American Rhinologic Society

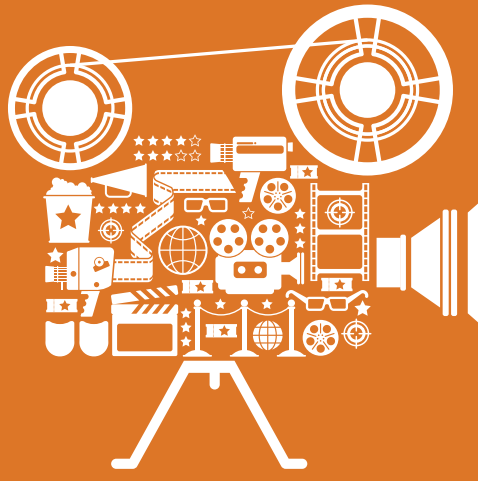
65th Annual Meeting

September 13-14, 2019

Hilton New Orleans Riverside
New Orleans, Louisiana

PROGRAM GUIDE

The ARS Welcomes the AAO-HNS Guest Countries: Philippines, Turkey, United Kingdom & Peru



FALL FILM FESSTIVAL

The ARS will again be featuring the **Fall Film Fesstival** - a ***video seminar*** featuring the most educational, unique and impressive videos of cases, complications and challenges submitted by the membership.

The videos were reviewed by an appointed committee and rated equally on rarity of pathology, technical complexity, novelty of procedure, educational value, and production quality. The top-rated videos (time-permitting) will be showcased at the meeting with an opportunity for the video editors to introduce each clip and respond to questions from the audience.

JAMES PALMER, MD, FARS

Presidential Welcome

On behalf of the American Rhinologic Society, I am so pleased to invite all those interested in Rhinologic disease to our 65th annual meeting in New Orleans. We are so glad to be back to a city that is so full of zest and energy, and especially hope you will have a chance to "work out" your special senses of taste and smell in some of NOLA's world famous restaurants!

A gargantuan thank-you is due to Dr. Robert Kern and the entire program committee, who have worked very closely to organize the many facets of this meeting and we hope it nicely serves all of your interests. Coming on the heels of RhinoWorld Chicago, I am excited to see the springboard of the Chicago meeting come to fruition as we continue to advance the science and clinical care of Rhinology.

The American Rhinologic Society has been committed to diagnosing and treating nasal and sinus disorders for over 60 years, and the society goals include teaching, research and socioeconomic support for its membership. It has been my great pleasure to serve as your President over the past year, and it has been a wonderful and exciting experience, full of friendship and camaraderie.

I am certain our organization is headed to do even more great things, and I thank you for the chance to serve as a steward of such a wonderful organization!

James Palmer, MD, FARS
President, American Rhinologic Society

ROBERT C. KERN, MD, FARS

Welcome from the Program Chair

Welcome to New Orleans for the 65th Annual American Rhinologic Society Meeting. As your President-Elect, I appreciate the opportunity to serve as program chair for 2019. This will pick up on many of the key RhinoWorld themes that are rapidly coming into sharper focus. We live in an exciting and transformative time in our subspecialty and this meeting is designed to keep our membership up to date, despite the pace of change.

The Program Committee has reviewed over 200 abstracts for this meeting and we once again owe them a huge debt of gratitude for their tireless work in ensuring the finest possible meeting content.

The Friday Scientific Sessions will begin with a Joint AAOA-ARS panel, this year re-evaluating the role of antibiotics and CRS. This is a vitally important topic to discuss as the appropriate use of antibiotics for chronic rhinosinusitis is changing. Following this, Roy Casiano will lead the first skull base surgical panel, followed by John Craig who will lead a panel on odontogenic sinusitis. The emphasis here will be on the appropriate roles of the oral surgeon and the rhinologist to optimize long term outcomes. Lastly, Bruce Tan is moderating a panel on phenotypes and endotypes, fast moving areas which have engendered much confusion in the field. The introduction of biologics for the treatment of CRS mandates that we have some consensus on the definitions of these terms and how those definitions will be applied. We will close on Friday with the Fall Film FESStival followed by the poster session and cocktail reception.

Saturday morning, we will again break up into 4 rooms with multiple sessions in each room. A broad range of topics will be covered including basic science, health economics, AERD, practical issues, the microbiome, olfaction and skull base surgery. Two panels will be featured, one on state-of-the-art management of AERD and the other on biologic therapies.

On Saturday afternoon, we will begin with the Women in Rhinology, Mentorship Program & Resident and Fellows Combined luncheon with guest speaker Maisie Shindo, MD. The topic will be “Coaching Resiliency in Residents and Preventing Physician Burnout”. This will be followed by the 15th Annual Kennedy Lecture featuring Robert Schleimer, PhD, addressing the latest translational research findings in the pathophysiology of CRS. Appropriately, this will be followed by the session featuring this years’ top-rated abstracts, which were selected in a blinded fashion by the Program Committee. Having been a part of this society for over 25 years, it is a great pleasure to see the scientific quality of the submissions continue to rise. Anderson Eloy will then moderate the second session on skull base surgery.

Lastly, in something that we hope will become an annual event, Dr. Kennedy will be leading a panel entitles “Ask the Experts – An Endoscopic Potpourri”.

I am confident that this year’s meeting will again provide all otolaryngologists interested in the field of Rhinology and Skull Base Surgery with valuable content that will impact their care of patients.

It has been an honor and a pleasure to serve as President-Elect and Program Chair and I look forward to seeing you all in New Orleans!

Robert C. Kern, MD, FARS
ARS President Elect and Program Chair

American Rhinologic Society Executives - 2019

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

How to Obtain Your CME Certificate

Go to ARS.CmeCertificateOnline.com and click on "ARS 65th Annual Meeting" link. On the site, you will be asked to evaluate the overall conference. A certificate will be made available for you to print. Questions? Email Certificate@AmedcoEmail.com

Learning Objectives

Upon completion of the session the participants should be able to:

- Discuss proven and novel innovations for the medical and surgical treatment of chronic rhinosinusitis
- Appreciate the emerging role of biologics for recurrent CRSwNP
- Understand the optimal management of ARD
- Understand the new innovations in skull base surgery

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BlackBerry

1) You'll be using the web version of the app. Open the web browser, click the BlackBerry menu button, select "Go To" and type https://crowd.cc/ars2019

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NOTE: Once you have opened the downloaded app, input "65th Annual Meeting" in the search bar for the event to appear, tap on it and enter code – **ars2019** to access it.

ARS 2019 FRIENDS IN RESEARCH DONORS

Thank you to all donors who have helped get the 2019 Friends in Research Campaign off to a great start!!! We thank you for your generosity! With the monies donated over the past few years the ARS has heen able to continue the Friends in Research sponsored grant which is in addition to our traditional CORE efforts! New this year the ARS is also offering a three-year, multi-site Con-sortium Grant.

With your support, we can continue to fund the studies that provide clinical insights valuable to the care of our patients. This work not only advances the care of our patients through scientific innova-tion, but also generates important data establishing the efficacy and cost effectiveness of our care. In the current financial landscape, this is equally important to ensure that our patients have access to the treatment necessary to address their complaints. We thank you again for your help in this worthy endeavor!

Visit *american-rhinologic.org* and join us in our 2019 year campaign.

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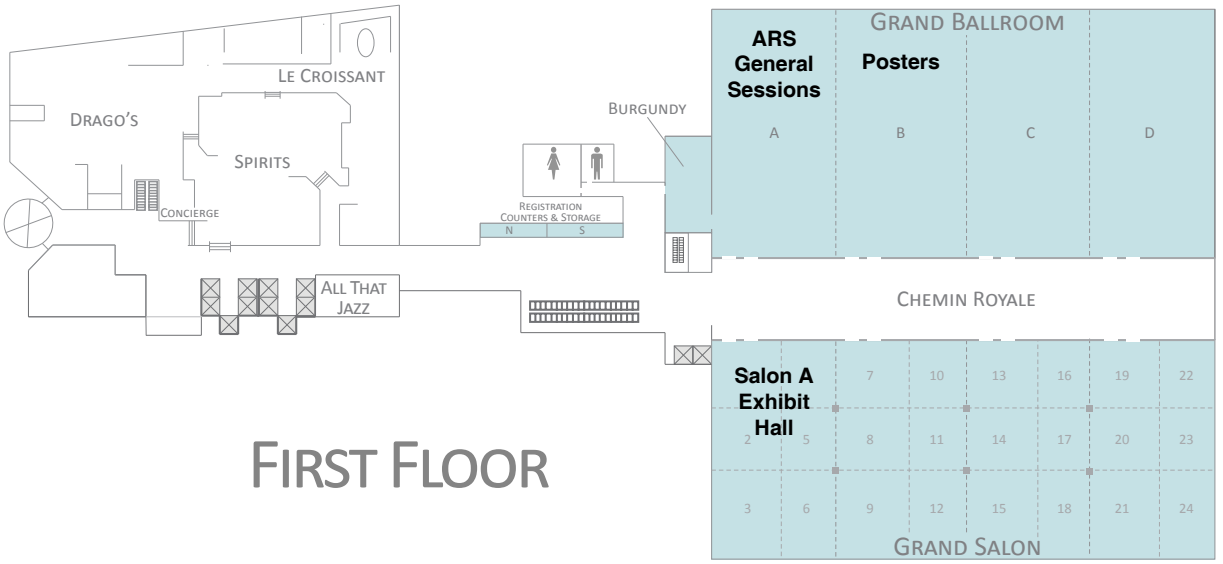

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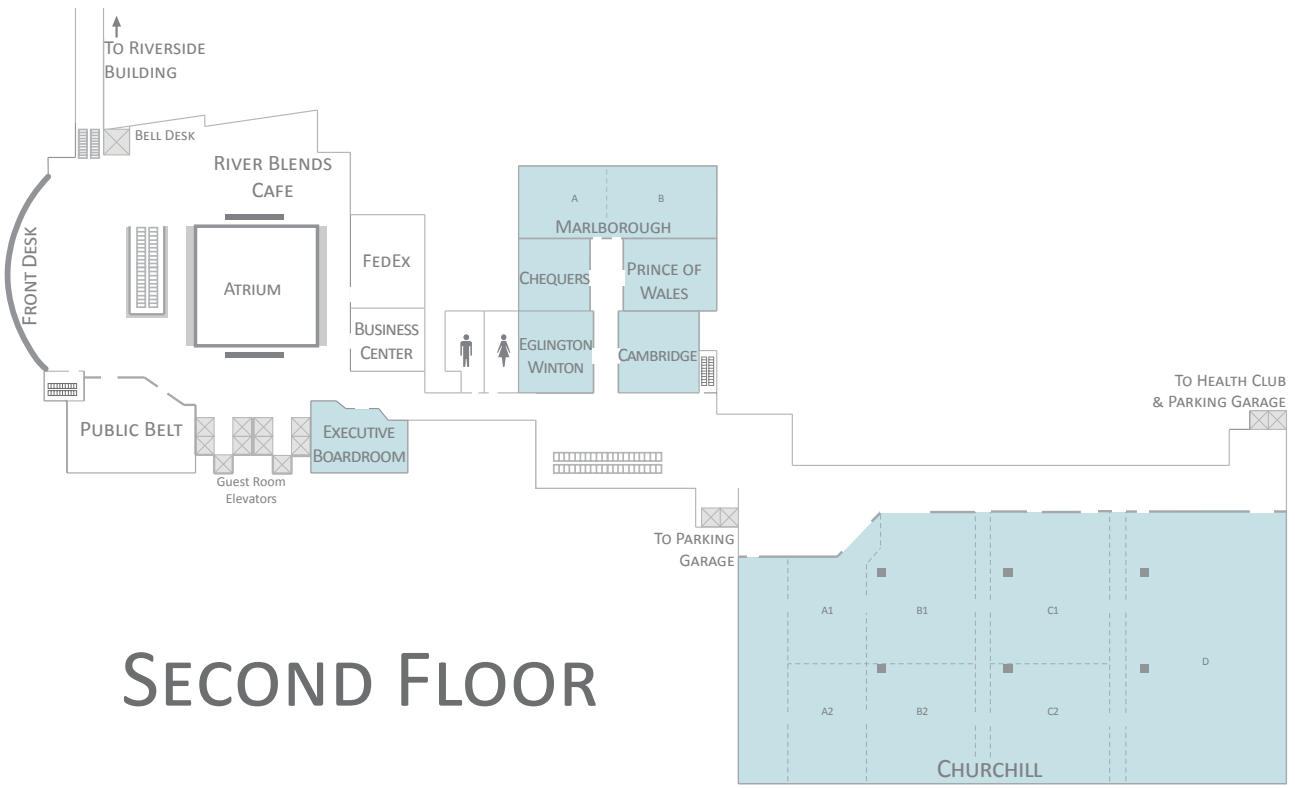
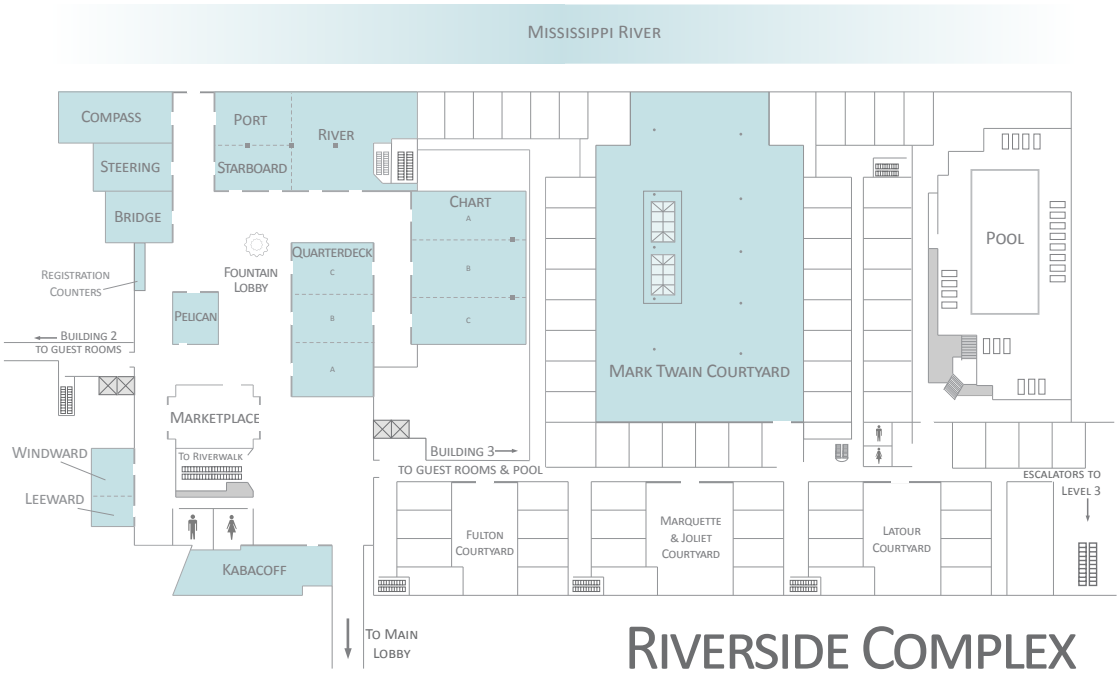


Second Floor

Floor Plan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A HUGE SUCCESS (and loads of fun!)

PROGRAM AT A GLANCE

Friday, September 13, 2019 - 12:00 pm – 5:00 pm, Grand Ballroom A

12:00pm – 12:45pm
Ancillary Session Luncheons

12:45pm – 1:00pm
Welcome and Business Meeting
Robert Kern, MD, FARS
President Elect / Program Chair

1:00pm – 2:00pm
ARS/AAOA Panel
What is "Appropriate" in CRS Diagnosis and Treatment?
Moderator: Sarah Wise, MD, FARS
Panelists: Claire Hopkins, MD, Sandra Lin, MD, Amber Luong, MD Ph.D., Vijay Ramakrishnan, MD, Timothy Smith, MD

2:00pm – 2:15pm
Presidential Address
James Palmer, MD, FARS
2:15pm – 3:00 pm
Skull Base Panel #1
"Selecting Effective Treatment Options for Malignant Sinonasal Neoplasms"
Moderator: Jean Anderson Eloy, MD, FARS
Panelists: Devyani Lal, MD, FARS, Stacey T. Gray, MD, FARS, Zara M. Patel, MD, FARS

3:00pm – 3:30pm
Break with Exhibitors in Salon A

3:30pm – 4:10pm
Odontogenic Sinusitis Panel
Moderator: John Craig, MD, FARS
Panelists: David Poetker, MD, FARS, Stacey Gray, MD, FARS, Al Pokorny, MD, Jose Mattos, MD, Roderick Tataryn, DDS, Tara Aghaloo, DDS, MD, PhD

4:10pm – 5:30pm
Endotypes and Phenotypes-Where are we now?
Moderator: Bruce Tan, MD
Panelists: Devyani Lal, MD, FARS, Zachary Soler, MD, FARS, Elina Toskala, MD, FARS, Justin Turner, MD, FARS

5:30pm-6:00pm
Fall Film FESStival
Judges: Christopher Church, MD, FARS, Erin O'Brien, MD, FARS, Jean Anderson Eloy, MD, FARS, Jamie Litvack, MD, FARS, Alex Chiu, MD, FARS

6:00pm-8:00pm - ***Grand Ballroom B***
Presidents Welcome Reception
Poster Presentation
Women in Rhinology
David W. Kennedy Lecturer

All information was taken from the original abstract submission

PROGRAM AT A GLANCE

Saturday September 14, 2019, Breakout Room 1 - 8:00 am – 12:00pm, Chart Ballroom A/B – Riverside Building

AERD Session

Moderators: Zachary Soler, MD, FARS, Nithin Adappa, MD, FARS, Edward Kuan, MD

8:00am – 8:07am
Treatment practices for aspirin exacerbated respiratory disease: Analysis of a national insurance claims database
Lauren Roland, MD, MSCI

8:07am – 8:14am
Complete surgery followed by aspirin desensitization decreases overall corticosteroid use
Edward C. Kuan, MD

8:14am – 8:21am
Up front DRAF III frontal sinusotomy results in sustained improvement in sinonasal quality of life in patients with aspirin exacerbated respiratory disease
Peter Papagiannopoulos, MD

8:21am – 8:28am
Aspirin exacerbated respiratory disease: Longitudinal assessment of a large cohort & implications of diagnostic delay
Rijul Kshirsagar, MD

8:28am – 8:32am
Discussion

8:32am-9:29am
AERD Panel
Panelists: Tanya Laidlaw, MD, Rodney Schlosser, MD, FARS

