Future Sino-nasal Research
Jay Ching-Chieh Wang, MD, Iain Hathorn, MD, Al-Rahim Habib, Estelle Chang, MD, Amin Javer,MD
Vancouver, BC Canada

Purpose:
Swine nasal mucus membrane has been shown to be a suitable model to study drug absorption. We set out to understand the sino-nasal anatomy of the domestic and Yucatan swine and determine their feasibility as an animal model to test new medications and drug eluting stents in sinuses.

Method:
Two domestic pig heads (6lbs, 13lbs) and two Yucatan pig heads (both 5lbs) were imaged using helical thin slice (1mm) CT. Two experienced rhinologists analyzed the images and performed nasal endoscopy on the swine. Particular attention was given to accessing the frontal sinus and suturing stents to the nasal septum using standard endoscopic instruments.

Results:
CT confirmed the domestic and Yucatan swine sino-nasal anatomy is similar to human, with maxillary, frontal, ethmoid, and sphenoid sinuses all present. The middle and inferior turbinates of swine arise from a single uniturbinate, and the superior turbinates contain large concha bullosa. The swine nasal septum is bone anteriorly and cartilage posteriorly, opposite to the human septum. The frontal sinus ostia, regardless of head size, were 10cm from the nasal aperture. On endoscopy, domestic swine frontal sinus ostia were easily accessible for topical medication deposition using standard zero degree endoscopes and straight instruments. Silastic splints can be sutured to the septum through the posterior cartilaginous portion, allowing for studies involving medication-eluting stents. However, the narrower snout in the Yucatan pigs prohibited endoscopic maneuvers, even with a pediatric scope.

Conclusion:
Domestic swine, but not Yucatan pigs, appear to be a feasible model for future sino-nasal research.

Poster Number: 1-143 - Withdrawn

Poster Number: 1-144
Health Care Utilization in Patients with CRS
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Background:
Rhinosinusitis has been estimated to affect up to 15% of the population and to cost the US healthcare system in excess of $5 billion. Despite these aggregate figures, there is a paucity of data regarding how specific services are utilized by CRS patients, particularly as a function of comorbid conditions.

Methods:
Retrospective case-control study of CRS patients managed by the Geisinger Health Plan over a 3-year period. Outpatient and emergency room visits, and inpatient admissions were tallied for various comorbidities using ICD-9 and CPT coding. Medication prescriptions and procedures were also quantified. Patients were stratified by polyp status and compared to a matched group of nonCRS controls.

Results:
The study population included >15,000 subjects. Visits to the outpatient office and emergency room, and inpatient admissions were significantly greater in CRS patients than controls. The majority of utilization occurred in the outpatient ambulatory setting. Comorbidities for which CRS patients tended to use most services included acute rhinosinusitis, bronchitis, allergic rhinitis, URI, asthma, conjunctivitis, diabetes, headache, chronic rhinitis and pharyngitis. Among CRS patients, those without polyps manifested significantly greater use of antibiotics and antihistamines, while intranasal steroids use was greater in polyp patients. Nonpolyp CRS patients more frequently underwent skin testing, but those with polyps more likely underwent CT scans, endoscopy, and surgery.

Conclusions:
Healthcare resource utilization for comorbid conditions was significantly greater in CRS patients than controls. Collectively, much of this was attributable to outpatient clinic visits and for many diagnoses that also involve aerodigestive inflammatory disease.

Poster Number: 1-145
Histopathological Evaluation of Chronic Rhinosinusitis: A Critical Review
Nancy Jiang, MD, Robert C Kern, MD, Kenneth W Altman, MD, Ph.D
New York, NY USA

Introduction:
Chronic rhinosinusitis (CRS) is a term that describes a constellation of symptoms, including facial pressure/pain, hyposmia, rhinorrhea, and nasal congestion. On histopathological evaluation of tissue samples from patients with CRS, the disease can be divided into pathophysiologically distinct subgroups. This brings into question the potential diagnostic value of performing tissue analysis of CRS specimens beyond routine hemotoxylin and eosin staining.

Methods:
A PubMed search was untaken to identify articles that evaluated the histopathological features of CRS. Six hundred and fifty two relevant articles were identified and after application of specific exclusion criteria, 130 articles were further reviewed in detail.

Results:
All articles included analysis of tissue samples from either in-office biopsies or intraoperative specimens of patients who underwent sinus surgery. CRS was often further divided into subgroups and compared to each other and to a control group. The subgroups included CRS with nasal polyps and CRS without nasal polyps, asthmatics and nonasthmatics, and with and without eosinophilia. Distinct inflammatory mediators were found for the different subgroups. Twenty-seven articles evaluated these inflammatory markers for their potential value as prognostic indicators.

Conclusions:
CRS is a heterogeneous disease based on its histopathological findings. Routine H&E staining is suboptimal to distinguish among these subgroups. Assessment of specific inflammatory mediators in sinus mucosa specimens may help provide prognostic information and guide more tailored treatment for the individual patient. However, further research needs to reflect a consensus on the subgrouping of patients, consistent comparisons between groups, and larger sample sizes.

Poster Number: 1-146

IL-17A Contributes to Develop and Regulate Allergic Inflammation in a Murine Allergic Rhinitis Model

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Background:
Interleukin (IL)-17A is a well-known pro-inflammatory cytokine. Despite the important role of Th17 cells in acute airway inflammation, the role of IL-17A in allergic rhinitis (AR) remains unclear.

Objective:
The objective of this study investigated the role of IL-17A in the allergic response in AR.

Methods:
Wild-type BALB/c and IL-17A-deficient mice were immunized intraperitoneally and were challenged intranasally with ovalbumin (OVA). Allergic symptom scores, eosinophil infiltration, serum IgE level, and the levels of several cytokines in nasal lavage fluid and splenocyte supernatants were analyzed.

Results:
IL-17A levels increased significantly in OVA-sensitized wild-type mice than in the negative control group. IL-17A-deficient mice showed a significant decrease in allergic symptoms, serum IgE levels, and eosinophil infiltration into the nasal mucosa compared to wild-type mice. IL-17A-deficient mice also showed decreased histamine and cysteinyl leukotriene release. Bone marrow-derived mast cells from IL-17A-deficient mice showed significantly lower degranulation and secretion of TNF-?. Moreover, IL-17A deficiency attenuated IL-5 level in nasal lavage fluid and its production in response to OVA, however did not increase IFN-? production and its level in nasal lavage fluid. In addition, Secretion of IL-17A from spleen cells induced the expression of pro-inflammatory cytokine mRNA in macrophages. The mean level of pro-inflammatory cytokines including TNF-? and IL-1?, decreased in IL-17A-deficient mice.

Conclusions:
These results suggest that IL-17A may partly contribute to the development of nasal allergic inflammation in an AR animal model and regulate AR via the activation of pro-inflammatory cytokines as well as modulation of Th2 cytokine.

Poster Number: 1-147

Incidence of Neoplasia in Clinically Suspicious Nasal Lesions and the Value of CT Imaging in Diagnosis

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Introduction:
There is currently no consensus as to whether all routine bilateral polypectomy specimens should be sent for formal histopathological diagnosis to exclude underlying neoplastic pathology. Our aim was to assess the necessity for histopathological investigation as routine practice in every case of bilateral and unilateral nasal lesions by estimating the incidence of unexpected pathologies. We also aimed to evaluate the use of CT scans in predicting histopathological diagnosis in patients with unilateral nasal lesions.

Methods:
Retroprospective analysis of 98 patients undergoing nasal polypectomy at a tertiary referral centre over a 12-month period. Evaluation of preoperative CT scans based on total and asymmetry index scores of the Lund-Mackay staging system.

Results:
5/23 patients (22%) with a unilateral lesion on rigid nasendoscopy had inverted papillomas (IP) on histopathological examination. None of the 75 patients (0%) with clinically bilateral lesions on rigid nasendoscopy showed evidence of neoplasia on histopathological examination. Patients with IP had lower total Lund-Mackay scores on their CT scans compared to patients with bilateral polyps (4.75±5.06 vs 15.53±6.15, P=0.0002). Asymmetry scores of IP patients (2.75±1.71) were higher compared to patients with both bilateral and unilateral polyps (0.74±0.85 and 0.75±0.85, P=0.0001 and P=0.0025).

Conclusion:
Our results suggest that only unilateral lesions need to be sent for histopathological diagnosis as no unexpected histopathological diagnoses were made in patients with bilateral lesions. CT imaging may have a role in predicting histopathological diagnosis by demonstrating asymmetry and less overall extent of sinus opacification in neoplastic lesions in these patients.

Poster Number: 1-148

Increased Expression of the G-protein Coupled Receptor EBI2 in Chronic Rhinosinusitis with Nasal Polyps

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Chicago, IL USA

Background:
Recent studies have shown molecules involved in B cell development and recruitment such as BAFF, CXCL12, CXCL13, as well as the respective receptors are elevated in nasal polyps (NPs) associated with chronic rhinosinsusitis (CRS). These findings suggest that during polyp formation there are processes that induce the recruitment, activation, class switch recombination, Ig production, and differentiation of B cells to plasma cells. EBI2 (Epstein-Barr virus induced gene 2) is a chemotactic receptor on B cells essential for localization to the outer follicles and formation of plasma cells.

Objectives:
The objective of this study was to investigate the expression of the G-protein coupled receptor EBI2, which is known to be a chemotactic receptor on B cells in mouse models.

Methods:
We collected nasal tissue from patients with CRS and control subjects. We assayed mRNA for EBI2 by sing microarray and real-time PCR and measured EBI2 protein by means of Western blot and immunohistochemistry.

Results:
EBI2 mRNA levels were significantly increased in NPs from patients with CRS with nasal polyps (CRSwNP; $P < .05$) compared to uncinate tissue (UT) from patients with CRS or control subjects. EBI2 protein levels were also significantly increased in NPs ($P<0.05$) compared to UT from patients with CRS and control subjects. Immunohistochemical analysis revealed EBI2 expression in mucosal epithelial cells and inflammatory cells.

