

ARS American
Rhinologic
Society



58th
annual meeting
of the American Rhinologic Society

September 8, 2012

Grand Hyatt Washington, Washington, DC

58th annual meeting

of the American Rhinologic Society

September 8, 2012

***Welcome to our
Guest Countries...***

France



Japan



South Africa





Michael Setzen, MD

Presidential Welcome to the 58th Annual ARS Meeting

On behalf of the Board of Directors of the American Rhinologic Society, it is an honor to welcome you to the 58th Annual ARS Meeting. What could possibly be more important than to sit back and relax in the comfort of the Washington Grand Hyatt here in our nation's capital two months prior to the general election.

I want to thank our Program Chair, Todd Kingdom and the Program Committee for putting together a truly outstanding meeting. During this conference attendees will have the opportunity to hear leading experts in Rhinology and Skull base surgery. The latest research opportunities will be presented, pros and cons will be debated during panel discussions and special topics of interest will be delivered by invited key note speakers.

Highlights include:

- Dissection Demonstration from the podium by Professor Heinz Stammberger:
- 8th Annual David W. Kennedy Lectureship by Donald C. Lanza, MD
- Breakfast Symposium: "New Innovations in Rhinology. The Hottest Topics with Breakfast"
- Residents and fellows in training luncheon
- Poster Presentation Wine & Cheese Reception
- Guest Countries for 2012 will be South Africa, France and Japan

This conference will provide an opportunity to meet with old friends and colleagues and build or renew relationships.

To our residents and fellows and first time attendees I welcome you all to this meeting and hope the stimulation is such that you will join the ARS. This 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 Washington, DC.

Michael Setzen MD, FACS
President, American Rhinologic Society



Todd Kingdom, MD

Program Chair Welcome

Welcome to the 58th Annual Meeting of ARS

I would like to welcome you to the 58th Annual Meeting of the American Rhinologic Society in Washington, DC. Once again the ARS is proud to provide this educational program to serve our members, all otolaryngologists, and allied health care providers from throughout the United States, North America, and the world.

This year the program structure will include a morning *Plenary Session* followed by two afternoon scientific sessions entitled *Clinical Rhinology* and *Basic & Translational Research*.

The morning session will feature the 8th Annual Kennedy Lecture delivered by Dr. Donald Lanza, past ARS President and leader in our field. A clinical panel on avoiding complications in ESS and a discussion of challenges in rhinology will be led by experts in rhinology. For the first time we will have a live cadaver demonstration dissection performed by Professor Heinz Stammberger.

The afternoon sessions will feature 40 scientific oral abstract presentations selected from over 100 submissions. Nearly 60 scientific poster presentations will be on display for review.

In addition there will be two afternoon panels featuring expert discussion on the *Changing Views on the Contributions of Microbes in CRS* and *Entropy: Local IgE Production in Sinonasal Disease*.

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 American Rhinologic Society.

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

American Rhinologic Society Executives - 2012



Michael Setzen, MD
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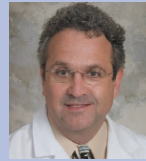
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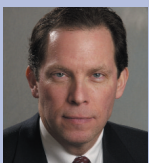
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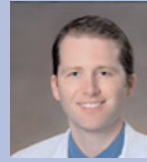
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ARS Mission Statement

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

Business/ACCME

Continuing Education

Accreditation Statement

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 7.50 *AMA PRA Category 1 Credits™*. Physicians should claim only the credit commensurate with the extent of their participation in the activity.

Goals and Objectives

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

1. Discuss the latest information on the medical management of patients with chronic rhinosinusitis and other rhinologic diseases including allergic rhinitis.
2. Gain an understanding of the indications, procedural nuances and potential complications of contemporary surgical techniques used in nasal, endoscopic sinus, and skull base surgery.
3. Demonstrate awareness of emerging research examining the pathophysiology of chronic rhinosinusitis and other rhinologic diseases.

Welcome New ARS Members!

January - July 2012

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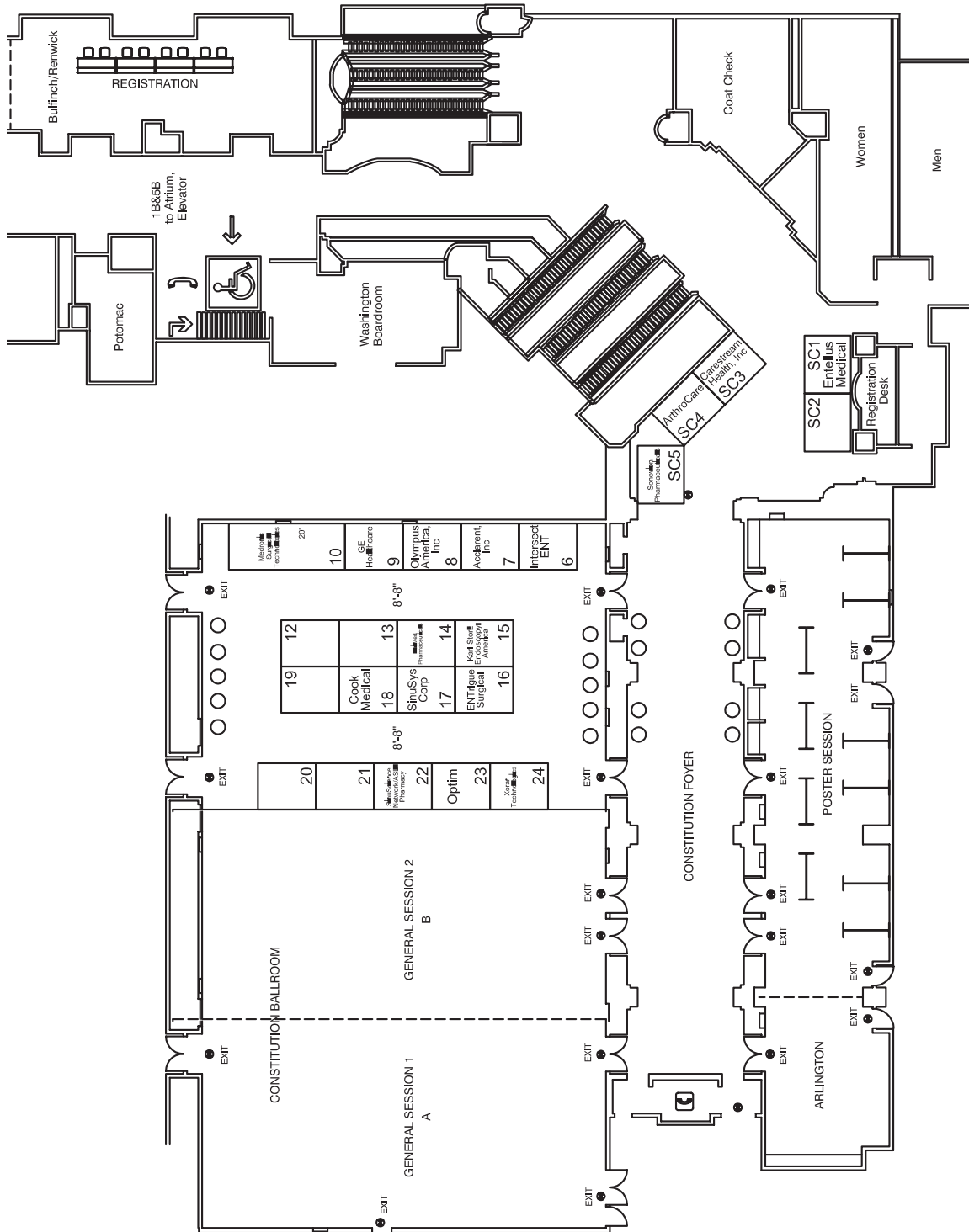
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Constitution - Floor Plans



58th Annual Meeting of the ARS

September 8, 2012 Washington, DC

Guest Countries: France, Japan, and South Africa



- **8th ANNUAL DAVID W. KENNEDY LECTURESHIP**

Guest Lecturer Donald C. Lanza, M.D.,

“Re-thinking Inverted Papilloma in 2012 - Challenges & Novel Treatment Strategies”



- **DISSECTION DEMONSTRATION**

Professor Heinz Stammberger, *Techniques in ESS*

Plus...

- **Resident's/Fellow's in Training Luncheon**
- **Exhibit Hall**
- **Attendees Luncheon with Exhibitors**
- **“Meet the Authors” Wine & Cheese Poster Reception**
(Supported by Intersect ENT)

Breakfast Symposium

September 8, 2012

Recent Innovations in Rhinology: *The Hottest Topics with Breakfast*

Timothy Smith, MD
Moderator

Heinz Stammberger, MD
Autologous Fibrin Glue

Jim Stankiewicz, MD
Balloons in the Office

Roy Casiano, MD
Powered Instruments

Andy Murr, MD
Steroids and Stents

Special Thanks for Supporting:
Entellus, Entrigue, Intersect, Laurimed, Medtronic

Plenary Session September 8, 2012 *Constitution A/B*

8:00 AM

Welcome

Todd Kingdom, MD, Program Chair

8:05 AM

Panel Discussion: Managing & Avoiding Complications in Rhinology

Moderator: James Stankiewicz, MD

Panelists: David Kennedy, MD, Devyani Lal, MD, Richard Orlandi, MD, David Poetker, MD, Kevin Welch, MD

8:45 AM

Presidential Address

Michael Setzen, MD

.

9:00 AM

Business Meeting

9:05 AM

Discussions in Rhinology: How The Experts Handle It?

Moderator: Todd Kingdom, MD

The Experts: Ralph Metson, MD, Heinz Stammberger, MD

9:30 AM

Break with Exhibitors - Constitution C

10:00 AM

Introduction of the 8th Annual Kennedy Lecturer

Peter Hwang, MD

The 8th Annual Kennedy Lecture -

Donald Lanza, MD

Re-thinking Inverted Papilloma in 2012 - Challenges & Novel Treatment Strategies

10:45 AM

Introduction of Professor Heinz Stammberger

Michael Setzen, MD

Demonstration Dissection of FESS -

Heinz Stammberger, MD

12:00 PM

Lunch with Exhibitors - Constitution C

Clinical Rhinology Session September 8, 2012 *Constitution A*

1:00 PM

Introduction

Todd Kingdom, MD

ARS President-Elect & Program Chair

**Moderators: Parul Goyal, MD,
Kevin Welch, MD**

1:05 PM

Evaluation of Post-operative Nasal Irrigations with Budesonide for Patients with Polyposis: A Blinded Randomized Controlled Trial

*Rounak B Rawal, BA, Allison M Deal, MS, Charles S Ebert, Jr, MD, MPH, Mitchell R Gore, MD, PhD, Brent A Senior, MD, FACS, Adam M Zanation, MD
Chapel Hill, NC USA*

Background:

Patients with chronic rhinosinusitis with polyposis (CRSwNP) often undergo surgery. Budesonide is often added to normal saline (NS) irrigations, although no evidence exists for its use for all-cause CRSwNP.

Objective:

This prospective, randomized, controlled trial compares two accepted modes of post-surgical treatment in patients with CRSwNP.

Methods:

Subjects were prospectively enrolled to NS or NS + budesonide arms. Patients were evaluated at the pre-operative visit and three post-operative visits (POV): POV1 (1-2 weeks post-op), POV2 (3-8 weeks post-op), and POV3 (3 - 6 months post-op). Patients completed three quality of life (QOL) questionnaires (SNOT - 22, RSOM-31, and RSDI), two endoscopic grading scores (POSE and Lund - Kennedy Scores) and two measures of olfaction (UPSIT and the PEA test).

Results:

Forty-eight patients were enrolled, with 23 patients in the NS arm and 25 patients in the NS

+ budesonide arm. Patients experienced significant improvement in all three QOL surveys by POV2 and POV3, although the degree of improvement between arms was not significant ($p = 0.40$, $p = 0.79$, and $p = 0.78$). Patients had significant improvement in both endoscopy scores, although the degree of improvement between arms was not significant ($p = 0.81$, $p = 0.73$). Patients in neither arms had significant improvement in either olfaction tests.

Discussion:

Although both NS and NS + budesonide treatments improve QOL and endoscopic scores for post-polypectomy patients, neither group significantly increases QOL and endoscopic scores as compared to the other. Olfaction was not significantly improved in either group.

1:11 PM

National Survey on the use of Preoperative Systemic Steroids in Endoscopic Sinus Surgery

*Javier Gonzalez-Castro, MD, Jose Busquets, MD
San Juan, PR United States*

Introduction:

The use of preoperative systemic steroids (SS) in Endoscopic Sinus Surgery (ESS) has been a topic of debate amongst Otolaryngologists for many years now. Until recently, most of the evidence to support SS use in ESS was largely anecdotal and based on expert opinion. Even with some recent randomized and blinded trials that have emerged, opinions amongst experts in the field are highly variable. The objective of this study is to identify and report the practice patterns of experts in the field regarding the use of pre-operative SS.

Methods:

A survey instrument was developed using SurveyMonkey® and sent to active members of the American Rhinologic Society (ARS). Responses to questions regarding SS use, regimen and benefits were recorded anonymously.

Results:

A total of 173 members answered the questionnaire. Although most respondents believe that there is inadequate evidence to justify their use, 88.82% of the study population do in fact use pre-operative SS in their practice. The most common reason for using SS amongst respon-

dents is Chronic Rhinosinusitis with Polyps (CRSwP), which is consistent with the literature available. We also found statistically significant differences between SS use in private versus academic practice, showing a trend towards more aggressive management in the academic affiliated physicians.

Conclusions:

The current study shows that most of the respondents in our group do in fact see an advantage in the use of SS before ESS. The data also highlights the opinion of most experts that more research with higher levels of evidence is still lacking.

1:17 PM

Oral Corticosteroids in the Management of Adult Chronic Rhinosinusitis with and without Nasal Polyps:

*David M Poetker, MD, MA, Luke A Jakubowski, MD, Devyani Lal, MD, Peter H Hwang, MD, Erin D Wright, MDCM, Med, Timothy L Smith, MD, MPH
Milwaukee, WI USA*

Introduction:

Oral steroids are commonly used in the management of chronic rhinosinusitis with and without nasal polyps (CRSwNP, CRSsNP, respectively). Past reports have included evaluation of the evidence for the use of oral steroids in CRS subtypes. However, a review with evidence-based recommendations for all CRS subtypes has never been performed. The purpose of this article is to provide a comprehensive, evidence-based approach for the utilization of oral steroids in the management of CRS.

Methods:

A systematic review of the literature was performed following recommendations of the Clinical Practice Guideline Manual, Conference on Guideline Standardization, and Appraisal of Guidelines and Research.

Evaluation:

Inclusion criteria were: adult population = 18 years old; chronic rhinosinusitis, oral steroids as the treatment group; and clearly defined primary clinical end-point.

Results:

This review identified and evaluated the literature on the use of oral steroids for CRSwNP, CRSsNP, allergic fungal sinusitis (AFS), and the use of oral steroids in the peri-operative period in these patients. Recommendations based on evidence, benefit/harm assessment, and value judgments are made.

Conclusion:

Oral steroids are strongly recommended for short-term management of CRSwNP. Oral steroids are also recommended for management of AFS. Oral steroid use in CRSsNP is optional due to insufficient strong evidence. Oral steroids are also strongly recommended in the peri-operative period for CRSwNP and AFS. There is no recommendation for oral steroids use in the peri-operative period in patients with CRSsNP. The risks of oral steroids are rare, but significant adverse effects must be considered.

1:23 PM

Comparison of Nasal Sprays and Irrigations in the Delivery of Topical Agents to the Olfactory Mucosa

Kent Lam, MD, Bruce K. Tan, MD, Jennifer M. Lavin, MD, Eric Meen, MD, David Conley, MD Chicago, IL United States

Background:

Treatment of sinonasal diseases utilizes topical agents administered using various application techniques, but few prior studies examine their distribution in the olfactory mucosa.

Objective:

To compare the distribution efficiency of nasal irrigations compared to nasal sprays within the human olfactory cleft.

Methods:

Eight cadaveric heads, providing a total of 15 nasal sides, underwent treatment with diluted methylene blue solution. Application utilized pressurized sprays followed by squeeze-bottle irrigations applied according to manufacturer instructions. Prior to treatment and following each method of agent delivery, videos and images from six standardized anatomical positions were recorded by nasal endoscopy. Three reviewers blinded to the method of agent delivery scored the images, using an ordinal scale to describe extent and relative intensity of staining.

Results:

Irrigations demonstrated a greater degree of penetration than sprays within the sphenoethmoid recess ($p<0.05$), superior turbinate ($p<0.05$), and superior olfactory cleft ($p<0.05$). While sprays coated 41-60 percent of a composite of these olfactory subsites, irrigations covered 81-100 percent of the same region. Sprays and irrigations, however, were comparable in the extent of staining at the vestibule ($p=0.05$), inferior turbinate ($p<0.05$), and middle turbinate ($p<0.05$).

Conclusions:

Compared to sprays, irrigations provide a more effective method to deliver topical agents to the anterior, posterior, and superior aspects of the olfactory cleft. The thorough distribution of squeeze-bottle irrigations to the olfactory mucosa has important implications for improving the delivery of therapeutic agents in peripheral olfactory disorders, but also requires recognition and testing of irrigation-based products for potential olfactory toxicities.

1:29 PM

Discussion/Q&A

Moderators: Christopher Church, MD, Mickey Stewart, MD

1:37 PM

Medical Therapy Versus Surgery for Chronic Rhinosinusitis: A Prospective, Multi-institutional Study with One-Year Follow-up

Timothy L. Smith, MD, MPH, Robert C. Kern, MD, James N. Palmer, MD, Rodney J. Schlosser, MD, Rakesh K. Chandra, MD, Alexander G. Chiu, MD Portland, Oregon USA

Introduction:

This study evaluates one year outcomes in patients with chronic rhinosinusitis (CRS) who were considered surgical candidates by study criteria and elected either medical management or endoscopic sinus surgery (ESS). In addition, some patients initially enrolled in the medical treatment arm crossed-over to the surgery arm during the study period and their respective outcomes are evaluated.

Methods:

Adult subjects with CRS who failed initial medical therapy were prospectively enrolled into a non-randomized, multi-institutional cohort. Subjects were included in one of three cohorts: medically managed, surgically managed, or cross-over (from medical to surgical). The primary outcome measure was disease-specific, quality-of-life(QOL). Bivariate and multivariate analyses compared QOL improvement between cohort groups.

Results:

Baseline comorbidity, QOL, and other disease severity measures were not different between the three cohorts. With one year follow up, surgical patients (n=65) reported significantly more improvement than medically managed patients (n=33; RSDI,p=0.039; CSS,p=0.018). Seventeen subjects who had initially elected medical management crossed-over to surgery during the follow-up period. QOL in the crossover cohort was initially stagnant or worsening followed by improvement after ESS (RSDI,p=0.035; CSS,p=0.070). At one-year follow-up, higher frequency of improvement was found in the surgical cohort vs. medical cohort for several outcomes (total CSS: 70.8% vs. 45.5%; OR:3.37[95% CI:1.27,8.90]; p=0.014).

Conclusions:

With one year of follow-up, patients electing ESS experienced significantly higher levels of improvement in outcomes as compared to patients managed by medication alone. In addition, a crossover cohort who initially elected medical management experienced improvement in several outcomes after crossing over to ESS.

1:43 PM

Diagnostic Paradigms in the Management of Chronic Rhinosinusitis from the Primary Care Provider Perspective: A Cost-Based Decision Analysis

Randy M Leung, MD, Rakesh K Chandra, MD, David B Conley, MD, Robert C Kern, MD, Bruce K Tan, MD
Barrie, Ontario Canada

Background:

To diagnose chronic rhinosinusitis (CRS), guidelines require either endoscopic or comput-

ed tomography (CT) findings of inflammation. To a primary care physician (PCP), this means a referral to an otolaryngologist or obtaining a CT scan for confirmation. Unfortunately, despite characteristic symptoms, it has been estimated that in primary practice, as low as 4% of patients actually have CRS - versus 20-36% in tertiary Rhinology clinics. The differential for CRS symptoms includes diagnoses such as migraine disorders and rhinitis, which are often managed medically by primary care doctors. When these patients are managed by otolaryngologists, recent data has suggested CT is more cost-efficient when applied earlier in the diagnostic algorithm.

Objective:

This study aims to identify a cost-efficient practice algorithm for primary care.

Methods:

A cost-based Markov-chain decision analysis based on literature reported probabilities, and Medicare costs was constructed for two scenarios: PCPs who are comfortable trying first line treatment for CRS, rhinitis and migraine, and PCPs who refer patients with these conditions to specialists for diagnosis and management. Modeling encompassed the time of initial encounter through initiation of definitive first line therapy.

Results:

Confirming diagnosis with CT scanning prior to treatment is less costly than treatment/referral based on an unconfirmed presumed diagnosis of CRS. This applies to scenarios where PCPs are comfortable initiating first-line treatment as well as PCPs who prefer to refer.

Conclusion:

In all scenarios, confirming diagnosis with CT scanning prior to treatment or referral is more cost-efficient than presuming a diagnosis of CRS based on symptoms alone.

1:49 PM

Effectiveness of Azithromycin as an Add-on Therapy to Steroid Irrigations in High-Risk Post-Endoscopic Sinus Surgery Patients

*Anastasios Maniakas, BSc, Martin-Yvon Desrosiers, MD, FRCSC
Montreal, Quebec Canada*

Objectives:

Chronic rhinosinusitis (CRS) has a high potential for recurrence following endoscopic sinus surgery (ESS), despite post-ESS corticosteroid irrigation. Azithromycin (AZI) is a macrolide antibiotic with anti-inflammatory properties that may be of benefit in such steroid-unresponsive patients. Our objectives were to evaluate the effectiveness of the addition of AZI in high-risk patients failing standard management and to identify predictive factors for treatment failure.

Methods:

A retrospective study of the post-operative evolution of all patients undergoing ESS for CRS in 2010 by a single surgeon was undertaken. Patients deemed at high risk of recurrence received BID nasal irrigation with 0.5mg of budesonide (BUD) in 240ml of saline, post-ESS. Patients showing signs of endoscopic recurrence at four months, despite BUD, were given azithromycin 250mg 3x/week (AZI) as part of their treatment regimen.