Olfaction and Skull Base Surgery

Moderators: Waleed Abuzeid, MBBS, Sammy Khalili, MD

9:29am – 9:36am
Olfactory-specific quality of life outcomes after endoscopic endonasal surgery of the sella
Milap Raikundalia, MD

9:36am – 9:43am
Olfactory function via sniffin sticks following bilateral superior turbinate resection
William Yao, MD

9:43am – 9:50am
Predictors of subjective olfactory dysfunction after endoscopic transsphenoidal hypophysectomy
Jake Lee, MD

9:50am-10:00am
Discussion

10:00am – 10:30am
Break with Exhibitors in Salon A

New Drugs/Devices

Moderators: William Yao, MD, Adam DeConde, MD

10:30am – 10:37am
VISUALIZE: A 24-Week, open-label study using nasoendoscopic video to evaluate the efficacy and safety of EDS-FLU 186 µg twice daily in adults with bilateral nasal polyps
William Yao, MD

10:37am – 10:44am
Mometasone absorption in human nasal airway epithelial cultures
Tuong Nguyen, BS

10:44am – 10:51am
Regional mass deposition of fluticasone propionate (FP) delivered with exhalation delivery system (EDS) device in postsurgical chronic rhinosinusitis (CRS) Draf III geometry estimated and visualized by Computational Fluid Dynamics (CFD)
John Craig, MD, FARS

10:51am – 10:58am
A Phase Ia tolerance and safety evaluation of topical nitric oxide sinus irrigation (NOSi) dose escalation in individuals with recalcitrant chronic rhinosinusitis (RCRS)
India Dhillon, MScH

10:58am – 11:05am
Drug-coating stability and release kinetics of the ciprofloxacin-azithromycin sinus stent
Do-Yeon Cho, MD

11:05am – 11:11am
Discussion

Practical Issues/ Immunosuppression

Moderators: Ian Humphreys, DO, FARS, Jarrett Walsh, MD, Christopher Le, MD, FARS

11:11am – 11:18am
Lightening in a bottle: Comparison of ultraviolet light to traditional sterilization in saline irrigations bottles
Qasim Husain, MD

11:18am – 11:25am
The effect of topical epinephrine 1:1000 with and without infiltration of 1% lidocaine with epinephrine 1:100,000 on endoscopic surgical field visualization: a double-blind randomized controlled study
Garret Choby, MD

11:25am – 11:32am
Discussion

11:32am – 11:39am
Treatment with immune stimulating therapies improves survival in chronic invasive fungal sinusitis: A multi-institutional review
Ian Humphreys, DO, FARS

11:39am – 11:46am
Atypical fungal infections affect outcomes in acute invasive fungal sinusitis: A multi-institutional review
Ian Humphreys, DO, FARS

11:46am – 11:53am
Outcomes in treatment of chronic and recurrent acute rhinosinusitis in the setting of medication induced immunosuppression
Zara Patel, MD, FARS

11:53am – 12:00pm
Discussion

12:00pm – 1:00pm
Lunch with Exhibitors in Salon A

Saturday September 14, 2019, Breakout Room 2 - 8:00 am – 12:00 pm, Chart Ballroom C – Riverside Building

Pain Session

Moderators: Arthur Wu, MD, FARS, Philip Chen, MD, FARS, H. Peter Doble, MD, FARS

8:00am – 8:07am
Effect of an evidenced based peri-operative pain protocol on postoperative opioid use after endoscopic sinus surgery
Jaxon Jordan, MD

8:07am – 8:14am
Effect of gabapentin pretreatment on peri-procedural pain during in-office posterior nasal nerve cryoablation
Steven Hoshal, MD

8:14am – 8:21am
A multicenter study on the effect of NSAIDs on postoperative pain after endoscopic sinus surgery
Arthur Wu, MD, FARS

8:21am – 8:28am
Opioid prescription and usage after rhinologic surgery: A systematic review
John Zheng, MD

8:28am - 8:35am
Discussion

Health Economics

Moderators: Joshua, Levy, MD, PhD, FARS, Adam De Conde, MD, Zachary Soler, MD, FARS

8:35am – 8:42am
Complications after endoscopic sinus surgery in smokers: A 2005-2016 NSQIP analysis
Jordan Teitelbaum, DO

8:42am – 8:49am
Developing consistent epistaxis management in the emergency department: Clinical care pathway utilization reduces transfers and improves care
Clare Richardson, MD

8:49am – 8:56am
Cost analysis of endoscopic sinus surgery for chronic rhinosinusitis: In-office based procedures versus traditional operating room endoscopic sinus surgery
Aliasgher Khaku, MD, MBA

8:56am 9:03am
A Multi-centre prospective study investigating the management of periorbital cellulitis
Sridhayan Mahalingam, MRCS (ENT)

9:03-9:10am
Operative time and cost estimation itemized by component procedures of endoscopic sinus surgery
Andrew J. Thomas, MD

9:10am-9:21am
Discussion

Polyps and Revision Surgery Session

Moderators: Marc Dubin, MD, FARS, Peter Manes, MD, FARS, Charles Tong, MD

9:21am – 9:28am
Patient and surgeon factors impacting revision surgery rates in chronic rhinosinusitis with nasal polyposis
Catherine Loftus, MS

9:28-9:35am
Histopathologic influences of tissue eosinophilia among chronic rhinosinusitis patients
Ashwin Ganti, BA

9:35am – 9:42am
Predictors of efficacy for combination oral and topical corticosteroids to treat patients with chronic rhinosinusitis with nasal polyps
Ahmad Sedaghat, MD, PhD

9:42am – 9:49am
Expected revision rates in chronic rhinosinusitis with nasal polyps: Meta-analysis of risk factors
Catherine Loftus, MS

9:49am – 10:00am
Discussion

10:00am – 10:30am
Break with Exhibitors in Salon A

Endotypes

Moderators: Justin Turner, MD, FARS, Thomas Higgins, MD, FARS, Jivianne Lee, MD, FARS

10:30am – 10:37am
Periostin: An emerging biomarker for CRS endotype and sinonasal quality of life
Ashton Lehmann, MD

10:37am – 10:44am
Central compartment atopic disease: Prevalence of asthma and allergy compared to other chronic rhinosinusitis with nasal polyp endotypes
Sonya Marcus, MD

10:44am – 10:51am
Dupilumab and CRS-np: A case series and observations on its efficacy in twenty-eight patients
Mr. Arjun Prasad

10:51am – 10:58am
Association of cough with asthma in chronic rhinosinusitis patients
Michael Marino, MD

10:58am – 11:05am
Subcutaneous nucala injection: An adjunctive treatment for recalcitrant allergic fungal rhinosinusitis
John Karp

11:05am - 11:10am
Discussion

11:10am – 12:00 pm
Biologics Panel
"Biologic therapy in the nasal polyp patient, from immunology to injection - A case-based discussion
Moderator: Sarah Wise, MD, FARS
Panelists: Cecelia Damask, DO, Joseph Han, MD, FARS, Douglas Reh, MD, FARS, Lauren Roland, MD, Stella Lee, MD

12:00pm – 1:00pm
Lunch with Exhibitors in Salon A

All information was taken from the original abstract submission

PROGRAM AT A GLANCE

Saturday September 14, 2019, Breakout Room 3 - 8:00 am – 12:00 pm, Quarterdeck A/B – Riverside Building

Olfaction Session

Moderators: Justin Turner, MD, FARS, Jivianne Lee, MD, FARS

8:00am – 8:07am
Factors driving olfactory loss in patients with chronic rhinosinusitis: A case control study
Rodney Schlosser, MD, FARS

8:07am – 8:14am
The use of platelet-rich plasma in treatment of olfactory dysfunction, a pilot study
Carol Yan, MD

8:14am – 8:21am
Short-term chronic rhinosinusitis medical management: Differential impact on quality of life and olfaction
Andrew Thomas, MD

8:21am – 8:28am
Olfactory cleft mucus inflammatory proteins and olfaction in chronic rhinosinusitis
Frederick Yoo, MD

8:28am – 8:38am
Discussion

Economics and Outcomes Skull Base

Moderators: Edward McCoul, MD, FARS, John Schneider, MD, Eric Wang, MD, FARS

8:38am – 8:45am
Association of sellar mass proliferative markers with radiographic features and clinical outcomes
Robert Liebman, MD

8:45am – 8:52am
Predicting readmission after endoscopic trans-sphenoidal pituitary surgery using machine learning
Christopher Puchi, BS

8:52am – 8:59am
Predicting prolonged length of stay after endoscopic transsphenoidal surgery for pituitary adenoma
Swar Vimawala, BS

8:59am – 9:06am
Economic implications of diagnostic strategies for cerebrospinal fluid rhinorrhea
Christopher Pool, MD

9:06am – 9:16am
Discussion

Microbiome

Moderators: Dana Crosby, MD, Charles Ebert, MD, FARS, Jordan Glicksman, MD

9:16am – 9:23am
Kappa-carrageenan sinus rinses reduce inflammation and intracellular Staphylococcus aureus infection in airway epithelial cells
Ms. Catherine Bennett

9:23am – 9:30am
Association of the sinonasal microbiome with clinical outcomes in chronic rhinosinusitis: A systematic review
James Wang, MD, PhD

9:30am – 9:37am
Long term outcomes of maximal medical management of chronic rhinosinusitis: Paving the way for more accurate cost effectiveness comparisons
George Scangas, MD

9:37am – 9:44am
Collapse of bacterial diversity of the sinus microbiome differentiates poor from good-evolution after ESS for CRS
Axel E. Renteria, MD, MSc

9:44 am – 10:00 am
Discussion

10:00am – 10:30am
Break with Exhibitors in Salon A

QOL I

Moderators: Stella Lee, MD, Stacey Gray, MD, FARS, Anthony DelSignore, MD

10:30am – 10:37am
Sexual health in patients with chronic rhinosinusitis and the effect of endoscopic sinus surgery
Arthur Wu, MD, FARS

10:37am – 10:44am
Acute exacerbations in recurrent acute rhinosinusitis: Differences in quality-of-life and endoscopic exam
Daniel Beswick, MD

10:44am – 10:51am
The relationship between sinonasal and disease specific quality of life in cystic fibrosis
Chetan Safi

10:51am – 10:58am
Differential perception and tolerance of chronic rhinosinusitis symptoms as a confounder of gender-disparate disease burden
Katie Phillips, MD

10:58am – 11:05am
Does age impact long term outcomes in chronic rhinosinusitis?
Thomas Holmes, MD

11:05am – 11:10am
Discussion

QOL II

Moderators: Douglas Reh, MD, FARS, Oswaldo Henriquez, MD, Monica Patadia, MD

11:10am – 11:17am
Modified Lund-Kennedy score as a predictor for significant symptom improvement after endoscopic sinonasal surgery
Yossawee Wangworawut, MD

11:17am – 11:24am
Development of a standardized assessment of patient reported outcomes following endoscopic sinus surgery for chronic rhinosinusitis
Connor Sommerfeld, MD

11:24am – 11:31am
Increased abundance of staphylococcus aureus characterizes microbiome in refractory CRS patients
Axel E. Renteria, MD, MSc

11:31am – 11:38am
Voice dysfunction in patients with chronic rhinosinusitis before and after endoscopic sinus surgery
Arthur Wu, MD, FARS

11:38am – 11:45am
Predictors of success in primary and revision endoscopic dacryocystorhinostomy
Ashton Lehmann, MD

11:45am – 11:59am
Discussion

12:00pm – 1:00pm
Lunch with Exhibitors in Salon A

Saturday September 14, 2019, Breakout Room 4, 8:00 am – 12:00 pm
Kabacoff Room – Riverside Building

Basic Science Session

Moderators: Benjamin Bleier, MD, FARS, Do-Yeon Cho, MD, Michael Kohanski, MD

8:00am – 8:07am
Barrier disruptive effects of mucus isolated from chronic rhinosinusitis
Stephen Kao, MBBS

8:07am – 8:14am
Measuring potential difference in the sinuses more accurately predicts acquired CFTR dysfunction in chronic rhinosinusitis
Do-Yeon Cho, MD

8:14am – 8:21am
Unexpected effects of systemic steroids on the CRSwNP proteome: Is protein upregulation more important than inhibition?
Alan D. Workman, MD, MTR

8:21am – 8:28am
Identification of significant poly-omic and functional upregulation of the PAPP-A/IGFBP/IGF axis in CRSwNP
Sarina Mueller, MD

8:28am – 8:35am
Reversal of smoking induced nasal mucosal changes after quitting smoking
Samy Elwany, MD

8:35am-8:53am
Discussion

Skull Base Basic Science and Clinical

Moderators: Jose Gurrola II, MD, Bradford Woodworth, MD, FARS, Jeb Justice, MD, FARS

8:53am – 9:00am
A metagenomic analysis of the virome of inverted papilloma and squamous cell carcinoma: Prevalence of HPV18-E6
Charles Tong, MD

9:00am – 9:07am
Is the Dulguerov staging system superior to Kadish for olfactory neuroblastoma? An individual participant data meta-analysis
Mark Arnold, MD

9:07am – 9:14am
Comprehensive genomic profiling demonstrates low tumor mutational burden in olfactory neuroblastoma
Jacob Friedman, MD

9:14am – 9:21am
Constellation of cellular changes following acute exposure to external beam radiotherapy
Mr. Phillip Gall

9:21-9:25am
Discussion

9:25am – 9:32am
Application of holographic augmented reality for external approaches to the frontal sinus
Caio Neves, MD

9:32am – 9:39am
Assessment of emotional well-being in patients treated for sinonasal malignancies
Alexander Graf, BS

9:39 am – 9:46am
The role of neoadjuvant therapy in the management of non-squamous cell carcinoma sinonasal malignancies: A national perspective
Zaid Al-Qurayshi, MD, MPH
Presented by Andrew Liu, MD

9:46am - 10:00am
Discussion

10:00am – 10:30am
Break with Exhibitors in Salon A

Draf III Session

Moderators: Eric Wang, MD, FARS, Jeffrey Suh, MD, Jonathan Ting, MD, FARS

10:30am – 10:37am
DRAF III leads to sustained improvement in sinonasal quality of life
Peter Papagiannopoulos, MD

10:37am – 10:44am
Eosinophilic chronic rhinosinusitis managed by the creation of functional neo-sinus cavity and post-operative corticosteroid irrigation care
William Li, MBBS

10:44am – 10:51am
Free mucosal grafts and anterior pedicled flaps to prevent ostium restenosis after endoscopic modified Lothrop (frontal drillout) procedure: A randomized controlled study
Ying-Piao Wang, MD, PhD

10:51am – 10:58am
Discussion

Misc

Moderators: Henry Barham, MD, FARS, Dana Crosby, MD, Stella Lee, MD

11:03am – 11:10am
Medial flap turbinoplasty: Revisiting safety and efficacy
Michelle Menon-Miyake, MD

11:10am – 11:17am
Complete middle turbinate resection is unlikely to cause empty nose syndrome in the first year postoperatively
Richard Law, MD

11:17am – 11:24am
Characteristics and treatment outcomes of suspected mast-cell activation syndrome with sino-nasal obstruction: A single institution experience
Jeehong Kim, MD

11:24am – 11:31am
Topography of polyp recurrence in eosinophilic chronic rhinosinusitis
Jessica Grayson, MD

11:31am – 11:36am
Discussion

11:36am – 11:43am
The effect of continuous positive airway pressure on the nasal cavity
Erin Reilly, MD

11:43am – 11:50am
A retrospective study of the efficacy and safety of balloon eustachian tuboplasty
Camilla Stepniak, MD

11:50am – 11:57am
Discussion

12:00pm – 1:00pm
Lunch with Exhibitors in Salon A

All information was taken from the original abstract submission

Saturday, September 14, 2019 - 12:00 pm – 6:00 pm, Grand Ballroom A

12:00pm – 1:00pm
COMPASS ROOM, RIVERSIDE BUILDING
Women in Rhinology, Mentorship Program and Resident's & Fellows Combined Lunch Program "Coaching Resiliency in Residents and Preventing Physician Burnout"
Guest Speaker: Maisie Shindo MD
Professor of Otolaryngology - Head and Neck Surgery
Surgical Director of the Thyroid and Parathyroid Center
Oregon Health and Science University

1:00pm – 1:55pm
15th Annual David W. Kennedy Lectureship
Invited Guest Speaker: Robert Schleimer, PhD
"Mechanisms of Pathogenesis of Chronic Rhinosinusitis"

TOP ABSTRACTS:

Moderators: Benjamin Bleier, MD, FARS, Do-Yeon Cho, MD, Michael Kohanski, MD

2:00pm – 2:08pm
The presence of virus significantly associates with chronic rhinosinusitis disease severity
Rachel Goggin, MBBS

2:08pm – 2:16 pm
Chronic inflammation directs an olfactory stem cell functional switch from neuroregeneration to immune defense
Andrew Lane, MD, FARS

2:16pm – 2:24pm
Longitudinal stability of chronic rhinosinusitis endotypes
Kristen Yancey, MD

2:24pm-2:30pm
Discussion

2:30pm – 2:38pm
Controlled delivery of ciprofloxacin and ivacaftor via sinus stent in a preclinical model
Do-Yeon Cho, MD

2:38pm – 2:46pm
Loss of BMI1 in mature olfactory sensory neurons leads to increased olfactory basal cell proliferation
Rhea Choi, MD, PhD

2:46pm-2:54pm
Gene correction of the Df508 CFTR mutation in human airway stem cells as a novel cell-based treatment strategy for cystic fibrosis
Jayakar Nayak, MD, PhD

2:54pm-3:00pm
Discussion

3:00pm – 3:30pm
Break with Exhibitors in Salon A

3:30pm-4:15pm
Skull Base Panel #2
"How I do it: Providing Endoscopic Exposure and Resection of Skull Base Neoplasms"
Moderator: Roy Casiano, MD, FARS
Panelists: Corrina Levine, MD, FARS, Bradford Woodworth, MD, FARS, Adam Zanation, MD

4:15pm – 6:00pm
AAO Panel 'Ask the Experts – An Endoscopic Potpourri'
Moderator: David Kennedy, MD
Panelists: Peter J. Wormald, MD, Benjamin Bleier, MD, FARS, Eugenia Vining, MD, Elina Toskala, MD, FARS, James Palmer, MD, FARS, Timothy Smith, MD, FARS

Cocktails from 6-7pm

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

Credit Designation Statement:
ARS designates this live activity for a maximum of 13.25 *AMA PRA Category 1 Credits*™. Physicians should claim only the credit commensurate with the extent of their participation in the activity.