Conclusion:
Overproduction of EBI2 in NPs might contribute to the pathogenesis of CRSwNP through the recruitment of B cells and differentiation of plasma cells.

Poster Number: 1-149

iNOS Expression Associated With Lymphocytic Response In WTC-Exposed Chronic Rhinosinusitis

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Introduction:
The World Trade Center (WTC)-exposed population has a high prevalence of chronic rhinosinusitis (CRS). We hypothesize that these patients have a unique lymphocyte profile and differ in the expression of inducible nitric oxide synthase (iNOS) than non-WTC-exposed patients with CRS.

Methods:
Pathology specimen blocks were obtained retrospectively from 26 WTC-exposed and 26 non-WTC-exposed subjects who underwent sinus surgery. Hematoxilyn & Eosin staining, immunohistochemistry for CD3, CD4, CD8, CD20 lymphocytes, and iNOS were obtained. Slides were blindly graded by 3 immunopathologists. iNOS expression was compared to lymphocytic response.

Results:
H&E staining was consistent among all specimens for acute and chronic inflammation. A Mann-Whitney U test was conducted. Average ranks of lymphocyte subpopulations (Controls vs. WTC-exposed) were: CD3 27.23 vs. 23.63 ($z = -0.966$, $p = 0.334$), CD4 27.54 vs. 23.29 ($z = -1.274$, $p = 0.202$), CD8 25.37 vs. 25.65 ($z = -0.073$, $p = 0.942$), CD20 27.15 vs. 23.71 ($z = -0.980$, $p = 0.327$), and iNOS 37.00 vs. 53.00 ($z=-0.653$, $p = 0.257$). There was substantial interrater agreement (? = 0.64). There was a positive correlation between the amount of iNOS expression and lymphocyte recruitment (correlation coefficients: CD3 0.491, CD4 0.519, CD8 0.374, CD20 0.355).

Discussion:
WTC-exposed patients requiring endoscopic sinus surgery have a lymphocytic response consistent with CRS, with no significant differences observed in lymphocyte recruitment or iNOS expression between the two groups studied. There was a positive correlation between iNOS expression and lymphocyte infiltration. Further studies evaluating the pathophysiology of WTC-exposed patients are indicated.

Poster Number: 1-150
Intracranial Abscess: A Rare Complication of Nasal Septal Abscess
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Introduction:
When left untreated, a septal hematoma can develop into a nasal septal abscess; further progression can lead to intracranial complications. We present the case of an intracranial abscess that developed secondary to a nasal septal abscess.

Methods:
Case report and review of the literature

Results:
A 22-year-old male presented with seizures 8 days after facial trauma. CT imaging demonstrated a nasal septal abscess and adjacent intracranial abscess. The patient had been seen twice previously in the emergency department, diagnosed with sinusitis and sent home. Urgent concurrent drainage of the abscesses was undertaken by an Otolaryngology and Neurosurgery team. The patient recovered fully and despite complete loss of his quadrangular cartilage, did not develop a septal perforation. An extensive literature review identified only 5 other previously reported cases of intracranial abscess secondary to a nasal septal abscess.

Conclusion:
Although quite rare, intracranial abscesses are a potentially life-threatening complication of nasal septal abscesses. We present a detailed documentation of the case, including figures, as well as a review of the literature with a focus on the diagnosis, treatment and outcome of intracranial abscesses secondary to nasal septal abscess.

Poster Number: 1-151
Invasive Disseminated Cryptococcus of the Left Ethmoid Sinus With Concomitant Meningitis
Michael Wiebel, MD, Nathan Deckard, MD, Michael Carron, MD
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Objective:
To present a unique and interesting case of invasive, disseminated cryptococcal sinusitis with concomitant meningitis with review of the literature.

Methods:
A 54-year-old woman with history of a renal transplant presented with a 2-week history of worsening left frontal headache, blurry vision, photophobia, rhinorrhea, and fevers. On computed tomography, she was found to have opacification of multiple ethmoid air cells with radiographic suggestion of osseous erosions of medial wall of the orbit and multiple walls of the ethmoid air cells. Subsequent cultures obtained from lumbar puncture grew Cryptococcus.

Results:
She was treated with liposomal amphotericin B and flucytosine for a suspected cryptococcal meningitis and underwent left functional endoscopic sinus surgery with drainage of the cavity along with cultures and tissue biopsy. The patient improved to baseline and was discharged home 16 days later.

Conclusions:
We present a summary of all cases of extrapulmonary, extrameningeal disease found within the modern medical literature. Prompt surgical treatment along with appropriate antifungal therapy may improve the prognosis in patients with cryptococcal sinusitis.

Poster Number: 1-152
Isolated Sphenoid Sinus Posttransplantation Lymphoproliferative Disorder Clinically and Radiographically Presenting as Invasive Fungal Sinusitis
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Philadelphia, PA USA

Introduction:
Posttransplantation lymphoproliferative disorder(PTLD) is a known complication of solid organ transplantation with chronic immunosuppression. Rare occurrences have been noted to occur in the head and neck, but rarely to present in a locally aggressive fashion.

Methods:
Retrospective Case report of an immunocompromised patient with a presentation mimicking invasive fungal sinusitis (IFS)

Results:
The patient was taken emergently to the operating room for an endosocopic skull base biopsy demonstrated PTLD.

Conclusions:
We present the first case of PTLD presenting in a locally aggressive fashion in the sphenoid sinus. Our findings highlight the importance of PTLD in the differential diagnosis of immunocompromised post-transplant patients with aggressive sinus lesions. Although a high clinical

index for IFS is necessary, PTLD, although rare, must be considered. A prompt diagnosis is essential as treatment options vary considerably and must be initiated quickly for these two distinct entities.

Poster Number: 1-153
Management of Anterior Skull Base Encephaloceles: An Eleven-Year Experience
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Introduction:
Skull base encephalocele is a rare defect, with varying etiologies and treatment strategies. Here we present the largest series of patients with skull base encephalocele repair in the Western hemisphere.

Methods:
Retrospective consecutive case series
Results: Between May 2000 and October 2011, 119 cases of skull base encephalocele were managed at UNC with a mean follow-up of 23 months (range: 0 - 116). 13 cases were frontal (11%), 60 cases were ethmoid (50%), and 46 (39%) cases were sphenoid in origin. 11 cases of encephalocele recurred, with mean time to recurrence of 9 months (range: 0 - 38). 131 different repair methods were used; 62 were free mucosa grafts, 32 were fat grafts, 24 were pedicled nasoseptal flaps, 3 were temporalis fascia grafts, 2 were pericranial flaps, and 2 were osteoplastic flaps and grafting. 76 cases occurred spontaneously (64%), 22 cases resulted from trauma (18%), 13 cases were iatrogenic (11%), and 8 cases resulted from tumor (7%). Lumbar drains were placed in 61 patients (51%). 17 patients underwent complications; ten patients experienced neurologic complications, while seven patients experienced systemic complications. Mean post-operative hospital stay was seven days. Recurrence and complications outcomes stratified by repair methods, location and etiology are presented.

Conclusions:
Anterior skull base encephaloceles can be almost uniformly approached with various endoscopic techniques with excellent long-term results. Although the majority of these patients can be successfully approached with minimally invasive techniques, potential complication rates approach 15%. This should be taken into consideration when counseling patients regarding surgical risks.

Poster Number: 1-154
Management of Severe Epistaxis Following Young's procedure
Jonathan Y Ting, MD, Aaron K Remenschneider, MD, Eric H Holbrook, MD
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Introduction:
Hereditary hemorrhagic telangiectasia (HHT) is an autosomal dominant disorder affecting multiple organ systems, with epistaxis being the most common manifestation. Multiple procedures have been utilized for the management of epistaxis in the setting of HHT, including closure of the anterior nares via a Young's procedure. While this procedure results in loss of smell and permanent nasal obstruction, proponents note significant improvement in patient symptomatology. There has been little discussion regarding the conundrum of managing significant epistaxis after this procedure.

Methods:
Case report

Results:
A 70-year-old female with a history of HHT presented to an outside hospital with bleeding from the nasopharynx 2 months after undergoing a modified Young's procedure. She was transfused with 2 units of PRBCs and transferred to our institution. Due to persistent epistaxis and need for airway protection, the patient was intubated and her throat packed. Twenty-four hours following a bilateral sphenopalatine artery embolization, she developed significant epistaxis requiring reversal of the Young's procedure on the left and placement of an anterior-posterior pack at the bedside. Upon packing removal several days later in the operating room, she was noted to have significant bleeding that necessitated reversal of the Young's procedure on the right side to obtain adequate exposure and hemostasis.

Conclusion:
We report a case of significant, life-threatening epistaxis following a modified Young's procedure that requiring multiple transfusions, bilateral embolization, and ultimately reversal of the Young's procedure for control of epistaxis. To our knowledge, this is the first report of this complication in the English literature.

Poster Number: 1-155

Meta-Analysis of Endoscopic Cerebrospinal Fluid Leak Repairs: Locoregional Control Rates and Characteristics of Recurrences

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Introduction:
The success of endonasal endoscopic cerebrospinal fluid leaks repairs is reported as high as 98% but detailed analyses of timing of recurrence and risk factors for recurrence are lacking.

Methods:
A search was conducted of MEDLINE, EMBASE, Cochrane databases, clinicaltrials.gov, and The National Guideline Clearinghouse databases and supplemented by references in retrieved articles. All authors used a detailed list of inclusion and exclusion criteria to determine articles eligible for final inclusion. The authors extracted data regarding study criteria appraisal, CSF leak and surgical characteristics, recurrence outcomes, and complications. Outcomes data were extracted and analyzed. Kaplan-Meier locoregional control (LRC) rate analysis was performed on cases with adequate data information.