Results:

57 high-risk patients were operated on between January and December 2010. At 4 months, 63.2% (36/57) had a favorable outcome with BUD. Twelve (12/21) non-responders to BUD received AZI, with an additional 66.7% (8/12) having a favorable response. Failure of BUD was associated with female gender ($p=0.048$), having elevated alpha-1-antitrypsin levels ($p=0.037$), and lower recovery rates of *Staphylococcus aureus* (BUD non-responders: 28.6%; responders: 48.2%; $p=0.160$). The AZI non-responder group was too small for comparison.

Conclusion:

A significant sub-group of high-risk patients showing disease recurrence after ESS, despite corticosteroid irrigations, may respond to the addition of AZI as part of their therapy. These findings suggest that alternate anti-inflammatory agents may be required for an optimized management of steroid-unresponsive CRS.

1:55 PM

A Prospective Study of Post-operative Symptoms in Sinonasal Quality-of-Life Following Endoscopic Endonasal Pituitary Surgery

*Jeffrey C Bedrosian, MD, Roheen Raithatha, MD, Edward D McCoul, MD, MPH, Vijay K Anand, MD, Theodore H Schwartz, MD
New York, NY USA*

Objectives:

To assess prospectively, post-operative changes in sinonasal quality-of-life symptoms following endoscopic endonasal pituitary surgery.

Methods:

Fifty-two patients were prospectively assessed with the Anterior Skull Base Questionnaire (ASBQ) preoperatively and up to 1 year postoperatively at each subsequent office visit. A subset of these data was analyzed to assess the effect of endoscopic pituitary surgery on post-operative taste, smell, appetite, nasal secretions and vision.

Results:

Using the ASBQ, a validated quality-of-life instrument, we prospectively assessed patient-reported symptoms following endoscopic endonasal pituitary surgery. Compared to pre-operative scores, both taste (3.69 vs. 2.89, $p<0.001$) and smell (3.76 vs. 2.58, $p<0.001$) were significantly decreased by 6 weeks post-operatively. However, by 6 months post-operatively both taste and smell scores were not significantly different from pre-operative results (3.41, $p=0.23$ and 3.18, $p=0.05$, respectively). No significant change in appetite or nasal secretions was observed in the post-operative period. Patients reported significant subjective improvement in vision by 3 weeks post-operatively with durable results at 1 year (2.80 vs. 3.33, $p=0.04$ vs. 3.59, $p=0.03$, respectively).

Conclusions:

Endoscopic endonasal pituitary surgery transiently decreases patient-reported perceptions of taste and smell in the early post-operative period. These results steadily improve by 6 weeks post-operatively, with no significant difference in quality-of-life scores by 6 months post-operatively. No change in appetite or nasal secretions was observed. Patients reported steady subjective improvement in vision beginning at 3 weeks post-operatively.

2:01 PM
Discussion/Q&A

*Moderators: Subinoy Das, MD,
Charles Ebert, MD*

2:09 PM
**Validation of the Kennedy Osteitis Score to
Clinico-histologic Features of Chronic
Rhinosinusitis**

*Presented by: Richard Harvey, MD
Kornkiat Snidvongs, MD, Rohan McLachlan,
Raymond Sacks, MD, Peter Earls, MD,
Richard Harvey, MD
Sydney, NSW Australia*

Background:

Osteitis is a feature of chronic rhinosinusitis (CRS) and often associated with recalcitrant disease. Radiological characteristics of osteitic sinus changes are commonly reported in practice but the clinical and pathologic significance is poorly defined. The objective of this study was to validate the Kennedy Osteitis Score (KOS) to clinico-histologic features of CRS.

Methods:

A cross-sectional study of CRS patients undergoing sinus surgery was conducted. Osteitis was scored radiologically using KOS. Associations between osteitis and histopathology, symptoms, SNOT-22, endoscopy, CT mucosal score and seromarkers were assessed. Interobserver correlation coefficient was performed. Additionally, the KOS was correlated to an alternate Global Osteitis Score for validation.

Results:

88 patients were assessed (45.5% female, age 50.3±13.6 years). 45 (51.1%) patients had osteitis. Patients with KOS greater than 0, had greater endoscopy score (6.1±2.9 versus 4.4±3.6, p=0.03) and CT score (14.0±6.0 versus 10.1±5.7, p<0.01) than those without osteitis. There was no difference in symptom score (2.4±1.3 versus 2.4±1.1, p=0.89) and SNOT-22 (2.0±1.0 versus 1.9±1.1, p=0.56) in patients with and without osteitis. KOS was higher in patients with tissue eosinophilia > 10/HPF (3.0(1.0-5.3) v 0.0(0.0-4.0), p=0.03) and serum eosinophilia >0.3 x10⁹/L (4.0(2.0-

7.0) versus 1.0(0.0-4.0), p<0.01). Importantly, this was also true for those without prior surgery. The interobserver correlation coefficient was good (R=0.86, p<0.001). There is a significant correlation between KOS and Global Osteitis Score (R=0.93, p<0.001).

Conclusions:

KOS is a simple, easy and reproducible scale in assessing osteitic bones in patients with CRS and can predict measures of severity in eosinophilic rhinosinusitis.

2:15 PM
**Recalcitrant Rhinosinusitis, Innate Immunity,
and Mannose-Binding Lectin**

*Jeb M Justice, MD, Donald C Lanza, MD
St Petersburg, FL USA*

Background/Purpose:

Mannose-Binding Lectin (MBL) is part of innate immunity and is involved in opsonizing bacteria by tagging the surface of intruding microbes. MBL deficiency is present in up to 7% of the population and has been implicated in recurrent respiratory tract infections in children. MBL deficiency has not been explored in rhinosinusitis, but is associated with increased mortality in adult pneumococcal infection. The purpose of this report is to describe a tertiary rhinology patient experience with MBL deficiency and recalcitrant rhinosinusitis.

Methods:

This retrospective case series report characterizes patients with low MBL levels from January 2010 to June 2012. Indications for MBL testing, sinus culture data, immunological testing results, and treatments used to control rhinosinusitis are described.

Results:

MBL levels were deficient in 10/34 (29.4%) of patients tested. IgG subclasses were abnormally low in 4/10, while IgA was normal in all and IgM was normal in 9/10 patients. Staphylococcus aureus, coagulase-negative staphylococcus species, and pseudomonas aeruginosa, known to be "tagged" by MBL, were the most common organisms grown on culture. Treatments included culture directed systemic antimicrobial therapy and topical steroids/antibiotics.

Conclusions:

MBL, an important component of the lectin complement pathway and innate immunity, is possibly associated with recalcitrant adult rhinosinusitis. Steroid/antibiotic irrigations appear to benefit patients with recalcitrant rhinosinusitis and possibly those with MBL deficiency. Given that the prevalence of MBL deficiency in this case series is 4 times that seen in the normal population, additional investigations are warranted to further elucidate the role of MBL deficiency in rhinosinusitis.

2:21 PM

The Effect of Positive Intraoperative Culture on Quality of Life Improvement After Endoscopic Sinus Surgery for Chronic Rhinosinusitis

*Zi Zhang, MD, Alexander G. Chiu, MD, Noam A. Cohen, MD, PhD, Nithin D. Adappa, MD, James N. Palmer, MD
Philadelphia, PA USA*

Introduction:

The effect of positive culture on endoscopic sinus surgery (ESS) outcome is unclear. We aim to determine whether positive intraoperative culture is associated with quality of life (QOL) improvement after ESS for chronic rhinosinusitis (CRS), especially *Staphylococcus aureus* and *Pseudomonas aeruginosa*.

Methods:

Consecutive adult CRS patients who underwent ESS were prospectively enrolled from 2007 to 2011. The 22 item Sinonasal Outcome Test (SNOT-22) was used to measure QOL before ESS, 1-, 3- and 6-month after ESS. Positive intraoperative bacterial culture was defined as any isolates of *Staphylococcus aureus*, *Streptococcus pneumoniae*, *Haemophilus influenzae*, *Moraxella catarrhalis*, *Pseudomonas aeruginosa*, other gram-negative rods, or anaerobes. Patients' demographics, comorbidities, and medication use were collected before ESS and controlled in the linear mixed-effects regression model to assess the associations.

Results:

379 CRS patients completed baseline SNOT-22 and had successful bacterial culture, and 35.4% of them were culture positive. The mean SNOT-22 scores before ESS, 1-, 3- and 6-month after ESS were 39±23, 19±19, 20±19 and 19±18

respectively, which showed clinically significant improvement after ESS. CRS patients with positive intraoperative cultures had significantly worse QOL at 6-month follow-up compared to culture negative patients (23±21 vs. 17±14, $p=0.031$), and CRS patients with *S. aureus* had significantly worse QOL at 3-month follow-up compared to the other patients (27±27 vs. 18±16, $p=0.019$).

Conclusions:

CRS patients with positive intraoperative cultures have less improvement of QOL during follow-ups, but this difference is not significant immediately after ESS. Presence of positive culture at surgery places patients in a negative prognostic category.

2:27 PM

Comparison of Endoscopically-Guided Swab versus Aspirate Culture Techniques in Post-FESS Patients: Blinded, Prospective Analysis

*Evan Walgama, MD
Dallas, TX USA*

Introduction:

Culture-directed antibiotic therapy remains imperative in the management paradigm of chronic rhinosinusitis (CRS). The objective of this study was to conduct a prospective, blinded comparison of endoscopically-guided swab vs. aspirate cultures from the same sinonasal site in patients presenting with acute infectious exacerbation post-sinus surgery.

Methods:

Fifty patients were prospectively enrolled in a tertiary care rhinology clinic. At the conclusion of the study, all cultures were unblinded to determine mean culture yield, most common pathogens, potential contaminants (defined as presence of scant or rare growth of commensal organisms), and therapeutic correlation.

Results:

The mean patient age was 49.2 years and 60% were females. Thirty-eight and 12 patients had undergone previous endoscopic sinus and skull base surgery, respectively. All patients had evidence of symptomatic exacerbation with purulence on endoscopy. There were mean of 1.24 pathogens assayed per aspirate culture versus mean of 1.06 per swab culture ($p\text{-value} = 0.22$).

The prevalence of *Pseudomonas aeruginosa* was 42% for suction cultures versus 30% for swab cultures. The prevalence of *Staphylococcus aureus* was 44% for suction cultures versus 42% for swab cultures. There were 8 and 11 likely contaminants using aspirate and swab cultures, respectively. Therapeutic correlation was strong in 76%, moderate in 16%, and weak in 8% of patients.

Conclusions:

The present blinded, prospective review demonstrated higher culture yield with fewer contaminants with aspirate vs. swab culture, though difference was not statistically significant. Both aspirate and swab techniques are acceptable alternatives for endoscopic-derived cultures in patients with post-FESS infectious exacerbations.

2:33 PM

Discussion/Q&A

2:41 PM

Break with Exhibitors - Constitution C

Moderators: David Conley, MD, Jeffrey Suh, MD

3:10 PM

Quantification of Airflow into the Maxillary Sinuses Before and After Functional Endoscopic Sinus Surgery

Dennis O. Frank, PhD, Adam M. Zanation, MD, Vishal H. Dhandha, BS, Charles S. Ebert, Jr, MD, Brent A. Senior, MD, Julia S. Kimbell, PhD Chapel Hill, NC USA

Objective:

Increases in maxillary sinus airflow following functional endoscopic sinus surgery (FESS) are unknown, yet this information is needed to evaluate potential mucosal drying. The goal of this study is to quantify the effects of FESS on airflow into the maxillary sinuses in four chronic rhinosinusitis (CRS) patients using computational fluid dynamics (CFD).

Methods:

As part of a clinical trial, pre- and post-operative

computed tomography (CT) scans of four patients who underwent bilateral or unilateral FESS were used to create three-dimensional (3D) reconstructions of the nasal airway and paranasal sinuses using Mimics™ (Materialise, Inc., Plymouth, MI). The size of the maxillary antrostomies post-FESS ranged from 115-168 mm². Computational meshes were generated from the 3D reconstructions using ICEM-CFD™ (ANSYS, Inc., Canonsburg, PA) and steady-state, laminar inspiratory airflow was simulated in each mesh using the CFD software Fluent™ (ANSYS, Inc.) under physiologic pressure-driven conditions. Airflow into the maxillary sinuses was estimated from the simulations and compared pre- and post-operatively.

Results:

CFD simulations predicted that airflow into post-FESS maxillary sinuses was 5 to more than 17,000 times higher than before surgery. In addition, on average, the speed of the flow going into the sinuses more than quadrupled after FESS.

Conclusions:

CFD simulations showed that the healed maxillary antrostomy after FESS can greatly enhance airflow into the maxillary sinus by several fold. Correlations of increased post operative airflow with water flux (drying) need to be explored. These results have translational implications for mucosal drying, nasal airflow turbulence and possibly post operative drug delivery.

3:16 PM

Comparison of Anatomical Abnormalities in Patients with Limited and Diffuse Chronic Rhinosinusitis

Ravi Jain, MBChB, Nicholas Stow, MBBS, MD, Richard Douglas, MBChB, MD Auckland, Auckland New Zealand

Objectives:

The role of anatomical abnormalities in the pathogenesis of chronic rhinosinusitis (CRS) remains unclear. We hypothesized that anatomical abnormalities causing obstruction of mucus drainage would be more prevalent in patients with limited CRS than in patients with pansinusitis who are more likely to have a generalized mucosal abnormality.

Methods:

The CT scans of patients with limited sinusitis (maxillary sinus and/or the ostio-meatal unit), patients with diffuse bilateral disease and asymptomatic controls were studied. Lund-Mackay (LM) scores were calculated, and the frequency of anatomical abnormalities that could affect mucus drainage of the ostio-meatal region was determined.

Results:

The limited disease group comprised 22 patients with 96 total anatomical variants (4.4 +/- 2.0 (mean per patient +/- SD)). Average LM scores were 5.2 +/- 3.2. The diffuse disease group comprised 28 patients with 70 anatomical variants (2.6 +/- 2.0 per patient). LM scores were 15.1 +/- 4.2. The control group had 27 patients with 68 variants (2.5 +/- 1.4 per patient). LM scores were 1.3 +/- 1.3. The frequency of anatomical variants in the limited group was significantly higher than in the pansinusitis and control groups ($p < 0.003$). There was no significant difference in the number of anatomical variations between the diffuse disease and control groups.

Conclusion:

These results suggest that patients with limited CRS may be predisposed by anatomical variants impairing drainage of the ostiomeatal region and, pansinusitis (likely resulting from generalized mucosal abnormality), is associated with a lower frequency of anatomical variants similar to the general population.

3:22 PM

Subcutaneous Immunotherapy for Allergic Rhinitis-an Evidenced Based Review with Recommendations

*Presented by Elina Toskala, MD
Michael T. Purkey, MD, Timothy L. Smith, MD,
Berrylin J. Ferguson, MD, Elina Toskala, MD, PhD*

Background:

Allergic rhinitis is a common allergic disease with increasing prevalence in Western Societies. Medical therapy is first line treatment, and is aimed at reducing symptoms of IgE-mediated inflammation of the nasal passages. In patients with disease refractory to medical therapy, subcutaneous immunotherapy is an option. The aim of this study is to review the efficacy and safety of subcutaneous

immunotherapy for seasonal and perennial allergic rhinitis.

Methods:

A systematic review of the literature was performed from 2006-2011 and compared with data from a 2007 Cochrane review on immunotherapy for seasonal allergic rhinitis. We included all studies of level 1 evidence. All forms of single extract immunotherapy were considered. Studies with primary asthma related end-points were excluded. Primary end-points were instruments of clinical efficacy (i.e. symptom-medication scores) and adverse events.

Results:

We retrieved 12 level 1 studies for review. In total, 1,512 patients were randomized into treatment groups, alternative study groups (alternative duration of therapy or SLIT), or placebo. Efficacy was evaluated based on reported symptom and/or medication score, validated quality of life instruments, immunological assays, challenge testing, and adverse events.

Conclusion:

Subcutaneous immunotherapy improves symptom and/or medication scores and validated quality of life measures. In addition, associated changes in surrogate markers of immunologic protection are observed. Subcutaneous immunotherapy is safe when administered to carefully selected patients and in settings capable of responding to systemic reactions. Subcutaneous immunotherapy is recommended for patients with seasonal or perennial allergic rhinitis not responsive to conservative medical therapy, and whose symptoms significantly affect quality of life.

3:28 PM

Sinonasal Anatomic Variants and Asthma are Associated with Faster Development of Chronic Rhinosinusitis in Patients with Allergic Rhinitis

*Ahmad R Sedaghat, MD, PhD, Stacey T Gray, MD, FACS, Claus O Wilke, PhD, David S Caradonna, MD, FACS
Boston, MA USA*

Background:

Allergic rhinitis (AR) and chronic rhinosinusitis (CRS) are a major burden to the healthcare

system. Although no causal relationship has been established, previous work has demonstrated the strong association of AR with CRS.

In this study, we sought to identify risk factors that may influence speed of development of CRS in patients with AR.

Methods:

Retrospective review of all patients diagnosed with AR without CRS presenting to an otolaryngology clinic at a tertiary medical center as part of a multidisciplinary allergy evaluation between March 2004 and November 2011. Medical records were evaluated for clinicodemographic factors including age, gender, smoking history, medical comorbidities, categories of AR based on formal allergy testing, the presence of sinonasal anatomic variants on computed tomography as well as subsequent development of CRS.

Results:

Faster progression to CRS in patients with AR was associated with comorbid asthma (hazard ratio [HR]=3.97) as well as sinonasal anatomic variants, infraorbital cells (HR=7.39) and frontal intersinus cells (HR=68.03), on multivariate survival analysis. A statistically significant but negative interaction between infraorbital cells and frontal intersinus cells suggests that concomitant presence of both leads to a less than additive increase in the rate of CRS progression.

Conclusions:

Sinonasal anatomical variants, infraorbital cells and frontal intersinus cells, as well as comorbid asthma are associated with faster development of CRS in patients with AR. The presence of these clinical characteristics identifies patients who should be counseled on compliance with medical therapy and, perhaps managed more aggressively for AR.

3:34 PM

Discussion/Q&A

Moderators: Jean Anderson Eloy, MD, Joseph Han, MD

3:42 PM

Cost-Effectiveness of Endoscopic Sphenopalatine Artery Ligation versus Posterior Packing as First-line Treatment for Posterior Epistaxis

Raj C Dedhia, MD, Shamit S Desai, BA, MA, Kenneth J Smith, MD, MS, Stella Lee, MD, Carl H Snyderman, MD, MBA, Eric W Wang, MD Pittsburgh, PA USA

Introduction:

The advent of endoscopic sphenopalatine artery ligation (ESPAL) in the control of posterior epistaxis provides an effective, low morbidity treatment option. In the current practice algorithm, ESPAL is pursued after failure of posterior packing. Given the morbidity and limited effectiveness of posterior packing, we sought to determine the cost-effectiveness of first-line ESPAL compared to the current practice model.

Methods:

A standard decision analysis model was constructed comparing "First-line ESPAL" and "Current Practice" algorithms. A literature search was performed to determine event probabilities and published Medicare data provided cost parameters. The primary outcomes were cost of treatment and resolution of epistaxis. One-way sensitivity analysis was performed for key parameters.

Results:

Costs for the "First-line ESPAL" arm and "Current Practice" arm were \$5,902 and \$8,046, respectively. This difference of \$2,144 in favor of the "First-line ESPAL" arm was increased to \$6,610 when the duration of nasal packing was increased from 3 to 5 days.

Conclusion:

This study demonstrates the cost-effectiveness of ESPAL as first-line therapy for posterior epistaxis. Given the improved effectiveness and patient comfort of ESPAL compared to posterior packing, ESPAL should be offered as an initial treatment option for medically stable patients with posterior epistaxis.

3:48 PM

Sonopet Ultrasonic Bone Aspirator Versus Traditional Instrumentation During Endoscopic Transsphenoidal Approach for Pituitary Tumor Resection

*Harry Michael Baddour Jr., MD,
Michael D Lupa, MD, Zara M Patel, MD
Atlanta, GA USA*

Background:

The Sonopet ultrasonic bone aspirator has been used within neurosurgery, otolaryngology and in other fields, but to our knowledge has not been reported in the literature for use in endoscopic transsphenoidal approaches (TSA) to the skull base. The study objective was to compare use of the Sonopet versus traditional cold steel instrumentation during TSA in terms of operative time and blood loss.

Methods:

The study design was a prospective, randomized, single-blinded controlled clinical trial. The population included patients who presented to a tertiary care skull base center with pituitary tumors amenable to endoscopic resection. Participants were randomized to either an endoscopic approach using the Sonopet ultrasonic bone aspirator or traditional steel instrumentation. Outcomes measured were operative time and blood loss for the approach and exposure portion of the procedure.

Results:

A total of 130 patients underwent an endoscopic TSA using either the Sonopet aspirator (n=66) or traditional steel instrumentation (n=64). The use of the Sonopet resulted in a significant reduction in both operative time (31.92 ± 3.04 minutes vs. 41.32 ± 2.75 minutes, $p < 0.0001$) and blood loss (16.5 ± 5.37 milliliters vs. 22.57 ± 3.09 milliliters, $p < 0.0001$) compared to traditional steel instrumentation.

Conclusions:

This study is, to our knowledge, the first prospective, randomized, controlled clinical trial comparatively demonstrating the speed and efficacy of the Sonopet bone aspirator for endoscopic TSA to the skull base. The significant reduction in operative time and blood loss compared to traditional instrumentation provides evidence in favor of use of the Sonopet for these procedures.

3:54 PM

Origins of Inverted Papilloma - Not related to HPV?

*Jeb M Justice, MD, Donald C Lanza, MD
St Petersburg, FL USA*

Background/Purpose:

Controversy exists in the literature regarding the pathogenesis of inverted papilloma (IP) as it relates to human papillomavirus (HPV). Histopathological studies of IP suggest an association is unlikely when dysplasia is absent. The purpose of this report is to describe the prevalence of HPV in non-dysplastic, early IP, and to summarize prior peer-reviewed publications evaluating the prevalence of HPV in IP and in the general population.