All information was taken from the original abstract submission

POSTER PRESENTATIONS

Poster #001
30-Day readmission and coordination of care following endoscopic transsphenoidal pituitary surgery
Michael Ghiam, MD

Poster #002
A case of refractory cerebrospinal fluid rhinorrhea
Atsushi Ishibashi, MD

Poster #003
A comparative analysis of sphenoid sinus osteoneogenesis in aspirin exacerbated respiratory disease
Madison Malfitano

Poster #004
A comparison of chronic rhinosinusitis recurrence rates after unilateral versus bilateral functional endoscopic sinus surgery
Devon Webb

Poster #005
A comparison of the cytokines involved in chronic rhinosinusitis and sickness behavior: A meta-analysis
Wasiq, Nadeem, MS2

Poster #006
A perioperative assessment of acute invasive fungal sinusitis symptoms and each prognostic value: A retrospective study
Courtney Hunter

Poster #007
A semitransparent 3D-printed paranasal sinus model: A novel tool for studying medication and irrigation deliver

Ari Stone, BS

Poster #008
A single surgeon experience with nasal defect reconstruction using the melolabial flap
Fergal Cadden, MBBS

Poster #009
A traumatic cerebrocyst presenting as severe pneumocephalus, secondary to chronic intranasal cocaine abuse with an anterior skull base defect in the setting of acute trauma
Daniel Spielman, MD

Poster #010
Abducens nerve palsy in the setting of sphenoid sinusitis and clival metastasis
Lauren Luk, MD, FARS

Poster #011
Acute bacterial rhinosinusitis treatment
Mark Gelpi, MD

Poster #012
Acute invasive fungal rhinosinusitis: Factors contributing to improved survival
Jaimin Patel, MD

Poster #013
Administrative burden of prior authorizations for computed tomography of the paranasal sinuses ordered by the otolaryngologist
Thomas Higgins, MD, MSPH, FARS

Poster #014
Analysis of practice trends in office nasal endoscopy based on Medicare provider utilization and payment data
Ashoke Khanwalkar, MD

Poster #015
Anesthesiologist opinions on inhalational anesthesia and total intravenous anesthesia for endoscopic sinus surgery
Philip Chen, MD, FARS

Poster #016
Assessing public interest in nasal and sinus surgery: A five-year analysis
Lindsey Goyal, MD

Poster #017
Assessment of internal nasal valve using anatomically accurate 3D airway models
Sana Hosseini, MSc

Poster #018
Association between smell dysfunction and nutritional eating
Robert Roth, BA

Poster #019
Average nasal cartilage framework thickness estimation for reconstructive purposes- A cadaveric study
Moustafa Ali, MD

Poster #020
Balloon dilatation for the management of pyriform aperture stenosis: A Case Report
David Chan, MD

Poster #021
Cadaveric study of unilateral nasal saline irrigation after surgery with and without posterior septectomy
Kent Tadokoro, MD

Poster #022
Case report of a pleomorphic adenoma of the nasal septum
Samantha Frank, MD

Poster #023
Case report: An unusual cause of eustachian tube dysfunction: Nasopharyngeal oncocytic cysts
Joshua Hwang

Poster #024
Case report: Complete occlusion of the contralateral cavernous carotid artery due to extrinsic compression of the lateral sphenoid wall, in the setting of a symptomatic pseudoaneurysm
Angela Donaldson, MD

Poster #025
CBD as a potential post-operative pain treatment; patient interest in CBD post-operative pain therapies in otolaryngology
Ashutosh Kacker, MD

Poster #026
Challenging the need for opioids in management of post-operative pain after functional endoscopic sinus surgery
Kurren Gill, MD

Poster #027
Characteristics of patients enrolled in two identical trials of omalizumab in chronic rhinosinusitis with nasal polyps
Joseph Han, MD, FARS

Poster #028
Characterization of WTC relief workers with post-exposure chronic rhinosinusitis
Lauren Williams, BA

Poster #029
Chemotherapy, radiation or resection? The use of neoadjuvant radiochemotherapy to treat sinonasal teratocarcinosarcoma
Matthew Miller, BA

Poster #030
Chronic invasive fungal sinusitis due to scedosporium apiospermum causing orbital apex syndrome and mandibular neuropathy
Matt Miller, MD

Poster #031
Chronic lymphocytic leukemia with orbital manifestations: A rare presentation of progressive disease
Donald Bennett, MD

Poster #032
Clinical characteristics and patient-reported outcomes (PROs) among chronic rhinosinusitis with nasal polyps (CRSwNP) patients with a history of sinus surgery
Megan Scott, BSc

Poster #033
Clinical characteristics, treatment patterns, and healthcare resource utilization (HCRU) in patients with chronic rhinosinusitis with nasal polyps (CRSwNP)
Claire Hopkins

Poster #034
Clinical validation of an automated, deep learning-based protocol for quantitative sinus CT analysis
Conner Massey, MD

Poster #035
Combined robotic transorbital and transnasal approach to the nasopharynx and anterior skull base: Feasibility study
Pavol Surda, Rhinology Consultant

Poster #036
Contour map point distribution and surgeon experience level affect accuracy of surgical navigation
Jason Talmadge, MD

Poster #037
Correlation between physician-assessed cosmetic changes with patient-assessed quality of life following orbital reconstruction
Gregory Epps, MD

Poster #038
Correlation of interpupillary distance (IPD) and width of nasal cavity
Heather Koehn, MD

Poster #039
Correlation with self-reported allergies and quality of life as determined by rhinosinusitis disability index in patients with sinonasal complaints
April Peterson

Poster #040
Cross reactivity in skin prick test results of members within Pooideae subfamily in the middle Missouri population
Brette Harding, MD, MS

Poster #041
Cross-sectional market analysis of innovation within the field of rhinology
Noel Ayoub, MD, MBA

Poster #042
CRS in ethnic groups: Are there differences in CRS Presentation?
Corinna Levine, MD, MPH, FARS

Poster #043
Cystic Fibrosis possibly protective against orbital complications of acute sinusitis
Richard Bavier, BA

Poster #044
Demographic characteristics between adults with obstructive sleep apnea who received nasal surgery
Dang-Khoa Nguyen, MS

Poster #045
Diagnosis and management of orbital fat during endoscopic sinus surgery
Edward Westfall, MD

Poster #046
Diagnostic utility of the opacification/pneumatization (O/P) ratio on quality of life after endoscopic sinus surgery
Sean Parsel, DO

Poster #047
Differences in preoperative CT findings in patients with chronic rhinosinusitis with polyps
Lauren Roland, MD, MSCI

Poster #048
Dupilumab efficacy in patients with severe chronic rhinosinusitis with nasal polyps with or without prior sinonasal surgery: Pooled results from the sinus-24 and sinus-52 phase 3 studies
Stella Lee, MD

Poster #049
Effect of the human cathelicidin LL-37 on nasal epithelial barrier integrity
Yujie Cao, Master of Medicine

Poster #050
Effects of essential oils to inhibit biofilm formation by sinonasal pathogens
James Wang, MD, PhD

Poster #051
Effects of pharyngeal packing in sinonasal surgeries: A randomized controlled trial
Bader Alim, MD

Poster #052
Emerging trends in nasal surgery: What is the impact of a bioabsorbable nasal implant?
Marshall Ge, MD

Poster #053
Endoscopic DCR versus endoscopic laser assisted DCR, comparative study
Wasam Albusalih, MD

Poster #054
Endoscopic management of CSF rhinorrhea in children: A systematic review with meta-analysis
Chadi Makary, MD

Poster #055
Epithelial-myoepithelial carcinoma of the lacrimal sac: Case report and literature review
Elisa Illing, MD

Poster #056
WITHDRAWN
Eustachian ptoms in pati chronic sinusitis before and after endoscopic sinus surgery
Arthur Wu, MD, FARS

Poster #057
Evaluation of PD-L1 expression in sinonasal inverted papilloma
Andrew Thomas, MD

Poster #058
Experiences with diagnostic and management surprises in AFRS
Sourabha Patro, MBBS, MS

Poster #059
Extended endoscopic sinus surgery for revision eosinophilic rhinosinusitis cases with asthma
Yasuyuki Hinohira, MD, PhD

Poster #060
Extended frontal sinus endoscopic approach. University of Chile Clinical Hospital experience
Cesar Funzalida, MD

Poster #061
Factors considered important in the rhinology match
Zachary Farhood, MD

Poster #062
Frontal Ostium Grade (FOG): A novel CT grading system for a safe endoscopic approach to the frontal sinus
Heitham Gheriani

Poster #063
Functional endoscopic sinus surgery and other rhinologic surgery after face transplantation
Alisa Yamasaki, MD

Poster #064
Geographic variation in epistaxis interventions among Medicare beneficiaries
Ido Badash, Medical Student

Poster #065
Hidden-port approach to endoscopic pericranial scalp flap for septal perforation closure
Alfredo García-Fernández, MD, PHD

Poster #066
Human papillomavirus–related multiphenotypic sinonasal carcinoma: A case study and literature review
Cody Anderson, BA

Poster #067
Improvement of nasal morbidity following nasoseptal flap reconstruction of skull base defects using reverse rotation flap
William Strober

Poster #068
Increase in IL-17-positive cells in sinonasal inverted papilloma
Chen Cao, Master of Medicine

Poster #069
Inflammatory infiltration characteristics of nasal inverted papillomas
Chen Cao, Master of Medicine

Poster #070
Infracochlear pneumatization of the sphenoid - Evidence of the "Fifth Sinus"
Spencer Payne, MD, FARS

Poster #071
In-hospital costs associated with expanded endonasal approach to meningioma resection
David Lerner, MD
(Presented by Theodore Lin, MD)

Poster #072
Investigation of allergic rhinitis epidemics by Baidu index in China
Yujie Cao, Master of Medicine

Poster #073
Lacrimal sac blue nevus
Rohit Garg, MD, FARS

Poster #074
Life-threatening epistaxis: a case of ruptured intra-sphenoidal internal carotid artery aneurysm, complicated by orbital apex syndrome following endovascular treatment
Marie Bussieres, MD

Poster #075
Living with nasal polyps in the US: A study to understand the patient journey
Zachary Soler, MD

Poster #076
Management of acute invasive fungal sinusitis with orbital involvement – When can the eye be saved?
Ryan Rimmer, MD

Poster #077
Management of recurrent acute rhinosinusitis (RARS): A systematic review
Mohamad Saltagi, MD

Poster #078
Managements of inferior turbinate hypertrophy by: Endoscopic inferior turbinoplasty and inferior turbinectomy (comparative study)
Wasam Albusalih, MD

Poster #079
Markers of eosinophilic inflammation are associated with response to the DP2 antagonist GB001
Brett Skolnick

Poster #080
Maxillary giant cell reparative granuloma: Case report and review of the literature
Nicholas Andresen, MD

Poster #081
Medicare reimbursement for balloon catheter dilations among high volume surgeons
David Kasle, MD

Poster #082
Modified endoscopic Denker's approach in management of inverted papilloma of the anterior maxillary sinus
Jivianne Lee, MD, FARS

Poster #083
Monitoring the trends of popular homeopathic remedies for sinusitis on internet search engines
Sydney Sachse

Poster #084
Occupational chronic rhinosinusitis: A review
Avi Albeg

Poster #085
Our experience with cone beam CT and it's utilisation in rhinology practice - 3-year retrospective review of our practice
Jana van der Veen, DOHNS, MRCS

Poster #086
Outcomes and complications of concurrent FESS and rhinoplasty: A systematic review
Benjamin Bitner, BS

Poster #087
Paediatric sino-nasal masses: Diversity and the challenges in a developing country
Kartik Parelkar, MS

Poster #088
Patterns of cervical lymph node metastasis in sinonasal squamous cell carcinoma
Roman Povolotskiy, BA

Poster #089
Perivascular epithelioid cell tumor (PEComa) of the pterygopalatine fossa
Michael Dougherty

Poster #090
Persistent pneumocephalus following cranialization of the frontal sinuses: An endoscopic approach for skull base repair
Lindsey Ryan, MD

Poster #091
Perspectives and expectations in endoscopic sinus surgery for patients with chronic rhinosinusitis: A description of the patient journey
Nadim Saydy, MD

Poster #092
Physical intervention outcomes for epistaxis control in pediatric coagulopathy
Jordan Teitelbaum, DO

Poster #093
Pleomorphic adenoma of the nasal septum: A case report
Mohamed Elrakhawy, MD

Poster #094
Post-operative pain management and perceived patient outcomes following endoscopic pituitary surgery
Austin Hoke

Poster #095
Predictors of survival in patients with acute invasive rhinosinusitis: A retrospective review
Nancy Wang, MD

Poster #096
Prescription patterns and opioid usage in sinonasal surgery
Christopher Newberry, MD

Poster #097
Prevalence of eustachian tube dysfunction in the U.S. elderly population
Jakob Fischer, MD

Poster #098
Primary skull base lymphoma: A case series
David Goldrich

Poster #099
Prolonged hospital stay following definitive surgical resection of sinonasal malignancies: Causes, predictors and survival
Kevin Connors

Poster #100
Pseudo frontal sinus due to incomplete frontal sinus cranialization
Donovan Lockwood, BS

Poster #101
Psychiatric morbidity in sinonasal malignancies: Analysis of incidence, predictors, and role of social support
Chandala Chitguppi, MD

Poster #102
Quality of YouTube videos as an educational tool for maxillary antrostomy
Craig Miller, MD

Poster #103
Radiation sinusitis: Head and neck radiation induces paranasal sinus mucosal thickening
Taha Mur, MD

Poster #104
Rapid detection of cerebrospinal fluid leaks at the point of care
Brandon Strong, BS

Poster #105
Readability of patient-reported outcome measures for chronic rhinosinusitis and anterior skull base diseases
Eric Lee

Poster #106
Recurrent benign vascular papillary neoplasm of the sphenoid sinus and sella with markers of both spindle cell oncocytoma and pituicytoma – A case report
Roshan Nayak, BS

Poster #107
Repeated intranasal fentanyl use in the setting of lamina papyracea and periorbita dehiscence: A case report and review of literature
Aaliyah Riccardi

Poster #108
Respiratory epithelial adenomatoid hamartoma: An underdiagnosed benign condition
Joseph Schertzer, BS

Poster #109
Review of Cystic Fibrosis transmembrane conductance regulator modulator therapy for chronic rhinosinusitis in Cystic Fibrosis patients
Eric Lee

Poster #110
Revision sinus surgery in the era of balloon dilation
David Jang, MD

Poster #111
Short course acetazolamide may be a safe and effective alternative to lumbar drains in repairing moderate to high flow CSF leaks after expanded approaches to suprasellar tumors
Murugappan Ramanathan, MD, FARS

Poster #112
Silent sinus syndrome with an accompanying benign deep masticator space mass: A case report and literature review
Nanki Hura, BS

Poster #113
Sinonasal adenocarcinoma: A population-based analysis of cancer disparities
Christopher Low, MD

Poster #114
Sinonasal complications in nasopharyngeal cancers following chemoradiotherapy
Zahed Shaikh

Poster #115
Sinonasal neuroendocrine carcinoma: A single institution experience
Christopher Low, MD

Poster #116
Sinonasal scalp hair growth from paramedian forehead flap for skull base reconstruction
Stewart Bernard, MD

Poster #117
Sinonasal squamous cell carcinoma presentation and outcome: A national perspective
Zaid Al-Qurayshi, MD, MPH

Poster #118
Sjogren's syndrome sequelae: Nasal synechiae and nasopharyngeal stenosis
Amarbir Gill

Poster #119
Spontaneous nasal polypectomy induced by EDS-FLU (XHANCE®) and Ziluetin (Zyflow®)
Marija Rowane, OMS

Poster #120
Surgical anatomy and management of the internal carotid artery in expanded endoscopic endonasal approaches to the cranial base
ZhaoHui Shi, MD, PhD

Poster #121
Synchronous inverted papilloma, oncocytic papilloma and pleomorphic adenoma: A case report and review of the literature
Ashleigh Halderman, MD

Poster #122
Telehealth in otolaryngology: Where is the evidence for cost-effectiveness?
Claudia Cabrera, MD, MS

Poster #123
Telemedicine in ENT maintains patient satisfaction and improves in accuracy over time
Anne Ning, BA

Poster #124
The effect of upper vs lower nostril irrigation – A post-surgical cadaver study
Kanghyun Kim, BS

Poster #125
The effects of daily intranasal probiotic irrigation on olfaction in normosmic and healthy participants
Nadim Saydy, MD

Poster #126
The effects of sphenoid surgery on nasal irrigation delivery
Jessica Grayson, MD

Poster #127
The extended anterior inferior approach to endoscopic medial maxillectomy for lesions of the anterior and inferior maxillary sinus
Alice Huang, BS

Poster #128
The growth of the advanced practice provider's role in otolaryngology
Gregory Barinsky, PharmD

Poster #129
The impact of resident involvement in endoscopic sinus surgery
Kristine Smith, MD

Poster #130
The many noses of opioid abuse – Case report and review of literature
Sharon Li, MD

Poster #131
The trends and risk factors of biphasic and recurrent anaphylaxis in the U.S. using ICD-10 CM codes
Jared Stuart, BBA

Poster #132
The value of 68Ga-DOTATATE PET/CT in [WITHDRAWN] small cell neuroendocrine carcinoma management and detection of local and distant metastases: Case study and review of literature
David Goldrich

Poster #133
Two cases of IgG4-related disease in the nasal ala associated in the setting of chronic inflammation
Annesha Basu, MD

Poster #134
Two cases of sinonasal necrosis concerning for invasive fungal sinusitis with no fungal elements on final pathology
Rachel Jonas

Poster #135
Understanding isolated sphenoid sinusitis and its management: Case report and literature review
Parsa Salehi, MD

Poster #136
Update on non-rhinologic facial pain: Single institutional experience
Gregory Epps, MD

Poster #137
Use of off-label steroid irrigations in chronic rhinosinusitis: A survey of the American Rhinologic Society
Qasim Husain, MD

Poster #138
Vascular anatomy of the inferior turbinate and its clinical implications
John Scott, MD FRCSC

Poster #139
Volumetric analysis of the maxillary sinus and orbit in silent sinus syndrome
Dev Amin, BS

Poster #140
YouTube as an information source for endoscopic sinus surgery
Arthur Uyesugi, MD

All information was taken from the original abstract submission

PROGRAM ABSTRACTS

Friday, September 13, 2019
1:00 pm – 5:00 pm
Grand Ballroom A

12:45 pm – 1:00 pm
Welcome and Business Meeting
Robert Kern, MD, FARS
President Elect / Program Chair

1:00 pm – 2:00 pm
ARS/AAOA Panel
What is "Appropriate" in CRS Diagnosis and Treatment?
Moderator: Sarah Wise, MD
Panelists: Claire Hopkins, MD, Sandra Lin, MD, Amber Luong, MD Ph.D., Vijay Ramakrishnan, MD, Timothy Smith, MD

2:00 pm – 2:15 pm
Presidential Address
James Palmer, MD, FARS

2:15 pm - 3:00pm
Skull Base Panel #1
"Selecting Effective Treatment Options for Malignant Sinonasal Neoplasms"
Moderator: Jean Anderson Eloy, MD, FARS
Panelists: Devyani Lal, MD, FARS, Stacey T. Gray, MD, FARS, Zara M. Patel, MD, FARS

3:00 pm – 3:30 pm
Break / Exhibit Hall

3:30 pm – 4:10 pm
Odontogenic Sinusitis Panel
Moderator: John Craig, MD
Panelists: David Poetker, MD, FARS, Stacey Gray, MD, FARS, Al Pokorny, MD, J. Mattos, MD, R. Tataryn, DDS, Tara Aghaloo, DDS, MD, PhD

4:10 pm – 5:30 pm
Endotypes and Phenotypes-Where are we now?
Moderator: Bruce Tan, MD
Panelists: Devyani Lal, MD, FARS, Zachary Soler, MD, FARS, Elina Toskala, MD, FARS, Justin Turner, MD, FARS

5:30 pm - 6:00 pm
Fall Film FESStival
Judges: Christopher Church, MD, FARS, Erin O'Brien, MD, FARS, Jean Anderson Eloy, MD, FARS, Jamie Litvack, MD, FARS, Alex Chiu, MD, FARS

6:00 pm - 8:00 pm
President's Welcome Reception / Poster Presentation

Saturday, September 14, 2019
Breakout Room 1
8:00 am – 12:00 pm
Chart Ballroom A/B
Riverside Building

AERD Session

Moderators: Zachary Soler, MD, FARS, Nithin Adappa, MD, FARS, Edward Kuan, MD

8:00 am – 8:07 am
Treatment practices for aspirin exacerbated respiratory disease: Analysis of a national insurance claims database
Lauren Roland, MD, MSCI
Celeste Nagy, MD
Heqoing Wang, MD
Renee Moore, PhD
Katherine Cahill, MD
Tanya M. Laidlaw, MD
Sarah Wise, MD, MSCR, FARS
John DelGaudio, MD
Joshua Levy, MD, MPH, FARS
Atlanta, GA
USA

Background:
Aspirin Exacerbated Respiratory Disease (AERD) is the triad of asthma, nasal polyposis and sensitivity to COX-1 inhibitors. Treatment options include medical management, surgical intervention and aspirin desensitization (AD).