Results:
The search results captured 683 citations. Data was extracted from 101 articles describing outcomes results on 2935 subjects. The most common locations of CSF leak included ethmoid, cribiform, and sphenoid sinus. The overall 3-year LRC rate for the analyzable sample was 93.5% (SE ±2.1) with a mean follow-up of 30.3 months (SE±1.9). Two-thirds (66.7%) of recurrences occurred within a month from surgery; however, other recurrences occurred over a month after the surgery and as late as 15 months postoperatively. The variations and outcomes based on location, etiology, risk factors, use of lumbar drain, and revision cases were also analyzed.

Conclusion:
Endonasal endoscopic CSF leak repair is a highly successful technique; however, identifying the characteristics of recurrences is important in perfecting the technique and counseling patients. Evaluation using validated survival analysis techniques allows better quantification and comparison over time.

Poster Number: 1-156

Modified Subtotal-Lothrop Procedure for Extended Frontal Sinus and Anterior Skull-Base Access: A Cadaveric Feasibility Study

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Newark, NJ USA

Introduction:
Endoscopic approaches to the frontal sinus and anterior skull base have progressed rapidly over the past decade. The endoscopic modified Lothrop procedure (EMLP) is a well established approach for recalcitrant frontal sinus disease and exposure of the anterior skull base. However, in select cases, this technique may involve unnecessary resection of sinonasal structures. In this anatomic study, we propose a modification of the EMLP, termed the modified subtotal-Lothrop procedure (MSLP) to access recalcitrant complex frontal sinus and anterior skull base disease for which access to the bilateral frontal sinus posterior table is required.

Methods:
A cadaveric dissection with photodocumentation was performed on four cadaver-heads using standard endoscopic techniques to demonstrate the MSLP and its feasibility.

Results:
The endoscopic MSLP allowed ample access for instrumentation in each of the dissections using a 30- or 70-degree endoscope. Adequate bilateral access to the posterior table of the frontal sinus was gained in all cases without the need for dissection of the contralateral FSR.

Conclusion:
The MSLP appears to be a feasible technique for exposure of the anterior skull base and accessing complex frontal sinus pathology. This modification provides similar anterior skull base exposure and surgical maneuverability as the EMLP, with the added benefits of limiting surgical dissection to one FSR, thereby preserving as much of the natural mucociliary drainage pathways as possible.

Poster Number: 1-157
Nasal Epithelial Repair and Regeneration in a Novel SO2 Volatile Agent Exposure Model
Dawn Bravo, MD, Ethan Soudry,MD, Do-Yeon Cho, MD, Alan Nguyen, Brigid Hogan, MD, Jayakar Nayak, MD
Stanford, CA USA

Introduction:
The nasal mucosa is a dynamic, regenerative epithelial barrier that remains functional despite exposure to environmental challenges. To better understand the cellular and molecular events contributing to nasal mucosal repair, new models of controlled epithelial damage or insult are required. Sulfur dioxide (SO2), a volatile gas that converts to a weak acid on mucosal surfaces, was analyzed for its utility as a model toxin to the nasal epithelium.

Methods:
C57BL/6 adult mice were exposed to inhaled SO2 at 500 ppm SO2 for three hours. Mice were analyzed 1.5, 3 and 7 days post injury (dpi) using bright field and multi-color immunofluorescence microscopy for selected cellular and molecular markers on nasal cavity coronal sections.

Results:
Exposure to SO2 causes the elimination of luminal epithelial and goblet cells within 1 dpi, leaving a population of intact basal cells above the basement membrane. Despite epithelial changes, no significant immune effector infiltrate is observed by 3 dpi. By 7 dpi, a regenerated nasal epithelium is detected, with normal expression of cellular and molecular markers.

Conclusions:
SO2 exposure facilitates global loss of all luminal nasal epithelial cells, producing a limited inflammatory response and complete restoration of the complex architecture of the nasal mucosa within 7 days. SO2 volatile gas exposure is a promising model for the induction of nasal epithelial damage, and elicits the high capacity for mucosal regeneration after injury. Additionally, these studies reveal a unique and novel population of poorly characterized basal epithelial cells, which are currently the subject of active investigation.

Poster Number: 1-158
Nasal Gout Presenting as Nasal Obstruction
Paul E Kwak, MD, Blythe K Gorman, MD, Krista L Olson, MD
Houston, TX USA

Background:
We present a case report of a 55 year-old man with history of multiple nasal traumas, obstructive sleep apnea, who was referred to our clinic for nasal obstruction and congestion, having failed multiple attempts at medical management. On evaluation, he was found to have severe septal deviation, elements of external and internal nasal valve collapse, as well as a nasal dorsal mass that was suspicious for gouty tophus. He was brought to the operating room and underwent septorhinoplasty through an open incision with nasal tip reconstruction. An external inverted V incision was used to expose an approximately 4 x 3 cm mass resting on the nasal dorsum, extending to the tip, super tip, and into the septal plane at the level of the upper lateral cartilages. Final pathology revealed this to be gouty tophus. We additionally harvested septal cartilage to create a caudal support strut graft as well as a columellar strut graft. He has done well in follow-up, and breathing and sleep are significantly improved.

Poster Number: 1-159
Nasal Septal Perforation Associated with Pyoderma Gangrenosum
Brook K McConnell, MD, Vijay Ramakrishnan, MD
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Introduction:
Pyoderma gangrenosum (PG) is a skin condition characterized by necrotic ulcers most commonly occurring on the lower extremities in association with inflammatory bowel disease and rheumatoid arthritis. PG rarely involves the head and neck, and very rarely causes nasal septal perforation.

Methods:
The following is a case report of PG causing a nasal septal perforation in a 71-year-old male with isolated cutaneous involvement without a history of either inflammatory bowel or autoimmune disease. Histological analysis, including CD3, CD5, CD20, CD43, and CD79a immunostaining, and serological testing, including cytoplasmic and perinuclear antineurtophil cytoplasmic antibody, antimyeloperoxidase antibody, and antiprotaminase-3 antibody, were used to evaluate for possible causes of for septal perforation.

Results:
Histologic analysis of nasal mucosal biopsies showed chronic inflammation without evidence of malignancy,

and serological testing made other diagnoses such as Wegener's granulomatosis unlikely.

Conclusions:
PG is a dermatologic disease with known autoimmune associations, and is diagnosed based on history and examination of characteristic lesions. In this case, the most likely cause of nasal septal perforation is PG.

Poster Number: 1-160
New Treatment and Monitoring Procedures for Nasal NK/T-cell Lymphoma, Intra-maxillary Arterial Chemotherapy and Analysis of Serum EBV DNA
Yasuaki Harabuchi, Prof, Miki Takahara, Dr, Kan Kishibe, Dr, Toshihiro Nagato, Dr, Akihiro Katada, Dr, Tatsuya Hayashi, Dr
Asahikawa, Hokkaido Japan

Introduction:
Nasal natural killer (NK)/T-cell lymphoma shows peculiar clinicopathologic features, showing destructive ulceration, granulation, and necrosis in mainly nasal cavity. The authors first demonstrated the presence of Epstein-Barr virus (EBV) genetic DNA in the lymphoma. Because the clinical course is highly progressive, effective tools would be necessary for treatments and monitoring of the tumor progression.

Methods:
We are trying arterial infusion chemotherapy from superficial temporal artery in combination with radiotherapy for early stage nasal NK/T-cell lymphoma. New regimen for the arterial infusion consist of fosfamide, carboplatin, methotrexate, peplomycin and etoposide (MPVIC-P). These drugs are independent of MDR. Effect of the treatments was evaluated by local findings, CT and MRI findings, and serum EBV-DNA copy number quantified by real-time PCR. EBV-DNA copy number has been reported to be very useful tumor marker for nasal NK/T-cell lymphoma by the authors.

Results:
From 2003, 12 patients with stage I nasal NK/T-cell lymphoma were treated by the arterial infusion of MPVIC-P regimen for 3 cycles and concomitant radiotherapy of 54-56Gy. All patients achieved complete remission (CR) and the 3-year disease free survival (DFS) rates were 100%. 10 out of 12 patients had high levels of serum EBV-DNA copy number, however, the levels decreased under detection level after treatment in all patients.

Conclusion:
According to these results, intra-maxillary arterial chemotherapy with concomitant radiotherapy is effective treatment for early stage nasal NK/T-cell lymphoma. Moreover, the measurement of serum EBV-DNA copy number is very useful for monitoring of the tumor progression.

Poster Number: 1-161
Novel Modifications of the Middle Turbinate Hinge Flap
Jonathan Liang, MD, Kiarash Shahlaie, MD, Quang C Luu, MD
Sacramento, CA USA

Objective:
To discuss applications of a middle turbinate hinge flap.

Methods:
We describe two cases of endoscopic endonasal surgery using novel modified middle turbinate flap techniques.

Results:
Patient A had a post-traumatic encephalocele. An endoscopic endonasal approach was used to debride the encephalocele to the anterior skull base. The middle turbinate was released posteriorly, and the medial mucosa was filleted off the turbinate bone leaving the lateral mucosa intact. A laterally-hinged middle turbinate flap was swung medially to reconstruct the anterior skull base defect. Patient B had persistent pneumocephalus after previous frontal sinus cranialization and obliteration. An endoscopic endonasal approach was used to obliterate the frontal recess. The middle turbinate was released posteriorly, and the lateral mucosa was filleted off the turbinate bone leaving the medial mucosa intact. Abdominal fat was used to plug the frontal recess, and a medially-hinged middle turbinate flap was swung laterally to obliterate the tract. This was combined with an axillary flap for additional anterior coverage.

Conclusions:
The middle turbinate hinge flap was first described by Soler et al (2009). We report two cases of novel modifications of the middle turbinate hinge flap. The middle turbinate hinge flap is very versatile. Medially-hinged applications help address the frontal recess, and, laterally-hinged applications help address the anterior skull base. The flap can be combined with other adjacent muscoal or composite flaps to augment the capacity of surface area coverage. The middle turbinate hinge flap has great potential in the era of minimally-invasive endoscopic skull base surgery.