Methods:

This retrospective case series characterizes consecutive patients with IP from January 2005 to May 2012. Presence or absence of low/high risk HPV was determined by standardized in-situ hybridization (ISH) DNA probes. Dysplasia was identified from surgical histopathology reports. Medline literature review to determine the prevalence of HPV in IP without either moderate or severe dysplasia was performed.

Results:

Average age was 64 years (range 40-84); gender: 17 men-12 women. High and/or low risk HPV was present in 1/29 (3%) patients and 1/29 (3%) had mild dysplasia. Literature review: HPV does not invade normal respiratory epithelium, oral cavity HPV is present in 11.4% of a similar US population, while 85-95% of common warts, condylomata acuminata and respiratory papillomatosis are associated with HPV.

Conclusions:

Given histological features and the low rate of HPV in IP without dysplasia (3%), HPV does not appear to be related to the initial pathogenesis of IP. It is postulated that this inflammatory polyp is susceptible to HPV infection due to its metaplastic tissue surface and thus may be related to the transformation of existing IP to squamous cell carcinoma.

4:00 PM

Risk Factors and Outcomes for Primary, Revision and Modified Lothrop (Draf 3) Frontal Sinus Surgery

Yuresh S Naidoo, MD, Ahmed Bassiouni, MD, Mark Keen, MD, Peter-John Wormald, Prof Adelaide, SA Australia

Objectives/Hypothesis:

To detail the outcomes of primary, revision and endoscopic modified Lothrop (EMLP) (Draf 3) frontal sinus surgery and evaluate whether risk factors would help determine which patients would benefit from which procedures

Study Design:

Retrospective Cohort study

Level of Evidence:

Level 4

Methods:

Retrospective chart review. Endoscopic assessment of frontal ostium patency and patient reported symptoms were prospectively collected on patients who underwent frontal sinusotomy between January 2003 and December 2009. High risk cohorts were studied to assess their response to standard ESS compared with EMLP.

Results:

339 patients underwent either primary or revision endoscopic frontal sinus surgery who met the inclusion and exclusion criteria. The average length of follow up was 20.8 months (95% CI 18. -22.9 months, SD 18.7 months). Post surgical recurrence of disease with persistence of symptoms requiring an EMLP occurred in 9 patients in the primary group and 38 in the revision group. The highest risk groups for failure of standard frontal sinusotomy were patients with nasal polyps, asthma, Lund Mackay score >16 and frontal ostium size <4mm. (Relative risk 9.9, P<0.0001).

Conclusions:

Patients with underlying asthma and polyposis as well as narrow frontal ostia and extensive radiological disease have a high failure rate from standard endoscopic frontal sinusotomy. In this patient group consideration should be given to offering the patient a primary EMLP procedure, which has excellent success rates with low risks and morbidity.

4:06 PM

Discussion/Q&A

4:15 PM

Combined ARS-AAOA Panel Discussion Entropy: Local IgE Production in Sinonasal Disease

Moderator: David Osguthorpe, MD

Panelists:

Testing for Th2-Mediated Nasal Inflammation and Local IgE Production - Bill Reisacher, MD

Local IgE Production in Polyps - Rodney Schlosser, MD

Local IgE Production in Fungal Sinusitis - Sarah Wise, MD

5:00 PM

Meeting adjourned

Basic & Translational Research Session September 8, 2012 *Constitution B*

1:00 PM

Introduction - Noam Cohen, MD (Chair, ARS Research Committee)

Moderators: Greg Davis, MD & Nathan Sautter, MD

1:05 PM

The Role of the Inflammasome in Cigarette Smoke Induced Rhinosinusitis

*Murugappan Ramanathan, MD, Thomas E. Sussan, PhD, Tomefa Asempa, BS, Shyam Biswal, PhD
Baltimore, MD USA*

Introduction:

Chronic cigarette smoke (CS) exposure can cause chronic inflammation of the nose and sinuses. The innate immune inflammasome has gained recent attention as a potential inflammatory regulator of oxidative insults such as CS. Previous studies have not examined the inflammasome's ability to regulate chronic CS induced sinonasal inflammation and antioxidant production.

Methods:

Wild type (WT) (n=5) and Caspase-1 knock out (Casp-1^{-/-}, deficient in the inflammasome) C56BL/6 mice (n=5) were exposed to CS via whole body inhalation daily for 8 months. Control WT (n=5) and Casp-1^{-/-} mice (n=5) were exposed to air. Nasal lavages were examined for cellular inflammation followed by histopathologic analysis of the sinonasal mucosa. Additionally, sinonasal mucosa was harvested and mRNA was isolated for RT-PCR analysis of proinflammatory cytokines and Nrf2 regulated antioxidant genes.

Results:

On average, inflammasome deficient mice chronically exposed to CS had increased nasal lavage eosinophilia and sinonasal epithelial

thickening on histologic sections when compared to WT mice exposed to CS. These mice also had an increase in the proinflammatory cytokine IL-6 along with a concurrent decrease in the Nrf2 regulated antioxidant gene NQO1 when compared to CS exposed WT mice.

Conclusions:

These results suggest that the inflammasome may regulate CS induced oxidative stress related sinonasal inflammation in mice. A better understanding of how this innate immune regulator of the inflammatory response may lead to more effective therapies against environmental-mediated oxidative stress related sinonasal inflammation.

1:11 PM

Olfactory Function in a Porcine Model of Cystic Fibrosis

*Eugene H Chang, MD, Tanner J Wallen, BS
Iowa City, IA USA*

Rationale:

Humans with cystic fibrosis (CF) often have a decreased sense of smell (hyposmia). It is unknown if hyposmia in CF is due to a primary loss of the cystic fibrosis transmembrane conductance regulator (CFTR) or a secondary consequence of nasal polyposis and chronic infection.

Objective:

To study if CFTR is necessary for olfaction, we examined the olfactory epithelia and response to odorants in a porcine CF model.

Methods:

We investigated the ultrastructure of the olfactory epithelia of newborn CF and non-CF pigs by electron microscopy. We adapted the electro-olfactogram (EOG) to measure voltage changes across the olfactory epithelia in response to odorant stimuli.

Results:

Newborn porcine ethmoid epithelia had well-developed olfactory epithelia. Newborn CF pigs had consistent responses to odorant stimuli by EOG that were not significantly different to their wild-type littermates.

Conclusions:

These results suggest that CFTR is not critical

in the development of the olfactory system. Further studies are needed to investigate if CFTR is important in the maintenance and maturation of the olfactory system. The pig is a potential model to test neural conduction to olfactory stimuli.

1:17 PM

The Predictive Value of the Bitter Taste Receptor T2R38 Genotype for Patients Requiring Primary Endoscopic Sinus Surgery for Chronic Rhinosinusitis

Nithin D Adappa, MD, James N Palmer, MD, Timothy J Howland, MS, Doghramji Laurel, RN, BSN, Robert J Lee, PhD, Noam A Cohen, MD, PhD Philadelphia, PA USA

Background:

The bitter taste receptor T2R38 was recently described to regulate upper airway innate defenses through nitric oxide production and increased ciliary function in response to microbial quorum sensing molecules. Further investigation demonstrated that the vigorousness of these defenses is modulated by polymorphisms within T2R38, which also confers taste perception to the molecule PTC. Based on this phenotype, individuals are broadly divided into supertasters, tasters (heterozygotes), and nontasters.

Objective:

To determine whether T2R38 genotype predicts the necessity for surgical intervention for primary chronic rhinosinusitis.

Methods:

We performed a retrospective review of patients who had undergone primary sinonasal surgery at the University of Pennsylvania and had been genotyped for T2R38 bitter taste receptor.

Results:

Twenty-nine patients were identified who had primary sinus surgery with T2R38 genotypes available at the time of abstract submission. One patient was a supertaster (3%), fifteen were heterozygotes (52%) and thirteen were non-tasters (45%) with general population genotype distribution being 20%, 50%, and 30% respectively. The lack of supertasters requiring surgical intervention compared to the general population was statistically significant ($p < 0.05$).

Conclusion:

This pilot study demonstrates a statistically significant deviation from the general population of T2R38 genotypes. In concordance with increased innate defense demonstrated by the supertaster genotype, we demonstrate that these patients are less likely to have chronic rhinosinusitis that fails medical therapy and necessitates surgical intervention. Ultimately, early genotype identification may aid in patient counseling regarding clinical response to medical therapy and guide decision making with regard to surgical intervention.

1:23 PM

Presence of Solitary Chemosensory Cells and Bitter Taste Transduction in Sinonasal Mucosa

Henry P Barham, MD, Sue C Kinnamon, PhD, Thomas E Finger, PhD, Marco Tizzano, PhD, Todd T Kingdom, MD, Vijay R Ramakrishnan, MD Aurora, Colorado USA

Background:

Solitary chemosensory cells (SCCs) are polymorphic cells found within the respiratory epithelium that respond to many stimuli, including noxious chemicals and bacterial signaling molecules. SCCs express all components of the bitter taste transduction pathway including the TAS2R family of G-protein coupled bitter taste receptors and their downstream signaling effectors: alpha-Gustducin, PLCbeta2, and the transduction channel, TrpM5. When activated, SCCs incite neurogenic reflexes, resulting in upregulation of local inflammatory pathways resulting in dendritic cell recruitment and increased vascular permeability.

Methods:

We used RT-PCR, qPCR, and immunohistochemistry on biopsies from human sinonasal mucosa to evaluate the presence, location, and density of SCCs in patients with chronic rhinosinusitis and controls. We selected four subsites-inferior turbinate, middle turbinate, septum, and uncinata- based on prior rodent studies from our lab.

Results:

RT-PCR consistently demonstrates the presence of mRNA for alpha-Gustducin, PLCbeta2, and TrpM5 in three of four sites (inferior and middle turbinates, septum) in 7 control and 17

diseased patients. The uncinate process, however, showed differential expression between control and diseased populations ($p=0.02$). Overall, qPCR for alpha-Gustducin and TrpM5 was similar between groups. PLCbeta2 immunostaining confirmed the presence of SCCs based on classic morphologic characteristics.

Conclusions:

SCCs are located in human sinonasal mucosa in functionally relevant areas, as are key proteins involved in the bitter taste transduction pathway. These findings carry major implications for inflammatory diseases such as rhinitis and rhinosinusitis, and may provide a mechanism for local neurogenic inflammation.

1:29 PM

Discussion/Q&A

Moderators: *Nithin Adappa, MD & Douglas Reh, MD*

1:37 PM

CD8A Gene Polymorphisms Predict Severe Chronic Rhinosinusitis

*Saud Alromaih, MD, Leandra Mfuna-Endam, Yohan Bosse, PhD, Ali Alfilali-Mouhim, PhD, Martin Desrosiers, MD
Montreal, QC CANADA*

Introduction:

A genetic basis to chronic rhinosinusitis (CRS) is postulated, but remains elusive. We have recently identified low levels of circulating CD8 lymphocytes as a frequent finding in severe, refractory CRS. Low circulating levels of CD8 lymphocytes secondary to mutations in the CD8a and Tapasin (TAPBP) genes lead to MHC-1 deficiency which is associated with severe CRS.

Objectives:

We wish to identify genetic factors associated with MHC1 deficiency in CRS.

Methods:

Previous results from a genome-wide association study of chronic rhinosinusitis (Bosse, 2009) were screened for polymorphisms in the CD8a and TAPBP genes. Significant polymor-

phisms were screened for associations with demographic factors characterizing severe sinusitis.

Results:

The CD8a SNP rs3810831 and TAPBP SNP rs2282851 were significantly associated with CRS. Homozygosity for rs3810831 (CD8a) was associated with a higher frequency of affected relatives ($p=0.042$), increased severity as characterized by age at diagnosis ($p=0.0009$), age at 1st surgery ($p=0.004$), and number of surgeries ($p=0.008$), while rs2282851 (TAPBP) was associated with mild disease (OR= 2.48, $p= 0.0076$)

Conclusion:

Modified CD8a or TAPBP gene function may contribute to the development of refractory CRS via altered MHC-1 function and reduction of circulating CD8 lymphocytes.

Significance:

Identification of markers in the CD8 or TAPBP genes via sequencing may offer a basis for genetic testing in CRS.

1:43 PM

Gene Expression Differences in Reactive Oxygen Species Regulation Point to an Altered Innate Immune Response in Chronic Rhinosinusitis

*Camille R Jardeleza, MD, Damien Jones, BSc, Dijana Miljkovic, BBtech, Neil Tan, MBBS, Sarah Vreugde, MD, Peter-John Wormald, MD
Adelaide, South Australia*

Background:

The complex interplay between host, environment and microbe in the aetiopathogenesis of chronic rhinosinusitis (CRS) remains to be completely described. This study focuses on the host-microbe interaction, specifically the regulation of nitric oxide (NO) and reactive oxygen species (ROS) against the pathogenic organism *Staphylococcus aureus* (S. aureus). NO and ROS play crucial roles in innate immunity and in the first line defense against microbial invasion.

Methodology:

Sinonasal tissue samples were harvested from CRS and control patients during surgery. CRS patients were classified S. aureus biofilm posi-

tive (B+) or negative (B-) using Fluorescence in situ hybridization and clinically as polyp positive (P+) or negative (P-). Samples were assessed using a Nitric oxide PCR array containing 84 genes involved in NO and ROS regulation and gene expression of all sub-groups were compared to each other.

Results:

23 samples were included with the greatest gene changes seen in the B+P+ CRS patients. Consistently altered genes based on biofilm and polyp status included the cytoprotective OXR1 (Oxidation Resistance 1) and PRDX6 (Peroxiredoxin 6), NCF2 (Neutrophil cytosolic factor 2), and the PRNP (Prion Protein) gene.

Conclusion:

Alterations in gene expression point to impaired innate immune responses differing among CRS sub-groups based on *S. aureus* biofilm and polyp status. This demonstrates that CRS is a spectrum rather than a single disease entity with suggestion that *S. aureus* biofilm presence alters gene expression. Further studies are required to validate these findings in a wider cohort of patients and correlate this to protein expression and disease manifestation.

1:49 PM

A Gene Pathway Analysis of Differential Expression in AFRS

Kibwei A McKinney, MD, Adam M Zanation, MD, Brian D Thorp, MD, Austin Rose, MD, Rounak B Rawal, BS, Charles S. Ebert, MD, MPH Chapel Hill, NC USA

Introduction:

There is a subset of patients with allergic fungal rhinosinusitis (AFRS) with unilateral disease and preservation of normal sinonasal anatomy on the contralateral side. Not much is known about the pathophysiologic factors that predispose patients to unilateral versus bilateral disease.

Objective:

To determine whether there is differential expression of inflammatory pathways between diseased and non-diseased mucosa of patients with AFRS.

Study Design:

Patient-matched analysis of global gene signature profiles and immune system pathways.

Methods:

16 Patients with documented 5/5 Bent-Kuhn AFRS criteria were included. Paired samples of ethmoid mucosa were harvested from the diseased and non-diseased sides of patients with unilateral AFRS (n=3) and were compared to samples from bilateral AFRS (n=13) and normal controls (n=5). RNA was hybridized to 4x44K microarray chips. A Gene Pathway Analysis of differential expression was performed on 15 immune system pathways from the Kyoto Encyclopedia of Genes and Genomes (KEGG), at a significance level of $p < 0.05$.

Results:

Thirteen of the 15 pathways assessed showed statistically significant differential expression between diseased and non-diseased samples of unilateral AFRS patients. Among these were the pathways for Toll-like receptor signaling, complement cascade, natural killer cell-mediated cytotoxicity, antigen processing and presentation, and the T- and B- cell receptor signaling.

Conclusions:

There are distinct differences in expression of immune pathways in patients with unilateral AFRS. Further elucidation of individual effectors will be critical in further defining the pathophysiology of this disease process.

1:55 PM

Matrix Metalloproteinase-9 Gene Regulation in Chronic Rhinosinusitis-associated Osteitis

Kara Y Detwiller, MD, Timothy L Smith, MD, MPH, Jess C Mace, MPH, Dennis R Trune, PhD, MBA, Nathan B Sautter, MD Portland, Oregon USA

Objective:

Chronic sinonasal inflammation is associated with tissue remodeling processes such as osteitis that may be a marker of refractory disease, however, the molecular pathophysiology of osteitis in chronic rhinosinusitis (CRS) is insufficiently understood.

Methods:

Ethmoid mucosa and bone samples were obtained from 35 medically refractory CRS patients and 9 healthy controls. All CRS patients were treated with standard perioperative oral and topical corticosteroids prior to tis-

sue sampling. Quantitative real time polymerase chain reaction (RT-PCR) was performed separately on bone and mucosa for Matrix Metalloproteinase-9 (MMP9). Osteitis was classified as mild (>3mm), moderate (4-5mm), or severe (>5mm) by measuring bone thickness of the maxillary, sphenoid, and ethmoid sinuses on multiplanar CT. Patients were stratified according to severity of radiographic osteitis and compared to controls.

Results:

9 patients demonstrated radiographic evidence of osteitis (mild=3, moderate/severe=6). Despite concurrent steroid therapy, bone PCR revealed biologically significant upregulation of MMP9 in all CRS patients, but the magnitude of upregulation decreased with severity of radiographic osteitis. Mucosa PCR showed biologically significant upregulation of MMP9 in moderate/severe osteitis only.

Conclusion:

This is the first study to evaluate the role of MMP9 in CRS patients with sinonasal osteitis. The pattern of expression suggests there may be a time and tissue dependent role for MMP9 in the pathophysiology of osteitis. In addition, MMP9 overexpression is observed despite pre-operative oral and intranasal steroid use, suggesting that MMP9 regulation may not be completely steroid responsive.

2:01 PM

Discussion/Q&A

Moderators: Richard Orlandi, MD, David Poetker, MD

2:09 PM

Regulation of Inflammation-associated Olfactory Dysfunction by the Type II TNF Receptor

Presented by Jonathan Liang, MD
Andrew P. Lane, MD, Tatyana Pozharskaya, BA,
Jonathan Liang, MD
Baltimore, MD USA

Objectives:

Olfactory loss is a debilitating symptom of chronic rhinosinusitis. To study the impact of inflammation on the olfactory system, the Inducible Olfactory Inflammation (IOI) trans-

genic mouse was created in which inflammation can be reversibly induced within the olfactory epithelium. In this study, the type II TNF receptor (TNFR2) was knocked out, and the effect on the olfactory loss phenotype was assessed.

Methods:

IOI mice were bred to TNFR2 knockout mice to yield progeny IOI mice lacking the TNFR2 receptor (TNFR2KO). TNF-alpha expression was induced within the olfactory epithelium for 6 weeks to generate chronic inflammation. Olfactory function was assayed by electro-olfactogram (EOG), and olfactory tissue was processed for histology and immunohistochemical staining.

Results:

Compared to IOI mice with wild type TNFR2, IOI mice lacking the TNFR2 demonstrated similar levels of inflammatory infiltration and enlargement of the subepithelial layer. However, IOI-TNFR2KO mice differed markedly in that the neuronal layer was largely preserved and active progenitor cell proliferation was present. Odorant responses were maintained in the IOI-TNFR2KO mice, in contrast to IOI mice.

Conclusions:

TNFR2 is the minor receptor for TNF-alpha, but appears to play an important role in mediating TNF-induced disruption of the olfactory system. This finding suggests that neuronal death and inhibition of proliferation in CRS may be mediated by TNFR2 on olfactory neurons and progenitor cells. Further studies are needed to elucidate the subcellular pathways involved and develop novel therapies for treating olfactory loss in the setting of CRS.

2:15 PM

Evaluation of mmp-9 and timp-1 Levels of the Patients with Nasal Polyposis after Corticosteroid Therapies

Dogan Pinar, MD, Hakan Cincik, MD, Evren Erkul, MD, Osman Metin Ipcioglu, MD,
Engin Cekin, MD, Atila Gungor, MD
Istanbul, NA Turkey

Objective:

The aim of this study is to evaluate the effects of intrapoly, systemic and local corticosteroid treatment modalities on MMP-9 and TIMP-1 level in polyyp tissues.

Study Design:

Prospective, controlled study.

Setting:

Tertiary Training Hospital

Subjects and Methods:

This study included 57 patients with nasal polyposis and 14 patients with concha bullosa. Group A treated with oral methylprednisolone, Group B treated with topical steroid spray, Group C treated with intralesional triamcinolone acetonid. Group D did not receive any medication. Group E had surgery for concha bullosa without nasal polyp disease. Tissue Samples from the groups were collected and, MMP-9 and TIMP-1 levels were measured by Enzyme-Linked Immunosorbent Assay method.

Results:

Mean MMP-9 levels of the groups were 57.29, 89.99, 49.31, 63.91 and 70 mcg/gr protein respectively. There were no significant differences among the groups regarding MMP-9 levels. Mean TIMP-1 levels of the groups were 52.21, 57.52, 32.32, 48.28 and 84.94mcg/gr protein respectively. There was significant difference of TIMP-1 level between groups C and E ($p_{C-E}=0.0019$), however there was no difference among the level of the other groups. When MMP-9/TIMP1 rates of all groups were compared, there were significant difference between group A and D ($p_{A-D}=0.005$) and between group A and E, also between group C and E.

Conclusion:

Our study is the first study to evaluate the effects of different corticosteroid treatment modalities on MMP-9 and TIMP-1 levels in nasal polyps and concluded that corticosteroid did not do a significant impact on this pathway.

2:21 PM

Corticosteroid Sensitivity of Epithelial MDR1/P-gp in Chronic Sinusitis with Nasal Polyps

Benjamin S Bleier, MD, Rachel Feldman, BA Boston, MA USA

Introduction:

P-glycoprotein(P-gp) is a 170kDa transmembrane glycoprotein encoded by the MDR1(ABCB1) gene. Recent studies have revealed that P-gp can function as a cytokine

efflux pump in a variety of tissues and is upregulated in chronic sinusitis with nasal polyps(CRSwNP). Corticosteroid exposure has been shown to downregulate lower airway P-gp expression thereby resulting in a reduction in P-gp mediated cytokine secretion. The purpose of this study is to therefore determine whether epithelial P-gp expression in CRSwNP is similarly sensitive to corticosteroid exposure.