Methods:
AERD patients were identified using the Truven MarketScan Database from 2009-2015. Patients were included using International Classification of Diseases, 9th-edition (ICD-9) codes for asthma, nasal polyps, and drug allergy. Treatments were determined by Current Procedural Terminology (CPT) codes for drug desensitization and endoscopic procedures.

Results:
5,628 patients were identified for study inclusion with mean age 46 years, 40% male. Of AERD patients, 395 (7%) underwent AD and 2171 (39%) underwent sinus surgery during the study time period. Among patients who were desensitized, 229 (58%) underwent surgery during the study time period; 201 (88%) prior to AD (median 61 days [Q1 30, Q3 208] prior to desensitization). For patients undergoing surgery following AD (n=46), surgery was performed a median of 302 (Q1 163, Q3 758) days after AD. Nineteen patients had multiple surgeries post-AD with median time between surgeries being 734 days (Q1 312, Q3 1484). 261 patients were not desensitized to aspirin but did undergo multiple surgeries. The median of the median time between surgeries in non-desensitized

patients was 287 days (Q1 15, Q3 617) which is shorter than for patients post-AD (p<0.001).

Conclusion:
A very small percentage of AERD patients undergo AD, likely due to lack of resources. Patients who had AD underwent surgery approximately 2 months prior to AD. AD increases the duration of time between surgeries, compared to patients who do not undergo AD.

8:07 am – 8:14 am
Complete surgery followed by aspirin desensitization decreases overall corticosteroid use
Edward C. Kuan, MD
Siddhant Tripathi
James Palmer, MD, FARS
Nithin Adappa, MD
John Bosso, MD
Irvine, CA
USA

Background:
Aspirin-exacerbated respiratory disease (AERD) is a highly challenging inflammatory disorder manifesting as aspirin/NSAID sensitivity, asthma, and nasal polyposis. Corticosteroids, both systemic and topical/inhaled, are commonly used to treat inflammation of the upper and lower airways. The objective of this study was to determine the impact of complete surgery and aspirin desensitization (AD) on short- and long-term corticosteroid use.

Methods:
Retrospective chart review of all patients with aspirin challenge-proven AERD who underwent complete endoscopic sinus surgery followed by AD. Daily prednisone use, average daily prednisone dose, and inhaled corticosteroid use was analyzed at the following time points: preoperative, postoperative/pre-AD, and 2-3 months, 4-6 months, 7-12 months, and 13-24 months following AD.

Results:
132 patients underwent surgery followed by AD. Compared to preoperatively, patients who underwent complete surgery and AD were less likely to be on daily prednisone at all time points (32% preoperatively vs. 10% at 13-24 months, all $p < 0.05$). Average daily prednisone dose decreased from 10.6 mg preoperatively to 3.8 mg at 13-24 months following AD ($p < 0.05$). Similarly, high-dose inhaled corticosteroid use decreased from 18% to 7% ($p < 0.05$).

Conclusions:
Complete surgery followed by AD decreases overall systemic and topical/inhaled corticosteroid use in AERD patients. This has significant implications for treatment in light of potentially hazardous side effects involved with corticosteroid use.

8:14 am – 8:21 am
Up front DRAF III frontal sinusotomy results in sustained improvement in sinonasal quality of life in patients with aspirin exacerbated respiratory disease
Peter Papagiannopoulos, MD
Charles Tong, MD
Edward Kuan, MD
Michael Kohanski, MD
David Kennedy, MD, FARS
John Bosso
Nithin Adappa
James Palmer, MD, FARS
University of Pennsylvania
USA

Introduction:
In this study we assessed patient outcomes after DRAF III procedure in patients with Aspirin Exacerbated Respiratory Disease (AERD).

Methods:
This is a single institution retrospective chart review. The rhinology surgical data base was queried for patients with AERD undergoing FESS with DRAF III procedure. Demographic information was obtained as well as SNOT-22 scores from 3 time points: pre-operative, early post-operative (within 3 months) and late post-operative (greater than 3 months). Paired-T test was performed to compare the groups.

Results:
There were 85 patients included. All patients had prior surgery. 39% had only 1 prior surgery while 61% had 2 or more prior surgeries. The mean post-operative follow-up was 12.32 months. Overall, the mean pre-operative, early post-operative, and late post-operative SNOT-22 scores were 40.86, 16.50, and 24.24. There was a significant improvement between pre-operative and early post-operative SNOT-22 ($p<0.00150$) and this significance was maintained between the pre-operative and late post-operative SNOT-22 scores ($p<0.00246$). There was no significant difference between early and late post-operative groups ($p<0.7414$). When comparing patients with one prior surgery to patients with 2 or more prior surgeries there was no difference in SNOT-22 between these groups at any time point (pre-op $p<0.9596$; early post-op, $p<.1392$; late post-op, $p<0.5384$).

Conclusion:
We demonstrated that in AERD, an early, aggressive frontal sinusotomy can achieve a significant reduction in patient reported symptoms in the post-operative period and this effect is durable up to 12-months postoperatively. Up front DRAF III should be considered in patients with AERD.

PROGRAM ABSTRACTS

8:21 am – 8:28 am
Aspirin exacerbated respiratory disease: Longitudinal assessment of a large cohort & implications of diagnostic delay
Rijul Kshirsagar,
David Chou, Resident Physician
Julia Wei, Analyst
Jonathan Liang, Attending Physician MD
Kaiser Permanente Oakland Medical Center
USA

Background:
Aspirin-exacerbated respiratory disease (AERD) refers to the combination of asthma, chronic rhinosinusitis with nasal polyposis (CRSwNP), and acute respiratory tract reactions to ingestion of aspirin and non-steroidal anti-inflammatory drugs. AERD often goes unrecognized due to disease-specific and healthcare system-specific factors. There have been very few studies investigating the diagnostic challenges of AERD. We aim to investigate whether delay in diagnosis of AERD is associated with poorer clinical outcomes as well as characterize the role of specialty evaluation in diagnosis.

Methods:
We conducted a retrospective observational study of 254 subjects with incident AERD diagnoses between 2009-2016 among Kaiser Permanente Northern California members. Descriptive and bivariate statistics were employed to analyze clinical characteristics and outcomes of AERD subjects with and without delay in diagnosis (defined as one year or greater from symptom onset to diagnosis).

Results:
24.4% of patients in the cohort had a delayed diagnosis. Patients with allergies had a lower risk for diagnostic delay ($p < 0.01$). Patients with a delay in diagnosis were more likely to have two or more courses of systemic steroids ($p = 0.04$). Allergists, otolaryngologists, and primary care physicians diagnosed 56%, 36%, and 8% of patients, respectively. There was no association between provider specialty at time of diagnosis and delay in diagnosis ($p = 0.22$).

Conclusion:
A substantial proportion of AERD patients have a diagnostic delay. Patients with allergies have a lower risk for this delay. Patients with diagnostic delay suffer from poorer clinical outcomes. This study is the first to describe diagnostic delay in AERD patients.

8:28am – 8:32am
Discussion

8:32am-9:29am
AERD Panel
Panelists: Tanya Laidlaw, MD, Rodney Schlosser, MD, FARS

OLFACTION AND SKULL BASE SURGERY

Moderators: Waleed Abuzeid, MBBS,
Sammy Khalili, MD

9:29 am – 9:36 am
Olfactory-specific quality of life outcomes after endoscopic endonasal surgery of the sella
Milap Raikundalia, MD
Lyndon Chan, Rhinology Fellow
Tracy Truong, Medical Student
Maragatha Kuchibhatla
Ralph Abi Hachem
Patrick Codd
Ali Zomorodi
David Jang
Duke University Medical Center
USA

Background:
Endoscopic endonasal surgery (EES) of the sella has been associated with excellent olfactory outcomes based on validated instruments. However, existing studies have not utilized olfactory-specific quality of life questionnaires.

Methods:
This is a single institution retrospective study of 43 consecutive patients who underwent EES for sellar lesions. The following tests were performed before and three months after surgery: University of Pennsylvania Smell Identification Test (UPSIT), 22-Item Sinonasal Outcomes Test (SNOT-22), and the Assessment of Self-reported Olfactory Functioning (ASOF), which has three domains: (1) Visual Analogue Scale (VAS), (2) smell-related problems (SRP), and (3) olfactory-related quality of life (ORQ).

Results:
Mean age at surgery was 53.1 ± 16.8 years, with a mean tumor size of 2.0 ± 1.1 cm. 14 patients (32.6%) underwent nasoseptal flap reconstruction. Pre- and postoperative scores were 34.3 ± 3.8 and 33.5 ± 4.3 for UPSIT, 19.5 ± 15.4 and 18.2 ± 14.2 for SNOT-22, 8.8 ± 1.4 and 8.6 ± 1.8 for ASOF-VAS, 4.8 ± 0.4 and 4.5 ± 0.7 for ASOF-SRP, and 4.8 ± 0.4 and 4.7 ± 0.7 for ASOF-ORQ. Only the ASOF-SRP demonstrated a statistically significant difference after surgery ($p=0.04$). Changes in ASOF scores correlated poorly with changes in UPSIT (Spearman coefficient <0.20)

Conclusion:
Scores on an olfactory-specific quality of life questionnaire were significantly reduced after surgery, whereas SNOT-22, UPSIT, and VAS scores showed no significant change. In addition, changes in the ASOF correlated poorly with changes in UPSIT. More sensitive instruments such as olfactory specific questionnaires and threshold testing may be necessary for assessing outcomes after EES.

9:36 am – 9:43 am
Olfactory function via sniffin sticks following bilateral superior turbinate resection
William Yao, MD
Shaina Gong
Sorour Ahmadi
Lindsey Ulin
Spiros Blackburn
Martin Citardi, MD, FARS
Amber Luong, MD, PhD, FARS
Houston, TX
USA

Introduction:
Expanded endoscopic transsphenoidal(EET) approaches have become the preferred for many skull base tumors which can include complete resection of both superior turbinate (ST) for wider exposure. Since ST resection has been associated with postoperative olfactory impairment, we sought to determine the impact of bilateral complete ST resection on olfaction.

Method:
A prospective observational study was conducted on 22 patients undergoing endoscopic skull base surgery sparing the olfactory tracts at a tertiary academic center. Olfactory function was measured with Sniffin' Sticks at the preoperative visit, 2-weeks and 6-8 weeks postoperatively. All components: odor threshold(OT), odor discrimination(OD), odor identification(OI) and composite scores (TDI = OT+OD+OI) were evaluated.

Result:
Study was completed in 12 patients with 10 lost to follow-up. At 2wks, a significant decrease was noted in composite scores(29.6 ± 3.5 vs 22.8 ± 6.2, p=0.007), OT(5.5 vs 2.8, p=.010) and OI (13.5 vs 11.0, p=.019). There was a significant increase in olfactory scores between 2wks and 6-8wks in TDI(22.8 ± 6.2 vs 29.7 ± 4.0, p=.004) as well as in OT(2.8 vs 6.2, p=.021), OD (9.0 vs 11.0, p=.017), and OI (11.0 vs. 12.5, p=.043). No significant difference was found between TDI(29.6 ± 3.5 vs 29.7 ± 4.0), OT(5.5 vs 6.25) and OD (10.6 vs 11.0) from preoperative and 6-8 wks postoperative visits.

Conclusion:
Patients undergoing bilateral ST resection during EET procedures experience transient hyposmia postoperatively. However, the olfactory function normalizes to preoperative levels at 6-8 weeks. The complete resection of the bilateral superior turbinates does not appear to decrease olfactory function as previously thought.

9:43 am – 9:50 am
Predictors of subjective olfactory dysfunction after endoscopic transsphenoidal hypophysectomy
Jake Lee, MD
Zindzi Thompson
Cristine Klatt-Cromwell
John Schneider, MD
Washington University in St. Louis/BJH
USA

Background:
Iatrogenic olfactory dysfunction after endoscopic transsphenoidal hypophysectomy (ETSH) is an overlooked complication without clearly elucidated risk factors. Thus, this study aims to comprehensively assess for demographic, comorbidity, intraoperative, and histologic predictors of subjective post-ETSH olfactory dysfunction (PEOD).

Methods:
A retrospective cohort study of patients who underwent primary ETSH between January 2015 and January 2019 was performed. Patients who underwent prior sinonasal or skull base surgery were excluded. All eligible patients were sent questionnaires about their sense of smell.

Results:
Of 123 subjects that responded to the questionnaire, 26% reported worse smell after surgery. Median time after surgery of questionnaire response was 29.3 (5.0 to 52.1) months. On multivariable analysis, history of smoking (adjusted odds ratio [aOR] 3.16, 95% confidence interval [CI] 1.33 to 7.51) was significantly associated with smell loss while history of asthma (aOR 2.49, 95% CI 0.83 to 7.52), postoperative sinusitis (aOR 2.31, 95% CI 0.78 to 6.88), and nasoseptal flap (aOR 1.86, 95% CI 0.75 to 4.58) were not statistically significantly associated but may have clinically meaningful significance due to the magnitude of their effect size. In contrast, comorbidity score; intraoperative variables such as middle and superior turbinate resection, mucosal grafting, and cerebrospinal fluid leak; and histologic variables such as non-pituitary adenoma status, functional status, and proliferative index were not significantly associated with smell loss.

Conclusions:
Smoking history was a significant risk factor for PEOD while comorbidity,intraoperative,and histologic variables were not associated with PEOD

9:50 am – 10:00 am
Discussion

10:00 am – 10:30 am
Break with Exhibitors in Salon A

PROGRAM ABSTRACTS

NEW DRUGS/DEVICES

Moderators: William Yao, MD,
Adam DeConde, MD

10:30 am – 10:37 am
VISUALIZE: A 24-week, open-label study using nasoendoscopic video to evaluate the efficacy and safety of EDS-FLU 186 µg twice daily in adults with bilateral nasal polyps
William Yao, MD
Vijay Ramakrishnan, MD
Amber Luong, MD, PhD, FARS
Martin Citardi, MD, FARS
Houston, TX
USA

Rationale:
In prior phase 3 randomized placebo-controlled trials, fluticasone propionate exhalation delivery system (EDS-FLU) over 24 weeks showed significant reduction in total polyp score compared with EDS-placebo. The goal of this study was to document nasal endoscopic changes along with polyp size and patient-reported symptoms associated with EDS-FLU over 24 weeks.

Method:
This open-label, multicenter study enrolled adults with bilateral nasal polyp grade of ≥3 out of 6 and 22-Item Sino-Nasal Outcome Test (SNOT-22) scores ≥20, and all had previous sinus surgery. All patients received EDS-FLU 186 µg BID for 24 weeks. Nasal endoscopies were performed and disease specific quality of life and sense of smell were assessed with SNOT-22 and "Sniffin' Sticks", respectively, at baseline, 3 months, and 6 months. An independent reviewer evaluated all videos.

Result:
A total of 11 patients were enrolled. At baseline, mean polyp grade was 3.1/6. SNOT-22 scores were 48.8, and Sniffin' Sticks measurements were 11.8/48. Consistent with past trials, a clinically meaningful reduction in SNOT-22 scores of 21 was noted at 24 weeks (P=0.003; 95% CI, 9.36 to 32.64). Olfaction improved by 4.7 points (P=0.115; 95% CI, 0.82 to 8.59). The mean polyp grade reduced from 3.1 to 2.4 (P=0.099; 95% CI, 1.74 to 2.98) at week24. Endoscopic evaluation also noted reduced inflammation and edema with EDS-FLU.

Conclusion:
EDS-FLU 186 µg BID given over 24 weeks resulted in clinically meaningful reduction in SNOT-22 scores. In addition, this study objectively documented improvement in olfaction and polyp grade. Endoscopic documentation showed generalized improved inflammation and edema but highlighted the need for a validated nasal endoscopic score.