Poster Number: 1-162

Olfactory Neuroblastoma Treated Using Endoscopic Endonasal Surgery

Yasuyuki Hinohira, MD, Taketoshi Nogaki, MD, Ayako Kanei, MD, Harumi Suzaki, MD
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Introduction:
Olfactory neuroblastoma (ONB) is a relatively rare malignant disease that frequently extends into the cranial cavity and involves the frontal lobe. Open surgery has so far been recommended to totally remove the tumor. However, recent developments of endoscopic surgery have come to provide successful results in the cases with ONB, using less invasive endonasal approach. We demonstrate 3 cases of ONB that was limited in the sinonasal region, which were treated using endoscopic endonasal surgery.

Cases:
We recently experienced 5 patients with ONB. In 3 of the 5 patients, ONB was limited in the sinonasal region. The 3 patients' Kadish classification showed A, B, B, respectively.

Results:
In the first case, the stalk of ONB limited in the nasal cavity was found in the medial superior part of the middle turbinate, and total removal of the tumor together with the middle and the superior turbinate was done. ONB extending into the ethmoid cavity was found in the second case. Total tumor removal was done avoiding exposure of the dura. In the third case, ONB involved the frontal and the ethmoid sinus. Total tumor resection was done, and the dura was exposed. The dura was not involved pathologically. Postoperative radiation therapy was added to the second and the third cases. No recurrence is seen in the 3 patients although the follow-up period is not enough.

Conclusion:
Endoscopic endonasal approach was useful and effective in the limited ONB cases.

Poster Number: 1-163

Osseous Metaplasia Found Within Bilateral Inverted Papilloma: A Case Report and Review of the Literature

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Objective:
To discuss the work up of metastatic cancer to the sinonasal cavity, importance of a thorough head and neck exam in refractory epistaxis, and utility of appropriate imaging and interventions.

Study design:
Case report and literature review.

Methods:
We present a case of a 56 year-old female with 1 week history of recurrent epistaxis. Initially treated at an outside hospital, she eventually transferred for further management of refractory epistaxis. Angiography revealed a large hypervascular mass located within the left frontal sinus with extension into the ethmoid sinus and nasal cavity. Subsequent MRI was consistent with a 5cm x 2cm x2cm hyperintense mass with dural thickening along the frontal pole and erosion of the orbital roof.

Results:
The patient was initially taken for nasal endoscopy and biopsy of the sinonasal mass; final pathology revealed metastatic renal cell carcinoma. Further CT imaging showed an 8 cm left suprarenal mass with associated renal nodules. She ultimately underwent a bifrontal craniotomy and craniofacial resection with pericranial flap skull base reconstruction prior to addressing her renal tumor due to the risk of life threatening epistaxis.

Conclusions:
Review of the primary literature shows that metastatic renal cell carcinoma to the sinonasal cavity producing refractory epistaxis is a relatively rare entity. Management should include appropriate imaging, thorough endoscopic evaluation and biopsy for pathological confirmation; surgical resection may be indicated depending on clinical staging and patient related factors. This case highlights the importance of a methodical approach to the work up of patients presenting with refractory epistaxis.

Poster Number: 1-164
Outcomes Analysis in Epistaxis Management: Development of an Evidence-Based Therapeutic Algorithm
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Epistaxis is a common problem with a significant cost to the health care system. This study explores the outcomes of multiple treatment modalities in order to optimize management and enable the development of an evidence based therapeutic algorithm.

Retrospective analysis of outcomes following tamponade, cauterization, and/or proximal vascular control in adults with epistaxis presenting to a tertiary care hospital. Patients with a history of trauma, malignancy, prior surgery, or known vascular malformations were excluded from the study. Multivariate logistic regression was used to calculate odds ratios (OR) and 95% confidence intervals (CI), adjusting for coagulopathy, hypertension, and bleeding site.

The population included 147 patients (94M, 53F). Non-dissolvable packing demonstrated the highest initial treatment failure rate of 57.4% (OR, 95%CI 3.37, 1.33-8.54 compared with cautery) and largest number of interventions necessary to resolve the bleeding at 1.9 (2.96, 1.21-7.21 compared with cautery). Length of non-dissolvable pack placement for 3, 4, or 5 days had no significant impact on recurrence. Among patients who failed initial management, those who next underwent cautery or proximal vascular control required a significantly shorter inpatient stay of 5.3 days versus 6.8 in those who underwent repeat packing (0.16, 0.04-0.68). There were no treatment failures following surgical arterial ligation.

Initial management of epistaxis with non-dissolvable packing had the highest rate of failure and greatest number of total interventions required. Duration of packing did not significantly impact recurrence. In patients who failed packing, progression to cautery or proximal vascular control led to significantly shorter inpatient stays than repeat packing.

Poster Number: 1-165
Oxidative Stress Induces Differential Regulation of Multiple Genes Involved in PAO1 Biofilm fFrmation
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Philadelphia, PA USA

Introduction:
Multiple factors have been implicated in the pathogenesis of chronic rhinosinusitis, including mucosal bacterial biofilm formation. Our previous work demonstrated that oxidative stress in the form of hydrogen peroxide (0.3% H2O2) induces biofilm formation in Pseudomonas aeruginosa (PAO-1). We now hypothesize that H2O2 induces differential regulation of multiple genes involved in pseudomonal quorum sensing and biofilm formation. Thus, we investigated six different PAO-1 biofilm pathway genes to identify their differential regulation in response to H2O2.

Methods:
PAO-1 tagged with a reporter plasmid containing a luciferase enzyme for luminescence and one of six different biofilm pathway genes (AlgC - phosphomannomutase, LasB - elastase, RhlA - rhamnosyltransferase chain A, FlgK - flagellar hook-associated protein 1, PilF - type 4 fimbrial biogenesis protein, LasL - autoinducer synthesis protein) were exposed to 0.3% H2O2 solution at several different time intervals (0, 1.5, and 3 hours). The luminescence was recorded at several different time intervals (0, 1.5, 3 and 24 hours) as a surrogate for gene expression.

Results:
PAO-1 given serial exposures to H2O2 demonstrated an upregulation in four of the six biofilm pathway genes investigated compared to control conditions ($p<0.05$). The upregulated biofilm pathway genes were RhlA, FlgK, PilF, and LasL.

Conclusion:
Oxidative stress in the form of H2O2 induced differential regulation of multiple genes involved in pseudomonal quorum sensing and biofilm formation. This may explain increased biofilm formation in microbes isolated from smokers. Furthermore, host defenses that utilize an oxidative burst may encourage microbial biofilm formation in vivo.

Poster Number: 1-166

Paranasal Sinus Cholesterol Granuloma: Diagnostic and Management Aspects

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Background:

Cholesterol granuloma (CG) is an expansile, cystic lesion most commonly observed in the temporal bone. CG is rarely encountered in the paranasal sinuses. Given its paucity in this region, the diagnostic and management aspects remain to be elucidated.

Methods:

Systematic review of the literature yielded 66 cases reported as individual data in 38 articles; an additional 69 cases were reported as aggregate data in 5 case series.

Results:

The mean age of the 135 patients was 43.8 years, with male:female ratio of 5.6:1. The most common presenting symptoms were orbital (66%), followed by headaches (19.3%). The most common location for CG was the frontal sinus (60%), followed by maxillary (34.1%) and ethmoid (3.7%) sinuses. CT imaging was employed in 84 patients (63.3%), with bone erosion being noted in 80% of cases. MR imaging was reported in only 9 cases (6.7%); high signal on T1- and T2-weighted images was evident in 77.8% and 66.7%, respectively. Surgical data was available on 65 cases; drainage was achieved by open and endoscopic techniques in 52 (80%) and 13 (20%) cases, respectively. Primary symptom improvement and CG cavity patency was achieved in 95.9% of cases at mean follow-up of 35.3 months.

Conclusion:

Paranasal sinus CG is most commonly observed in middle-aged males, arises in the frontal sinus, and presents with orbital symptoms. Both open and endoscopic techniques can be utilized with high success rate. The present study represents the 1st attempt in the literature to construct a clinical profile of this rare entity.

Poster Number: 1-167

Paranasal Sinuses Computerized Tomography (CT) Images Algorithmic Interpretation

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Purpose:

To come up with comprehensive algorithmic interpretation of Computerized Tomography (CT) Images of Paranasal Sinuses with anatomic details and related CT images.

Design and methods:

Action research was undertaken. Thorough literature search for the descriptive articles of the Paranasal Sinuses CT and highlight the deficit and incomprehensive aspects of any existing reported interpretation technique or algorithm. And a systemic interpretation algorithm was constructed and utilized as a learning tool (Lecture) for one arm of the junior Otorhinolaryngology and Head & Neck Surgery(ORL HNS) residents of the Saudi Board. A Questionnaire was formulated emphasizing in the steps and skills of CT of Paranasal Sinuses interpretation, by investigating the radiological and clinical anatomy in the CT images. The questionnaire was answered by the junior residents group and the Senior Residents and Consultants group.

Results:

Were analyzed and compared for both groups showing a higher score in the junior (Algorithm) group compared to the other group

Conclusions:

The structured comprehensive algorithm of the CT Paranasal Sinuses is an effective and reliable tool and reference that would enhance and refine the (ORL HNS) training resident Knowledge

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Poster Number: 1-168

Pediatric Allergic Fungal Sinusitis (AFS): Is it a More Severe Disease than Adult AFS?

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Chapel Hill, NC USA

Introduction:
There is scant literature describing Pediatric Allergic Fungal Sinusisits (AFS). This study aims to characterize the clinical presentation, fungal sensitivities, radiology, management, pathology, and recurrence rates.

Methods:
Retrospective chart review was performed at The University of North Carolina at Chapel Hill, during a seven year period. Twenty patients met Bent-Kuhn criteria for AFS.