Methods:

IRB approved study utilizing nasal polyp tissue in 18 patients with CRSwNP. Nine patients were steroid naïve and nine were treated with 40mg of prednisone daily for 1 week prior to tissue sampling. Quantitative fluorescent immunohistochemistry(Q-FIHC) was performed using an anti-P-gp antibody and a secondary FITC conjugated Fc specific fragment. Protein expression was quantified by calculating the epithelial to nonspecific background intensity ratio. Scores less than 1 suggested negligible expression. Staining ratios between patient groups were compared using a 2-tailed Student's t-test.

Results:

Among the steroid naïve patients, P-gp staining ratios in the polyp epithelium were elevated commensurate with prior studies(1.556 ± 0.365). There was no significant difference found in the steroid exposed group(1.333 ± 1.172 , $p=NS$).

Conclusions:

MDR1/P-gp expression in nasal polyps is not significantly reduced in the setting of corticosteroid exposure differing from findings seen in the lower airway. This data suggests that the overexpression of P-gp in nasal polyps coupled with its corticosteroid insensitivity may play a role in the pathogenesis of the CRSwNP.

2:27 PM

Roles of Dual NADPH Oxidases in Chronic Rhinosinusitis

Do-Yeon Cho, MD, Dawn Bravo, PhD, Jayakar V Nayak, MD, PhD, Peter H Hwang, MD, Beate Illek, PhD, Horst Fischer, PhD Stanford, CA USA

Introduction:

The airway epithelium generates reactive oxygen species (ROS) as the first line of innate defense. Physiologic balance between ROS

production and rate of their elimination protects against oxidative cell injury. Dual oxidases (DUOX1 and DUOX2) are the H₂O₂-producing isoforms of NADPH oxidase family found in airway epithelium. The purpose of this study was to identify the molecular expression and function of DUOXs in chronic rhinosinusitis (CRS).

Methods:

Human nasal tissue and secretion were collected from three groups (normal, CRS with and without polyposis). Luminex cytokine assay and Amplex-Red H₂O₂ assay of nasal secretion were performed as well as immunofluorescence microscopy and qPCR (DUOX1 and DUOX2) of nasal tissue.

Results:

Significantly higher levels of IL-2, IL-4, IL-8 were detected in CRS with and without polyposis compared to normal ($p=0.018, 0.049, 0.023$, respectively). mRNA expression for DUOX1 (80.7 ± 60.5) was significantly higher in CRS with nasal polyposis compared to normal (2.7 ± 1.2) and CRS (2.3 ± 0.5) ($p=0.042$). CRS with (18.6 ± 9.9) and without polyposis (4.0 ± 1.3) had statistically higher DUOX2 expression, compared to normal (1.1 ± 0.3 ; $p=0.008$). Immunohistochemistry staining of DUOX was observed in the apical portion of epithelium. H₂O₂-production was significantly higher in CRS with (114.6 ± 33.4 NRFU) and without polyposis (100.4 ± 13.1) compared to normal (67.1 ± 3.0) ($p=0.03$).

Conclusions:

Key inflammatory cytokines were found to be up-regulated in CRS. Both DUOX1 and DUOX2 were up-regulated in CRS with polyposis and DUOX2 was up-regulated in CRS without polyposis. DUOX proteins were expressed in nasal epithelium and may play an important role in ROS production and pathogenesis in CRS.

2:33 PM

Discussion/Q&A

2:41 PM

Break with Exhibitors - Constitution C

Moderators: Eric Holbrook, MD, Vijay Ramakrishnan, MD

3:10 PM

Sinonasal Epithelial Wound Resealing in an In Vitro Model: Inhibition of Wound Closure with IL-4 Exposure

*Sarah K Wise, MD, Kyle A DenBeste, BS, Elizabeth K Hoddeson, MD, Charles A Parkos, MD, PhD, Asma Nusrat, MD
Atlanta, GA USA*

Introduction:

Prolonged healing and persistent inflammation following surgery for rhinosinusitis impact patient satisfaction and healthcare resources. Cytokines interleukin (IL)-4, 5, and 13 are important mediators in Th2 inflammatory rhinosinusitis. Decreased wound healing has been demonstrated with Th2 cytokine exposure, but this is not extensively studied in sinonasal epithelium. We hypothesized that in vitro exposure of primary sinonasal epithelial cell cultures to characteristic Th2 inflammatory cytokine IL-4 and IL-13 will impair wound resealing and decrease expression of epithelial migratory protein annexin 2 at the wound edge.

Methods:

Following 24-hour exposure to IL-4, 5, or 13 versus controls, sterile linear mechanical wounds were created in primary sinonasal epithelial cultures ($n = 12$ wounds per condition). Wounds were followed for 36 hours or until complete closure and wound areas calculated by image analysis. Group differences in epithelial migratory protein annexin 2 were assessed by immunofluorescence labeling, confocal microscopy, and Western blots.

Results:

Significant wound closure differences were identified across cytokine exposure groups ($p<0.001$). At 36-hours, 75% of wounds exposed to IL-4 were incompletely closed, whereas only 25% of control wounds remained open. IL-13 did not significantly impair sinonasal epithelial wound resealing in vitro. With IL-4 exposure, wound edge annexin 2 was decreased versus no-cytokine exposure control ($p<0.01$).

Conclusions:

Th2 cytokine IL-4 decreases sinonasal epithelial wound closure in vitro. Wound edge annexin 2 is also diminished with IL-4 exposure. This

supports the hypothesis that IL-4 exposure impairs sinonasal epithelial wound healing and may contribute to prolonged healing in Th2 inflammatory rhinosinusitis.

3:16 PM

Cigarette Smoke Inhibits Nasal Airway Epithelial Cell Growth and Survival

*Jean Kim, MD PhD, Hyun S Lee, PhD
Baltimore, MD USA*

Introduction:

Second hand smoke (SHS) exposure has been shown to be highly associated with chronic rhinosinusitis (CRS). We hypothesized that nasal epithelial cell growth from healthy human subjects is dependent on vascular endothelial growth factor (VEGF) and that SHS results in impairment of cell growth and survival necessary for normal epithelial cell function. To study this, we examined whether epithelial cell growth is dependent upon VEGF. We also examined the effect of cigarette smoke extract (CSE) exposure to functionally inhibit human primary nasal epithelial cell (PNEC) growth and induce apoptosis of PNEC.

Methods:

Human PNEC from normal control subjects were cultured to sub-confluence under submerged conditions. Cell growth was assessed using a proliferation assay. Apoptosis was assessed using flow cytometric analysis of annexin V-FITC.

Results:

Exposure of PNEC from normal healthy control subjects to VEGF receptor blocking antibody against NP1 resulted in inhibition of constitutive cell growth. CSE exposure resulted in dose-dependent inhibition of constitutive nasal epithelial cell growth. CSE exposure also resulted in induction of annexin V-FITC staining in a dose-dependent manner, comparable to that seen with VEGF blockade using anti-NP1 antibody.

Conclusions:

PNEC from normal healthy control subjects display VEGF-dependent constitutive cell growth. CSE impairs cell growth and promotes apoptosis of normal healthy nasal epithelial cells, thereby contributing to epithelial cell dysfunction in CRS.

3:22 PM

Azithromycin and Simvastatin Reduce IL-6 Secretion in an Epithelial Cell Model of Chronic Rhinosinusitis

*Marie Devars du Mayne, MD, Valérie Tardif, MSc,
Leandra Mfuna, MSc, Martin Desrosiers, MD
Montreal, Quebec Canada*

Aims:

In chronic rhinosinusitis (CRS) corticosteroids remain the gold standard of therapy. However, as in asthma, a percentage of patients have disease unresponsive to steroids and alternate anti-inflammatory agents may be required. Azithromycin (AZI) suppresses NF κ B activation, downstream pro-inflammatory cytokines and has been used in CRS. Simvastatin (SIMVA) has pleiotropic anti-inflammatory effects and may also be of benefit in CRS. We wished to assess the anti-inflammatory actions of AZI and SIMVA on epithelial cells in an in-vitro model of CRS.

Methods:

Primary epithelial cell cultures were raised from sinus mucosa obtained from CRS patients at time of ESS and raised until differentiated in an air-liquid interface. Cells were incubated in the presence of medium, AZI (10 et 50 μ g/mL) and SIMVA (5 μ g/mL). Cytokine generation was assessed by measurement of IL-6 by ELISA. (n=6 patients)

Results:

Incubation with both AZI and SIMVA gave reduced IL-6 levels, with SIMVA having the greatest effect. (MED: 278.2 pg/mL, AZI 10 μ g/mL: 232,7 pg/mL; AZI 50 μ g/mL: 219.9 pg/mL; SIMVA : 63.7 pg/mL, p=0.01)

Conclusion:

These results confirm an anti-inflammatory effect of AZI and SIMVA on epithelial cells in this ex-vivo model of CRS.

Implications:

These agents may have potential roles as anti-inflammatory agents in patients with CRS unresponsive to usual therapy. These early ex-vivo results should nevertheless be confirmed by assessment on organotypic ex-vivo models and in CRS subjects prior to adoption in clinical practice.

3:28 PM

Damage-associated Molecular Patterns Stimulate IL-33 Expression in Nasal Polyp Epithelial Cells

Andrew Lane, MD, Gina Paris, BA,
Jonathan Liang, MD
Baltimore, MD USA

Objectives:

Chronic rhinosinusitis with nasal polyps (CRSwNP) is a disorder characterized by eosinophilic inflammation and local Th2 cytokine production. Innate lymphoid cells that elaborate Th2 cytokines have recently been characterized within nasal polyps. These cells can be activated by the epithelial cell-derived cytokine IL-33. In this study, we demonstrate that molecules associated with tissue damage (DAMPs) elicit expression of IL-33 in sinonasal epithelial cells (SNEC) derived from recalcitrant nasal polyposis patients.

Methods:

SNEC were obtained from 14 patients during ESS from patients with nasal polyposis. The subjects were subsequently followed for greater than 6 months and classified with respect to endoscopic recurrence or persistence of polyps. SNEC were grown in culture at the air-liquid interface and exposed to DAMPs for 48 hours. Cells were processed for either mRNA extraction or immunochemistry. IL33 levels were determined by real-time PCR and by immunochemical staining with anti-IL-33 antibody.

Results:

Exposure to HMBG1 or ATP resulted in a statistically significant increase in IL-33 mRNA expression in SNEC derived from patients with recalcitrant polyps. This increase was reflected at the protein level by immunochemical staining of IL-33.

Conclusion:

Tissue damage is a non-specific trigger of epithelial IL-33 production in treatment-recalcitrant polyps, which may be responsible for perpetuating eosinophilic inflammation in CRSwNP. This common pathway may help explain why multiple environmental and infectious agents have been implicated in association with CRSwNP exacerbation.

3:34 PM
Discussion/Q&A

*Moderators: Devyani Lal, MD,
Ameet Singh, MD*

3:42 PM

Non-invasive Staphylococcus Aureus Biofilm Determination in Chronic Rhinosinusitis by Detecting the Exopolysaccharide Matrix Component Poly-N-acetylglucosamine

Andrew Foreman, MD, PhD, Joshua Jarvis-Bardy, MD, Samuel Boase, MD,
Peter-John Wormald, MD
Woodville, SA Australia

Introduction:

The role that bacterial biofilms might play in recalcitrant forms of CRS is increasingly being recognized. However the detection of bacteria existing in this form, using standard culture, is limited by their unique metabolically inactive properties. All current biofilm diagnostic modalities require invasive mucosal biopsies, which limit their use to the operating theatre.

Method:

20 CRS patients and 5 controls were enrolled in a prospective study to assess the feasibility of non-invasively diagnosing *S. aureus* biofilms by detecting the biofilm matrix polysaccharide poly-N-acetylglucosamine (PNAG). An immunofluorescence protocol was developed for PNAG detection and compared with both standard microbiological cultures and FISH.

Results:

13/20 CRS patients had evidence of *S. aureus* biofilm formation using FISH. Of these, 12 had detectable PNAG. Interestingly none of the *S. aureus* FISH negative patients were PNAG positive despite the presence of coagulase negative Staphylococci biofilms, some of which may exhibit PNAG in their pathogenic forms.

Discussion:

The development of a non-invasive *S. aureus* biofilm diagnostic test provides a reliable means to identify a high-risk group of CRS patients who harbor *S. aureus* biofilms. The ability to utilize outside of the peri-operative period to assess surgical efficacy, guide management

and evaluate new treatment modalities provides a significant advance in this field of research and clinical practice.

Conclusions:

This study has confirmed the feasibility of non-invasive detection of *S. aureus* biofilms with a simple test that produces comparable results with the more invasive methods that are currently relied upon.

3:48 PM

Intracellular Staphylococcus Aureus: The Trojan Horse of Recalcitrant Chronic Rhinosinusitis?

*Neil C-W Tan, MBBS, MRCS, Andrew Foreman, MBBS, PhD, Camille Jardeleza, MBBS, Richard Douglas, MBChB, FRACS, Sarah Vreugde, MBBS, PhD, Peter-John Wormald, MD, FRACS
Adelaide, SA Australia*

Introduction:

Despite recent evidence suggesting that *Staphylococcus aureus* exists within the sinonasal epithelium of chronic rhinosinusitis (CRS) patients, the true clinical significance had not been defined. The intracellular environment may provide a protective niche for pathogenic bacteria to evade host immunity and yet provide a reservoir for re-infection. To date, no studies have examined the impact of this bacterial phenotype; therefore this study was designed to evaluate the role of intracellular *S. aureus* on post-surgical outcomes.

Methods:

This prospective study included fifty-six patients undergoing endoscopic sinus surgery for medically-recalcitrant CRS. Sinonasal mucosa harvested at the time of surgery was dually stained with fluorescent molecular probes and imaged using Confocal Scanning Laser Microscopy for biofilm and intracellular status. Patients were followed-up in their early and late postoperative course for evidence of on-going disease and signs of clinical relapse.

Results:

Intracellular *S. aureus* was identified in 23/56 (41%) patients, and all were associated with surface biofilm. Biofilm alone was found 16 (29%) patients and 17 (30%) patients had no evidence of organisms. Intracellular positive

patients had a significantly higher risk of late relapse ($p=0.037$) and persistence of bacteria throughout the postoperative course ($p=0.0445$). In this study, biofilm status without co-existing intracellular bacteria did not appear to impact on outcomes.

Conclusions:

Relapse of disease following ESS is significantly associated with intracellular *S. aureus*. Evidence suggests that this disease phenotype is an independent risk factor to surface biofilm status. Novel treatment modalities must be developed to target the intracellular bacteria themselves.

3:54 PM

Neutrophilic Inflammation on Sinus Cytology is Associated with Poor Response to Standard Therapy in Post-ESS Patients

*Sawsan Al-Mot, BSc
Montreal, Quebec Canada*

Objectives:

We have described an in-vitro expression signature for CRS (Desrosiers, 2011) suggesting patterns of high- and low- neutrophilic inflammation in CRS. We wished to determine whether minimally-invasive cytology brushing of the sinus mucosa could be used to characterise sinus mucosal immunity in-vivo in CRS, and evaluate whether it influences disease evolution.

Method:

A gastric cytology brush was used to sample the frontal recess in 8 control subjects and 33 post-ESS CRS patients (11 good-evolution; 22 bad-evolution). Cytologies were prepared and stained for neutrophil elastase (NE) using IHC. Neutrophilia was characterized as intensity of NE staining on a scale of 1 - 5. Results were assessed using receiver-operating characteristic (ROC) analysis and Spearman's rank analysis to compare groups.

Result:

Neutrophil level was high in both CRSwNP and CRSsNP, with no difference between the two CRS groups. ROC analysis identified that a cut-off point at 2 on a 5-point scale predicted CRS (sensitivity: 74%; specificity: 80%). When stratified according to disease evolution, neutrophilia was high only in the poor-evolution CRS subgroup ($p=0.000012$)

Conclusion:

Sinus cytology can identify neutrophilic inflammation at the sinus mucosa level in post-ESS patients, using a simple, minimally-invasive sampling technique that can be performed in clinic. Identification of high neutrophilia in only post-ESS persistent disease suggests that previously described high-neutrophilic inflammation expression signatures in CRS may be associated with a more severe, steroid-insensitive form of CRS. Sinus cytology may identify refractory CRS cases requiring alternate anti-inflammatory treatments.

4:00 PM

The Characteristics of Intramucosal Bacteria in Chronic Rhinosinusitis (CRS).

*Raymond Kim, MD, Sally Roberts, MD, Joshua Freeman, MD, Richard Douglas, MD
Auckland, AKL New Zealand*

Introduction:

We have observed intraepithelial and interstitial bacterial microcolonies within the mucosa of patients with CRS. The remarkable feature of the intramucosal microcolonies, predominantly *Staphylococcus aureus*, is that they do not elicit an inflammatory response. We hypothesized that these microcolonies are metabolically different from planktonic bacteria, rendering them less immunogenic. We have sought to characterize the nature of the intramucosal colonies.

Methods:

Mucosal swabs, and tissue biopsies were taken from 45 patients with CRS and 13 with normal sinuses having transnasal pituitary surgery. Strains of *S aureus* were compared via pulse field gel electrophoresis, if cultured from both swab and tissue. Small colony variants (SCVs) of *S aureus* were attempted to be cultured. SCVs are metabolically atypical forms that tend to be antibiotic resistant and produce fewer virulence factors than wild-type. Accessory gene regulator (*agr*) gene activity was deduced by assessing the hemolysis around colonies on blood agar plates. *agr* controls the activity of many of *S aureus* virulence factors, and hemolysis has been found to correlate with *agr* activity.

Results:

S aureus were of the same strain in all cases, when cultured from both swab and mucosa. SCVs were grown in 2 samples, but both were of

non-*S aureus* staphylococcal species. All *S aureus* cultured from tissue samples were β -hemolytic, suggesting normal *agr* activity.

Conclusion:

These studies suggest that intramucosal *S aureus* are genetically closely related and phenotypically similar to surface *S aureus*. Further studies are needed to explore the possible mechanisms by which intramucosal colonies become less immunogenic.

4:06 PM

Discussion/Q&A

4:15 PM

Evolution in Action: Changing Views on the Contribution of Microbes to CRS

Moderator: Noam Cohen, MD

Panelists:

Martin Desrosiers, MD - Dysbiosis of the Sinus Microbiome on Local Immune Responses in CRS

Peter John Wormald, MD - Staph Aureus and its Role in CRS

Noam Cohen, MD - Genetic Susceptibility to Gram-Negative Sinonasal Infection and CRS

5:00 PM

Meeting adjourned

Poster# P-1

A Comparative Assessment of the Patient Education Resources from the American Academy of Otolaryngology-Head and Neck Surgery Foundation (AAO-HNSF) and American Rhinologic Society Patient Education Materials

Nitin Agarwal, BS, David R Hansberry, PhD, Qasim Husain, BS, Saurin Anghvi, BS, Mohemmed N Khan, MD, FACS, Jean Anderson Eloy, MD, FACS, Newark, NJ USA

Introduction:

The American Medical Association and National Institutes of Health recommend the readability of patient information resources be between 4th and 6th grade levels. The authors compare the readability of online patient education resources provided by the American Academy of Otolaryngology-Head and Neck Surgery Foundation (AAO-HNSF) and American Rhinologic Society (ARS) website using nine assessment tools.

Methods:

Online patient education resources from the AAO-HNSF and ARS were downloaded in February 2012. Readability assessments were conducted using the Flesch Reading Ease (FRE), Flesch-Kincaid Grade Level (FKGL), SMOG Grading (SMOG), Coleman-Liau Index (CLI), Gunning-Fog Index (GFI), the Raygor Readability Estimate (RRE), and the Fry Graph. Written text from each website was pasted into Microsoft® Word® (Microsoft Corp, Redmond, WA) documents and analyzed using Readability Studio Professional Edition Version 2012.1 (Oleander Software, Ltd, Vandalia, Ohio). The mean readability scores from the two websites were compared using a Student's t-test.

Results:

In total 186 articles were analyzed. All patient education resources acquired from the AAO-HNSF were written between an 11th grade and graduate reading level. ARS resources were written between a 9th grade and graduate reading level. The mean readability scores of the information from both sources were statistically significant when assessed using FRE ($p < 0.05$), SMOG ($p < 0.05$), or GFI ($p < 0.01$).

Conclusions:

AAO-HNSF and ARS online materials were

both considered difficult to read. The reading level of each website exceeded the recommended sixth grade level, which may warrant revisions to reach a wider audience and increase patient comprehension.

Poster# P-2

A critical view on the use of nasal casts to assess nasal spray deposition patterns

Per G Djupesland, MD, PhD, Yardley, PA USA

Introduction:

Assessment of nasal spray deposition pattern in a commercially available silicone human nasal cast (Koken Co) using a water-indication coating has in recent publications been advocated as a quick method to study patient-, device- and formulation-related variables. However, the Koken-cast is primarily an educational tool with a flat transparent septum to show the complicated nasal structure. We measured the dimensions of the Koken cast and compared them with normative in vivo data and another silicone cast (OptiNose, US Inc.).

Methods:

Acoustic rhinometry (AR) was used to measure the dimensions of the casts and the healthy male individual who served as the model for the OptiNose-cast. The measured minimal cross-sectional area (MCA) describes the dimensions at the narrowing of the nasal valve; the area that determines airflow and particle deposition patterns.

Results:

The MCA on right and left sides were; Koken-cast (MCA right/left=1.95/1.80 cm²); OptiNose cast (MCA right/left=0.69/0.70cm²); in vivo (MCA right/left=0.75/0.56 cm²). Normative AR data in healthy males are; MCAright/left=0,59±0,19/56±0,13cm². The AR dimensions of the OptiNose cast and the healthy individual were very similar (Pearson $r=0.98$ and $r^2=0.96$, $P>0.0001$ for the anterior 6 cm)

Conclusions:

Largely due to the flat septum of the Koken-cast design, the MCA is 3-4 times larger than normative AR data in healthy individuals and far outside the normal range. In contrast, the OptiNose-cast dimensions are very similar to the in vivo AR-normative values. Cast dimen-

sions should always be reported and airflow and spray deposition data from casts with too large dimensions must be interpreted with caution.

Poster# P-3

A prospective study of post-operative symptoms in sinonasal quality-of-life following endoscopic endonasal non-pituitary skull base surgery

*Jeffrey C Bedrosian, MD, Roheen Raithatha, MD, Edward D McCoul, MD, MPH, Vijay K Anand, MD, Theodore H Schwartz, MD
New York, NY USA*

Objectives:

To better delineate the effect of extended endoscopic endonasal non-pituitary skull base surgery on specific post-operative sinonasal quality-of-life symptoms.