10:37 am – 10:44 am
Mometasone absorption in human nasal airway epithelial cultures
Tuong Nguyen, BS
Paul Soma
Brian Thorp, MD, FARS
Adam Zanation, MD
Baller
Charles Ebert, MD, MPH, FARS
Brent Senior, MD, FARS
Brandie Ehrmann
Scott Randell
Adam Kimple, MD, PhD
Chapel Hill,
USA

Topical mometasone is frequently used as an intranasal spray, on drug eluting stents, as well as compounded by specialty pharmacies as a sinus rinse. A typical sinus rinse contains 1.2 mg of mometasone dissolved in a 240 ml bottle of isotonic saline and is flushed through the sinonasal cavity. While there is good clinical data to support mometasone irrigation, the contact time of the rinse solutions is only on the order of five to ten seconds. We previously demonstrated, using a murine tracheal epithelial model, maximal mometasone absorption occurs on the order of hours. Utilizing high-performance liquid chromatography mass spectrophotometry, we characterized the absorption of mometasone on Air-Liquid-Interface human nasal cultures, obtained from healthy donors. We applied mometasone to the apical surface for various time points, then rinsed off non-absorbed mometasone with phosphate buffered saline. Millicell membranes and the adherent epithelial cells were then harvested and stored in guanidine hydrochloride for quantification using mass spectrophotometry. 50 percent of the maximal absorption occurred 33 minutes after application and maximal absorption occurred two hours after application. Our data provides an estimate for rates of absorption of mometasone applied to the sinonasal cavity and suggests the absorption rates poorly match the contact time during saline lavage.

10:44 am – 10:51 am
Regional mass deposition of fluticasone propionate (FP) delivered with exhalation delivery system (EDS) device in postsurgical chronic rhinosinusitis (CRS) Draf III geometry estimated and visualized by Computational Fluid Dynamics (CFD)
John Craig, MD
John Messina, PharmD
Marit Kleven, PhD
Per Djupesland, MD, PhD
Detroit, MI
USA

Introduction:
A key goal for endoscopic sinus surgery (ESS) is to improve topical drug delivery to inflamed sinonasal

surfaces. CFD and cast studies suggest that high-volume, low-flow delivery can reach all sinuses, but delivery is cumbersome and highly variable with head position and extent of surgery. This study applies advanced CFD to quantify regional dose/surface unit (cm2) of EDS delivery.

Methods:
A CT–based 3D model from a CRS patient after ESS including Draf III was prepared using SpaceClaim. We assessed EDS delivery of 93µg FP in 102µL to the left nostril. Surface and volume mesh were generated with ANSYS Fluent Meshing (≈2.5 million cells). Applying the Discrete Phase Model (Fluent v.19.2 [ANSYS Inc]), multiple droplet sizes defined by laser diffraction of the spray plume were injected synchronously with the dynamic, in vivo–measured EDS-flow profile. Summed regional FP dose/cm2 for 2 actuations to each side were estimated.

Results:
EDS-delivery deposits droplets in all segments, including to the contralateral side via the large Draf III septum opening. Assuming symmetrical deposition and 2 actuations to each side (93µg×4), the FP dose/cm2 on the nasal mucosa (right/left: 95/75cm2), common ethmoid space (32cm2), and frontal recess (12cm2) were ≈1-5µg/cm2. Summed FP dose/cm2 in maxillary sinuses (right/left: 60/54cm2) was ≈5.3E-3µg/cm2, and unified frontal sinus (31cm2) was ≈2.30E-5µg/cm2. <0.4% escaped from the exit nostril.

Conclusions:
Confirming observations in casts, EDS efficiently delivers concentrated FP to nasal mucosa, ethmoid space, and frontal recess. Maxillary and frontal sinus FP doses/cm2 are low but similar to inhaled FP levels reported (in vivo & CFD) in tracheobronchial and alveoli airways.

10:51 am – 10:58 am
A phase Ia tolerance and safety evaluation of topical nitric oxide sinus irrigation (NOSi) dose escalation in individuals with recalcitrant chronic rhinosinusitis (RCRS)
India Dhillon, BScH
Sara Derikvand
Rami Al-Salman, MD
Amin Javer, MD

Introduction:
Recalcitrant chronic rhinosinusitis (RCRS) is a persistent inflammatory condition despite surgery and aggressive medical therapies. Nitric Oxide (NO) is an endogenously produced molecule that exhibits antimicrobial & anti-inflammatory properties. This study aims to determine the tolerance & safety of escalating dose treatments of NO sinus irrigation (NOSi) in RCRS adults. Method: Prospective, proof-of-concept study at St. Paul's Sinus Centre in Vancouver, B.C. 5 adult subjects with RCRS irrigated their sinuses twice daily for 12 days with NOSi with dose escalation every 2 days. Safety monitoring on days 5, 7, 9 & 11 included tolerability as reported by Visual Analogue Scale (VAS), adverse events (AE), methemoglobin (MetHb), O2 saturation (SaO2) and ambient NO2. Changes to Modified Lund-Kennedy (MLK) endoscopic score, sinonasal mucosal culture, olfaction, mucociliary function, and quality of life as measured by Sino-Nasal Outcome Test (SNOT-22) were recorded at baseline & day 13. Results: 4/5 subjects tolerated the highest dose of NOSi twice daily. No AE or changes to ambient NO2, MetHb or SaO2 outside of normal range were reported. 3/5 subjects exhibited improvements in total MLK score (baseline median=13, mean=9.25;day 13 median=10, mean=9.2). Reduced growth of bacterial & fungal organisms was reported in 3/5 subjects. SNOT-22 score improved in all subjects (baseline median=49, mean=49.4;day 13 median=26, mean=26.6). Increases in mucociliary clearance time within normal ranges were noted in 3/5 subjects. No significant changes to olfaction or mucosal tissue were reported.

Conclusion:
Preliminary results suggest NOSi is a tolerable & safe sinus irrigation and could provide an efficacious treatment for RCRS.

10:58 am – 11:05 am
Drug-coating stability and release kinetics of the ciprofloxacin-azithromycin sinus stent
Do-Yeon Cho, MD
Dong Jin Lim
Daniel Skinner, BS
John Mclemor
Nicholas Rivers
Jeffrey Elder
Mark Allen
Shaoyan Zhang, PhD
Bradford Woodworth, MD, FARS
Birmingham, AL
USA

Introduction:
Chronic rhinosinusitis (CRS) is a complex disease, characterized by persistent inflammation and bacterial infection. Ciprofloxacin and azithromycin are commonly prescribed antibiotics for CRS, but the ability to provide targeted release in the sinuses could mitigate side effects and improve drug concentrations at the site of the infection. The objective of this study is to evaluate the coating and drug release characteristics of the novel ciprofloxacin-azithromycin sinus stent (CASS).

Methods:
The CASS was created by coating ciprofloxacin (hydrophilic, inner layer) and azithromycin (hydrophobic, outer layer) onto a biodegradable poly-L-lactic acid (PLLA) stent. In vitro evaluation included: 1) assessment of drug stability by zeta potential and drug coating stability within the stent using scanning electron microscopy (SEM); and 2) determination of ciprofloxacin

PROGRAM ABSTRACTS

and azithromycin release kinetics compared to a single coating (ciprofloxacin only) using spectrophotometer and enzyme-linked immunosorbent assays.

Results:
The presence of drugs was confirmed by zeta potential. On SEM, both drugs were uniformly coated on the surface of the PLLA. In the single drug coated stent, 91.6% of ciprofloxacin (55.0+/-5.3 µg) was released within 10 days. However, in the dual coated stents, both antibiotics were released in a sustained manner and 70% of ciprofloxacin (41.7+/-10.5 µg) and 86.7% of azithromycin (2.6+/-0.3 mg) were released by 3 weeks.

Conclusions:
The CASS maintains a uniform coating and sustained delivery of ciprofloxacin and azithromycin compared to the burst release pattern observed with the ciprofloxacin sinus stent. Further studies evaluating the efficacy of CASS in a preclinical model is planned.

11:05 am - 11:11 am
Discussion

PRACTICAL ISSUES/ IMMUNOSUPPRESSION

Moderators: Ian Humphreys, DO, FARS, Jarrett Walsh, MD, Christopher Le, MD, FARS

11:11 am – 11:18 am
Lightening in a bottle: Comparison of ultraviolet light to traditional sterilization in saline irrigations Bottles
Qasim Husain, MD
Catherine Banks, MD
Bradford Woodworth, MD, FARS
Benjamin Bleier, MD, FARS
Mass Eye & Ear
USA

Background:
Nasal saline irrigations (NSI) are commonplace in treatment of patients with sinonasal disorders. Contamination of both the water source and delivery bottle remain a challenge. The goal of this study was to optimize a disinfection technique using various methods of preparation, disinfection, and delivery of NSIs.

Methods:
Distilled and home tap water sources in NSI bottles were contaminated by 4 bacterial strains, B. subtilis, S. aureus, P. aeruginosa, L. pneumophila. Contaminated bottles were cleaned with tap water, tap water with detergent, or microwave and swabbed for culture. Water source disinfection was performed with reverse osmosis, distillation, activated carbon filtration, boiling, or ultraviolet light (UV) treatment. Test samples from each experimental group (n=3/group) were cultivated on the appropriate media with colony forming units (CFUs) reported.

Results:
All methods of bottle cleaning with tap water with/without detergent and microwave significantly reduced bacterial load (CFUs) by over 99% ($p < 0.05$). Distillation and boiling of the contaminated water source eliminated 100% of bacteria while reverse osmosis and activated carbon filtration did not. A single UV treatment of contaminated water within a bottle eliminated 99% of bacteria within the water and 100% in the bottle.

Conclusions:
Cleansing of NSI bottles with tap water with/without detergent or microwave produced robust bacterial disinfection. Distillation and boiling of a contaminated water source completely eliminated all bacteria. UV light treatment was capable of simultaneous disinfection of both the water source and bottle suggesting this may be a convenient, one-step method of preparing NSIs for patients.

11:18 am – 11:25 am
The effect of topical epinephrine 1:1000 with and without infiltration of 1% lidocaine with epinephrine 1:100,000 on endoscopic surgical field visualization: a double-blind randomized controlled study
Garret Choby, MD
Navarat Tangbumrungtham, MD
Nicole Borchard, Ms.
Sachi Dholakia, BS
Ximena Fonseca
Peter Hwang, MD, FARS
Mayo Clinic
USA

Introduction:
The objective of this study is to determine whether the additional infiltration of 1% lidocaine with 1:100,000 epinephrine to topical application of 1:1,000 epinephrine significantly improves surgical field grading scale score over topical 1:1,000 epinephrine alone.

Methods:
A prospective, double-blind, randomized controlled study was performed of patients undergoing bilateral ESS for chronic rhinosinusitis (CRS). Patients were enrolled and randomly assigned to receive infiltration with 1% lidocaine with 1:100,000 epinephrine on one side of the nasal cavity and saline on the other side in preparation for ESS. Topical application with 1:1,000 epinepherine was also completed. Surgical videos were recorded and Wormald surgical field grading scale was assigned by two blinded reviewers. The number of extra 1:1,000 epinephrine pledgets used during the surgery, estimated blood loss, surgical duration and post-operative bleeding were also recorded.

Results:
A total of 40 patients undergoing ESS were enrolled. There were no significant differences in Wormald surgical field grading scale, number of extra pledgets used and estimated blood loss between the nasal cavity side infiltrated with 1% lidocaine with 1:100,000 epinepherine in comparison to infiltration with saline. The side infiltrated with 1% lidocaine with 1:100,000 epinephrine had a reduced operative time compared to the side infiltrated with saline (p=0.002). There also were no differences in post-operative bleeding between groups.

Conclusion:
Addition of infiltration of 1% lidocaine with epinephrine 1:100,000 to topical application of epinephrine 1:1,000 for preparation of ESS does not significantly improve surgical visualization.

11:25 am – 11:32 am
Discussion

11:32 am – 11:39 am
Treatment with immune stimulating therapies improves survival in chronic invasive fungal sinusitis: a multi-institutional review
Ian Humphreys, DO, FARS
Peter Hwang, MD, FARS
Greg Davis, MD, FARS
Justin Turner, MD
Grace Wandell, Resident Physician
Craig Miller, Resident Physician
Aakanksha Rathor
University of Washington
USA

Objectives:
The aims of this study were to identify patient and treatment factors that impact survival in chronic invasive fungal sinusitis (CIFS), and specifically study the effect of immune stimulators on outcomes, in one of the largest cohorts to date.

Methods:
Pathology records were reviewed for biopsy-proven CIFS from three academic institutions from 1995-2016. Variables were analyzed using log rank survival analysis. Univariate Cox regression was performed at 6 and 12 months.

Results:
Thirty eight patients were included in the analysis. Hematologic malignancy was the most common underlying disease (40%). Aspergillus was the most common fungus (63%). Greater than 76% of the patients had an absolute neutrophil count (ANC) greater than 1000 at the time of diagnosis. Overall survival at 6 and 12 months were 68% and 48% respectively. In univariate analysis, factors associated with worse survival included: ANC <1000 at 6 months (HR 5, p = 0.011) and ANC <1000 at 12 months (HR 5.8, p = 0.001). The following factors were associated with improved survival in univariate analysis: recent chemotherapy (HR 0.2, p = 0.003), ANC >1000 at 6 months (HR 0.6, p = 0.004), ANC >1000 at 12 months (HR 0.7, p = 0.002), and treatment with immune-stimulating therapies (IST) at both 6 and 12 months (HR 0.1, p = 0.001 and HR 0.001, p = 0.001 respectively).

Conclusions:
We present the largest multi-institutional case-series of CIFS and long-term survival follow-up. ANC counts less than 1000 at the time of diagnosis predict poorer survival, whereas those who have recently undergone chemotherapy and receive IST have better survivorship. Further prospective studies are needed to further define factors that affect outcomes.

11:39 am – 11:46 am
Atypical fungal infections affect outcomes in acute invasive fungal sinusitis: a multi-institutional review
Ian Humphreys, DO, FARS
University of Washington
USA

Objectives:
The aims of this study were to study specific factors of atypical fungal infections in acute invasive fungal sinusitis (AIFS) that affect outcomes, in one of the largest cohorts to date.

Methods:
Pathology and microbiology records were reviewed for biopsy-proven AIFS from three academic institutions from 1995-2016. Patients included in the analysis had infection with atypical fungal organisms. Kaplan-Meier survival analysis and univariate Cox regression were performed.

Results:
Out of 114 patients with AIFS 11 patients had infection with atypical fungal organisms with Fusarium and Candida being most common (64%). Hematologic malignancy was the most common underlying disease (92%). Recent chemotherapy (<1 month) occurred in 75% of patients. All patients received IV antifungals, most received surgery (10/11) and immune stimulating therapy (IST, 8/12). 58% of patients survived at 1 month, and 16% at 12 months. No patient with atypical fungus other than Fusarium or Candida (e.g., Scedosporium) survived to 12 months. All patients had multi-sinus involvement with the maxillary affected in every patient. In univariate analysis infection with atypical fungi was associated with worse survival at 1 month (HR 3.1, p= 0.04). In multivariate analysis there was a 3-fold higher risk of death at 1 month (3.1, 95% CI, 1.1-8.6, p=0.03).

PROGRAM ABSTRACTS

Conclusions:
We present the largest multi-institutional case series of AIFS with atypical fungal organisms. Patients infected with these organisms have multi-sinus involvement, worse survival, succumb to disease quicker, and are more likely to receive IST. Future prospective studies are needed to better understand the mycologic basis of disease in this patient population.

11:46 am – 11:53 am
Outcomes in treatment of chronic and recurrent acute rhinosinusitis in the setting of medication induced immunosuppression
Zara Patel, MD, FARS
Rahul Alapati, BS
Peter Hwang, MD, FARS
Jayakar Nayak, MD, PhD
Stanford University
USA

Background:
There is no data currently available to direct nuanced treatment for recurrent acute and chronic rhinosinusitis (RARS, CRS) in patients on daily, long term medications that suppress the immune system. This study evaluates the outcomes of different treatment pathways for rhinosinusitis when treating this patient population.

Methods:
A retrospective review of patients on immune suppressing medication presenting to a tertiary care center with RARS or CRS between the years 2014-2019 was completed. Patients were categorized into three groups based on treatment: medical management alone (MM), medical management followed by surgery (SAMM), or upfront surgery (US). Lund-Kennedy scores (LKS) and SNOT-22 scores were evaluated at baseline, 1 month and 3 months from presentation.

Results:
68 patients met inclusion criteria, with no difference in demographics between groups. Patients who were treated with US and SAMM had significantly higher baseline LKS than those who were treated with MM alone (p=0.050, p=0.039). Once this difference was controlled for, there was no significant difference in overall change of LKS between the three groups over time. There was no significant disparity in baseline SNOT-22 scores between the three groups, but patients who underwent US had a significantly higher and faster improvement in SNOT-22 from baseline compared to those undergoing MM alone, specifically 13.3 points faster (p=0.026).

Conclusion
Patients experiencing CRS and RARS who are taking immune suppressing medication can significantly improve from both medical and surgical management, but upfront surgical management appears to result in greater and faster disease resolution relative to medical management alone.

11:53 am – 12:00 pm
Discussion

12:00 pm – 1:00 pm
Lunch with Exhibitors in Salon A

Saturday, September 14, 2019
Breakout Room 2
8:00 am – 12:00 pm
Chart Ballroom C
Riverside Building

PAIN SESSION

Moderators: Arthur Wu, MD, FARS, Philip Chen, MD, FARS, H. Peter Doble, MD, FARS

8:00 am – 8:07 am
Effect of an evidenced based peri-operative pain protocol on postoperative opioid use after endoscopic sinus surgery
Jaxon Jordan, MD
Scott Stringer, Professor and Chair
University of Mississippi Medical Center

Background:
There are over 40,000 opioid overdose deaths in the United States each year, and the estimated cost of opioid use and misuse was estimated at $78.5 billion dollars in 2013 (Sethi, Florence). The objective of our study was to examine the effect on opioid prescribing after implementing an evidenced based standardized pain control protocol prior to endoscopic sinonasal surgery with the hypothesis that it would decrease opioid prescriptions. Methods: We performed a retrospective review of 170 patients who underwent routine functional endoscopic sinus surgery, septoplasty, and/or inferior turbinate reduction over a two-year period. A standardized pain regimen was implemented midway through the time period and consisted of a single oral dose of Gabapentin 400mg and Acetaminophen 1000mg at least thirty minutes prior to surgery, Nasopore packing soaked in 0.5% Tetracaine intraoperatively, and an average of 17.5 Tramadol 50mg tablets postoperatively. The primary outcome measure for the study was the average number of opioid equivalents prescribed before and after the new protocol. Tramadol is not considered to be an opioid medication. Results: The average number of opioid medications, described as Hydrocodone 5mg equivalents, decreased from 24.19 equivalents pre-protocol to 1.32 equivalents after the initiation of the new peri-operative regimen. There was no significant difference in postoperative phone calls regarding pain between the two groups. Prescriptions did not vary by age, gender, Lund-MacKay score, or type of surgery.

Conclusion:
A standardized pain management protocol prior to endoscopic sinonasal surgery can effectively decrease the number of opioid pills prescribed.