Results:
A total of 20 patients (age range 8-18 on initial presentation; mean age 13; median age 13) were identified. Twelve patients were male; eight were female; 70% were African American. Clinical presentations include: sinonasal complaints (n=20), allergic rhinitis (n=18), recurrent sinusitis (n=15), headaches (n=13), asthma (n=12), facial skeletal changes (n=10), noisy breathing (n=5), visual deficits (n=4), and aspirin sensitivity (n=1). Forty percent (n=8) of patients initially presented with unilateral disease and two of these had bilateral progression. Fourteen had evidence of bony erosion, most commonly of the lamina papyracea (n=9). Fifty percent (n=10) have undergone multiple endoscopic sinus procedures. The most common fungal sensitivities were to Alternaria tenuis (n=12), Curvularia lunata (n=9), Fusarium moniliforme (n=8), and Candida albicans (n=5). Of thirteen patients with over 1 year follow up, seven recurred within 1 year, nine within 2 years, and eleven within 10 years.

Conclusions:
Pediatric AFS typically presents at a more advanced stage compared to adult AFS and has higher rates of facial skeletal changes, proptosis and has a high recurrence rate. It may present as unilateral disease, with bony erosion, as well as progress to bilateral involvement.

Poster Number: 1-169

Pre-Morbid Conditions Preceding Physician Diagnosed Chronic Rhinosinusitis

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Background:
Chronic Rhinosinusitis (CRS) is a prevalent inflammatory condition of the upper airway. The medical risk factors preceding a diagnosis of CRS are underexplored.

Objectives:
The objective of this study was to examine the prior diagnoses preceding a physician diagnosis of CRS and nasal polyposis (NP).

Methods:
Using the electronic health records of a large US healthcare system, we used physician-entered ICD9 codes to identify patients newly diagnosed with CRS and NP and an age and visit-frequency adjusted control group during the years 2007-2009. We analyzed the ICD9 codes utilized in the timeframe prior to compare the physician diagnosed pre-morbid illnesses preceding the CRS diagnosis.

Results:
A total of 595 patients with NP, 7523 patients with CRS were identified during the time frame studied. Compared to control, NP patients were older and more likely of male gender but were otherwise matched for healthcare utilization trends. CRS and NP patients had higher rates acute sinusitis prior to their chronic diagnosis. Additionally, they were more likely to have preceding diagnoses of allergic rhinitis, chronic rhinitis, asthma and headache($p<0.001$). CRS patients were more likely to have previous history of infections including suppurative otitis media, upper respiratory tract infections, pneumonia, bronchitis, staphylococcus related infections, conjunctivitis and urinary tract infections ($p<0.001$).

Conclusion:
CRS or NP exhibit a pre-morbid pattern of chronic respiratory and airway that includes previously published risk factors and several previously unrecognized risk factors.

Poster Number: 1-170

Radiographic Density of Sinus Opacification Informs Computed Tomography-Based Staging of Chronic Rhinosinusitis

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Background:
Traditional methods for staging of chronic rhinosinusitis (CRS) by computed tomography (CT) have not proven to be predictive of subjective reports of patients' symptoms. An objective measure of CRS severity, particularly if available from CT data, that correlates well with patients' symptoms would be a valuable tool in assessment of disease status and outcomes after surgery.

Methods:
Retrospective chart review of CRS patients with symptom data from the rhinosinusitis symptom inventory (RSI) survey and objective data from a sinus CT scan. CRS disease severity on CT imaging was measured according to the traditional Lund-Mackay scoring, as well as by raw measures of the densities of sinus opacities (in Hounsfield units, HU) and density-weighted Lund-Mackay scoring. These data were related to symptom severity scores using a multivariate regression model.

Results:
There was no significant correlation between either raw density values of sinus opacities or weighted Lund-Mackay scores with facial or total symptom scores. Oropharyngeal symptoms scores negatively correlated with the sum of "average HU" values (P=0.036, beta=-1.120) but positively correlated with the sum of "maximum HU" values (P=0.047, beta=1.221). There was a significant negative correlation between the systemic symptoms score and mean of "average HU" values (P=0.010, beta=-0.272). Finally, there was a positive correlation between "maximum HU" value-weighted Lund-Mackay score with nasal symptom scores (P=0.016, beta=0.241), systemic symptom scores (P=0.008, beta=0.605) and total symptom scores (P=0.078, beta=0.179).

Conclusions:
Incorporation of radiographic characteristics of sinus opacification with the Lund-Mackay scores offers greater predictive power of patients' subjective symptom severity.

Poster Number: 1-171

Recent Changing Trends in Rhinologic Surgery

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Introduction:
Endoscopic Sinus surgery remains one of the most commonly performed procedures in the US with more than 600 000 patients undergoing sinus operations annually. Advances in our understanding of chronic rhinosinusitis (CRS) as well as the technology used to treat it has resulted in significant changes in surgical management. The purpose of this study is to identify recent changes in the performance and coding of certain ESS in the hope of generating further discussion and research in this area.

Method:
The MarketScan Research Database was used to query health insurance claims for all rhinological procedures performed between 2007- 2009. The frequency of use of different current procedural codes (CPT) endorsed by the American Medical Association were analysed and compared to general otolaryngological procedures in an attempt to identify trends in the performance and coding of certain ESS procedures.

Results:
Compared to general otolayngological procedures such as adenotonsilletomy there was a statistically significant increase in the use of CPT codes for all ESS procedures between 2007-2009. The most marked interval changes were seen in the use of the CPT codes for procedures previously considered more complex, namely frontal sinusotomy (75%) and sphenoidotomy (33%) as well as maxillary antrostomy with tissue removal (31%).

Conclusion:
The performance of certain ESS procedures previously considered more complex due to anatomy, access and proximity to vital structures has increased dramatically in the past few years, whilst increases in basic procedures have mirrored anticipated changes similar to those seen in general otolaryngological procedures.

Poster Number: 1-172
Renal Cell Carcinoma Presenting As Epistaxis: Case Presentation and Review of the Literature
Anthony G Del Signore, MD, Andrew Kleinberger, MD, Christopher Shaari, MD, Satish Govindaraj, MD
New York, NY USA

Objective:
To discuss the work up of metastatic cancer to the sinonasal cavity, importance of a thorough head and neck exam in refractory epistaxis, and utility of appropriate imaging and interventions.

Study design:
Case report and literature review.

Methods:
We present a case of a 56 year-old female with 1 week history of recurrent epistaxis. Initially treated at an outside hospital, she eventually transferred for further management of refractory epistaxis. Angiography revealed a large hypervascular mass located within the left frontal sinus with extension into the ethmoid sinus and nasal cavity. Subsequent MRI was consistent with a 5cm x 2cm x2cm hyperintense mass with dural thickening along the frontal pole and erosion of the orbital roof.

Results:
The patient was initially taken for nasal endoscopy and biopsy of the sinonasal mass; final pathology revealed metastatic renal cell carcinoma. Further CT imaging showed an 8 cm left suprarenal mass with associated renal nodules. She ultimately underwent a bifrontal craniotomy and craniofacial resection with pericranial flap skull base reconstruction prior to addressing her renal tumor due to the risk of life threatening epistaxis.

Conclusions:
Review of the primary literature shows that metastatic renal cell carcinoma to the sinonasal cavity producing refractory epistaxis is a relatively rare entity. Management should include appropriate imaging, thorough endoscopic evaluation and biopsy for pathological confirmation; surgical resection may be indicated depending on clinical staging and patient related factors. This case highlights the importance of a methodical approach to the work up of patients presenting with refractory epistaxis.

Poster Number: 1-173
Revision Endoscopic Modified Lothrop
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Introduction:
The objective of this study was to examine the results after revision of the endoscopic modified Lothrop procedure (EMLP).

Methods:
A retrospective analysis was performed on prospectively collected data at an academic tertiary referral center, where 128 patients underwent EMLP between 2006 and 2009. Twelve of these patients subsequently needed revision EMLP due to closure of the common frontal sinusotomy, and recurrent symptoms. These charts were reviewed for pre-operative symptoms and indications for surgery, operative details (including frontal sinusotomy measurements, mucosal stripping, and the use of stents), post-operative symptoms, and common frontal patency.

Results:
The mean age at time of primary EMLP was 46.3 years. The mean total follow-up time was 3.8 years and 2.4 years after primary and revision EMLP, respectively. The most common indication for revision surgery was a closed common frontal sinusotomy, with recurrent infections, nasal polyposis, and frontal headaches. The average common frontal sinusotomy measurements during revision EMLP were 18.7 mm from orbit to orbit, and 7.9 mm in anteroposterior dimension. A stent was used in 41.7% of cases, and removed after a mean time of 75.3 days. Some degree of intra-sinus mucosal stripping was performed in 33.3% of cases. On the last documented visit, a common frontal ostium was endoscopically visualized in 91.7% of the patients (66.7% patent and 25% stenotic) after revision EMLP. Symptoms resolved or improved in all twelve patients.

Conclusion:
Revision EMLP is effective in treating recurrent frontal sinus disease after failed primary EMLP.

Poster Number: 1-174

Sarcoidosis of the Upper Respiratory Tract: Analysis of Pulmonary Function, Chest Radiography Staging, and Clinical Outcome

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Introduction:
A small percentage of patients with sarcoidosis develop isolated upper respiratory tract involvement, called sarcoidosis of the upper respiratory tract (SURT). The clinical features and outcomes of patients with SURT are not well described due to its rarity.

Methods:
After IRB approval, the University of Michigan Sarcoidosis Database was analyzed. Patient demographics, hospitalization within the past 3 years, steroid bursts within the past 3 years, pulmonary function tests (including forced expiratory volume in 1 second [FEV1] and forced vital capacity [FVC]), and Scadding chest radiograph scores were recorded. Group one represents sarcoidosis without SURT and group two represents sarcoidosis with SURT. SPSS 19 was used for data analysis.