Methods:

Thirty-three patients were prospectively assessed with the Anterior Skull Base Questionnaire (ASBQ) preoperatively and up to 1 year postoperatively at each subsequent office visit. A subset of these data was analyzed to assess the effect of endoscopic skull base surgery on post-operative taste, smell, appetite, nasal secretions and vision.

Results:

Using the ASBQ, a validated quality-of-life instrument, we prospectively assessed patient-reported symptoms following endoscopic endonasal non-pituitary surgery. Pathologies included chordomas (n=7), craniopharyngiomas (n=6), encephaloceles (n=4), meningiomas (n=4), skull base malignancies (n=3) and others (n=9). Compared to pre-operative scores, patient reported sense of smell was significantly decreased at 3 weeks and 6 months post-operatively (3.11 vs. 2.45, p=0.04 vs. 2.31, p=0.03, respectively). By 1 year, patient-reported sense of smell was no longer significantly decreased (2.7, p=0.77). There were no observed statistically significant changes in patient reported appetite, taste, nasal secretions or vision during the 1 year post-operative follow up period.

Conclusions:

Within this diverse set of pathologies, extended endoscopic endonasal skull base approaches produced a prolonged post-operative patient-reported decrease in sense of smell. These

results were no longer statistically different by 1 year post-operatively. This may, however, be due to a smaller follow-up group reporting 1 year results (n=10). No reported post-operative changes in appetite, taste, nasal secretions or vision were observed.

Poster# P-4

A Simple Method for Endonasal Endoscopic Dacryocystorhinostomy

*Mohsen Naraghi, MD
Tehran, Tehran Iran*

Introduction:

In this article, author's simple technique on endonasal endoscopic will be presented with results, mentioning the main advantages of it.

Methods:

The maxillary crest was the best landmark in our cases, eliminating the need for light pipe. The mucosa over the sac was elevated by a triangular elevator. After exposure of the bony crest this bone was removed by a sharp punch forceps. After total exposure of the sac, the medial wall of the sac was removed by the same punch forceps. The opening is made so large, exposing the lateral wall of sac, observing openings of the canaliculus into the sac in many cases. The nasal mucosal flap was incised to laying it over the sac. By the final trim of flap up to the remaining sac wall, fine approximating of the edges is done. The latter step is very important in preventing post operative granulation and should be done meticulously. The procedure needs no tenting by lacrimal probe and no stenting of the lacrimal system.

Results:

In follow up of patients, ninety five percent of patients free of symptoms. This wide rhinostomy together with nontraumatic technique avoiding mucosal damage and bone exposure at the end of procedure ensures patency in long term.

Conclusion:

This simple technique diminishes the expenses of powered or laser instrumentation with comparable results. It seems that preserving normal tissues and creating a patent rhinostomy with least surgical trauma and less subsequent scar, plays the most important role to achieve desirable results.

Poster# P-5**Academic rhinology: A survey of otolaryngology residency programs in the United States**

*Abtin Tabaei, MD, Leon Chen, MD, Madeleine R Schaberg, MD, Roheen Raithatha, MD, Seth M Brown, MD-MBA
New York, NY USA*

Objectives:

The evolution of rhinology as a distinct sub-specialty has significant implications for clinical and academic medicine. Its impact on residency programs remains incompletely defined.

Methods:

A survey of faculty profiles of otolaryngology residency programs in the United States was performed to examine the professional demographics and academic activities of rhinologists.

Results:

9% of chairmen and 12 % of residency program directors were rhinologists. The number of full-time rhinology faculty members varied significantly amongst departments (mean:1, range:0-4). 30% of departments had no full-time rhinologists at the primary training institution. Rhinology faculty members were noted to have a high number of scientific publications over the past 5 years (mean:15 per faculty, range:0-88). A high level of membership to the American Rhinologic Society (90%) and a modest level of membership to Triological Society(23%), NASBS(22%), and AAOA(12%) were noted. The presence of a rhinology fellowship in the department and a larger residency size were associated with a larger rhinology faculty. A higher number of publications per faculty were noted in programs with rhinology fellowships and with multiple rhinology faculty members. A longer duration of time since completion of training was associated with a greater number of publications, a lower likelihood of completing a fellowship and a higher membership rate in the Triological Society.

Conclusions:

Variability exists in the presence and academic activities of rhinology faculties in otolaryngology residency programs. Continued analysis of the impact of rhinology sub-specialization on workforce measures and residency education is required.

Poster# P-6**Assessment of Mucocele Formation after Endoscopic Nasoseptal Flap Reconstruction of Skull Base Defects**

*Qasim Husain, BS, Saurin Sanghvi, BS, Pratik A Shukla, MD, Osamah J Choudhry, MD, James K Liu, MD, Jean Anderson Eloy, MD, FACS
Newark, NJ USA*

Introduction:

Advances in endoscopic skull base surgery have led to the resection of increasingly larger cranial base lesions, resulting in large skull base defects. These defects have initially led to increased postoperative cerebrospinal fluid (CSF) leaks. The development of the vascularized pedicled nasoseptal flap (PNSF) has successfully reduced postoperative CSF leaks. Mucocele formation however, has been reported as a complication of this technique. In this study, we analyze the incidence of mucocele formation following repair of skull base defects using a PNSF.

Methods:

A retrospective review of a prospective database from December 2008 to December 2011 was performed to identify patients who underwent PNSF reconstruction for large ventral skull base defects. Demographic data, defect site, incidence of postoperative CSF leaks and rate of mucocele formation were collected.

Results:

Seventy patients undergoing PNSF repair of skull base defects were identified. No postoperative mucocele formation was noted at an average radiological follow-up of 11.7 months (range 3-36.9 months) and clinical follow-up of 13.8 months (range, 3-38.9 months), making the overall mucocele rate 0%. The postoperative CSF leak rate was 2.9%.

Conclusions:

Proper closure of skull base defects is crucial to prevent CSF leaks. The PNSF has been proven to be an efficient technique for these repairs. Although this flap may carry an inherent risk of mucocele formation when placed over mucosolized bone during repair, we found that meticulous and strategic removal of mucosa from the site of flap placement resulted in a 0% incidence of postoperative mucocele formation in our cohort.

Poster# P-7**Assessment of the short term patency of the maxillary sinus ostium following dilatation with an osmotic device in a sheep model**

Jerome E. Hester, MD, David Edgren, BS, Andrea Koreck, MD, PhD, Jason Fox, BS East Palo Alto, CA USA

Introduction:

Establishment of patency of the sinus ostia is paramount to the treatment of chronic sinusitis. Endoscopic sinus surgery has been shown to be effective in accomplishing this. Recently, catheter based balloon dilatation has been introduced as an alternative method to open the sinus ostia. The purpose of this investigation was to explore the feasibility of an osmotically driven, self expanding device to dilate the sinus ostia in an animal model.

Methods:

The devices were placed under endoscopic vision into the maxillary sinus ostia of adult sheep. The devices were removed at pre-determined time points between 4 and 15 hours and measurements taken of the diameter of both the expanded device and the resulting ostia. In a subset of animals endoscopy was repeated at 13 and 27 days after placement.

Results:

Initial examination revealed strong correlation between the size of the dilated device and the resultant ostia. A smooth bore opening resulted with no signs of mucosal injury. All ostia were found to maintain essentially this same dilated size at the 27 day follow up examination.

Conclusion:

This initial study indicates that this osmotically driven self expanding device will dilate in vivo and produce a patent ostia that is maintained for at least 27 days. The ease of placement and atraumatic means of dilatation make this mechanism an attractive treatment strategy. Additional testing in patients will be needed to confirm safety and efficacy.

Poster# P-8**Atypical Radiographic Presentations of Juvenile Nasopharyngeal Angiofibroma.**

Anna Knisely, MD, Carl Snyderman, MD, Carlos Pinheiro-Neto, MD, Eric Wang, MD Pittsburgh, PA USA

Objective:

To describe nasopharyngeal angiofibroma (JNA) with atypical imaging characteristics including clival erosion in the absence of pterygopalatine fossa (PPF) enlargement.

Background:

JNA is an uncommon, locally destructive benign nasal neoplasm that classically presents with progressive nasal obstruction and/or epistaxis in an adolescent male. JNA is thought to arise from the sphenopalatine foramen, and may extend into the nasal cavity, orbit, and cranial fossa. Biopsy of these masses is ill-advised due to their intensely vascular nature, thus highlighting the importance of imaging in the accurate diagnosis of the disease. PPF enlargement is characteristic and has been cited as a constant feature in patients with JNA. The Holman-Miller sign (HMS), anterior displacement of posterior wall maxillary sinus is considered pathognomonic.

Methods:

Pre-operative CT and/or MRI of patients with pathological-proven JNAs were reviewed at a single institution from 2000-2011. All cases were reviewed for presence of PPF enlargement, HMS, and clival erosion.

Results:

Three out of twenty-two JNAs had atypical radiographic presentations, specifically a lack of PPF enlargement or HMS. One JNA involved only the nasal cavity and nasopharynx, an uncommon, but described pattern. Interestingly, two of these three cases demonstrated clival and posterior pterygoid involvement, while the overall incidence is significantly less.

Conclusions:

The characteristic radiologic findings of PPF enlargement and HMS are present in the majority of cases and aid in the diagnosis of JNA, however their absence does not preclude it. Atypical cases may present with clival erosion, making the differentiation between JNA and rhabdomyosarcoma increasingly difficult.

Poster# P-9**Balloon catheter dilation in pediatric silent sinus syndrome: a case series**

*Jackie Matijasec, MD, Kevin McLaughlin, MD
New Orleans, LA USA*

Objective:

It has been suggested that balloon catheter dilation is less successful in pediatric patients with hypoplastic maxillary sinus. Our experience has been to the contrary and we describe a cohort of pediatric patients with silent sinus syndrome and their treatment with balloon catheter dilation.

Study Design:

Case series.

Methods:

6 patients presented to the rhinology service with atelectatic maxillary sinus disease. Each of these 6 pediatric patients was treated with balloon catheter dilation of the antrum of the affected sinus. To date, none of the patients have recurred. Patients who required follow up CT scans have shown complete resolution of atelectasis. No significant complications have been encountered in this cohort to date. Age, gender, race, and complications were recorded.

Results:

6 pediatric patients with silent sinus syndrome underwent balloon catheter dilation of the maxillary antrum without complication.

Conclusions:

Balloon catheter dilation of the maxillary antrum can safely and effectively treat silent sinus syndrome in the pediatric population. We present our observations and describe alternative balloon dilation technique for successful surgery in this patient population.

Poster# P-10**Clinical practice, professional activities and career satisfaction in academic rhinology**

*Abtin Tabaee, MD, Leon Chen, MD, Timothy L Smith, MD, MPH, Peter H Hwang, MD, Roheen Raithatha, MD, Madeleine R Schaberg, MD
New York, NY USA*

Objective:

The emergence of rhinology as a distinct subspecialty has significant implications on residency education and work-force measures. An understanding of the clinical practice, professional activities, and career satisfaction in rhinology are necessary for further definition of the field.

Methods:

An anonymous, web-based survey of rhinology faculty in otolaryngology residency programs was performed. Respondents were queried regarding different clinical and professional activities and the percentage of their clinical and surgical practice devoted to various disorders. Career satisfaction in multiple domains was assessed.

Results:

45 respondents successfully completed the survey. A significantly greater degree of time was devoted to clinical(40%) and surgical(30%) care when compared with research(13%), administrative(11%) and teaching(8%) activities. Office visits were most commonly devoted to inflammatory sinusitis(47%), rhinitis(19%), nasal obstruction(16%) and skull base pathology(13%). Surgical cases were most commonly devoted to advanced endoscopic surgery(42%) and routine endoscopic surgery(25%), both for inflammatory sinusitis. Career satisfaction scores were highest for medical and surgical care, teaching activities, financial and emotional well being and overall career to date. Lower satisfaction scores were noted for research and administrative activities and for balance of personal life with work. Female respondents were more likely to devote time to teaching and reported a higher percentage of cases devoted to routine endoscopic sinus surgery. Respondents who completed training within the past 10 years were more likely to have completed a fellowship.

Conclusions:

The current study further defines the professional, clinical and surgical activities in academic rhinology. An overall high level of career satisfaction by rhinologists is described.

Poster# P-11**Community-Acquired Methacillin Resistant Staphylococcus aureus Nasal Abscesses in a Lower Socioeconomic Urban Population**

*Andrea S Wang, MD, Rita M Roure, MD, Aaron N Pearlman, MD
New York, NY USA*

Objective:

To determine the prevalence of community acquired methicillin resistant *S. aureus* (CA-MRSA) and methicillin sensitive *S. aureus* (MSSA) nasal abscesses in a lower socioeconomic urban population over a five-year period.

Methods:

A retrospective chart review of consecutive patients with nasal abscess cultures performed in the otolaryngology clinic from 2007 to 2012.

Results:

29 cases of nasal abscesses were identified. All cultures grew *S. aureus*, and 34.5% were MSSA and 65.5% (90% CI 49.98%-78.32%) were CA-MRSA. Comparing CA-MRSA and MSSA, there was no statistically significant increase in prevalence of CA-MRSA over five years; and there was no statistical difference comparing gender, year, or age. There was a high rate of erythromycin resistance (15/19) and a low rate of sulfamethoxazole/trimethoprim (2/19) and clindamycin (1/17) resistance in the CA-MRSA cases.

Conclusion:

In this population, the proportion of CA-MRSA nasal abscesses is nearly twice that of MSSA nasal abscesses. The overall prevalence of CA-MRSA appears to be stable over the past five years. This may represent a stabilization of CA-MRSA colonization in this community. An awareness of the high proportion of CA-MRSA will allow for the appropriate selection of antibiotic therapy.

Poster# P-12**Comparison of coblation vs. KTP laser cautery treatment for hereditary hemorrhagic telangiectasia-related epistaxis**

*Nathan B Sautter, MD, Naveen Bhandarkar, MD
Portland, OR USA*

Introduction:

Potassium-titanyl-phosphate (KTP) laser cautery is commonly utilized for treatment of HHT-related epistaxis (HHT-RE). Coblation cautery has not been rigorously evaluated for HHT-RE.

Methods:

Patients seeking treatment for HHT-RE between September 2010 and September 2011 were prospectively randomized to KTP or coblator cautery. Length of surgery and estimated blood loss (EBL) were recorded. Epistaxis severity score (ESS) questionnaires and 10-cm visual analog scales (VAS) for a multitude of HHT-RE symptoms were administered at enrollment and 3, 6, 12 months following surgery. Statistical significance was determined using Friedman test and Pearson's Chi-squared analysis.

Results:

Thirteen HHT patients were enrolled. 7 patients underwent coblation and 6 underwent KTP treatment. Average age was 64.6, and male:female ratio was 5:8. One patient in the coblation group was lost to follow-up. 3 patients in the KTP group and 2 patients in the coblation group requested additional cautery within 12 months. There were no complications and no significant differences in terms of EBL, surgical time, and length of surgery. Mean ESS was not significantly different between treatment groups at any time point; however, mean ESS was higher in the coblator group at baseline and lower at all other time points as compared to the KTP group. VAS for nasal obstruction was significantly lower in the coblation group at all postoperative time points.

Conclusion:

Coblation cautery may be superior to KTP cautery in terms of long-term epistaxis control. Patients experience less nasal obstruction following coblation. Further study with greater numbers is warranted to better determine treatment outcomes.

Poster# P-13**Dermoid cyst in a patient with frontoethmoidal sinuses mass: a case report**

*Mohsen Naraghi, MD, Nazanin Hajarolasvadi, MD
Tehran, Tehran Iran*

Introduction:

Dermoid cysts are congenital benign anomalies originating from ectodermal tissue during neural tube closure. These cysts may present in different regions but the incidence of head and neck dermoid cysts is only 7%. Dermoid cyst in frontoethmoidal sinuses is a rare condition and only a few reports noted this type of dermoid cyst. Herein, we report an unusual case of dermoid cyst in frontoethmoidal sinuses presenting as frontoethmoidal mucocele.

Methods:

A 27-year-old man with right medial canthus enlarging mass from 4 years ago had also complaint of epiphora with worsening in cold weather. The patient does not have any sign of nasal obstruction, postnasal discharge, vision alteration or limited eye movements. In CT scan a well-defined mass was noticed in frontoethmoidal sinuses. Based on clinical and radiological findings the patient underwent functional endoscopic sinus surgery.

Results:

In surgical procedure, after incising uncinata process and entering bulla ethmoidalis, the mass with yellow discharge and large amount of hair was revealed. The cyst extending to frontal sinus was evacuated and removed completely. Pathological evaluation was consistent with dermoid cyst. Postoperatively, the patient's epiphora resolved completely.

Conclusion:

Mucocele is much more common diagnosis in frontoethmoidal sinuses cystic lesions. Herein, we presented a case of dermoid cyst as a possible diagnosis of masses in this region and should be considered in differential diagnosis of patients with frontoethmoidal mucoceles.

Poster# P-14**Diagnostic Characteristics of Sinonasal Organizing Hematomas: Avoiding Misdiagnosis**

*Arthur W Wu, MD, Jonathan Y Ting, MD, Peter M Sadow, MD, PhD, Amy F Juliano, MD, Stacy T Gray, MD, Eric H Holbrook, MD
Boston, MA USA*

Introduction:

Organizing hematomas of the paranasal sinuses can be a diagnostic dilemma. Based on clinical presentation, endoscopic examination and radiographic analysis, these lesions can be misinterpreted as an aggressive malignant process. Establishing diagnostic criteria for identifying these lesions pre-operatively would facilitate appropriate management and patient counseling.

Methods:

Retrospective case series of seven patients with sinonasal organizing hematoma. Radiographic imaging, pathology, and clinical presentations were reviewed for identifying characteristics common among each case.

Results:

The most common presenting symptoms included epistaxis, nasal obstruction and facial pressure. Four patients had masses visible on nasal endoscopy. Pre-operative biopsy of these masses were consistently non-diagnostic. Radiographically, the most diagnostic finding was "shells" of T2 hypointensity on MRI surrounding a central lobulated mass. These shells correspond to rims of fibrosis at the periphery of the mass on pathology, and areas of fresh hemorrhage are found at the center of these lobules.

Conclusion:

Sinonasal organizing hematomas are rare lesions of the sinonasal cavity whose clinical characteristics are often pre-operatively suggestive of a benign or malignant neoplasm. Endoscopy, preoperative biopsy, and CT imaging do not lend helpful information in differentiating these lesions from a neoplastic process. However, MR imaging can lead to positive diagnosis by recognizing the distinct outer rims of T2 hypointensity typically seen in these lesions.

Poster# P-15**Endoscopic Graduated Multi-Angle Resection of Juvenile Nasopharyngeal Angiofibroma: Minimizing Facial Incisions- Technical Note and Report of 4 Cases**

Mohammed N Khan, BA, Qasim Husain, BS, James K Liu, MD, Jean Anderson Eloy, MD Newark, NJ USA

Introduction:

The infratemporal fossa (ITF) has been one of the more difficult areas of the skull base to access. Traditional open procedures do not always afford optimal visualization, leading to significant morbidity and poor cosmesis.

Juvenile nasopharyngeal angiofibroma (JNA) is a highly vascular, benign neoplasm that, despite slow growth, has the potential for local invasion and requires resection. The advent of endoscopic procedures has allowed for resection of JNA from the ITF with greater surgical freedom and decreased incidence of facial deformity and scarring.

Methods:

This case series presents four cases of resection of JNA (each with a different surgical complexity) with emphasis on minimizing facial incisions through multi-angle endoscopic techniques. The use of three different endoscopic approaches to the ITF in varying combinations is described. Demographic data, history, location of lesion, and procedure specifics are discussed.

Results:

A graduated multiangle endoscopic approach using a combination of an ipsilateral nasal approach, a contralateral transseptal approach, and a submaxillary approach were used to allow for superior surgical maneuverability for resection of JNA from the ITF in all four patients. Decisions on optimal combination of approaches were made based on the size and exact location of the tumor. All four patients had successful outcomes without facial incisions.

Conclusions:

Access to the ITF can be gained through appropriate combination of the three endoscopic procedures described. Using a multiangle approach to this area allows for greater surgical customization of access to JNA resection depending on the size and exact location of the tumor.

Poster# P-16**Endoscopic posterior nasal neurectomy: the state of the art**

Takeo Kanaya, MD, Kenji Kawano, MD, Toru Kikawada, MD Chuo-ku, Tokyo Japan

Objective:

Endoscopic posterior nasal neurectomy (EPNN) was first reported in 1997. Since then, our clinics have performed EPNN on more than 4500 patients suffering from allergic and nonallergic rhinitis. We have refined the technique continuously, and this paper presents our most current technique.

Methods:

EPNN is performed under general anesthesia. We make two incisions, one at the middle meatus and the other incision at the inferior meatus. A suction-irrigation system allows us to resect the lateral posterior superior nasal nerves (LPSNN) and the posterior inferior nasal nerves (PINN) while preserving the blood vessels. EPNN is not combined with other procedures such as inferior turbinoplasty.

Results:

We compared the pre-operative and post-operative area of the nasal cavity by CT scans one month after surgery. We confirmed a reduction in hypertrophy of the mucosa of the inferior turbinates, middle turbinates, and nasal septum.

Conclusions:

Current EPNN reduces nasal obstruction effectively by expanding the nasal pathways around the middle and inferior turbinates. Severe complications are avoided because direct vision, provided by the suction-irrigation system, allows differentiation of nerves from blood vessels.

Poster# P-17**Endoscopic Removal of Massive Sinonasal and Skull Base Cavernous Hemangioma**

Olga Kovalerchik, BA, Qasim Husain, BS, Saurin Sangvhi, BS, Zain Boghani, BS, James K Liu, MD, Jean Anderson Eloy, MD, FACS Newark, NJ USA

Introduction:

Hemangiomas of the nasal septum and paranasal sinus, although rare, must be considered in the evaluation of an intra-nasal mass with large volume epistaxis. While the availability of literature discussing cavernous hemangiomas of the nose is limited, there has not been a case reported of an exclusively soft-tissue sinonasal cavernous hemangioma that extends to the skull base. Here we describe the successful endoscopic resection of a massive right sinonasal cavernous hemangioma that extends to, but does not involve, the anterior skull base.