8:07 am – 8:14 am
Effect of gabapentin pretreatment on peri-procedural pain during in-office posterior nasal nerve cryoablation
Steven Hoshal, MD
Toby Steele
Minji Kim
Amarbir Gill
Lane Squires
E. Bradley Strong
Jeffrey Suh, MD
University of California Davis
USA

Background:
Posterior nasal nerve cryoablation (PNN) is a novel surgical technique to address allergic and non-alleric rhinitis. Peri-procedural pain has been reported after PNN, and currently there are no protocols for optimal in-office local anesthesia. Our study seeks to evaluate the effect of gabapentin to reduce patient discomfort during in-office PNN.

Methods:
Multi-institutional prospective analysis of patients undergoing in-office PNN for chronic rhinitis between March 2018 and April 2019. Patients received local anesthesia with or without 600 mg oral Gabapentin one-hour pre-procedure. Demographics, baseline disease specific quality of life questionnaires; mini-Rhinoconjunctivitis Quality of Life Questionnaire (mini-RQLQ) and Total Nasal Symptom Score (TNSS) were recorded. Patient discomfort was measured by the pain visual analogue scale (VAS) post treatment. Fisher's exact and Wilcoxon two sample tests were used to seek differences between the two groups.

Results:
A total of 26 patients were enrolled (Gabapentin n=15, control=11). TNSS in the Gabapentin vs. control groups were [median (25th percentile – 75th percentile)] 10.5 (8.5-12.0) and 11.0 (9.0-13.0) (p = .62). Mini-RQLQ scores in Gabapentin vs. control groups were 45.0 (28.0-56.0) and 41.0 (39.0-61.0) (p = .51). The median VAS pain scores at five, twenty, and thirty minutes in the Gabapentin vs. control group were 0.0 (0.0-2.0) vs. 3.0 (1.0-4.0), 2.0 (0.0 – 3.0) vs. 8.0 (6.0-10.0), and 1.0 (0.0-1.0) vs. 5.0 (4.0-6.0) (p=.02, .0043, and .003 respectively).

Conclusion:
Pre-procedure gabapentin significantly reduces immediate and delayed post procedural patient discomfort following posterior nasal nerve cryoablation.

8:14 am – 8:21 am
A multicenter study on the effect of NSAIDs on postoperative pain after endoscopic sinus surgery
Arthur Wu, MD
Evan Walgama
Jonathan Ting
Thomas Higgins, MD, FARS
Cedars-Sinai
USA

Background:
The taboo of avoiding non-steroidal anti-inflammatory drugs (NSAIDs) for postoperative pain after endoscopic sinus surgery (ESS) has been waning. Decreasing concern for bleeding combined with the impetus to reduce opioid prescriptions given the national opioid epidemic led the authors to change their practices to include NSAIDs. This study's aim was to analyze the differences between patients who were and were not recommended NSAIDs after ESS.

Methods:
A prospective cohort study was performed on patients undergoing ESS at three different institutions by four surgeons. Initial power analysis of a small cohort of 25 patients determined that 29 patients in each group would detect a 1.5 value change in pain VAS score. Prior to introducing NSAIDs, all patients were given prescription for hydrocodone-acetaminophen 5/500mg and also recommended acetaminophen 325mg. After adding NSAIDs, ibuprofen 200 mg was also recommended. Patients were asked to keep a 7-day pain diary, medication log, and give an overall pain VAS score. Demographics, surgical variables, and comorbidities were also analyzed.

Results:
93 total patients were recruited (62 without NSAIDs, 31 with NSAIDs). Overall mean pain VAS score was 3.10 for the non-NSAID group and 3.63 for the NSAID group (p-value = 0.19). The day with the highest mean pain was the first postop day. The average number of total opioid pills taken was 7.0 vs 4.1 (without NSAIDs vs with NSAIDS, p = 0.02). There were no bleeding complications.

Conclusion:
NSAID use was introduced into the practice of four practicing rhinologists. No bleeding complications were seen. No change in postoperative pain was seen. However, overall opioid usage was reduced significantly.

PROGRAM ABSTRACTS

8:21 am – 8:28 am
Opioid prescription and usage after rhinologic surgery: A systematic review
John Zheng, MD
Charles Riley
Matthew Kim
Anthony Sclafani
Abtin Tabaee, MD
New York Presbyterian - Weill Cornell
USA

Background:
Judicious prescription of opioid medication is paramount to curtail drug diversion, misuse, and abuse, which has been implicated in the national opioid epidemic. Limited data exists defining expected pain after rhinologic surgery and appropriate quantity of opioid prescription. The purpose of this study is to examine post-operative pain levels and patients' opioid requirement.

Methods:
A systematic review was performed in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) guidelines. PubMed, Embase, Ovid MEDLINE, Cochrane Library databases were queried, and relevant articles were identified.

Results:
A total of 410 articles were identified, with 14 meeting final inclusion criteria. Significant heterogeneity existed regarding type and quantity of opioid prescribed, as well as the inclusion of a subjective pain scale. Nine of 14 studies utilized a subjective patient-reported pain score as an outcome measure and reported mild to moderate post-operative pain that diminished over first 3-6 days. Eight studies reported significant over-prescription of opioid medications and excess tablets compared to patients' actual usage. Several factors may increase opioid requirement, including concurrent septoplasty, younger age, and current smoking status.

Conclusion:
Sinonasal surgery is well tolerated with mild to moderate and rapidly diminishing post-operative pain. Patients may be prescribed more opioid than is necessary for expected post-operative pain, resulting in the potential for opioid misuse and abuse. Current evidence is limited by a predominance of Level 4 studies. Larger, high-quality studies with a standardized pain reporting scale are needed.

8:28 am – 8:35 am
Discussion

HEALTH ECONOMICS

Moderators: Joshua Levy, MD, PhD, FARS,
Adam DeConde, MD, Zachary Soler, MD, FARS

8:35 am – 8:42 am
Complications after endoscopic sinus surgery in smokers: A 2005-2016 NSQIP analysis
Jordan Teitelbaum, DO
Catie Grasse
Dennis Quan
Ralph Abi Hachem
David Jang
Duke University
Duham, NC??
USA

Background:
Exposure to cigarette smoke has been associated with a higher incidence of postoperative complications across a variety of surgical specialties. However, it is unclear if smoking increases this risk after endoscopic sinus surgery (ESS). Because complication rates after ESS are relatively low, a large national database allows for a statistically meaningful study of this topic.

Methods:
The American College of Surgeons National Surgical Quality Improvement Program (ACS-NSQIP) dataset from 2005 to 2016 was analyzed. Patients who underwent ESS were identified. Thirty-day postoperative complication rates between smokers and nonsmokers were compared. Complications included infection, thromboembolic and cardiovascular events, reintubation, and readmission.

Results:
921 patients who underwent ESS were identified. 182 (20%) were smokers and 739 (80%) were nonsmokers. 609 patients underwent outpatient ESS, while 312 patients underwent inpatient ESS. A total of 12 patients experienced postoperative surgical site infections involving the deeper tissues beyond the wound (organ/space SSI). On univariate analysis, smoking was associated with a higher incidence of organ/space SSI ($p=0.0067$) and pulmonary embolism ($p=0.0321$) after ESS. On multivariate logistic regression, smoking was associated with increased odds (4.495, 1.11 – 18.17, $p = 0.0347$) of organ/space SSI after ESS.

Conclusions:
This study demonstrates an association between exposure to cigarette smoke and potentially serious surgical site infections in the 30-day postoperative period after ESS. Our findings may help when counseling smokers who are considering ESS. Further study is required to understand the nature of these infections and ways to prevent them.

8:42 am – 8:49 am
Developing consistent epistaxis management in the emergency department: Clinical care pathway utilization reduces transfers and improves care
Clare Richardson, MD
Anish Abrol
Claudia Cabrera
Kenneth Rodriguez
Nicole Maronian
Brian D'Anza, MD

Introduction:
Epistaxis costs US hospital systems over $100 million dollars annually. Many of these patients are seen in Emergency Departments (EDs), where they may be treated inconsistently and with questionable effectiveness. Our goal was to develop and implement an epistaxis care pathway (CP) for EDs within our health system, and to analyze its effects on consistency of treatment and hospital transfers.

Methods:
An interdisciplinary team was assembled to develop a pathway for treatment of epistaxis in the ED. A search was conducted for patients transferred for epistaxis for matched eight month time periods before and after implementation of the pathway. The patients were analyzed via retrospective chart review for demographics, interventions and admission statistics.

Results:
Pre-pathway, 38 patients were transferred for epistaxis versus 15 post-pathway, showing a reduction of 61%. Before the CP, no EM physicians documented a nasal exam with proper equipment, whereas 53% did after. There was a shift towards treatments like topical vasoconstrictors (50% to 87%) and absorbable packing (2% to 40%). Use of non-absorbable packing decreased from 92% to 80%, with bilateral packing down from 32% to 13%. ENT consults for epistaxis transfers decreased by 20%, and patients who did undergo consultation required less invasive treatment.

Conclusions:
Prior to implementation of a care pathway, ED treatment of epistaxis within our system varied significantly. Post-implementation, there was not only standardization of treatment but also a significant reduction in transfers. Our study indicates that a clinical care pathway is an effective way to standardize care and prevent unnecessary hospital transfers for epistaxis.

8:49 am – 8:56 am
Cost analysis of endoscopic sinus surgery for chronic rhinosinusitis: In-office based procedures versus traditional operating room endoscopic sinus surgery
Aliasgher Khaku, MD, MBA
Joseph Han, MD, FARS
Kent Lam, MD
Eastern Virginia Medical School (EVMS)
USA

Background:
Office-based sinus procedures have become popularized in recent years for their substantial savings of time and costs. The aim of this study is to compare the costs from the provider perspective associated with traditional endoscopic sinus surgery (ESS) versus in-office based procedures (IOP) for chronic rhinosinusitis (CRS).

Methods:
We constructed a mathematical model to compare provider expenditures for ESS versus IOP in a simulated cohort of CRS patients. Cohort characteristics and expenditures were calibrated to recent trials that reported initial follow-up, initial expenditures, rates of revision surgery, and long-term crossover rates from IOP to ESS. A cost effectiveness analysis and model were constructed using decision tree modeling, Markov microsimulation, net-present-value (NPV) analysis, and tornado analysis.

Results:
Over a 10-year period the net-present value of ESS versus IOP was $600,296.29 and $345,060.55, respectively. ESS resulted in expenditures totaling $12,005.93/patient in comparison to IOP expenditures of $6,9001.21/patient. Additionally, even greater savings of $4,276.18/patient are noted if a patient requiring revision surgery can be managed with IOP rather than ESS. Downstream cost incurred in the IOP are largely due to the slightly higher probability of requiring revision surgery. The tornado analysis showed that the most sensitive variable was the rate of cross-over followed by rate of revision surgery. These results remain consistent over a rate of return from 0% to 5%.

Conclusion:
IOP may reduce expenditures and hence provide cost-effective strategies for managing select CRS patie

8:56 am – 9:03 am
A multi-centre prospective study investigating the management of periorbital cellulitis
Sridhayan Mahalingamm MRCS(ENT), MSc
Robert Hone
Gareth Lloyd
Ali Al-Lami
Eamon Shamil
James Rudd
Gentle Wong
Robert Grounds
Anum Pervez
National Health Service

Introduction:
Periorbital cellulitis is a potential sight-threatening emergency and is managed by otorhinolaryngologists, ophthalmologists and/or paediatricians. The majority of

PROGRAM ABSTRACTS

patients improve with aggressive medical management. Previous studies have suggested significant variations in practice and there is a lack of evidence regarding the optimal management of this condition.

Methods:
A prospective study was conducted at eight centres in the United Kingdom, over a 12-month period, assessing the management of patients requiring inpatient treatment of periorbital cellulitis secondary to sinusitis.

Results:
145 patients were recruited of whom 38 were excluded, primarily as these were not secondary to sinusitis. Of the remaining 107 patients, 76 (71%) were children (mean age of 4.9 years) and 31 were adults (mean age of 47.4 years). The most common antimicrobial regimes were ceftriaxone (with or without metronidazole), and coamoxiclav. 30% of children and 35.4% of adults were not administered an intranasal corticosteroid. Early review by otorlaryngology as well as early initiation of intranasal steroids (within 24 hours) was associated with a reduction in requirement for surgical intervention. Patients treated with ceftriaxone and metronidazole had a shorter duration of inpatient stay (3.9days) in comparison to ceftriaxone alone (5.5days) or co-amoxclav (4.5days). This regime was also associated with a reduction in requirement for surgical intervention in patients who had Chandler III/IV CT scans.

Conclusion:
This is the first multicentre prospective study assessing the management of periorbital cellulitis. Further studies will allow us to generate an evidence base in order to develop a consensus.

9:03am – 9:10am
Operative time and cost estimation itemized by component procedures of endoscopic sinus surgery
Andrew J. Thomas, MD
Edward McCoul, MD, FARS
Jeremy D. Meier
Christopher Newberry, MD
Timothy Smith, MD, FARS
Jeremiah Alt, MD, FARS

Introduction:
Endoscopic sinus surgery (ESS) is a variable combination of individual procedures. Cost estimates for ESS as a single entity have wide variation, likely influenced by variation in procedures performed. We sought to identify operative time, supply costs, and total procedure cost specific to the component procedure combinations comprising ESS.

Methods:
Bilateral ESS cases at 22 Intermountain Health Care facilities (2008 to 2016) were identified from a database with corresponding cost and time data. Procedure details were obtained by chart review. Least squares (LS) means of cost and time for specific procedures were obtained by multivariable regression modeling including potential confounding variables.

Results:
Among 1,481 total bilateral cases with 21 different procedure combinations, operative time ranged from 59.5 minutes [95% CI: 48.6, 73.0] for total ethmoidectomy, to 147.1 minutes [95% CI: 126.4, 171.2] for full ESS with maxillary/sphenoid tissue removal. Total cost ranged from $2,112 [95% CI: $1,672, $2,667] for sphenoidotomy, to $4,640 [95% CI: $4,115, $5,232] for full ESS with maxillary tissue removal. Supply costs ranged from $636 [95% CI: $389, $1,040] for sphenoidotomy, to $2,191 [95% CI: $1,649, $2,909] for full ESS with maxillary/sphenoid tissue removal.

Conclusions
Operative time and cost varies with the extent of bilateral ESS procedures performed. These procedure-specific time and cost estimates greatly expand the resolution of currently published values for ESS as a single entity, and may benefit efforts to improve value of ESS. Variation within individual combinations of ESS procedures also suggests additional opportunity for procedure-specific value improvement within these groups.

9:10 am – 9:21 am
Discussion

POLYPS AND REVISION SURGERY SESSION

Moderators: Marc Dubin, MD, FARS, Peter Manes, MD, FARS, Charles Tong, MD

9:21 am – 9:28 am
Patient and surgeon factors impacting revision surgery rates in chronic rhinosinusitis with nasal polyposis
Catherine Loftus, MS
Zachary Soler, MD
Vincent Desiato, DO
Sina Koochakzadeh, BS
Frederick Yoo, MD
Kristina Storck, MSPH
Rodney Schlosser, MD, FARS
Medical University of South Carolina

Background:
Understanding factors that impact revision endoscopic sinus surgery (ESS) rates in chronic rhinosinusitis with nasal polyposis (CRSwNP) is important to inform decision-making and optimize patient care. The purpose of this study was to evaluate factors that

impact the revision surgical rate of CRSwNP patients across a single institution.

Methods:
A prospective review of CRSwNP patients undergoing ESS between 2002 to 2019 was performed. Overall and CRS-subgroup revision rates were calculated and a Cox proportional hazards model was performed to identify factors predictive for revision surgery.

Results:
The cohort included 482 patients with a mean follow up of 43.9 months. Among patients with 1 year or more of follow up, 25.8% of patients received revision surgery, for a rate of 5.56/100 person years. In bivariate analysis, risk factors associated with increased risk of revision surgery were: younger age, steroid rinse non-compliance, allergic fungal rhinsinusitis (AFRS), African American race, and ongoing immunotherapy ($p<0.05$). When Cox multivariable regression was performed for those with AFRS, factors associated with revision were younger age and prior surgery.

Conclusion:
A number of factors appear to impact revision surgery rate, including demographics, phenotype, and treatment compliance. As we enter an era of personalized medicine, it is important to consider the various factors which can impact revision surgery rates.

9:28 am – 9:35 am
Histopathologic influences of tissue eosinophilia among chronic rhinosinusitis patients
Ashwin Ganti, BA, Medical student
Hannah Brown, Medical Student
Hannah Kuhar, Ms.
Paolo Gattuso
Mahboobeh Mahdavinia, MD, PhD
Pete Batra, MD, FARS
Bobby Tajudeen, MD
Rush University
USA

Background:
A subset of chronic rhinosinusitis (CRS) patients demonstrates tissue eosinophilia on structured histopathology. Prior studies have suggested that these patients are at increased risk for recurrent disease. The goals of this study are to identify histopathologic features of CRS patients with eosinophilia and compare the influence of tissue eosinophilia to the effects of age and revision surgery on histopathology.

Methods:
A structured histopathology report was utilized to analyze sinus tissue removed during functional endoscopic sinus surgery (FESS). Multivariate regression analysis was conducted to evaluate the association of age, tissue eosinophil count, and history of revision surgery with histopathology variables.

Results:
A total of 281 CRS patients were included, of which 106 had tissue eosinophilia and 175 did not. Regression analysis demonstrated that tissue eosinophilia was associated with basement membrane thickening ($p < 0.001$), fibrosis ($p = 0.001$), squamous metaplasia ($p < 0.001$), tissue neutrophilia ($p = 0.020$), sub-epithelial edema ($p < 0.001$), eosinophil aggregates ($p < 0.001$), and the presence of Charcot-Leyden crystals ($p < 0.001$). Age and history of revision surgery were not significant predictors of histopathology variables on multivariate analysis ($p > 0.05$).

Conclusion:
Tissue eosinophilia appears to be the predominant driving factor of histopathologic inflammatory changes irrespective of previous sinus surgery or age at diagnosis. These findings may have important implications on the extent of surgical management and prognosis for patients with tissue eosinophilia presenting for primary surgery.

9:35 am – 9:42 am
Predictors of efficacy for combination oral and topical corticosteroids to treat patients with chronic rhinosinusitis with nasal polyps
Ahmad Sedaghat, MD, PhD
Madison Epperson, Medical Student
Katie Phillips, MD
David Caradonna, MD
Stacey Gray, MD, FARS
University of Cincinnati College of Medicine
USA

Introduction:
A short-course oral corticosteroid taper and topical intranasal corticosteroids may maximize the success of medical management for chronic rhinosinusitis with nasal polyps (CRSwNP). In this study, we sought to identify characteristics that would be predictive of efficacy for this combination regimen.