Results:
132 patients with sarcoidosis were available for study, including 8 patients with SURT. Average length of follow up was 75 months for group one and 91 months for group two. Chi-square analysis showed no statistical difference between the two groups for patient age, race, or age at presentation. Non-parametric testing showed no significant difference between groups for FEV1, FVC, Scadding stage, or number of steroid bursts required. However, patients with SURT were hospitalized significantly more frequently than non-SURT patients over the last three years of follow up (1 versus 0.23 hospitalizations, p=0.032).

Conclusion:
Patients with SURT are more likely to have required hospitalization compared with sarcoidosis patients without SURT. There are no significant differences between SURT and non-SURT patients in regards to age at presentation, CXR stage, FVC, or need for steroid bursts.

Poster Number: 1-175

Schneiderian (sinonasal) Papillomas: Comparison of Exophytic (fungiform), Cylindrical Cell (oncocytic), and Inverted Types

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Introduction:
Sinonasal papillomas are benign epithelial neoplasms arising from Schneiderian mucosa. Three subtypes exist and must be distinguished among each other, including exophytic (fungiform), cylindrical cell (oncocytic), and inverted. The purpose of this study is to differentiate between the different types of Schneiderian papillomas and to describe their histology and management.

Methods:
Retrospective review in an academic medical center of patients with Schneiderian papillomas over a 10-year period

Results:
43 consecutive patients with sinonasal papillomas who underwent sinus surgery were identified. There were 32 (74%) males and 11 (26%) females diagnosed with an average age of 57. Exophytic (n=1), cylindrical cell (n=9), and inverted types (n=33) were identified. Inverted papillomas were associated with transformation into squamous cell carcinoma in 3 (9%) cases, dysplasia in 3 (9%) cases, and bony invasion in 2 (6%) cases. Neither cylindrical cell nor exophytic subtypes were associated with dysplasia or malignancy. Recurrences occurred in 7 (16%) cases, 3 of the inverted and 4 of the cylindrical cell subtype.

Conclusion:
Histologically, the exophytic type has thickened squamous epithelial proliferation while the cylindrical cell type has multiple layers of epithelial proliferation. The inverted type has an endophytic or "inverted" growth pattern of thickened squamous epithelial proliferation. The inverted type is the most aggressive and has the highest chance of transformation to carcinoma. In contrast, the cylindrical type (oncocytic) was not associated with dysplasia or malignancy in our series. Aggressive surgical excision is required for both cylindrical and inverting types due to the high propensity for recurrence.

Poster Number: 1-176
Schneiderian Papillomas Revisited
Luke A Donatelli, MD, Roheen P Raithatha, MD, Ashutosh S Kacker, MD
New York, NY (Presented by Roheen Raithatha, MD)

Introduction:
Schneiderian papillomas (SP) are benign tumors arising from the ciliated respiratory mucosa of the sinonasal tract. Three types have been described: inverted, squamous and oncocytic. We evaluated the pathologic features associated with SPs and performed a literature review of their natural history.

Methods:
A retrospective chart review was performed to identify patients with SP treated by the senior author (AK) between 2005 and 2011, and to identify associated clinical/pathologic data.

Results:
Eighteen patients (10 males, 8 females; mean age of 55) were found to have SPs confirmed by histologic diagnosis. Eight patients presented with nasal obstruction, 4 with chronic sinusitis and 2 with epistaxis. SPs were incidentally found in 4 patients. Pathologic assessment identified 9 (50%) inverted, 7 (39%) squamous and 2 (11%) oncocytic papillomas. Inverted papillomas originated from the maxillary sinus in 4 patients, lateral nasal wall in 1 patient, middle turbinate in 2 patients, frontal sinus in 1 patient, and multiple sites in 1 patient. Squamous papillomas originated from the septum in 4 patients, inferior turbinate in 2 patients, and nasal vestibule in 1 patient. Both oncocytic papillomas originated from the maxillary sinus. Twelve patients underwent purely endoscopic resection. Four patients underwent direct transnasal excision. For 2 patients, combined endoscopic and open procedures were required. Primary recurrences were seen in 2 patients (11%). In 2 patients (11%), squamous cell carcinoma was also found in the pathologic specimen.

Conclusions:
While SPs are rare, benign tumors, Otolaryngologists should be aware of their potential for recurrence and malignant transformation.

Poster Number: 1-177
Sinonasal Computed Tomography Findings In Sarcoidosis
Joseph Zenga, BA, Reeti Joshi, MD, Anne Getz, MD, Nick Debnath, MD
St. Louis, MO USA

Introduction:
Sarcoidosis is a chronic granulomatous disease that affects multiple organ systems including the upper respiratory tract. Sinonasal involvement is thought to be uncommon, but up to 40% of patients may manifest sinonasal complaints. The objective of this study was to determine whether patients with sarcoidosis exhibit characteristic sinus computed tomography (CT) findings based on Lund-Mackay scores and the assessment of bony erosion, neo-osteogenesis, and nodular mucosal thickening.

Methods:
A retrospective review was performed on 39 patients presenting to a tertiary academic medical center with a diagnosis of biopsy-proven sarcoidosis and paranasal sinus CT imaging over a 7 year period from 2004-2011.

Results:
The mean age was 48 years with a male:female ratio of 1:3. African-Americans comprised 82% of the patients. The mean Lund-Mackay score was 6.2. Neo-osteogenesis was present in 15.3%. Bony erosion was present in 7.7%. Nodular mucosal thickening of the turbinates, septum, or sinus mucoperiosteum was noted in 20.5%. Only one patient had a septal perforation.

Conclusions:
Patients with sarcoidosis may not demonstrate significantly elevated Lund-Mackay scores on CT imaging. However, the presence of nodular mucosal thickening of the nasal cavity, septum, and sinuses may suggest sinonasal involvement of this chronic granulomatous disease in patients with symptoms of sinusitis.

Poster Number: 1-178

Sinonasal Manifestations of Sarcoidosis: A Single Institution Experience with 38 Cases

Mohammad O Aloulah, MD, Peter R Manes, MD, Yuk H Ng, MBBS, Bradley F Marple, MD, Matthew W Ryan, MD, Pete S Batra, FACS
Dallas, TX USA

Introduction:
Sarcoidosis is a chronic disease process characterized by non-caseating granulomatous inflammation, usually involving the lower respiratory tract. Given the rarity of rhinologic involvement, the objectives of the present study were: (1) to describe clinical features; and (2) to review outcomes of rhinologic surgery for sinonasal sarcoidosis.

Methods:
Retrospective analysis was performed of 132 patients with sarcoidosis referred to otolaryngology at a tertiary care referral center between January 2006 and July 2011.

Results:
Sinonasal involvement was evident in 38 cases (28.8%). The mean age was 52 years with female:male ratio of 2.8:1. The most common presenting symptoms included nasal obstruction (65.8%), crusting (29.9%), and epistaxis (18.4%). Most frequent endoscopic findings included crusting (55.3%), mucosal thickening (44.7%), and subcutaneous nodules (21%). CT imaging demonstrated turbinate or septal nodularity (21%), osteoneogenesis (15.8%), and bone erosion (10.5%). Medical management was typically comprised of saline irrigations (73.3%), topical nasal steroids (68.4%), and oral steroids (63.2%). Refractory sinus symptoms required sinonasal surgery in 9 cases (23.6%), including FESS (77.8%), FESS with septoplasty (11.1%) and nasal biopsy (11.1%). Overall symptom improvement was noted in 39.5% at mean follow-up of 16.2 months.

Conclusion:
Sinonasal involvement is noted in approximately 30% of patients with known sarcoidosis presenting to an otolaryngology clinic. Rhinologic morbidity is high with significant number of patients presenting with nasal symptoms and endoscopic evidence of crusting and mucosal thickening. Medical therapy with irrigations and topical/oral steroids suffices in majority of patients, with surgery for refractory symptoms being required in a small subset of cases.

Poster Number: 1-179

Sinonasal Osteoma, An Enigmatic Lesion

Akaber Halawi, MD, Casey Swenson, MD, Robert A Robinson, MD,Ph, Joan Maley, MD, Scott Graham, MD
Iowa, USA

Objective:
To investigate the clinical features and the growth rate of sinonasal osteomas

Subjects and Methods:
Retrospective chart review of cases of sinonasal osteomas followed at a tertiary referral center since January 2001.

Results:
148 patients with osteomas were identified. The lesions were found incidentally in 89% of patients and 43% were in the frontal sinus. 15% of the patients had headaches but the headaches were congruent with the osteoma location in only 6.71%. Sinus mucosal disease was seen in 31% of the patients but the mucosal disease was adjacent to the osteoma in 8% only. 10 of the 149 patients underwent surgery for cosmetic concerns or rapidly growing osteomas. 13 patients had intestinal tubular adenoma, and 1 had a gene mutation consistent with Gardner's syndrome. Data from 56 osteomas followed with CT imaging at different time intervals was used to assess the tumor growth rate. The mean linear growth rate was 0.117 mm/year (95%CI: 0.004-0.230). The median change in maximum dimension was -0.066 mm at 3 to 9 months (IQR= -0.404-1.069), 0.369mm at 9 to 15 months (IQR= -0.032-0.855), 0.066 mm at 21 to 27 months (IQR= -0.034-0.219), and 0.082 mm at 45 to 51 months (IQR= -0.000-0.197).The mean area growth rate was 1.84 mm2/year (95%CI: -0.51-4.20). There was no significant association between tumor size, location, and complications.

Conclusion:
Osteomas are slow growing lesions with no specific growth pattern and with rare complications. Their behavior justifies a conservative approach toward asymptomatic lesions with close radiologic follow up.

Poster Number: 1-180
Sinusitis in SCID Patients
Victor M Da Costa, MD, Eileen M Raynor, MD
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Introduction:
Severe Combined Immunodeficiency (SCID) is a rare genetic disorder of adaptive immunity, in which a patient cannot mount an immune response to infectious diseases. Chronic sinusitis is a common manifestation of SCID which is often managed by the otolaryngologist; however, there is no established practice of when to obtain imaging or when surgery is indicated in this patient population. There appears to be a lower threshold to obtain imaging and perform surgery in all patients with immunodeficiency. The purpose of this study is to describe the current imaging practices and surgical intervention in SCID patients at Duke University.