Methods:

Case report and current literature review.

Results:

A 66 year-old man who was referred to our hospital with profuse epistaxis and a large right-sided nasal mass. CT and MRI scanning demonstrated a vascular mass in the anterior skull base with severe ipsilateral septal deviation as well as disease in the right frontal and maxillary sinuses. Histological examination revealed a cavernous hemangioma. A successful resection of this right sinonasal/anterior cranial fossa extradural mass was achieved using an endoscopic endonasal approach. Septoplasty, right frontal sinusotomy, and right maxillary antrostomy were also performed on this patient using sinonasal endoscopy. The patient tolerated the procedure well and has shown no signs of bleeding or complications in the months after the operation.

Conclusion:

An uncommon tumor of the nasal cavity and paranasal sinuses has been found in an extremely rare site. The aim of this report is to increase awareness of sinonasal cavernous hemangiomas and to reinforce the use of endoscopic approach for efficient treatment of patients with this condition.

Poster# P-18**Endoscopic Skull Base Surgery Practice Patterns: Survey of the North American Skull Base Society (NASBS)**

Pete S. Batra, MD, FACS, Jivianne Lee, MD, Samuel L. Barnett, MD, Brent A. Senior, MD, FACS, Michael Stezen, MD, FACS, Dennis H. Kraus, MD Dallas, TX USA

Introduction:

The objective of this study was to evaluate the potential impact of advanced endoscopic techniques on the current practice patterns in skull base surgery.

Methods:

A 21-item written survey approved by the ARS and NASBS was conducted at the 22nd Annual NASBS meeting in Las Vegas, NV, from February 17-19, 2012. The target group included 212 practicing skull base surgeons.

Results:

Seventy-nine physicians (37.3%) completed the survey. The subspecialty composition included 42 (53%) otolaryngologists and 35 (44%) neurosurgeons. The respondents represented all regions of the country, with most common being north central (24%) and mid-Atlantic (23%) states. Open and endoscopic skull base techniques were used by 91% and 80%, respectively. During a typical year, the number of endoscopic skull base cases ranged between 20-50 in 32%, 50-100 in 13%, and >100 in 8%. Endoscopic pituitary surgery was performed by 95%, while transcribriform, transplanum, and transclival approaches were utilized by 70.5%, 66%, and 66%, respectively. Wide variation in coding philosophy was noted, including use of unlisted neurosurgical (34%), open skull base (24%), unlisted endoscopic (20%), and sinus surgery (20%) codes. Only 30% of physicians reported adequate reimbursement in =50% of the performed cases. Overall, 87% were supportive of creation of dedicated endoscopic skull base codes.

Conclusions:

The present survey attests to the widespread adaptation of endoscopic techniques in the management schema of skull base surgery. The wide variation in coding techniques and inadequate reimbursement suggests that future dialogue should also focus to develop consensus of the billing and coding process.

Poster# P-19**Evaluation of intravenous tranexamic Acid on Bleeding during Functional Endoscopic Sinus Surgery**

*Fatemeh Hajimohammadi, MD, Mohsen Naraghi, MD, Afshar Etemadi Aleagha, MD, Mehrdad Behzadi, MD, Payman Dabirmoghaddam, MD
Tehran, Tehran Iran*

Introduction:

Bleeding during functional endoscopic sinus surgery (FESS) remains a challenge for both surgeons and anesthesiologists despite several modalities available for improving the surgical field. In spite of demonstrated favorable effects of tranexamic acid (TA) on bleeding tendency in cardiac, major orthopedic, transplantation and prostate surgeries, its intravenous (IV) use in FESS has never been examined. This study was conducted to evaluate the efficacy of intravenous TA in improving the surgical field in FESS.

Materials and Methods:

In placebo-controlled clinical trial a total of 88 ASA physical status I-II patients, aged 15-66 years, undergoing endoscopic sinus surgery under general anesthesia were allocated based on random table number, to receive either intravenous TA 15mg/Kg or sterile water 200cc as a bolus dose immediately before induction of anesthesia. Anesthesia and surgery protocols were the same in both groups. Bleeding and satisfaction scores were obtained from the surgeon and his aid and compared between two groups.

Results:

In view of the surgeon, the median (range) bleeding scores in the TA group was 98.41 (51.35) and in placebo group was 148.98 (71.75) (P value=0.01). Accordingly the surgeon was more satisfied with the surgical field in the TA group than placebo group.

Conclusion:

Based on various parameters, intravenous TA cannot clinically reduce bleeding during FESS.

Poster# P-20**Geometric Alopecia Following Preoperative Angioembolization of Juvenile Nasopharyngeal Angiofibroma**

*Alejandro Vazquez, MD, Pratik A Shukla, MD, Osamah J Choudhry, MD, Chirag D Gandhi, MD, James K Liu, MD, Jean Anderson Eloy, MD, FACS
Newark, NJ USA*

Background:

Preoperative angiography and subsequent embolization of the vascular supply of Juvenile Nasopharyngeal Angiofibroma are routinely performed for larger tumors to decrease intraoperative bleeding. Geometric alopecia from angioembolization of JNA has not been previously reported in the otolaryngologic literature. In this case report, we discuss geometric alopecia from radiation exposure during preoperative angioembolization of a JNA.

Methods: Case report.

Results: A 13-year-old male with a three-month history of nasal obstruction was referred to our institution for evaluation and management of a right sinonasal mass after a biopsy was consistent with JNA. CT and MRI demonstrated a large, primarily right-sided nasopharyngeal lesion with extension into the right pterygopalatine fossa, infratemporal fossa, bilateral sphenoid sinuses, as well as erosion of the anterior clivus and right pterygoid plates. Nasal endoscopic evaluation revealed a large mass obstructing the right nasopharynx with deviation of the posterior nasal septum to the left. The left Internal maxillary artery was subsequently embolized with N-Butyl Cyanoacrylate (NBCA) glue. The patient underwent uneventful endoscopic resection of the tumor. At six-week follow-up, the patient was noted to have a large, well-demarcated, semicircular segment of alopecia in the right occipitoparietal region.

Conclusion:

Preoperative JNA embolization for gross total tumor resection may result in radiation exposure related consequences. Although alopecia may be a relatively benign complication of the fluoroscopic guided procedures, changes in external appearance may have a psycho-social effect on patients and may be permanent. Otolaryngologists must be aware of this entity in order to adequately educate and inform their patients.

Poster# P-21**Hemangiopericytoma in paranasal sinuses: A Ten Years Study**

*Mohsen Naraghi, MD, Farveh Ramezanzadeh, MD, Saeed Shoar, MD, Massoud Boroojerdi, MD, AmirHoushang Omidvari, MD, Sara Esmae ili, MD, Sorro Kalantari, MD
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Introduction:

Hemangiopericytoma is a very rare vascular tumor with one of the least prevalences reported in paranasal sinuses. We reported eleven cases of hemangiopericytoma who were referred to our center in the past ten years to provide evidences about clinical features of this tumor and its treatment outcomes.

Methods:

We retrospectively reviewed the hospital data base to extract the medical records of diagnosed hemangiopericytoma cases in the past 10 years.

Results:

Of eleven cases included in our study, 3 (27%) patients were male compared to 8 female (73%) with an average age of 40 years. Ten of the patients (91%) were referred from urban health center. The presenting symptoms include 6 nasal obstruction, 4 nasal mass, 2 epistaxis, 1 exophthalmia, 1 nasal congestion, 1 nasal pain, and 1 ocular mass. Sinus involvements had been observed in maxillary sinus of 7 patients, ethmoid sinus of 5 patients, and sphenoid sinus of 1 case. 7 (64%) tumors were removed by endoscopic surgery, preoperative embolization was performed in 6 of them. The remainder 4 (36%) had been treated with open surgical approaches.

Conclusion:

In contrast to the literature, our records showed the maxillary as the most common site of hemangiopericytoma followed by ethmoid and the least common sphenoid. It may be due to the secondary involvement of the maxillary sinus. Endoscopic surgery with preoperative embolization could be an acceptable method for resection of tumor.

Poster# P-22**Hyaluronic Acid and External Nasal Valve Function: A New Alternative for Surgery**

*Mohsen Naraghi, MD, Alain Fabrice Sontou, MD
Tehran, Tehran Iran*

Introduction:

Improvement of external nasal valve function is one of the most challenging issues in nasal surgery. Despite complicated techniques based on utilizing different grafts and sutures, long term results are still under debate. There are increasing indications for generous use of hyaluronic acid in otorhinolaryngology including laryngology and facial plastic surgery with only few articles on its use in rhinology and internal nasal valve. This is the first experience on hyaluronic acid improvement of the external nasal valve.

Method:

In this study, we present our experience on 32 patients with the complaint of nasal obstruction due to collapse of the external valve, with or without internal valve problem. The epicenter of obstruction and severity was determined by physical examination, nasal endoscopy, rhinomanometry and acoustic rhinometry. All patients underwent augmentation of the weakened areas of the external nasal valve with hyaluronic acid injection.

Results:

Comparison of pre and post-procedure symptom groups was performed in all patients and revealed that functional problem improved in all of the patients, with a wide range of changes from minor to major improvement. The immediate result experience was exciting for many patients.

Conclusion:

Hyaluronic acid nasal valve procedures could be an easy, safe and cost effective method for improving external nasal valve function in primary and revision cases. However it should be done very cautiously by an expert surgeon with ample experiences on surgical correction of the external nasal valve to make this alternative technique in selected patients, mimicking the role of the supporting grafts.

Poster# P-23**Hyperostotic Esthesioneuroblastoma: Case Report and Review of the Literature**

*Murugappan Ramanathan, MD,
Anand V. Germanwala, MD
Baltimore, MD USA*

Introduction:

Esthesioneuroblastoma is an uncommon malignant neoplasm that arises from the olfactory neuroepithelium and is largely considered a soft tissue tumor. We report a rare case of esthesioneuroblastoma with extensive hyperostosis of the tumor, skull base, and lamina papyracea.

Methods:

Case report and review of the literature.

Results:

A 42 year old male presented to clinic with a left abducens palsy and diplopia. Imaging by CT scan and MRI revealed a large left sided skull base tumor with intracranial invasion in the setting of extensive osteoblastosis of the middle turbinate, skull base, and left lamina papyracea. Endoscopic biopsy of this lesion revealed esthesioneuroblastoma. The patient underwent an endoscopic-assisted bifrontal craniotomy for excision of this tumor in addition to a left sided orbital decompression to remove the hyperostotic lamina papyracea. The large skull base defect was reconstructed using both a pericranial flap and a vascularized pedicled nasoseptal flap. Postoperatively, the patient had a resolution of his abducens palsy. As the extensive hyperostotic skull base could not be entirely resected, the patient underwent chemotherapy and radiation therapy.

Conclusions:

A survey of the literature reveals one prior report of 2 cases without as extensive an osteoblastic reaction as this case. In conclusion, the presence of an osteoblastic reaction in the setting of a soft tissue mass in the nasal and intracranial cavities is rare and esthesioneuroblastoma should be considered in the differential diagnosis. Management should include a multidisciplinary approach towards surgical resection and postoperative chemotherapy and radiation if indicated.

Poster# P-24**Idiopathic Sclerosing Inflammation Presenting as Sinusitis**

*Henry P Barham, MD
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Background:

Idiopathic sclerosing orbital inflammation is a rare finding that is poorly delineated, immune mediated and causes severe symptoms and disability. It has been described affecting the orbit in addition to other sites within the head and neck, but has rarely been described presenting as sinusitis.

Methods:

Case Report and literature review.

Results:

A 14-year-old female with right sided face and eye pain and pressure for greater than 1 month presented 3 days after endoscopic sinus surgery for presumed acute sinusitis. She subsequently developed ipsilateral vision loss and hypesthesia of the infraorbital nerve. MRI revealed a mildly enhancing soft tissue intensity lesion extending from the right maxillary sinus into the pterygopalatine fossa and orbital apex through the inferior orbital fissure. Biopsies of the lesion were consistent with a sclerosing inflammatory lesion. High dose steroids lead to rapid improvement in vision and pain, however the patient was unable to tolerate steroid weaning due to recurrence of eye pain and headache. Repeat imaging demonstrated progression of the lesion. Rheumatology was consulted and the patient's steroid therapy was altered and her medications expanded to include azathioprine. The patient's symptoms improved and subsequent imaging demonstrated a reduction in the size and extent of the lesion.

Conclusion:

Idiopathic sclerosing inflammation is characterized by primary, chronic, and immunologically mediated fibrosis. Patients typically have a poor response to corticosteroid treatment or radiotherapy. Immunosuppressive therapy in addition to Corticosteroids is the recommended treatment.

Poster# P-25**In-Office Balloon Dilation and Drainage of Frontal Sinus Mucocele**

*Jean Anderson Eloy, MD, FACS, Qasim Husain, BS, Pratik A Shukla, MD, Osamah Choudhry, MD, Jean Daniel Eloy, MD, Paul D Langer, MD, FACS
Newark, NJ USA*

Introduction:

Treatment of frontal sinus disease represents one of the most challenging aspects of endoscopic sinus surgery. Frontal sinus mucocele drainage may be an exception to the rule, since in many instances; the expansion of the mucocele widens the frontal sinus recess and renders surgical drainage technically undemanding. The past few years have witnessed and increased use of balloon dilation devices in sinus surgery. In this report, we describe our step-by-step in-office experience using this tool for drainage of a large frontal sinus mucocele.

Methods:

Case report

Results:

A 68-year-old woman presented with a 2-year history of asymptomatic progressive right eye proptosis and pressure. Nasal endoscopic examination revealed a deviated nasal septum to the left side and a widened right middle meatus and frontal sinus recess. CT of the orbits and paranasal sinuses showed a right frontal sinus expansile lesion and MRI showed a large right frontal sinus mass with signal intensity consistent with a frontal sinus mucocele. After an adequate anesthesia effect, the mucocele content was partially drained with a 21-gauge needle. The frontal sinus recess area was subsequently cannulated using the transnasal balloon dilation probe (Entellus Medical Inc., Maple Grove, MN) under direct endoscopic visualization with a 30 or 70-degree endoscope. Postoperatively, the patient's proptosis was significantly decreased and CT showed a widely patent right frontal sinus cavity.

Conclusion:

In-office frontal sinus mucocele drainage using balloon dilation appears to be a feasible technique and potential alternative to conventional endoscopic procedures in the operating room.

Poster# P-26**In-Office Jones Tube Exchange Using the Seldinger Technique**

*Jean Anderson Eloy, MD, FACS, Saurin Sangvhi, BS, Osamah J. Choudhry, MD, Pratik A Shukla, MD, Jean Daniel Eloy, MD, Paul D Langer, MD, FACS
Newark, NJ USA*

Introduction:

Conjunctivodacryocystorhinostomy (CDCR) with Jones tube placement is usually performed as a primary procedure for severe stenosis or obstruction of both upper and lower canaliculi of the lacrimal drainage pathway, or occasionally, after unsuccessful dacryocystorhinostomy (DCR). Jones tube obstruction is quite common, and often requires removal of the obstructed tube and replacement or exchange of the tube in the operating room. In this report, we describe a novel in-office method to exchange an obstructed Jones tube that provides the aforementioned benefits while preserving patient comfort.

Methods:

Case report.

Results:

A 66-year-old woman with a history of multiple procedures (including Jones tube placement) for treatment of lacrimal duct obstruction presented with left-sided tearing. Rigid 30-degree nasal endoscopic examination revealed a deviated nasal septum superiorly to the right side with an obstructed Jones tube lumen secondary to thick crusting. An in-office exchange of the Jones tube using the Seldinger technique was performed. Patient is currently doing well 2 years after the procedure and only requires periodic Jones tube care.

Conclusion:

In-office Jones tube exchange using the Seldinger technique is feasible and represents a potential alternative to conventional tube exchange performed in the operating room. In carefully selected patients, this technique may negate the need for general anesthesia and use of the operating room, reducing surgical time and cost.

Poster# P-27**In-Office Vasovagal Response After Rhinologic Manipulation**

*Qasim Husain, BS, Brian M Radvansky, BA, Saurin Sangvhi, BS, Osamah J Choudhry, MD, Jean Anderson Eloy, MD, FACS
Newark, NJ USA*

Introduction:

Over the past decade, multiple improvements have been made in instrumentation and surgical techniques for endoscopic sinus surgery (ESS). These improvements have caused a shift towards more minimally invasive procedures and from the operating room towards in-office procedures. With the increased number of in-office procedures, one can expect an increase in the number of potential complications. The incidence of vasovagal episode in the office during rhinologic procedures has not been previously reported. In this study, we discuss our experience with patients who suffered a vasovagal response during in-office rhinologic manipulation.

Methods:

A retrospective analysis at a large tertiary referral center was performed on all patients undergoing in-office rhinologic manipulation between July 2008 and June 2012. During this period, a total of 4973 patients underwent procedures involving endoscopic diagnosis or treatment.

Results:

Eight patients (0.16%) out of 4973 experienced vasovagal syncope during in-office endoscopic manipulation. Seven of eight patients recovered from the vasovagal episode and were discharged home after 30 minutes of observation. One of the eight patients did not fully recover within 60 minutes and was sent to the Emergency Department, where the patient was stabilized and discharged the same day.

Conclusion:

While the incidence of vasovagal syncope during rhinologic manipulation remains low, it has potentially deleterious effects that rhinologists should be prepared to manage.

Poster# P-28**Intraoperative Grading of Maxillary Sinus Disease: Reliability, Validity, and Clinical Application**

*Marc A Tewfik, MD, MSc, FRCSC, Leigh Sowerby, MD, FRCSC, Andrew Foreman, MBBS, PhD, Stephen Floreani, MD, FRACS, Peter-John Wormald, MD, FRCS, FRACS
Montreal, QC Canada*

Introduction:

Effective management of the maxillary sinus is key to the success of endoscopic sinus surgery. However, depending on the severity of disease, different approaches are required to achieve this. In order to aid intraoperative decision-making, a grading system for maxillary sinus disease has been created, ranging from 1 to 3 based on the appearance of the mucosa and mucus content of the sinus. The purpose of this study is to assess the intra-rater, inter-rater and test-retest validity of this system.

Methods:

Four blinded otolaryngologists were recruited and presented with a short instructional video, followed by 100 randomly ordered clips of maxillary antrostomies performed by the senior author for chronic sinusitis. Scores from senior author were used as the gold standard. A second viewing of the videos in a different order was scored two weeks later to examine the test-retest reliability. Statistical analysis was performed using ordered logistic regression models.

Results:

Average inter-rater agreement was 70.5% ($\kappa = 0.66$), intra-rater agreement was 94% ($\kappa = 0.88$), and test-retest agreement was 88% ($\kappa = 0.79$). The scores assigned by the senior author were used to select the surgical approach used to address each sinus.

Conclusion:

Our study confirm the intra-rater and test-retest validity of the maxillary grading system, and suggest an acceptable inter-rater validity. The clinical utility of this system is in guiding intraoperative decision-making for the maxillary sinus between uncinectomy alone, antrostomy enlargement, and trephination. Representative case examples and outcomes will also be presented.

Poster# P-29**Invasive Fungal Sinusitis with Disseminated Cutaneous Disease Treated Successfully with Aggressive Surgical and Medical Therapy**

*Michael D Lupa, MD, Zara M Patel, MD
Atlanta, GA USA*

Background:

Surgical debridement and medical therapy with antifungal agents are the standard of care for the treatment of acute invasive fungal sinusitis (IFS). What is debated is the degree of surgery to perform, and for which patients surgery provides a survival benefit. We present two patients that had disseminated fungal infection with cutaneous manifestations who underwent endoscopic debridement of their sinonasal disease and medical therapy, who achieved control of their infections.

Methods:

Case series

Results:

Patient one was a 66 year old male with AML with persistent neutropenia. He developed painful erythematous skin nodules which on biopsy revealed fungal organisms with angioinvasion. IFS with *Fusarium* species was subsequently diagnosed during workup for a source of disseminated infection. The patient underwent endoscopic debridement with concurrent medical therapy. He was discharged home four weeks later with no further progression of his fungal infection. Patient two was a 24 year old female with relapsed ALL and persistent neutropenia. The patient developed painful nodules on her extremities which on biopsy revealed *Fusarium*. On workup for a source of infection, IFS was discovered. She underwent endoscopic debridement with medical therapy. The patient was subsequently discharged home with no further fungal disease progression.

Conclusions:

We present two patients with disseminated fungemia with cutaneous manifestations and IFS that survived their infections with aggressive surgical debridement and medical therapy. Some authors have questioned the value of surgical intervention in this group of patients but in these two individuals, control of the fungal infection was achieved.

Poster# P-30**Management of Sinonasal Chondrosarcoma: A Systematic Review of 158 Patients**

*Mohammed N Khan, BA, Qasim Husain, BS,
Zain Bhogani, BS, Jean Anderson Eloy, MD,
FACS*

Newark, NJ USA

Introduction:

This study reviews the published outcomes related to management of sinonasal chondrosarcoma. Clinical presentation, demographics, imaging characteristics, treatment, and management outcomes of this uncommon disease are reported.

Methods:

A systematic review of studies for sinonasal chondrosarcoma from 1950 to 2012 was conducted. A PubMed search for articles related to this condition, along with bibliographies of the selected articles was performed. Articles were examined for individual patient data (IPD) that reported survivability. Demographic data, disease site, treatment strategies, follow-up, outcome, and survival were analyzed.

Results:

A total of 63 journal articles were included, comprising a total of 158 cases of sinonasal chondrosarcoma. The average follow-up was 77 months (range, 1 to 325.2 months). Surgical resection was the most common treatment modality with a 5-year survival of 74.4%. A combination of surgery and radiation therapy was the second most commonly used treatment modality with a 5-year survival of 83.2%. The overall 5-year survival rate for all treatment modality was 76.5 %.

Conclusions:

This review contains the largest pool of sinonasal chondrosarcoma patients to date and provides support for the use of aggressive surgical resection in this condition. The use of adjunctive radiotherapy for prevention of local recurrence after subtotal or total resection did not show significant improvement. However, the use of adjuvant radiotherapy trended toward a higher 5-year survival.