Materials and methods:
Sixty-four patients with CRSwNP with bilateral polyps and polyp score of at least 3 and 22-item Sinonasal Outcome Test (SNOT-22) score >19 were prospectively enrolled and uniformly treated with a 15-day prednisone taper and twice daily dilute budesonide irrigations. Participants were assessed at enrollment and at follow up two to five months later. Clinical and demographic characteristics were assessed at enrollment. At both time points, CRS symptoms were assessed with the SNOT-22 and polyp score (ranging from 0–6) was assessed endoscopically.

Results:
Pre-treatment SNOT-22 score (adj. b = -0.83, 95%CI: -1.08 to -0.58, $p<0.001$) and comorbid asthma (adj. b=15.75, 95%CI: 4.74–26.75, $p=0.007$) associated with change in SNOT-22 experienced over the study period. Achieving a greater-than-1-MCID improvement in SNOT-22 score was also associated with pre-treatment

PROGRAM ABSTRACTS

SNOT-22 score (adjusted OR=1.09, 95%CI: 1.04–1.14, p<0.001) and comorbid asthma (adjusted OR=0.13, 95%CI: 0.03–0.72, p=0.019). SNOT-22 score >46 having 81.5% sensitivity and 78.4% specificity to detect patients experiencing 1-MCID improvement. Pretreatment polyp score was not associated with any outcome.

Discussion:
In treatment of CRSwNP with prednisone and budesonide irrigations, pretreatment endoscopy was not informative of treatment response although pretreatment SNOT-22 and comorbid asthma may be more predictive.

9:42 am – 9:49 am
Expected revision rates in chronic rhinosinusitis with nasal polyps: Meta-analysis of risk factors
Catherine Loftus, MS
Zachary Soler, MD
Sina Koochakzadeh, BS
Vincent Desiato, DO
Frederick Yoo, MD
Rodney Schlosser, MD, FARS
Medical University of South Carolina
USA

Background:
Wide variations in revision endoscopic sinus surgery (ESS) rates for chronic rhinosinusitis with nasal polyposis (CRSwNP) have been reported. With newer non-surgical therapies being offered for CRSwNP, it is important to understand expected revision rates and factors that impacted need for revision.

Methods:
A literature search was conducted on Pubmed, Scopus and Cochrane Review databases. Following PRISMA guidelines, a systematic review and meta-analysis was performed on studies that reported revision surgery data for CRSwNP patients.

Results:
Forty-five studies with 34, 220 subjects were meta-analyzed, with an overall revision rate of 18.6% (95% CI 14.1-23.6%). Studies with extractable follow-up data reported a mean revision rate of 16.2% over a weighted mean follow up of 89.6 months. Factors associated with increased revision rates included allergic fungal rhinosinusitis (28.7%), aspirin exacerbated respiratory disease (27.2%), asthma (22.6%), prior polypectomy (26.0%), and publication prior to 2008 (22.7%) (p<0.05 for all).

Conclusion:
While polyps can often recur after ESS, expected long term ESS revision rates should be approximately 14-24%. Identifying risk factors for revision surgery can help manage patient expectations and determine optimal treatments.

9:49 am – 10:00 am
Discussion

10:00 am – 10:30 am
Break with Exhibitors in Salon A

ENDOTYPES

Moderators: Justin Turner, MD, FARS, Thomas Higgins, MD, FARS, Jivianne Lee, MD, FARS

10:30 am – 10:37 am
Periostin: An emerging biomarker for CRS endotype and sinonasal quality of life
Ashton Lehmann, MD
George Scangas, MD
Alice Maxfield, MD
Ralph Metson, MD
Konstantina M. Stankovic, MD, PhD
Massachusetts Eye and Ear Infirmary

Background:
Chronic rhinosinusitis (CRS) has a negative impact on quality of life (QOL), yet its current management is limited by the absence of clinically relevant biomarkers. Periostin, an extracellular matrix protein, is upregulated in CRS sinonasal tissue. The purpose of this study was to compare periostin levels according to CRS phenotype, disease severity, and postoperative clinical outcomes.

Methods:
Patients with CRS (n=208) underwent serum assay for periostin at the time of sinus surgery. Prospectively followed patients completed sinonasal-specific QOL questionnaires SinoNasal Outcome Test-22 (SNOT-22) and Chronic Sinusitis Survey (CSS) before (n=97) and 3 months after (n=58) surgery. CRS patients were compared to non-CRS controls undergoing septoplasty (n=14).

Results:
Periostin levels were significantly elevated in patients with CRS with nasal polyps (CRSwNP) compared to controls (71.0±58.8 vs. 41.3±21.2 ng/mL, p<0.001). The highest mean level of periostin was found in patients with CRSwNP and comorbid asthma (77.8±66.8 ng/mL). In patients with CRSwNP, those with AERD had significantly higher levels of periostin (96.2±68.9 vs. 63.8±53.8 ng/mL, p=0.034). Periostin level in CRS patients was positively associated with Lund-Mackay CT score (ρ=0.477, p<0.001). Higher periostin level was associated with poorer baseline sinonasal QOL per CSS score (ρ=-0.247, p=0.015) and poorer postoperative clinical outcomes according to the change in SNOT-22 scores from baseline to 3 months following surgery (ρ=-0.323, p=0.013).

Conclusion:
Serum periostin level appears to be a biomarker for

CRS severity and clinical outcome with the potential to redefine prognosis and improve prognostication in this patient population.

10:37 am – 10:44 am
Central compartment atopic disease: Prevalence of asthma and allergy compared to other chronic rhinosinusitis with nasal polyp endotypes
Sonya Marcus, MD
Joseph Schertzer, MD Candidate
Lauren T. Roland, MD, FARS
Sarah Wise, MD, MSCR, FARS
Joshua Levy, MD, MPH, FARS
John DelGaudio, MD, FARS
Atlanta, GA
USA

Background:
Central compartment atopic disease (CCAD) is a recently described chronic rhinosinusitis with nasal polyp (CRSwNP) endotype that is significantly associated with inhalant allergy. The purpose of this study was to determine asthma and allergy prevalence in CCAD and other CRSwNP endotypes.

Methods:
Retrospective analysis at a tertiary care institution was performed between 2015-2019. CRSwNP was grouped into the following subtypes: allergic fungal rhinosinusitis (AFRS), aspirin-exacerbated respiratory disease (AERD), CCAD, and CRSwNP not otherwise specified (CRSwNP NOS). Prevalence of asthma and allergy was compared between groups.

Results:
A total of 369 patients were included: 142 (38.5%) CRSwNP NOS, 86 (23.3%) AFRS, 86 (23.3%) AERD, and 55 (14.9%) CCAD. Asthma prevalence was 100% in AERD, 35.2% in CRSwNP NOS, 19.8% in AFRS and 16.7% in CCAD. Allergy prevalence was 100% in AFRS, 97.6% in CCAD, 82.6% in AERD and 50% in CRSwNP NOS. Chi squared analysis showed a significant difference in asthma prevalence between CCAD and AERD ($p<0.001$), CCAD and CRSwNP NOS ($p=0.038$) and between AFRS and CRSwNP NOS ($p=0.021$), but no significant difference between CCAD and AFRS ($p=1.000$). Allergy prevalence was statistically significantly higher in CCAD, AERD and AFRS compared to CRSwNP NOS ($p<0.001$).

Conclusion:
CCAD represents a different endotype of CRSwNP. CCAD has a high prevalence of allergy and low prevalence of asthma, similar to AFRS. Prevalence of allergy in CCAD, AFRS, and AERD was higher than in CRSwNP NOS.

10:44 am – 10:51 am
Dupilumab and CRS-np: A case series and observations on its efficacy in twenty-eight patients
Arjun Prasad
Michael J. Chandler
Ashutosh Kacker
Lane Krevitt
USA

Chronic Rhinosinusitis with Nasal Polyposis (CRSwNP) often occurs co-morbidly with asthma. Despite medical and surgical approaches to CRSwNP and asthma with medicated sinus rinses, some still have oral steroid dependency with sinusitis driving the asthma. Dupilumab (Dupixent®), an Il 4 and Il 13 antagonist, was recently FDA approved for the treatment of steroid dependent asthma. Dupilumab is efficacious in nasal polyp reduction. Forty post-surgical CRSwNP patients with steroid dependent asthma were identified and treated with dupilumab. Asthma and CRSwNP responses to dupilumab were assessed clinically and visually. We report on these forty patients treated with dupilumab. 40 patients with CRSwNP and asthma were started on dupilumab therapy. At submission, 28 patients had completed 4 weeks and up to 28 weeks of therapy with reduction of methylprednisolone to adrenal doses of 6 mg daily or less at 4 weeks. 16 were males and 12 females. 6 were ASA sensitive. All were post-surgery and used potent topical medicated sinus rinses and oral steroids in doses of 4-16 mg of methylprednisolone daily. Endoscopic images and spirometry were done at initiation, at 2 weeks, and q 4 weeks. The primary endpoint of treatment was steroid reduction. The decision to lower steroids was made by one author and image evaluation was done blindly by another. All 28 patients with 4 weeks therapy reported subjective benefits with improved endoscopic findings and reduced oral steroid doses to 6 mg of methylprednisolone or less. In steroid dependent asthmatics/CRSwNP, dupilumab is efficacious in improving asthma and sinusitis symptoms, findings, and oral steroids use by 4 weeks. Prospective clinical trials should validate these initial observations.

10:51 am – 10:58 am
Association of cough with asthma in chronic rhinosinusitis patients
Michael Marino, MD
Mayo Clinic
USA

Background:
Asthma is a known comorbidity in patients with chronic rhinosinusitis (CRS). Cough is a frequent symptomatic complaint in both CRS and asthma, and is captured on the 22-item Sinonasal Outcome test (SNOT-22). This study investigated the association of cough with asthma in CRS patients, and potential predictive value.

Methods:
Patients presenting to the rhinology clinic for initial evaluation with a subsequent diagnosis of CRS were considered for inclusion. Exclusion criteria were history of previous endoscopic sinus surgery and autoimmune conditions. The presence of cough and reported

severity was determined using the SNOT-22 questionnaire. Subgroup analysis was performed for patients with (CRSwNP) and without nasal polyps (CRSsNP).

Results:
Cough was reported by 64.0% of all patients (n=297). A diagnosis of asthma was made in 38.7% of patients. Cough was more frequently reported by patients with comorbid asthma (p=0.006), with sensitivity of 73.9% (95% confidence interval [CI]; 62.8%, 79.6%). Cough severity had poor predication for asthma diagnosis (AUC=0.60). Patients with CRSsNP and asthma more frequently had cough (p=0.002), with sensitivity of 83.3% (95% CI; 70.4%, 91.3%). In CRSwNP there was no statistical difference in the frequency of cough in patients with comorbid asthma (p=0.187).

Conclusions:
Complaint of cough was associated with comorbid diagnosis of asthma in CRS patients. In CRSsNP, complaint of cough had a strong association with asthma diagnosis, although specificity was low. The presence of cough in CRS patients should alert the physician to the possibility for comorbid asthma.

10:58 am – 11:05 am
Subcutaneous nucala injection: An adjunctive treatment for recalcitrant allergic fungal rhinosinusitis
John Karp
Rikesh Panchmatia
India Dhillon
Sumaiya Muathen
Laura Samson
Amin Javer, MD

Objective:
Recalcitrant Allergic Fungal Rhinosinusitis (AFRS), a complex subtype of Chronic Rhinosinusitis, is a non-invasive fungal sinus disease that results from chronic allergic inflammation of the sinonasal mucosa. Failure to respond to mainstay therapies and sinus surgery leave AFRS patients with limited alternatives and a decreased quality of life. Nucala is an anti-IL5 medication currently designed to treat patients with severe eosinophilic asthma. This study aimed to identify the possible efficacy of Nucala injections on Modified Lund-Kennedy (MLK) endoscopic scores in recalcitrant AFRS patients.

Methods:
Retrospective chart review of 30 recalcitrant AFRS patients who added one Nucala injection per month to their treatment between November 2016 and June 2019. Patients were evaluated endoscopically at baseline and at each subsequent follow-up every 6-8 weeks.

Results:
A Friedman test was conducted to compare the MLK score differences for up to 9 follow-up visits from Nucala initiation. No significant differences were found in the total MLK score change (p = 0.66). No significant differences were found in changes to MLK edema and polyposis scores only (p = 0.55). SNOT-22 scores for 3 follow-up visits from Nucala initiation were also compared using a Friedman test. No significant differences were found in the total SNOT-22 score changes (p = 0.42). Median Eosinophil count significantly decreased by 0.32x109/L (95%CI:0.10, 0.95; p<0.01) between baseline and subsequent median 211 days follow up.

Conclusion:
Nucala injections administered once monthly, as an adjunct treatment for recalcitrant AFRS, is associated with no significant improvement in MLK endoscopic scores.

11:05 am – 11:10 am
Discussion

11:10 am – 12:00 pm
Biologics Panel
"Biologic therapy in the nasal polyp patient, from immunology to injection - A case-based discussion
Moderator: Sarah Wise, MD, FARS
Panelists: Cecelia Damask, DO, Joseph Han, MD, FARS, Douglas Reh, MD, FARS, Lauren Roland, MD, Stella Lee, MD

12:00 pm – 1:00 pm
Lunch with Exhibitors in Salon A

Saturday, September 14, 2019
Breakout Room 3
8:00 am – 12:00 pm
Quarterdeck A/B
Riverside Building

Olfaction Session

Moderators: Justin Turner, MD. FARS, Jivianne Lee, MD, FARS

8:00 am – 8:07 am
Factors driving olfactory loss in patients with chronic rhinosinusitis: A case control study
Rodney Schlosser, MD, FARS
Jess C. Mace, MPH
Timothy Smith, MD, FARS
Jeremiah Alt, MD, PhD, FARS
Daniel Beswick
Jose Mattos
Spencer Payne, MD, FARS
Vijay Ramakrishnan, MD
Kristina Storck, MSPH
Zachary Soler, MD

Medical University of South Carolina
USA

Background:
Olfactory dysfunction (OD) in chronic rhinosinusitis (CRS) is a common problem. It is likely that factors such as sex, race, age, allergies, asthma, smoking, and other comorbidities play a role in OD in CRS patients. In order to determine which aspects of OD are due solely to CRS and which are associated with other confounding factors, control populations are needed in order to allow appropriate risk assessments.

Methods:
Prospective, multi-institutional enrollment of patients with CRS and control subjects without CRS was performed. Demographic information, comorbidities, and olfactory testing (Sniffin' Sticks) to obtain threshold (T), discrimination (D) and identification (I) scores was collected.

Results:
A total of 224 patients with CRS and 164 control subjects were enrolled. Olfaction was worse in CRS patients compared to controls (mean TDI=22.4[±9.5] vs. 28.8[±7.0], respectively, $p<0.001$). Only 27% of CRS patients were normosmic compared to 49% of controls ($p<0.001$). When stratifying by nasal polyp (NP) status, CRSwNP patients had significant impairments in TDI, T, D, and I compared to controls with mean differences of 11.2, 3.3, 3.5, and 4.4 points respectively (all $p<0.001$). In contrast, CRS patients without NP (CRSsNP) had impaired T when compared to controls with a mean difference of 2.2 points ($p<0.001$). Multivariate modeling of TDI scoring demonstrated that OD associated with polyps, asthma, diabetes, and age. CRSsNP was not independently associated with TDI scores.

Conclusion:
OD in CRS patients is a multi-factorial phenomenon. Independent drivers appear to be polyp status, asthma, diabetes and age. OD in patients with CRSsNP is similar to controls with the exception of impaired thresholds.

8:07 am – 8:14 am
The use of platelet-rich plasma in treatment of olfactory dysfunction, a pilot study
Carol Yan, MD
David Mundy, BS
Zara Patel, MD, FARS
University of California San Diego
USA

Background:
Olfactory dysfunction is a prevalent problem with a significant impact on quality of life and increased mortality. Limited effective therapies exist. Platelet-rich plasma (PRP) is an autologous biologic product with anti-inflammatory and neuroprotective effects. This novel pilot study evaluated the role of PRP on olfactory neuro-regeneration in patients with hyposmia.

Methods:
Eight patients who had olfactory loss greater than 6 months in duration, no evidence of sinonasal inflammatory disease, and no improvement with olfactory training and budesonide topical rinses, were enrolled in this preliminary study. Patients received a single intranasal injection of PRP into the mucosa of the olfactory cleft. The Sniffin' Sticks olfactory test consisting of threshold, discrimination, and identification measurements (TDI) was administered at the beginning of the study and at 1 and 3 months.

Results:
All patients reported a subjective improvement of their smell shortly after injection but then stabilized. At 3-month post-treatment, three patients with functional anosmia (TDI < 16) did not improve significantly. Five patients with hyposmia (TDI > 16 but < 30) showed an improvement with 60% achieving normosmia (TDI > 30) at 3-month follow up. On average, patients with baseline TDI > 16 improved by 5.2 points with the most significant improvement in the threshold sub-component. There were no adverse outcomes from intranasal PRP injections.

Conclusion:
PRP appears safe for use in the treatment of olfactory loss, and preliminary data suggests possible efficacy, especially for those with moderate yet persistent loss. Further studies will help determine optimal frequency and duration of use.

8:14 am – 8:21 am
Short-term chronic rhinosinusitis medical management: Differential impact on quality of life and olfaction
Andrew Thomas, MD
Jess C. Mace, MPH
Vijay Ramakrishnan, MD, FARS
Jeremiah Alt, MD, PhD, FARS
Jose Mattos, MD
Rodney Schlosser, MD, FARS
Zachary Soler, MD, FARS
Timothy Smith, MD, FARS
OHSU
USA

Background:
Patients with chronic rhinosinusitis (CRS) experience both reduced quality-of-life (QOL) and olfactory function. Literature surrounding the effects of short courses of appropriate medical therapy (AMT) for CRS is limited. Olfactory-specific QOL improves without improvement in olfactory function testing, suggesting a possible discrepancy between QOL and olfactory response to AMT.

Methods:
Adults with symptomatic CRS who had not yet exhausted therapeutic options were prospectively enrolled into an observational, multi-site study.

PROGRAM ABSTRACTS

Individualized AMT was initiated per evidence-based guidelines. Endoscopy examination (Lund-Kennedy), olfactory function (Sniffin' Sticks) testing, and QOL survey responses (22-item SinoNasal Outcome Test [SNOT-22]; Questionnaire of Olfactory Disorders-Negative Statements [QOD-NS]) were obtained at enrollment and follow-up.