Methods:
A retrospective chart review of patients with SCID and sinusitis was analyzed for demographic data, frequency of CT imaging and surgical intervention. CT scans were graded using Lund McKay (LM) scoring.

Results:
Twenty-eight patients were identified as SCID or another immunodeficiency. 16 had their first CT scan before age of five with an average LM score of 9.3. Average number of CT scans obtained per patient was three. Eight patients underwent initial endoscopic sinus surgery with an average age of 6.5 years. There was no correlation between the number of CT scans and surgical intervention (p=0.18).

Conclusions:
Frequency of imaging does not appear to play a role in determining need for surgical intervention. Stricter criteria for obtaining sinus imaging in this already at risk population can reduce radiation exposure and be more cost effective.

Poster Number: 1-181
Sphenoid Meningoencephaloceles: Combined Endoscopic and Open Resection and Repair
Kelli Crabtree, MD, Ashwin Ananth, BS, Paul J. Camarata, MD, Larry A Hoover, MD
Kansas City, KS USA

Introduction:
The objective of this paper is to review our experience with sphenoid sinus meningoencephaloceles. Over the past nine months we have diagnosed and repaired, by combined endoscopic and open techniques, six sphenoid sinus meningoencephaloceles. Five of these six had associated cerebrospinal fluid (CSF) leaks as the presenting symptom, one presented as sinusitis with a sphenoid mass.

Methods:
Both a transnasal endoscopic and transfacial/transmaxillary open approaches via a sublabial incision were utilized in these patients. Removal of the posterior maxillary sinus wall and pterygoid plate was required to follow the encephalocele to its lateral skull base/middle fossa floor origin. Multiple vascular structures of the medial infratemporal fossa must be carefully identified and cauterized to prevent excessive bleeding.
Gelfoam with commerical fibrinogen glue and attached crushed bone paté is used to repair the bony defect. This is reinforced with several layers of abdominal fat and again fibrin glue. Local vascularized middle turbinate flaps are also used when necessary to cover the sphenoid sinus opening and reinforce the repair. Lumbar drains have been used to decrease CSF pressure on the repair in selected cases.

Results:
All patients had immediate postoperative cessation of their cerebrospinal fluid nasal drainage. No patients have as yet required reexploration for recurrence.

Conclusion:
Combined transfacial and endoscopic techniques obviated the need for a craniotomy, shortening hospital stay, decreasing morbidity and reducing cost. All cases have healed over the site of meningoencephalocele origin and show no signs of recurrence.

Poster Number: 1-182
Spindle Cell Carcinoma of the Nasal Cavity: A Case Report and Review of the Literature
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New York, NY USA

An extremely rare case of nasal cavity spindle cell carcinoma is presented, together with a literature review of spindle cell carcinoma presenting in the nasal cavity and paranasal sinuses. A 29-year-old male presented with intermittent epistaxis. On exam, the patient had an ulcerated, well-circumscribed mass in the left nasal vestibule. A biopsy of the mass had vague histologic features consistent with a low-grade carcinoma. The patient subsequently underwent wide local excision via a lateral alotomy approach. Immunohistochemical (IHC) staining of the mass showed the cells to be variably reactive for cytokeratins and CD31. Based on the light microscopic and IHC findings, the mass was deemed a low grade spindle cell carcinoma. To the authors' knowledge, this represents the first case report of nasal cavity spindle carcino-

ma with this staining pattern. Despite the paucity of knowledge regarding this rare entity, we feel that given the aggressive nature of this lesion in other head and neck subsites, appropriate treatment consists of wide local excision.

Poster Number: 1-183
Systematic Review of Endoscopic Reconstruction Techniques in the Era of Endoscopic Endonasal Skull Base Surgery
Ethan Soudry, MD, Justin H Turner, MD, PhD, J V Nayak, MD, PhD, Peter H Hwang, MD
Stanford, CA USA

Introduction:
Endoscopic skull base surgery has evolved over recent years to encompass increasingly large skull base resections to address sinonasal malignancies or to provide access for intracranial lesions. As a result the reconstruction techniques for managing these large defects have evolved as well.

Objective :
A systematic review was performed in order to provide evidence-based recommendations for reconstruction of endoscopically created skull base defects. The primary outcome measure examined was post-operative cerebrospinal fluid (CSF) leak rate. Information regarding the location of the skull base defect and CSF flow rate (high vs. low) was also queried.

Methods:
Three databases (PubMed, SCOPUS, COCHRANE) were queried for studies discussing endoscopic skull base resection. Search was limited to studies published in the English literature and involving human subjects. Two independent reviewers evaluated studies according to specific inclusion and exclusion criteria.

Results:
A total of 1300 abstracts were reviewed. 18 studies, all case series, met the specified inclusion criteria. Overall post-operative CSF leak rate was approximately 9%. Low flow leaks were successfully repaired through numerous techniques. In high flow CSF leaks, pedicled local and regional flaps were associated with a significant decrease in postoperative CSF leak rates. Analysis of reconstruction techniques according to the location of the skull base resection defect revealed variable (0 to 25%) post-operative CSF leak rates.

Conclusions:
Based on available evidence, low and high flow leaks after endonasal skull base surgery require different management strategies. An algorithm for skull base reconstruction according to defect location and CSF leak flow rate is presented.

Poster Number: 1-184
Techniques and Limitations for Reducing Nasoseptal Flap Donor Site Morbidity Following Endoscopic Skull Base Surgery
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Introduction:
The pedicled nasoseptal flap has become the mainstay of reconstruction for expanded endonasal approaches to the ventral skull base. The septal donor site contributes to the postoperative morbidity associated with the procedure because of significant nasal crusting and drainage. This study reviews middle turbinate free mucosal grafts (MTMG), reverse rotational flaps, dermal grafts, and controlled septectomies for reducing nasal morbidity by decreasing the amount of time the septal cartilage remains exposed.

Methods:
A literature review was performed and compared with our institutional experience. Four options were identified beyond healing by secondary intention as described above. These techniques along with their limitations and advantages are discussed. After performing all options, the current practice at our institution is a controlled septectomy with a MTMG. Viability and healing outcomes from 53 MTMG are presented.

Results:
There is currently a lack of evidence in the literature to determine the best method to reduce donor site morbidity. A descriptive technical report of the "reverse rotational flap" exists but does not report any patient outcomes. Our institutional experience with the MTMG and controlled septectomy demonstrates decreased crusting at 6 weeks postoperatively and has an overall graft viability rate of 98%.

Conclusions:
Based on our data and experience, the preferred method for enhancing mucosalization and decreasing donor site morbidity is the controlled septectomy with MTMG. The advantages include decreased in post-operative crusting, and unimpeded intraoperative visualization.

Poster Number: 1-185
The Accessory Posterolateral Nerve- An Immunohistologic Characterization
Benjamin S Bleier, MD, Rachel Feldman, BA, Peter M Sadow, MD, PhD, Arthur Wu, MD, Jonathan Ting, MD, Ralph B Metson, MD
Boston, MA USA

Introduction:
Recent endoscopic dissection studies have redefined the postganglionic pterygopalatine(PPG) neural pathways suggesting that neurovascular rami may project directly through the palatine bone to innervate the posterolateral nasal mucosa. The goal of this study is to characterize these accessory posterolateral nerves by immunohistochemistry to determine their architecture and whether they contain autonomic fibers.

Methods:
IRB approved study in 7 patients in which the presence of accessory posterolateral nerves were surgically identified exiting the perpendicular plate of the palatine bone and sampled. The presence of neural tissue was confirmed by H&E and S100 staining. Nerves were then stained with anti-human Choline acetyltransferase(ChAT, 1:100) and anti-human Dopamine beta-hydroxylase(DBH, 1:100) followed by a FITC labeled secondary antibody to test for the presence of peripheral parasympathetic and sympathetic fibers, respectively. Human cadaveric sensory nerves were used as a negative control.

Results:
Of the 7 samples, all contained neural elements and 2 were associated with arteries. All nerves were comprised of a single fascicle containing an approximately equal distribution of ChAT and DBH positive fibers.

Conclusions:
This study supports prior work defining a newly recognized pathway in which nerves project through the perpendicular plate of the palatine bone to directly supply the mucosa. Our data confirm that these accessory posterolateral nerves are composed of autonomic fibers. Recognition of this pathway may be exploited in the treatment of sinonasal disease resulting from the autonomic dysregulation.

Poster Number: 1-186
The Effect of Balloon Size in Eustachian Tube Dilatation Procedures
Jeffrey C Bedrosian, MD, Vijay K Anand, MD
New York, NY USA

Introduction:
Endoscopic endonasal balloon dilation of the Eustachian tubes is a new and emerging technique. Dilation of the cartilaginous portion of the Eustachian tube with an AcclarENTTM (Menlo Park, CA) sinus balloon is readily achievable, however, there is inadequate data to support the choice of balloon diameter that will produce the best results. We report on our experience with 24 mm length balloons and compare our outcomes with 5 and 7 mm diameter balloons.

Methods:
Patients underwent either unilateral or bilateral endoscopic endonasal balloon dilation with an AcclarENT sinus balloon. Patients' Eustachian tubes were dilated with either 5 mm diameter or 7 mm diameter balloons over an 18 month period. The choice was made on the appearance of the size of the torus tubarius. Outcomes were based on SNOT-22 surveys, our validated ETDQ surveys and tympanometry.

Results:
Thirty-five separate Eustachian tube dilations were recorded in 21 patients. Eight patients were dilated with a 5 mm balloon and 13 patients were dilated with a 7 mm balloon. ETDQ preoperative scores were 37.6 and 36.3 (p= 0.73) respectively. There was a trend toward improved outcome at the 3 week post-operative interval 21.1 versus 24.0 (p = 0.05) in the 5 mm group, however, this difference was not maintained at later time points. All patients demonstrated Type A tympanograms post-operatively.