Poster# P-31
Management of Sinonasal Hemangiopericytomas: A Systematic Review

*Mufaddal Q Dahodwala, MS, Qasim Husain, BS, Saurin Sangvhi, BS, Osamah J Choudhry, MD, James K Liu, MD, Jean Anderson Eloy, MD, FACS
Newark, NJ USA*

Introduction:

Hemangiopericytomas are typically found in soft-tissue, but only rarely found in the sinonasal tract. Cases of these sinonasal hemangiopericytomas have been reported mostly through case studies, and optimal treatment is considered surgical excision. With the wider use of endoscopic methods, an updated systematic review of the treatment of these cases is warranted.

Methods:

Cases were identified using a broad MEDLINE and PubMed search. Relevant studies were identified, and data was extracted regarding patient demographics, presenting symptoms, tumor characteristics, treatment, and outcomes.

Results:

One hundred and twenty-eight cases were collected from 56 articles, consisting of case reports and series. The most common presenting symptoms were epistaxis, nasal obstruction, and facial pain/swelling/pressure. Computed tomography and X-ray were the most common modes of imaging during diagnosis and operative planning. In most cases, the tumor occupied more than one distinct location in the sinonasal tract at initial presentation. Surgical resection was the mainstay of treatment in 125 of the 128 cases (97.7%), either through open resection or endoscopic techniques. Surgical removal resulted in no recurrence in 78.9% of the cases. The use of endoscopic techniques increased significantly in the past decade.

Conclusion:

Surgical management remains the mainstay of treatment for hemangiopericytomas. Endoscopic resection of these lesions has significantly increased over the last decades and has become a safe, viable, and preferred alternative to open resection in selected patients.

Poster# P-32
Management of Sinonasal Neoplasms by Endoscopic and Combined Approaches

*Mohsen Naraghi, MD
Tehran, Tehran Iran*

Introduction:

Recent advances in treatment of nasal and paranasal sinus tumors have evolved to the minimally invasive endoscopic surgery as the exclusive management for most cases of benign tumors and as a combination method in most cases of malignant tumors. In this paper, 16 years of personal experience in endonasal endoscopic surgery for sinonasal neoplasms will be discussed, emphasizing advantages, disadvantages and recent advances in this field.

Methods:

Since 1997 more than four hundred fifty four cases of sinonasal neoplasms underwent endoscopic surgery as the exclusive surgical intervention or a combination procedure. In endoscopic hybrid group, the endoscope entered liberally through the open accesses to give the maximum view and reduce recurrences. Angiofibroma was the most common pathology among the tumors with one hundred thirty two cases, of which one hundred twelve of them were performed exclusively endoscopically.

Results:

Surgical plan was established on the basis of pathologic condition and location of tumor. Most of benign lesions were managed by endoscopic surgery with lower recurrence rate. In extensive intracranial extensions or in some malignant lesions, combinations with an external approach were valuable. Postoperative endoscopy was performed regularly for detection of recurrence.

Conclusion:

Endoscopic surgical resection could enhance complete tumor removal by providing excellent magnified and angled view, with or without complementary approaches. It could be accomplished not only by endonasal routes, but also as combination with open approached to enhance the accuracy and vision. Image guided surgery could help to make a safe surgery with more confidence in tumor removal.

Poster# P-33**Nasal Septal Mucopyocele**

*Senja Tomovic, MD, Chirag R Patel, MD, Ki Han, MD
Newark, NJ USA*

Introduction:

Mucoceles are expansile mucous collecting cysts which may develop secondary to iatrogenic injury, chronic infection, allergic sinonasal disease, or trauma. They occur most commonly in the paranasal sinuses and may become infected, at which point they are referred to as mucopyoceles. Worldwide, only 4 cases of nasal septal mucoceles and only one case of a nasal septal mucopyocele have been described in the literature. We present the case of a nasal septal mucopyocele encountered at our institution.

Method:

Case Report

Results:

A 60 year old male who underwent septoplasty 20 years prior presented with complaints of progressively worsening bilateral nasal obstruction over many years as well as bilateral middle ear effusions and conductive hearing loss. Imaging demonstrated a cystic lesion of the nasal septum which was found intraoperatively to contain mucopus. Mucopyocele was confirmed histopathologically. This is only the second reported case of a nasal septal mucopyocele.

Conclusion:

While exceedingly rare, mucocele and mucopyocele may occur in the nasal septum and should be considered in the differential of a nasal cavity mass. This should also be kept in mind as possible complications of surgery involving the nasal septum.

Poster# P-34**Nasopharyngeal Chordoma; a Case Report.**

*Hakan Cincik, MD, Dogan Pinar, MD, Evren Erkul, MD, Atila Gungor, MD
Istanbul, NA Turkey*

Subject:

Chordomas originating from embryonic remnant of the notochord are rare, slowly enlarging, local aggressive, benign tumor of the skull base and sacrum. Chordoma typically arises from clivus and enlarges to the around structures of skull base and destructs them. If chordoma occurs in nasopharynx, it can mix-up with other tumors of the nasopharynx.

Case report:

56 years female presented with headache as the sole complaint, who was treated by neurology clinic as a diagnosis of tension type headache for a year. MRI showed a mass placed middle of the nasopharynx and involved the nasal septum. Endoscopic examination showed a mass with a smooth mucosal surface. She underwent a nasal endoscopic surgery for a biopsy and frozen pathologic assessment reported as a chordoma. Surgical team decided to the total resection of the mass. Permanent histopathologic result was same as the frozen report. She sent for RT.

Conclusion:

When chordoma occur in nasopharynx it may mimic other tumors. MRI and CT are very important tool differentiating chordoma from the other mass. If chordoma is diagnosed in nasopharynx, Transnasal Endoscopic approach is good way to remove it.

Poster# P-35**Ophthalmic artery aneurysm presenting as spontaneous high volume epistaxis**

*Kara Y Detwiller, MD, Peter E Andersen, MD,
Nathan B Sautter, MD
Portland, Oregon USA*

Introduction:

High volume epistaxis secondary to aberrations of the internal carotid artery (ICA) circulation is rare and potentially life-threatening. We present a case report of a patient with an ophthalmic artery aneurysm who developed high volume epistaxis.

Methods:

Chart review.

Results:

The patient presented initially in March 2001 with persistent sphenoid sinus CSF rhinorrhea following failed aneurysm clipping via pterional craniotomy approach. Endoscopic repair of the CSF leak was unsuccessful, and the patient ultimately required revision craniotomy with reconstruction of the skull base using a vascularized free flap. The patient recovered uneventfully, but presented in December 2011 with several episodes of spontaneous, left-sided, high volume epistaxis while working at high altitude, requiring blood transfusion. Angiography of the ICA revealed a persistent aneurysm with a small area of extravasation and embolization coils outside of the lumen of the aneurysm; however, this was not felt at the time to be the source of his bleeding and therefore embolization of the left facial and maxillary arteries was performed. The patient returned two weeks later following another episode of high volume epistaxis, and endoscopic examination under anesthesia revealed visible platinum coils present in the posterior left sphenoid. The patient subsequently underwent endovascular pipeline shunt embolization of the residual aneurysm resulting in resolution of epistaxis.

Conclusion:

We present an unusual case of potentially life-threatening high volume epistaxis that may have been unmasked by low barometric pressure at high altitude. The ophthalmic artery aneurysm responsible for the epistaxis was successfully treated with a pipeline embolization device.

Poster# P-36**Orbit Surgery by the Nose: The State of Art**

*Mohsen Naraghi, MD
Tehran, Tehran Iran*

Introduction:

The origin of orbital lesions could be intraorbital, sinonasal or intracranial. Various surgical approaches have been applied for treatment of the orbital pathologies. The medial orbital wall is composed mainly of lamina papyracea which could be accessed easily through the ethmoid sinuses. In this article, personal experiences in endoscopic approach to the orbital lesions have been explained.

Materials & Methods:

Three hundred thirty patients with different orbital lesions underwent endoscopic orbital surgery in fifteen years period. A standard anterior and posterior ethmoidectomy were performed in most of cases. In sinogenic orbital lesions, treatment was complete by treating sinus of origin. In the case of the intact lamina papyracea, it was removed followed by an incision through the periosteum. At the latter stage, much precision was applied to avoid bleeding and ocular muscles injury.

Results:

The outcomes were dependent on the type of the lesions. In the inflammatory conditions, the endoscopic surgery was performed as a curative modality with functional benefits for the sinuses. In the benign lesions, complete resection of the tumor was accomplished exclusively endoscopic in most of the cases. Malignant tumors such as intraorbital lymphoma frequently required other therapeutic modalities.

Conclusion:

Endoscopic surgery could be an alternative treatment for a wide variety of orbital lesions including orbital masses. The endonasal routes have the advantages of being less invasive, excellent homeostasis, time saving and no scars compared to the traditional external approaches. Disadvantages include a steeper learning curve, higher equipment cost and need for an experienced surgeon.

Poster# P-37**Outcomes of the Transpterygoid Approach to Lateral Sphenoid Sinus CSF Leaks and Meningoencephaloceles**

*Nadieska Caballero, MD, Kevin C Welch, MD
Maywood, IL UStA*

Background:

Data regarding the management of meningoencephaloceles and cerebrospinal fluid (CSF) leaks in the lateral recess of the sphenoid sinus (LRS) are sparse. In this study, we describe endoscopic repair of these lesions via a transpterygoid (TPTG) approach and report associated complications.

Methods:

A retrospective review of patients who underwent endoscopic TPTG repair from 2007-2011 was conducted. Data collected included demographics, BMI, defect size, sinus pathology, and placement of a lumbar drain. Complications including V2 numbness, ocular dryness, cerebrovascular events, headaches, bleeding, rhinosinusitis, seizures, metabolic disturbances, infection, sepsis, meningitis, brain abscess, recurrence and death were noted.

Results:

Eleven patients were identified. 9 were female and 2 were male. The average age was 50. The average BMI was 43.7 Kg/m². CSF rhinorrhea was the most common presenting symptom (82%). The meningoencephalocele was right-sided in 3 patients (27%) and left-sided in 8 patients (73%). The average size was 0.5 cm². 5 patients (45%) had a lumbar drain placed. Neurological complications included intraparenchymal hemorrhage (1/11) resulting in seizure, hemipalatal hypesthesia (2/11) and headaches (6/11). Ocular complications were limited to dry eyes (5/11), which improved in 3 patients. Acetazolamide was used in 9 patients, 3 of which developed electrolyte disturbances. There were no cases of sepsis, meningitis or brain abscesses. The average duration of follow-up was 18 months (range 5-42). The overall success rate was 100%.

Conclusion:

The transpterygoid approach represents a highly effective and low-morbidity/mortality technique to repair LRS meningoencephaloceles and CSF leaks.

Poster# P-38**Pediced Mucochondral Nasoseptal Flap for Reconstruction of Orbital Floor Defect**

*Evelyne Kalyoussef, MD, James K. Liu, MD,
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Newark, New Jersey USA*

Introduction:

Repair of orbital floor defects is imperative for support of orbital contents and prevent herniation into the maxillary or ethmoidal sinuses which may lead to atrophy of orbital tissues, enophthalmos or hypoglobus resulting in diplopia. Materials traditionally used for orbital floor defects repair include prosthetic implants and alloplastic or autogenous material. Nasal septal cartilage has been used previously as a free graft for reconstruction, however it relies on local tissue for its blood supply and may become ischemic and necrose in the postoperative period. The vascularized pediced nasoseptal flap, consisting of mucoperichondrium and mucoperiosteum, is routinely used as an effective flap for skull base and dural reconstruction. We report the first case of using a pediced mucochondral nasoseptal flap.

Method:

A fifty-two year old male with malignant peripheral nerve sheath tumor of the left maxilla and orbital floor underwent combined open and endoscopic tumor resection, resulting in a large orbital floor defect. Due to the expected need for postoperative radiation therapy and the risk of graft protrusion with synthetic material use of an autogenous graft with robust blood supply and inherent structural strength was sought.

Results:

A pediced mucochondral nasoseptal flap consisting of ipsilateral nasoseptal mucosa and quadrangular cartilage was harvested and was successfully used for the repair. The patient did well postoperatively without complications.

Conclusion:

The pediced mucochondral nasoseptal flap provides a vascularized flap with intrinsic cartilaginous support and mucosal lining. It offers a new technique for reconstruction of orbital floor defects and perhaps bony skull base defect

Poster# P-39**Pituitary adenoma extending into the paranasal sinuses**

*Takahiro Suzuki, MD, Yasuyuki Hinohira, MD, Harumi Suzuki, MD
Tokyo, N/A Japan*

Objective:

Pituitary tumor is one of common brain tumors. Extrasellar extension into the paranasal sinuses is infrequent, and that may have malignancy. We recently experienced three cases of pituitary adenoma extending into the paranasal sinuses operated on with neurosurgeons. We showed the details of surgery of the cases and discussed about the respective roles in cooperation of ENT and neurosurgeons.

Cases:

Three cases with pituitary adenoma were demonstrated.

Results:

Case1: 72 years old female complained of visual disturbance caused by recurrent pituitary adenoma extending into the right sphenoid sinus, the maxillary sinus and the pterygopalatine fossa. ENT surgeons first removed the tumor in the paranasal sinuses with use of endoscope, and then neurosurgeon removed the residual tumor in the sella turcica with use of microscope.

Case2: 73 years old female. The tumor like the sphenoid tumor existed in both sphenoid sinuses. ENT surgeons took biopsy samples for diagnosis, and then neurosurgeons removed the tumor.

Case 3: The tumor involved the carotid artery in the left sphenoid sinus. ENT surgeons provided neurosurgeons with visibility using endoscope and neurosurgeons removed the tumor.

Conclusion:

ENT surgeons remove the tumor in the paranasal region and neurosurgeons do in the sella turcica. Cooperation of both surgeons in visibility and manipulation is significant.

Poster# P-40**Postoperative Cerebrospinal Fluid Leak after Septoplasty: A Potential Complication of Occult Anterior Skull Base Encephalocele**

*Resha S Soni, BS, Qasim Husain, BS, Saurin Sangvhi, BS, James K Liu, MD, Jean Anderson Eloy, MD, FACS
Newark, NJ USA*

Introduction:

Postoperative CSF rhinorrhea after septoplasty is a known entity resulting from errors in surgical technique and improper handling of the perpendicular plate of the ethmoid bone. When these occur, urgent management is necessary to prevent deleterious sequelae such as meningitis, intracranial abscess, and pneumocephalus. In this report, we present a case of CSF rhinorrhea occurring 2 weeks after septoplasty from manipulation of an occult anterior skull base encephalocele.

Methods:

Case report.

Results:

A 67-year-old obese female was referred to our tertiary-care center for profuse left-sided rhinorrhea beginning two weeks after a septoplasty and bilateral inferior turbinate reduction. Nasal endoscopy revealed bilateral nasal crusting and a mid septal perforation. CSF leakage was confirmed by a positive $\beta 2$ -transferrin testing. Paranasal sinus CT scan was suspicious for a bony defect of the roof of the left sphenoid sinus. The encephalocele was cauterized using endoscopic bipolar. The area around the encephalocele was demucosalized and cauterized to prevent postoperative intracranial mucocele formation. The skull base defect was repaired using thick acellular dermal allograft (ADA) (LifeCell Corporation, Branchburg, NJ) intracranially followed by an overlay of middle turbinate mucosal autograft. The repair was subsequently bolstered by multiple large pieces of gentamicin-soaked Gelfoam.

Conclusion:

Encephaloceles are rare occurrences characterized by herniation of intracranial contents through a skull base defect. Although many cases of CSF rhinorrhea following septoplasty occur due to iatrogenic alteration of the cribriform plate, otolaryngologists should consider the possibility of a previously undiagnosed encephalocele in their differential diagnosis.

Poster# P-41**Pre-operative predictors for intra-operative blood loss in endoscopic surgery for sinonasal malignancy**

John J Chi, MD, Jeffrey Suh, MD, Alexander G Chiu, MD, James N Palmer, MD, Vijay R Ramakrishnan, MD Philadelphia, PA USA

Background:

Endoscopic resection of sinonasal malignancy has become gradually accepted in carefully selected cases. Endoscopic tumor resection often requires rapid initial tumor debulking, which may be associated with significant blood loss. If anticipated, surgical maneuvers can be performed to limit hemorrhage, such as arterial ligation or use of a coblator. The purpose of this study was to identify pre-operative predictive factors for intra-operative blood loss in surgery for sinonasal malignancy.

Methods:

A retrospective chart review was performed of 70 patients who underwent endoscopic resection of sinonasal malignancy at tertiary care institutions from 2002 to 2012. Patient data were collected on presenting symptoms, medical co-morbidities, radiographic features, pre-operative hemoglobin level, operative details, tumor histology and stage, post-operative course, and need for transfusion.

Results:

The most common tumor types were adenocarcinoma, melanoma, esthesioneuroblastoma, and squamous cell carcinoma, respectively. Preoperative complaint of epistaxis was expected to be the most relevant factor, however there was no difference in intraoperative blood loss between tumor patients with and without preoperative epistaxis (490 vs 531 mL, respectively; $p=0.822$). No significant statistical difference was identified in the other preoperative factors examined.

Conclusion:

For patients undergoing endoscopic resection of sinonasal tumors, it can be challenging to predict the degree of blood loss expected. The surgeon should be prepared to perform necessary maneuvers to minimize blood loss in order to facilitate meticulous dissection and reduce the need for transfusion.

Poster# P-42**Quality of surgical field during endoscopic sinus surgery: A systematic review of the effect of total intravenous anesthesia compared to inhalation anesthesia**

Elizabeth Kelly, MD, Suneeta Gollapudy, MD, Matthias Riess, MD, PhD, Harvey Woehlck, MD, David Poetker, MD, MA Milwaukee, WI USA

Background:

Adequate surgical field visualization is imperative for successful outcomes in endoscopic sinus surgery (ESS). The type of anesthetic administered can alter a patient's hemodynamic parameters and impact endoscopic visualization during surgery. The aim of this study is to review the evidence regarding the effect of total intravenous anesthesia (TIVA) compared to inhalational anesthesia (INA) on visualization of the surgical field during ESS.

Methods:

A systematic review of the literature was performed. Ovid MEDLINE, Scopus, and Cochrane databases were searched from 1946 to January 2012. Citations from the primary search were reviewed and filtered to identify all relevant abstracts in English. Articles meriting full review included prospective controlled trials enrolling adult patients undergoing endoscopic sinus surgery that were randomized to a group receiving INA or TIVA with outcome measures that focused on surgical field visualization.

Results:

Seven eligible trials fulfilled inclusion criteria. Four of the seven articles demonstrated a statistically significant improvement in surgical field grade during ESS when receiving TIVA compared with INA. Detailed INA dosages were often not provided. High levels of INA may have been administered; therefore, side effects of INA rather than effects of an ideal INA administration were possibly represented. Analgesic administration also varied among the anesthetic groups further complicating interpretation of study results. The lack of power and the heterogeneity of the studies precluded a formal meta-analysis.

Conclusions:

The majority of current evidence suggests TIVA may improve surgical conditions in ESS, however there are significant limitations with these studies and need for further study.

Poster# P-43**Rhinoplasty and psychopathologic symptoms relationship**

*Mohsen Naraghi, MD, Razieh Adabi Mohazab, MD
Tehran, Tehran Iran*

Purpose:

1) To evaluate whether candidates of aesthetic nose surgeries show more psychopathologies than other patients undertaking non cosmetic surgeries. 2) To assess psychopathologic symptoms in patients seeking rhinoplasty

Methods:

The symptom check-list- 90-revised (SCL-90-R) was used to evaluate current psychopathologies in candidates of rhinoplasty and other otorhinolaryngology surgery patients. The answers are evaluated in 9 primary symptom dimensions: Somatization, Obsessive Compulsive, Interpersonal sensitivity, Depression, Anxiety, Anger -Hostility, Phobic Anxiety, Paranoid Ideation and Psychoticism. Data were analyzed through chi-square, student t-test and one- way ANOVA.

Results:

The male candidates of rhinoplasty had significantly more previous history of trauma to nose than females (P: 0.046). Within the rhinoplasty candidates 63.9% showed at least one pathologic primary symptom (scale \geq 1) with females being involved more than males (P: 0.024). In other otorhinolaryngology surgery patients, 70.3% had at least one pathologic primary symptom, while no significant difference was observed within the two sexes (p: 0.51). The frequency of pathologic symptoms in rhinoplasty and other surgery groups was not different (P: 0.56). The most frequent symptom in both groups was paranoid ideation and the least frequent one was psychoticism. Psychopathology (score \geq 3) was observed as paranoid ideation in one patient of control group.

Conclusions:

The assessment of psychopathologic symptoms in cosmetic surgeries patients has reported controversial data due to previous studies. Even though the present study reveals no significant differences of psychological symptoms between rhinoplasty and non- cosmetic patients of otorhinolaryngology, the data shows that female rhinoplasty candidates are more psychologically pathologic than male candidates.

Poster# P-44**Selective Middle Turbinectomy to Minimize Postoperative Obstruction Following Lester Jones Tube Placement**

*Deepa V Cherla, BS, Osamah J Choudhry, MD,
Jean Anderson Eloy, MD, FACS
Newark, NJ USA*

Introduction:

Conjunctivodacryocystorhinostomy (CDCR) with the insertion of a Lester Jones (LJT) tube is a surgical procedure used to relieve epiphora caused by upper lacrimal system dysfunction from extensive proximal canalicular obstruction, canalicular stenosis, or canalicular flaccidity. Jones tube obstruction, which is the second most frequent complication of CDCR with tube placement, can result from LJT placement against the anterior end of the middle meatus. In this study, we describe our results in 3 patients who underwent selective anterior/superior middle turbinectomy after LJT obstruction.

Methods:

A retrospective analysis was performed on 3 patients with LJT obstruction from contact against the anterior/superior middle turbinate. Selective middle turbinectomy was performed in all 3 patients. Patency of the LJT was assessed symptomatically and by nasal endoscopy at the latest follow-up.

Results:

All 3 patients displayed a patent LJT after a mean follow-up of 17.3 months without complications. Longer-term complications associated with CDCR with LJT placement, including continuous epiphora, dacrocystitis, and poor patient satisfaction, were not observed.