Conclusions:
The size of the balloon diameter deployed during the procedure does not appear to affect the results of Eustachian tube dilatation during our 6 month study period.

Poster Number: 1-187
The Management of the Silent Sinus Continuum in the Endoscopic Era
Amy E Lawrason, MD, Belachew Tessema, MD, Seth M Brown, MD
West Hartford, CT USA

Introduction:
Silent sinus syndrome is a known, but poorly defined entity in the otolaryngic literature. It is thought to occur secondary to maxillary sinus opacification, development of an atelectatic uncinate and inversion of the maxillary

sinus causing orbital complications. We reviewed our experience to better define the silent sinus continuum and to discuss patient management as well as a new classification scheme.

Methods:
A retrospective chart review of patients surgically treated for an atelectatic uncinate and hypoplastic, opacified maxillary sinus from 2008 to present was performed. Patients were classified into five groups based on physical exam and radiographic findings ranging from an atelectatic uncinate to enophthalmos with diplopia.

Results:
11 patients (12 sinuses) were identified and each patient was graded using the following classification system; grade 1: atelectatic uncinate without sinus wall collapse; grade 2: medial maxillary wall collapse; grade 3: posterior/lateral wall collapse; grade 4: orbital floor collapse; grade 5: diplopia. Two sinuses were classified as grade 1, five as grade 2, one grade 3, and four as grade 4. The most common presenting complaint was headache, with radiographic findings mostly incidental. All patients demonstrated a patent maxillary sinus on follow-up.

Conclusion:
Silent sinus syndrome is a disease of gradual progression with a difficult to predict time course and outcome. We describe a classification system created to help guide the otolaryngologist with treatment. We believe that in the endoscopic era, all patients presenting along this continuum who are medically stable should be offered surgical intervention to prevent orbital complications.

Poster Number: 1-188
The Role of Season, Temperature and Humidity on the Incidence of Epistaxis in Alberta, Canada
Leigh J Sowerby, MD, Josh DeSerres, Luke Rudmik, MD, Erin D Wright, MD
Edmonton, Alberta Canada

Introduction:
Classical dogma holds that epistaxis is more common in winter months. There is significant heterogeneity reported in the literature, with some authors reporting no correlation with season or temperature. No study has yet examined the effect of season, humidity and temperature on epistaxis in a place with as severe weather extremes as seen in Alberta, Canada.

Methods:
Retrospective review of consecutive patients presenting to the Emergency Department in Edmonton over a three year period. All cases of epistaxis and cases requiring admission were recorded; cases due to trauma and multiple visits were excluded. Daily weather data was recorded from the Edmonton airport. Statistical analysis with Pearson's correlation coefficient was performed.

Results:
1873 patients presented during the study period. Mean daily temperatures ranged from a low of -40oF to a high of +73oF. A significant negative correlation was found for mean monthly temperature with epistaxis events (Pearson's r=-0.781, p=0.001) and with admissions (Pearson's r=-0.55, p=0.03). No significant correlation was identified for mean monthly humidity (Epistaxis: Pearson's r=-0.14, p= 0.66, Admission: Pearson's r=-0.103, p=0.75). A significant correlation was present for daily temperature and epistaxis presentation (Pearson's r=-0.58, p=0.02, range 1.5 to 2.4 events/day), but was not present for daily humidity. A seasonal difference was noted, but only with a significant decrease in summer for both epistaxis presentation and admission.

Conclusion:
A significant relationship was found to exist for both decreasing daily and monthly mean temperature with increasing rates of epistaxis and admissions for epistaxis. No correlation was found for humidity.

Poster Number: 1-189
Transnasal Endoscopic Approach for Odontoidectomy
Giridhar Venkatraman, MD, Brian Thomas, MD
lebanon, NH USA

Introduction:
A transnasal endoscopic approach to odontoidectomy has been recently described as an alternative to the more traditional transoral approach. We present a novel case report of this procedure following posterior fossa decompression and craniocervical fusion, a discussion of pertinent anatomic relationships, and a review of the available literature.

Methods:
Case report and literature review

Results:
A 10year-old female found to have a Chiari-1 malformation with a retroflexed odontoid process and ventral spinal cord compression. The risk of instability and further brain stem compression following a posterior only approach was a concern so a two stage procedure was planned. Analysis of her anatomy on cross sectional imaging showed the base of the odontoid well within the plane of access through a pure transnasal approach. She underwent posterior fossa decompression and occipital to C2 fusion, and the following day she underwent odontoidectomy via a transnasal endoscopic

approach. There were no significant post-operative complications.

Conclusion:
The transnasal endoscopic approach to the anterior craniocervical junction is a feasible lower morbidity alternative to the transoral approach. Analysis of the relationship between the odontoid and the nasal passageway will aid in appropriate patient selection.

Poster Number: 1-190
Treatment of Anosmia Caused by Chronic Sinusitis
Taketoshi Nogaki, MD, Yasuyuki Hinohira, MD, Atsuko Furuta, MD, Harumi Suzaki, MD
Tokyo, Japan

Objectives:
Chronic sinusitis (CS) is the most frequent cause of olfactory dysfunction. Medical treatments and/or the surgical intervention for CS are given to the patients. However, anosmia that means total olfactory dysfunction is difficult to treat. This study demonstrated that our treatment and outcome of the anosmia patients caused by CS.

Study design:
Retrospective study.

Methods:
Between 2006 and 2009, 17 patients with anosmia caused by CS were treated in our department. No patients showed response in both T & T olfactometry and the intravenous olfactometry (Alinamin test). CS was diagnosed with CT scan and endoscopic examinations.

Results:
In 4 patients, the bilateral olfactory fissures were totally obstructed by polyps and/or edema in both CT and endoscopic findings. In the remaining 13 patients showed the unilateral obstruction. All 17 patients had medical treatments for CS, including a topical steroid nasal drop treatment. Endoscopic endonasal sinus surgery (ESS) was performed on 5 including 2 total obstruction patients. Olfactory function improved in 6 of the 17 patients, and 2 of the 6 patients had undergone ESS.

Conclusion:
Treatment of anosmia is considered difficult. Our study showed that treatment for CS including ESS might have shown efficacy on the olfactory function.

Poster Number: 1-191
Uncinectomy Improves Accuracy of Maxillary Cannulation during Transnasal Balloon Sinuplasty
Wesley M Abadie, MD, Joseph W Rohrer, MD, Pryor S Brenner, MD, Erik K Weitzel, MD, Kevin C McMains, MD, Roy F Thomas, MD. (Presented by Joseph Rohrer, MD)
Lackland AFB, TX, USA

Background:
Trans-nasal balloon dilation of the maxillary ostium has been shown to be associated with the creation of a false passage and decreased penetration of nasal douching into the maxillary sinus. This is likely due to the inability to see the ostia before cannulation and a medial remodeling of the uncinates position. Our goal was to evaluate if uncinectomy could overcome this obstacle and improve ostial cannulation accuracy.

Methods:
Five thawed fresh frozen cadavers with normal unoperated sinus anatomy underwent canine fossa trephination for trans-antral visualization of the maxillary ostium. A surgeon blinded to the intra-maxillary endoscopic observation performed trans-nasal maxillary ostium balloon dilation with a 30 degree scope, 110 degree guide catheter, and a guide wire. Observers documented cannulation accuracy, then uncinectomies were performed, and then re-cannulation was carried out with the same blinding routine. Pre-uncinectomy, post-uncinectomy, and post 5mm balloon dilation nasal douching penetration was assessed.

Results:
Cannulation errors occurred in 7/10 attempts before uncinectomy and 1/10 attempts after uncinectomy ($p<0.022$). There was no statistical difference between irrigation penetration into the maxillary sinus in any of the 3 surgical states tested.

Discussion:
Uncinectomy enhances the ability to successfully cannulate the maxillary ostium with standard balloon dilation equipment. It also eliminates the uncinate as a source of obstruction to nasal douching after standard balloon dilation. Uncinectomy before maxillary sinus balloon dilation can improve the safety and effectiveness of maxillary sinus balloon dilation.

Poster Number: 1-192 - Withdrawn

Poster Number: 1-193

Use of Computed Tomography to Determine Variance in the Three Dimensional Anatomy of the Ethmoid Roof

Michael I Orestes, MD, Esther Kim, MD, Peter Beddow, Ph.D, Sam Becker, MD, James A Duncavage, MD,
Bethesda, MD USA

Objective:
To determine the relationship and slope of the ethmoid roof in both an anterior-posterior and lateral-medial direction.

Study Design:
Retrospective review of consecutive axial, coronal and sagittal planes of the paranasal sinuses via computed tomography (CT) scans.

Methods:
Retrospective review of 102 consecutive axial, coronal and sagittal planes of sinus CT scans performed at Vanderbilt University Hospital from 01 July 2009 to 01 Nov 2009. The height of the anterior and posterior aspect of the skull base was measured laterally along the lamina paprycea and medially along the septum. The slope of the skull base was determined from these points both in an anterior-posterior and medial-lateral direction. The results were divided into anterior and posterior dominant (dominant portion with greater vertical height).

Results:
A posterior dominant angle was present in 8 and 55 the left lateral and medial skull base respectively. An anterior dominant angle was noted on the left in 93 scans laterally and 43 scans medially. A posterior dominant angle was present in 14 and 59 of the right lateral and medial skull bases respectively. This was compared to anterior dominant angles which were noted in 87 scans laterally and 41 scans medially.

Conclusions:
In the observed population of people the angle of the skull base both in an anterior-posterior and medial-lateral direction varies greatly even between right and left sides. This study shows the importance of pre-operative imaging and use of sagittal views to avoid inadvertent entrance into the skull base during ethmoid surgery.

The 58th Annual Meeting
of the American Rhinologic Society

September 8, 2012

Grand Hyatt Washington, Washington, DC

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- Breakfast Symposium "Innovations in Rhinology"
- Poster Presentation Wine & Cheese Reception - 5:30pm - 7:30pm

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