Conclusions:

Selective anterior/superior middle turbinectomy may prevent or relieve LJT obstruction, providing for increased room along the lateral nasal mucosa along which to place the LJT and decreasing the need for further surgeries arising from LJT blockage.

Poster# P-45**Self-esteem status in rhinoplasty and non-cosmetic surgery patients**

*Mohsen Naraghi, MD, Razieh Adabi Mohazab, MD
Tehran, Tehran Iran*

Purpose:

1) To understand if rhinoplasty candidates suffer from lower self-esteem than those undertaking non cosmetic surgeries. 2) To compare the state of self-esteem in rhinoplasty and non-cosmetic surgical patients.

Methods:

The Rhosenberg's self-esteem scale was evaluated in two separate groups, candidates of rhinoplasty and non-cosmetic surgeries in otorhinolaryngology. Overall 10 questions scored from 0 to 30, the scores below 15 suggests low self-esteem. 90 patients were asked to answer the inventory pre-operatively and the data was analyzed through chi-square and student t-test.

Results:

Overall 54.4% of female patients, 62% were in rhinoplasty group (p: 0.02). The mean Rhosenburg scale in rhinoplasty seekers was 22.16 with 4.5% showing low self-esteem (< 15), while with the mean rhosenburg scale of 20.82, 15.6% of non-cosmetic surgical patients revealed low self-esteem (P: 0.15). Although none of the male rhinoplasty candidates had low self-esteem, there was no significant difference in Rhosenburg scales within the two genders (P: 0.44). Non-cosmetic otorhinolaryngology surgery female patients had significantly lower self-esteem (P: 0.03).

Conclusions:

The previous data on the self-esteem of cosmetic surgeries candidates had reported lower self-esteem in this group with an emphasis over the female patients. Based on the present study the overall self-esteem scores of rhinoplasty patients was not different of the other patients of otorhinolaryngology surgeries. The female rhinoplasty candidates did not show lower self-esteem than the males. Interestingly their overall self-esteem was significantly higher than the other female patients.

Poster# P-46**Single Center Experience with a Novel Chitosan-PEG Nasal Packing**

*Nadim B Bikhazi, MD
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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 poster presents the experience of a single center with 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.

Methods:

Eight patients were treated with the chitosan-PEG nasal packing following nasal surgery (14 placements; 6 bilateral, 2 unilateral). The nasal packing was placed at the surgical site dry, then hydrated with sterile saline to expand the packing and maintain its position. Patients returned for a follow-up evaluation 5-8 days after the procedure and were visually inspected for the presence of the chitosan-PEG nasal packing, adhesion formation, and mucosal healing.

Results:

No scarring or adhesion formation was observed in any of the 14 placements. The chitosan-PEG packing had completely degraded in 6/14 nasal packs. Small, isolated portions of the packing were observed in the remaining target locations. The soft, mucus-like remnants were left in place or removed via gentle aspiration. There were no reports of the packing migrating away from the surgical site or patient discomfort following the procedure.

Conclusion:

The chitosan-PEG packing prevented adhesion between tissues following nasal surgery, was easy to handle and manipulate during placement, substantially degraded by the follow-up visit, and did not cause any patient discomfort.

Poster# P-47**Sinus Atelectasis as long-term complication of rhinoplasty**

*Mohsen Naraghi, MD, Shabnam Mortazavi, MD, Massoud Borojjerdi, MD, Nazanin Hajarolasvadi, MD
Tehran, Tehran Iran*

Maxillary sinus atelectasis or silent sinus syndrome is a rare clinical entity that progresses gradually due to the osteomeatal complex obstruction. Ostiomeatal blockage due to the damage of this complex is the most possible cause of maxillary sinus atelectasis. The term silent sinus syndrome was defined as unilateral progressive enophtalmos secondary to the maxillary sinus opacification.

We present four patients developed chronic sinus atelectasis after septorhinoplasty. There has been only one prior report of sinus atelectasis presenting after rhinoplasty. Despite of this prior report, sinus atelectasis in our four patients is a first report of delayed sinus atelectasis following rhinoplasty that all were developed more than one year after procedure. Lateral displacement of the end part of middle turbinate results in obstruction of the ostiomeatal and accumulation of secretions in closed sinus cavity. All of the patients had nasal dressing after surgery. Our hypothesis is that the nasal dressing following rhinoplasty may lead to lateralization of the end of middle turbinate. Delayed sinus atelectasis can be a potential missed complication of septorhinoplasty which may present several years after surgery

Poster# P-48**Sinus Headache: Rhinogenic Headache or Migraine? An Evidence Based Guide to Diagnosis and Treatment**

*Zara M Patel, MD, David W Kennedy, MD, Michael Setzen, MD, FACS, FAAP, David M Poetker, MD, MA, John M DelGaudio, MD
Atlanta, GA USA*

Background:

Patients present to physicians across multiple disciplines with the complaint of "sinus headache". This lay term is widely accepted in the media, yet has been repeatedly questioned in the medical literature, and experts in the fields of otolaryngology, neurology, and allergy have agreed that it is an overused and often incorrect diagnosis. There are review articles and consensus panels regarding this issue, but thus far no guidelines based purely on a review of the level of evidence provided by the literature.

Methods:

A systematic review of the literature was performed and the Clinical Practice Guideline Manual, Conference on Guideline Standardization (COGS), and the Appraisal of Guidelines and Research Evaluation (AGREE) instrument recommendations were followed. Study inclusion criteria: adult population >18 years old, self-diagnosed or physician-diagnosed "sinus headache", clearly defined diagnostic criteria in diagnostic studies, and clearly defined primary clinical end-point in therapeutic studies.

Results:

We identified and evaluated the literature on diagnosing and treating patients with a primary complaint of sinus headache. The literature was reviewed for both quality of research design as well as benefit and harm of the proposed interventions.

Conclusions:

If a thorough neurologic and otolaryngologic evaluation is performed, the majority of patients presenting with sinus headache in the absence of acute inflammatory findings will be diagnosed with migraine. In this situation, the appropriate treatment for the majority of patients presenting with "sinus headache" is migraine directed therapy. In a highly select group of patients, directed nasal surgery addressing endonasal contact points may be an option.

Poster# P-49**Spontaneous CSF leak repair: A five year prospective evaluation**

Mohamad R Chaaban, MD, Bradford A Woodworth, MD, Kristen O Riley, MD Birmingham, AL USA

Introduction:

Mounting evidence indicates the majority of spontaneous cerebrospinal fluid (CSF) leaks are associated with intracranial hypertension. The objectives of the current study were to assess outcomes regarding spontaneous CSF leaks focusing on premorbid factors, surgical technique, and management of intracranial pressure.

Methods:

Prospective evaluation of patients with spontaneous CSF leaks was performed. Data regarding demographics, nature of presentation, body mass index (BMI), location and size of defect, intracranial pressure, clinical follow up, and complications were collected.

Results:

Over 5 years, 42 patients (avg. age 51) with 48 spontaneous CSF leaks were treated by a single otolaryngologist. Twenty subjects presented with recurrence of their CSF leak following previous endoscopic and/or open approaches by other physicians. Obesity was present in 79% of individuals (average BMI 36). Forty-four CSF leaks (92%) were successfully repaired at first attempt. With secondary repair, all CSF leaks were closed at last clinical follow-up (average 22 months). Three patients developed late failures (>2 months) with one recurrence at a distinct location from the primary site at 8 months post procedure (associated with ventriculoperitoneal shunt failure). Opening pressures via lumbar puncture averaged 22.8+/-7.5 cmH2O, which significantly increased to 31.9+/-10.4 cmH2O ($p < 0.0001$) following closure of the skull base defect(s). Management of intracranial hypertension included acetazolamide or permanent CSF diversion in 16 patients (5 revisions of failed pre-existing ventriculoperitoneal shunts).

Conclusions:

While spontaneous CSF leaks have the highest recurrence rate of any etiology, prospective evaluation demonstrates high success rates with control of intracranial hypertension.

Poster# P-50**Subepithelial intracellular bacterial biofilms in nasal polyps - a novel finding**

Stephen M Hayes, MD, Luanne Hall-Stoodley, PhD, Salil B Nair, MD, Philip Harris, MD, Saul Faust, MD, Rami J Salib, MD Southampton, Hampshire United Kingdom

Objectives:

Chronic rhinosinusitis (CRS with and without polyps) affects up to 15% of the UK population. Recent studies have identified bacterial biofilms on the sinonasal mucosal of patients with CRS. However, there is little precedent in the literature characterising bacterial biofilms in nasal polyps. We, therefore, conducted a study to compare bacterial biofilms in nasal polyps with those in sinonasal mucosa from patients with CRS with polyps.

Methods:

A prospective study of 8 patients undergoing endoscopic sinus surgery for CRS with polyps, and 2 control patients undergoing trans-sphenoidal pituitary surgery. Uncinate mucosa and polyp were obtained and assessed for bacterial biofilms using Fluorescence in situ Hybridisation and imaging with Confocal Laser Scanning Microscopy.

Results:

In all CRS cases, bacterial biofilms were identified on the epithelial surface of uncinate mucosa. No biofilms were identified on the surface of polyps or control mucosa. However, in all polyps, bacterial biofilms appeared to be sub-epithelial, intracellular and not attached to the epithelial surface.

Conclusion:

The identification of sub-epithelial, intracellular bacterial biofilms in nasal polyps is not only a novel finding but also challenges the concept of biofilms being always attached to a surface. It is possible that in a drive for survival, biofilms may have developed a host-cell 'parasitic' ability allowing concealment from host defences. We are currently in the process of identifying these biofilm-containing cells. These study findings shed light on the role of bacterial biofilms in the pathogenesis of nasal polyps, and may help explain the recalcitrant nature of the disease.

Poster# P-51**Survey of 253 patients with nasal fracture**

Mohsen Naraghi, MD, Babak Saedi, MD,
Mahsa Abbaszadeh, MD, Hamidreza
Seifmanesh, MD
Tehran, Tehran Iran

Objectives:

Nasal fracture can result in psychological and functional outcomes and may have impact on general quality of life. Here we studied our patients with nasal fracture during two consecutive years in our center.

Methods:

253 patient enrolled in the study during two-year period. Demographic data, clinical features and radiological findings were recorded. We assessed level of satisfaction in terms of nasal obstruction and nasal appearance using Visual Analogue Scale (VAS).

Results:

Totally, 235 patients were enrolled. The mean age was 23.5 ± 12.5 year (range 1 to 69) and 75.3% were male. Assault (34.5%), falling down (23.4%), sport injuries (17%), motor vehicle accidents (13.2%) and casual damage by heavy objects (11.9%) were the etiologies of nasal bone fracture, respectively. 97% of all case had lateral nasal fracture and 38.7% had septal deviation. VAS was recorded for 180 patients and its mean was 8.7 ± 1.8 for nasal obstruction and 9.1 ± 1.8 for nasal appearance (male > female, $P=0.06$). Those with nasal bone fracture due to assault and motor vehicle accident more seek forensic doctor ($P<0.001$).

Conclusion:

Changing the appearance of the nose and pain were the most common clinical feature amongst men and women, respectively. Individuals with history of previous nasal bone fracture are more prone to second nasal bone fracture. No significant relation was found between satisfaction and age, sex and type of anesthesia.

Poster# P-52**The bacteriology of chronic rhinosinusitis and the pre-eminence of Staphylococcus aureus in revision patients.**

Edward J Cleland, MBBS, Ahmed Bassiouni,
MBBCh, Peter-John Wormald, MD
Woodville, South Australia Australia

Background:

The role of bacteria in the aetiopathogenesis of chronic rhinosinusitis (CRS) remains an area of interest. The impact of surgery and factors such as nasal polyposis, asthma and aspirin sensitivity on the bacterial state are not completely understood. This study examines the culture results from a large cohort of CRS patients to shed light on these questions.

Methods:

This retrospective study utilised the culture results from 513 CRS patients, which were analysed for species growth and compared to demographic factors such as previous surgery, presence of polyps, aspirin sensitivity and asthma. Univariate and multivariate logistic regression models were utilised for statistical analysis.

Results:

83% of patients had a positive culture result. The average number of isolates detected per patient was 0.95. *S. aureus* was the most frequently cultured organism, found in 35% of patients, followed by *P. aeruginosa* (9%), *Haemophilus* spp. (7%) and *S. pneumonia* (5%). Revision patients were significantly more likely to grow *S. aureus* ($P = 0.0009$), *P. aeruginosa* ($P = 0.0436$) and have a positive culture ($P = 0.005$). Asthma was correlated with a positive culture ($P = 0.0392$). No significant difference was determined between polyp and non-polyp groups for any of the bacterial outcomes.

Conclusion:

This study highlights important factors in the bacteriology of CRS patients. *S. aureus* was the most prevalent species identified followed by *P. aeruginosa*. *S. aureus* rates of isolation were also significantly higher in patients undergoing revision surgery. No association was found between the presence of nasal polyposis and culture rates.

Poster# P-53**The Central Onodi Cell: A Previously Unreported Anatomic Variation**

*Deepa Cherla, BS, Saurin Sanghvi, BS, Qasim Husain, BS, Senja Tomovic, MD, James K Liu, MD, Jean Anderson Eloy, MD, FACS
Newark, NJ USA*

Introduction:

While the endoscopic endonasal transsphenoidal route provides a minimally invasive approach and wide field of view for removal of sellar and parasellar lesions, a thorough knowledge of sphenoid sinus anatomy is necessary to avoid complications. These include arterial hemorrhage, visual loss, and cranial nerve and extra-ocular muscle palsies. The best radiographic tool to analyze the sphenoid sinus and its surrounding structures is the computed tomography (CT) scan.

Methods:

A case report.

Results:

Preoperative CT scan demonstrated a central ethmoid air cell posterior to the anterior face of the sphenoid sinus. The central Onodi cell was identified through an endoscopic endonasal approach in a position superior to the sphenoid sinus with bilateral optic nerve bulging. The patient did well postoperatively with improvement in her headaches and no vision changes or CSF leak.

Conclusion:

The central Onodi cell is an overriding posterior ethmoid cell that lies superior and midline to the sphenoid sinus and in close association with the optic nerve. Preoperative recognition of the Onodi cell is necessary to avoid injury to closely associated structures, including the internal carotid artery and the optic nerve, as well as identify structures that may interfere with exposure of the sellar floor or increase patient susceptibility to sinusitis.

Poster# P-54**The effect of nasal saline irrigation on olfaction: A prospective randomized trial.**

*Jack J Liu, MD, Guy C Chan, PhD, Avi S Hecht, MD, Daniel R Storm, PhD, Greg E Davis, MD
Seattle, WA USA*

Introduction:

Nasal saline irrigation is a safe adjunct treatment for chronic rhinosinusitis; however, its effect on olfaction is unclear. Cyclic AMP (cAMP) is a key second messenger in the mechanism of olfaction and has been shown to be associated with smell function. In animal studies, olfactory cilia are harvested by simple saline washes. This study aimed to characterize the effect of nasal saline irrigation on smell function.

Methods:

Volunteers with normal olfaction were randomized into a control or irrigation cohort. In the initial appointment, subjects completed a University of Pennsylvania Smell Identification Test (UPSIT) and nasal samples were obtained by 2 methods, the nasal curette and cytobrush. The irrigation cohort performed daily nasal saline irrigations. Both cohorts then returned in 1 week. The UPSIT and nasal cell collection were repeated, and each subject completed a subjective olfactory transition scale. Nasal samples were processed for cAMP levels using a commercial ELISA assay.

Results:

30 subjects were enrolled and randomized into each cohort. Pre- and post-irrigation mean UPSIT scores were 36.4 and 36.7 ($P=0.52$). No subjects reported a subjective smell loss. Ten pairs of nasal samples were assayed. Using the curette, pre- and post-irrigation cAMP levels were 539 and 497 ($p=0.17$). Using the cytobrush, respective cAMP levels were 519 and 455 ($p=0.13$).

Conclusion:

Nasal saline irrigation has no subjective or objective effect on olfaction. It also does not appear to affect cAMP levels, a potential marker of smell function.

Poster# P-55**The Incidence of Diabetes Insipidus in Endoscopic Pituitary Surgery**

Arjuna Kuperan, MD, Kaashif Eazazuddin, DO, Anderson Eloy, MD, James K Liu, MD Newark, NJ USA

Introduction:

Diabetes insipidus(DI) is a well known complication of endoscopic pituitary surgery especially with extended approaches and craniopharyngiomas. Both transient and permanent DI, defined as less than and greater than 6 months respectively, result in a prolonged hospital course, patient morbidity, and in some cases indefinite treatment. The purpose of this study is to perform an institutional review of all endoscopic pituitary surgery, the frequency of transient and permanent diabetes insipidus, and compare it to other large series.

Methods:

Retrospective review of a single tertiary care center

Results:

Overall, there were 70 endoscopic pituitary surgeries performed between January 2009 and June 2012, and 10 of these were craniopharyngiomas. The overall, transient, and permanent rates of DI were 21.4%, 10%, and 11.4%. In the craniopharyngioma group the equivalent rates were 90%, 40%, and 50%. Removing craniopharyngiomas from the total group the DI rates were 10%, 5%, and 5%. All cases of DI with pituitary adenomas involved extended endoscopic approaches.

Conclusions:

Our results with adenoma resection are comparable to other large published series. The overall rates of DI and those rates among only craniopharyngiomas are difficult to compare as a result of sparse parallel data. Further data must be collected in order provide meaningful comparisons between subgroups such as craniopharyngiomas and adenomas.

Poster# P-56**The Many Faces of The Balloon: A New Treatment For Acquired Nasopharyngeal Stenosis**

Devars du Mayne Marie, Fellow, Woods Owen, Resident, Desrosiers Martin, MD Montreal, Quebec Canada

Objective:

We describe our use of balloon dilation to treat an acquired nasopharyngeal stenosis (NPS) following radiotherapy. A 62-year-old patient treated by chemo/radiotherapy for a T4N2M0 nasopharyngeal carcinoma presented with complete bilateral nasal obstruction ten months after radiotherapy. Endoscopic examination and sinus CT confirmed the stenosis. Recurrence was excluded after histological examination. In the literature, proposed therapeutic options associate various combinations of local flaps, laser excision, application of mitomycin-C and nasal stenting. Although these therapies can be efficient, they remain invasive and do not prevent the high risk of recurrence (33 %). This motivated us to attempt a new, potentially less aggressive procedure using only the balloon dilation to relieve the stenosis.

Method:

A small passage in the stenosis was cannulated using a rigid probe and a Nelaton catheter and used to pass a 12mm oesophageal dilation balloon, which was then inflated, to 12 ATM. The procedure was performed under general anesthesia under videoendoscopic control.

Results:

The result was immediate, with complete relief of the stenosis, which respected the mucous membrane. At one-month post-operative follow-up, nasal breathing was greatly improved, with endoscopic examination confirming a good functional result, showing a widely patent nasopharynx without mucosal scar.

Conclusion:

Transnasal balloon dilation may represent a rapid, safe, noninvasive, and effective treatment of NPS. Even if current follow-up period is insufficient to estimate its long-term efficiency, balloon dilation appears to be a atraumatic technique for both the mucosal membrane and the patient, which makes it easily repeatable in case of recurrence.

Poster# P-57**The prevalence of Osteitis in the Uncinate process in CRS patients versus controls.**

*Peter J Catalano, MD, Meir Warman, MD, Rahul C Gupta, MD, Rohan C Wijewickrama, MD
Boston, MA USA*

Introduction:

Chronic rhinosinusitis (CRS) is a common inflammatory condition with multiple etiologies. Osteitis of the underlying bone, and in particular, the uncinata process (UP) is postulated as one of the main causes for CRS. The prevalence of bone remodeling changes in the uncinata process (UP) of healthy controls has not been previously examined.

Objectives:

The objectives of this study were to determine and compare the prevalence of osteitis of the uncinata bone in patients with CRS versus healthy controls.

Methods:

Prospective histopathologic examination of the UP/uncinate bone was performed to identify osteitis in the study group (patients undergoing sinus surgery for CRS) versus a similar-sized control group. The presence of osteitis was determined as bone remodeling and the formation of woven bone using polarized light microscopy.

Results:

A total of 20 consecutive uncinata bones were examined. 10 from patients with CRS and 10 from the control group. The mean age of patients was 43 and 44 years in the two groups. Pathologic evidence for osteitis was found in 50% of the CRS patients and 30% of the control group.

Conclusions:

Osteitis of the uncinata bone is present in both asymptomatic control patients as well as those undergoing surgery for CRS. These results question the contribution of osteitis of the UP as a significant factor in the pathogenesis of CRS. This preliminary data needs to be further evaluated in large scale CRS and healthy populations.

Poster# P-58**Uncinate-Preserving Transnasal Cannulation and Dilatation of the Natural Maxillary Ostium in a Cadaveric Model**

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Background:

Guide catheter and guidewire-assisted transnasal balloon placement during maxillary sinus ostial dilatation was reported to create false passages through the maxillary fontanelle. Accuracy of transnasal dilatation of the natural maxillary ostium was evaluated following procedure training for a malleable-tipped multi-sinus balloon device.

Methods:

Transnasal cannulation and dilatation of 42 cadaveric maxillary sinus ostia was attempted by six surgeons including three with very limited clinical experience using the device. All physicians received procedure training per the study protocol that included shaping the malleable-tipped balloon device into the recommended maxillary configuration of 135 degrees. Tissue dissection was prohibited. Canine fossa trephination and transantral endoscopy evaluated cannulation and dilatation outcomes. Physician operators were blinded to transantral images and results were filmed and documented by two independent reviewers.

Results:

Appropriate transnasal cannulation and dilatation of natural maxillary sinus ostia occurred in 92.9% (39/42) of attempts. Two failures emanated from procedural deviations. In one deviation, the bend angle was changed to 90 degrees and the device tip did not cannulate the ostium. In the second, the device was passed through a pre-existing hole in the uncinata and cannulated the natural ostium. A third failure occurred when the device was passed through the fontanelle creating a false lumen. When protocol procedural techniques were used, the success rate was 97.5% (39/40).

Conclusion: Using recommended procedural techniques and a malleable-tipped balloon device, newly trained and experienced physicians alike can perform uncinata-preserving transnasal cannulation and dilatation of the maxillary ostium with a high rate of success.





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