Results:
Study participants were followed for a mean 7.8 weeks and reported within-subject relative improvement of 39.5% (n=39, p<0.001) in SNOT-22 total scores, including 50% (p=0.014) improvement for response item #21 "sense of smell/taste". Sniffin' Sticks olfactory scores relatively improved by 10.9% (n=33, p=0.109) which was not significant and lacked correlation with SNOT-22 (R=-0.247, p=0.165) and QOD-NS total scores (R=-0.016, p=0.930), but correlated with endoscopy score (R=-0.436, p=0.018).

Conclusions:
Patients with CRS initiating short-term AMT demonstrate significant improvements in QOL, including olfactory-specific measures, without corresponding improvement in clinically measured olfactory function. Olfactory function changes are moderately correlated to endoscopy score changes, but lack association with QOL measurements.

8:21 am – 8:28 am
Olfactory cleft mucus inflammatory proteins and olfaction in chronic rhinosinusitis
Frederick Yoo, MD
Zachary Soler, MD, FARS
Rodney Schlosser, MD, FARS
Jennifer Mulligan
Vijay Ramakrishnan, MD, FARS
Daniel Beswick
Jeremiah Alt, MD, PhD, FARS
Jose Mattos
Spencer Payne, MD, FARS
Kristina Storck, MSPH
Timothy Smith, MD, FARS
Medical University of South Carolina
USA

Introduction:
Chronic rhinosinusitis (CRS) is one of the most common causes of olfactory loss but the pathophysiology underlying olfactory dysfunction in CRS has not been fully elucidated. Prior studies found correlations between olfactory cleft (OC) inflammatory cytokines/chemokines and olfaction in CRS. This study evaluated the relationship between OC mucus inflammatory proteins and olfaction in a multi-institutional cohort.

Methods:
Adults with CRS were prospectively recruited. Demographics, comorbidities, olfactory assessment (Sniffin' Sticks), computed tomography (CT), and OC mucus for protein analysis were collected. Statistical analysis was performed to determine associations between olfactory function, OC mucus protein concentrations and CT opacification.

Results:
Sixty-two patients were enrolled, with average age of 48.2 years (SD=16.2), 56.5% female, and 59.7% classified as CRS with nasal polyps (CRSwNP). Ten of 26 OC mucus proteins were significantly correlated with composite TDI scores and OC opacification. Subgroup analysis by polyp status revealed that within the CRSwNP group, CCL2, IL5, IL6, IL13, IL10, IL9, TNF-a, CCL5, and CCL11 were significantly correlated with olfaction. For CRS without polyps (CRSsNP), only CXCL5 correlated. In CRSwNP, IL6, IL10, VEGF, and IgE correlated with OC opacification, while in CRSsNP, only CXCL5 correlated. OC mucus proteins and Lund-Mackay score correlated only in the CRSsNP group (CXCL5, IL5, IL13, IgE).

Conclusions:
Several OC mucus proteins have been found to correlate with olfactory function and OC opacification. The profile of OC mucus proteins differs between CRSsNP and CRSwNP subgroups, suggesting different mechanisms between groups but further study is required.

8:28 am – 8:38 am
Discussion

Economics and Outcomes Skull Base

Moderators: Edward McCoul, MD, FARS, John Schneider, MD, Eric Wang, MD, FARS

8:38 am – 8:45 am
Association of sellar mass proliferative markers with radiographic features and clinical outcomes
Robert Liebman, MD
Kent Lam, MD
Andrew Heffernan
Joseph Han, MD, FARS
Eastern Virginia Medical School

Objectives:
The clinical importance of tumor markers for pituitary tumors is unclear. Our study evaluates the association of tumor markers Ki-67 (MIB1) and p53 with tumor features on diagnostic imaging and with intra-operative and post-operative outcomes.

Methods:
Patients, who underwent endoscopic pituitary resection at a single institution from July 2007 to June 2016, were included for retrospective chart review. Data analyzed included: pituitary tumor histology, radiographic features (i.e., morphology, 3-D volume, cavernous sinus or optic nerve encroachment), intra-operative findings, and post-operative outcomes (i.e., tumor recurrence, CSF leak, visual disturbance).

Proliferative marker levels were measured and stratified into discrete groups (0-<1%, 1-2%, 2-5%, and >5%). These values were correlated with other tumor characteristics to determine their clinical utility.

Results:
A total of 159 consecutive patients with pituitary tumors were included. Ki-67 and p53 were evaluated in 78 (49%) and 73 (46%) subject tumors, respectively. Adenomas accounted for 142 (89%) of the tumors, 55 (39%) of which were secretory pituitary tumors. Fifty-seven (36%) tumors had bilobed morphology. Forty-one (53%), 10 (13%), 18 (23%), and 8 (10%) of tumors had Ki-67 of 0-<1%, 1-2%, 2-5%, and >5%, respectively. A statistically significant difference was achieved with tumor volume when compared among categorical groups for Ki-67 (MIB1) levels (p=0.036).

Conclusions:
Higher Ki-67 proliferative marker was associated with increased tumor volume. P53 marker did not correlate with increased tumor volume. We failed to show association between proliferative markers and radiographic tumor morphology or post-operative outcomes.

8:45am – 8:52 am
Predicting readmission after endoscopic transsphenoidal pituitary surgery using machine learning
Christopher Puchi, BS, Medical Student
Shanik Fernando, Resident
Jordan Malenke, Resident
Justin Turner
Paul Russell
Rakesh Chandra , MD, FARS
Kyle Weaver
Lola Chambless
Naweed Chowdhury
Vanderbilt University School of Medicine
USA

Background:
Readmission after endoscopic transsphenoidal surgery (TSS) for pituitary tumor resection occurs in up to 8.5% of cases, indicating a need for better perioperative risk stratification models. We evaluated several independent modeling approaches to assess their predictive performance and determine important risk factors for readmission.

Methods:
938 patients were identified from a single-center TSS registry. Cases were randomly split into training and testing sets. The training set was used to build three separate predictive models for readmission using traditional logistic regression (LR) and two machine-learning algorithms: gradient boosting (XGBoost) and random forest (RF). The area under the receiver operating characteristic curve (AUC) was computed to determine model performance on the test set. Bootstrap sampling was used to compare model AUCs.

Results:
Both machine learning models showed statistically significant improvements for prediction of readmission, with AUCs of 0.783 (XGBoost, p=0.029) and 0.777 (RF, p=0.009) compared to 0.552 for LR. No difference was noted between the two machine learning models (p=0.945). Body mass index, age, tumor size, and days of ICU care were identified by both models as important perioperative risk factors.

Conclusion:
This study demonstrates the potential utility of machine learning methods for improving the ability to identify individuals at higher risk of readmission after TSS when compared to traditional methods. Future work includes validating this approach with multi-center data, implementing a user-friendly interface for clinical practice, and determining appropriate prospective interventions for high-risk individuals to reduce readmissions.

8:52 am – 8:59 am
Predicting prolonged length of stay after endoscopic transsphenoidal surgery for pituitary adenoma
Swar Vimawala, BS
Chandala Chitguppi, MD
Judd Fastenberg, MD
Tomas Garzon-Muvdi, MD
Marc Rosen, MD, FARS
Gurston Nyquist, MD, FARS
Mindy Rabinowitz, MD
James Evans, MD
Erin Reilly, MD
Philadelphia, PA
USA

Background:
Endoscopic transsphenoidal surgery (ETS) for pituitary adenoma has become more commonly used in the past decade. While most patients have a short postoperative hospitalization, some patients still require a prolonged stay. We aim to identify predictors for a prolonged hospitalization in the setting of ETS for pituitary adenomas.

Methods:
Retrospective chart review of 658 patients undergoing ETS for a pituitary adenoma at a single tertiary care academic center from 2005 to 2019. Length of stay was defined as from date of surgery to date of discharge. Patients with a length of stay in the top 10th percentile (>4 days, N=72) were compared to the remainder (N=586).

Results:
The average age was 54 years and 52.5% were male. The mean length of stay was 2.1 days vs 7.5 days. On univariate analysis, atrial fibrillation (p=.002),

hypertension (p=.033), partial resection (p<.001), apoplexy (p=.020), intraoperative cerebrospinal fluid (CSF) leak (p=.001), nasoseptal flap (p=.049), postoperative diabetes insipidus (DI) (p=.010), and readmission within 30 days (p=.025) were significantly associated with a hospital stay beyond 4 days. Continuous positive airway pressure (CPAP) (OR 12.754; 95% CI 2.332, 68.752; P=.003) and presence of intraoperative CSF leak (OR 7.602; 95% CI 1.843, 31.350; P=.005) remained significant on multivariate analysis.

Conclusion:
For patients undergoing endoscopic transsphenoidal surgery for pituitary adenomas, an intraoperative leak or preoperative use of CPAP predicted a length of stay greater than 4 days. Common reasons for a prolonged length of stay were postoperative CSF leak (17/72), management of DI or hypopituitarism (15/72), or reoperation due to surgical or medical complication.

8:59 am – 9:06 am
Economic implications of diagnostic strategies for cerebrospinal fluid rhinorrhea
Christopher Pool, MD
Vijay Patel, MD
Amber Schilling
Christopher Hollenbeak
Neerav Goyal

A decision tree analysis of diagnostic algorithms for cerebrospinal fluid (CSF) rhinorrhea localization was performed in order to elucidate direct cost implications of various radiographic techniques. The primary outcome measurement was cost, determined based on reimbursement data published by Centers for Medicare and Medicaid Services. The model was parametrized after a systematic review of studies published from 1990-2017 was completed to estimate the sensitivity, specificity, and accuracy of four commonly utilized localization modalities for CSF rhinorrhea (High-resolution CT [HRCT], Magnetic Resonance Cisternography, Radionuclide Cisternography, and CT Cisternography [CTC]). In addition to base case analysis, one-way sensitivity analyses were also performed to evaluate robustness of results to model parameters. All analyses were performed using TreeAge Pro software.

Among patients with high suspicion for CSF rhinorrhea, use of HRCT followed by exploration in the operating room if preliminary HRCT was negative was found to be the optimal localization modality from a cost perspective ($1,458 per patient). The next least costly algorithm was CTC followed by direct visualization in the operating room ($1,897 per patient). Sensitivity analyses generally supported HRCT to be the optimal strategy over a wide range of parameter values.

This model suggests primary use of HRCT is the lowest cost approach to localize CSF rhinorrhea. These results differ from previously published algorithms with respect to CTC. Considering risks and morbidity associated with intrathecal contrast administration and low relative cost of HRCT, this work advocates HRCT as first line to localize CSF rhinorrhea.

9:06 am – 9:16 am
Discussion

Microbiome

Moderators: Dana Crosby, MD, Charles Ebert, MD, FARS, Jordan Glicksman, MD

9:16 am – 9:23 am
Kappa-carrageenan sinus rinses reduce inflammation and intracellular Staphylococcus aureus infection in airway epithelial cells
Catherine Bennett, Ms.
Alkis Psaltis
University of Adelaide
Australia

Background:
Chronic rhinosinusitis (CRS) is often refractory to conventional antimicrobial treatment. We investigate the antimicrobial and anti-inflammatory effect of adding kappa-carrageenan to a commercially-available sinus rinse, Flo. Method: Kappa-carrageenan was added to Flo CRS and Flo Sinus Care sinus rinses and applied to air liquid interface (ALI) cultured primary human nasal epithelial cells (HNECs) from 10 CRS patients. Inflammatory markers were measured using enzyme-linked immunosorbent assay (ELISA). Kappa-carrageenan-supplemented rinses were applied to human bronchial epithelial cells (HBEs) in the presence of different Staphylococcus aureus strains to observe its effect on intracellular infection rates.

Results:
Flo Sinus Care with kappa-carrageenan rinse solutions resulted in a marked reduction of interleukin-6 (IL-6) production by HNECs from CRS patients (P<0.05), superior to that seen with budesonide. Both Flo CRS and Flo Sinus Care rinses significantly reduced the S. aureus intracellular infection of human bronchial epithelial (HBE) cells (P=<0.0001), with a further reduction with the addition of kappa-carrageenan to both Flo sinus rinses. Conclusions: Commercially available Flo CRS and Flo Sinus Care rinses significantly reduced S. aureus intracellular infection rates of HBE cells. The addition of kappa-carrageenan to Flo Sinus Care also reduces IL-6 production by HNECs in vitro, suggesting an additional anti-inflammatory action. These findings hold promise for kappa-carrageenan Flo Sinus care as an alternative agent for the management of CRS.

9:23 am – 9:30 am
Association of the sinonasal microbiome with clinical outcomes in chronic rhinosinusitis: A systematic review
James Wang, MD, PhD, Resident Physician
Charles Moore, Resident Physician
Madison Epperson, Medical Student
Ahmad Sedaghat, MD, PhD
University of Cincinnati

Background:
Association between sinonasal microbiome and clinical outcomes of patients with chronic rhinosinusitis (CRS) is unclear. We performed a systematic review of prior studies evaluating the CRS microbiome in relation to clinical outcomes.

Methods:
Computerized searches of PubMed/Medline were updated through January 2019. A systematic review of the literature was performed, including data extraction focusing on sample region, sequencing platforms, predominant organisms, and outcomes measures.

Results:
Nine criterion-meeting studies included 300 participants, with varied results. Eight studies utilized 16s-rRNA and one used 18s-rRNA sequencing to assess the sinonasal microbiome. Seven studies utilized Sinonasal Outcome Test scores, 1 applied another CRS symptom metric, and 1 used need for additional procedures/antibiotics as the primary clinical outcome. Three studies suggest that baseline abundance of phyla Actinobacteria (specifically genus Corynebacterium) was predictive of better surgical outcome. One study found C. tuberculostearicum was positively correlated with symptom severity. Another study revealed genus Escherichia was over-represented in CRS and had positive correlation with increased symptom scores. In addition, one study identified A. johnsonii to be associated with improvement in symptom scores while supporting P. aeruginosa as having a negative impact on quality of life. Malassezia was the most prevalent genus and detected in all patients in the 18s-rRNA study.

Conclusions:
Microbiome data are varied in their association with clinical outcomes of CRS patients. Further research is required to identify if predominance of certain microbes within the microbiome is predictive of CRS patients' outcomes.

9:30 am – 9:37 am
Long term outcomes of maximal medical management of chronic rhinosinusitis: Paving the way for more accurate cost effectiveness comparisons
George Scangas, MD
Ralph Metson, MD, FARS
Nicolas Busaba, MD, FARS
Benjamin Bleier, MD, FARS
Eric Holbrook, MD, FARS
Stacey Gray, MD, FARS
Boston, MA
USA

Objective:
Health utility value (HUV) is a measure of health-related quality of life (QOL) utilized for the valuation and comparison of treatments. The Euroqol 5-Dimension (EQ-5D) questionnaire remains the highest quality validated method for determining HUV, but has not been applied for this purpose in medically treated patients with chronic rhinosinusitis (CRS). The objective of this study was to evaluate the impact of maximal medical treatment of CRS on both disease-specific and general health-related long-term QOL.

Methods:
The study population consisted of 115 medically treated patients with CRS from 4 different otolaryngologic practices who completed two disease-specific instruments (the Chronic Sinusitis Survey (CSS) and the Sinonasal Outcomes Test-22 (SNOT-22)) and one general health-related QOL instrument (EQ-5D). Baseline scores were compared to those collected 3 and 12 months after initiation of treatment.

Results:
Mean baseline HUV (standard deviation) was 0.84 (0.11). HUV did not significantly change at 3 months ($p=0.80$) but improved significantly at 12 months ($p=0.003$), with an average change of 0.07 (.13) meeting the minimal clinically important difference (MCID) of 0.03 for the EQ-5D instrument. CSS and SNOT-22 scores demonstrated similar post-treatment outcomes. Of all recorded medical treatments, only budesonide irrigations were significantly associated ($p=0.03$) with improvement in overall SNOT-22 scores at either 3 or 12 months.

Conclusion:
Maximal medical management provides improvement in HUV in patients with CRS at one year. These values, when paired with cost data, can serve as a comparison for any other treatment option for CRS in the performance of cost-utility analyses.

9:37 am – 9:44 am
Collapse of bacterial diversity of the sinus microbiome differentiates poor from good-evolution after ESS for CRS
Axel E. Renteria, MD, MSc
Anastasios Maniakas, MD, MSc
Emmanuel Gonzalez, PhD
Marc-Henri Asmar, MD
Leandra Mfuna-Endam, MSc
Martin Desrosiers, MD
University of Montreal
Canada

PROGRAM ABSTRACTS

Introduction:
Microbiome dysbiosis is a well-documented feature of CRS, however, how it develops remains unexplained. In this study, we compare the evolution of the microbiome of CRS patients after endoscopic sinus surgery (ESS) to understand microbiome changes associated with disease recurrence after surgery using in-depth 16S bacterial RNA analysis.

Method:
Prospective, placebo controlled, trial (Maniakas, 2018). Adult patients with CRS at increased risk of failing surgical treatment were recruited at time of ESS and followed prospectively after surgery. All patients continued budesonide post-operatively. Endoscopically-obtained sinus swabs were collected for 16S bacterial sequencing at the time of surgery and 4 months post-op. 16S bacterial analysis using the ANCHOR technique compared groups of responder/non-responder to surgery to assess bacterial genus abundance, alpha diversity and beta diversity differences.

Results:
116 patients were recruited (58 responders, 58 non-responders) and followed. Compared to the responders, non-responders to ESS demonstrated a significant decrease in alpha diversity ($P < 0.0001$) as well as a significant difference between the two groups ($P<0.001$), also known as beta diversity. Among the genera with significant different abundances, Staphyloccocus was one of them, with S. aureus found to be higher in non-responders, yet, this did not attain significance ($P = 0.0745$)

Conclusion/Implications:
Sub-optimal evolution after ESS depicted by non-responders is characterized by a collapse of bacterial diversity and increased presence of pathobionts such as S. aureus. This identifies high diversity as a therapeutic goal and S. aureus as a specific target. However, further studies are required.

9:44 am – 10:00 am
Discussion

10:00 am – 10:30 am
Break with Exhibitors in Salon A

QOL I

Moderators: Stella Lee, MD, Stacey Gray, MD, FARS, Anthony DelSignore, MD

10:30 am – 10:37 am
Sexual health in patients with chronic rhinosinusitis and the effect of endoscopic sinus surgery
Arthur Wu, MD, FARS
Evan Walgama, MD
Martin Hopp, MD, PhD
Narine Vardanyan, Administrator
Los Angeles, CA
USA

Background:
Chronic rhinosinusitis (CRS) has been associated with decreased overall quality of life and patient-reported outcomes can be affected by co-morbid conditions. We sought to determine the prevalence of sexual dysfunction symptoms in patients with chronic rhinosinusitis and whether endoscopic sinus surgery (ESS) has any effect on sexual function using validated instruments of sexual dysfunction for men and women.

Methods:
We compare the Female Sexual Function Index (FSFI) and the Sexual Health Inventory in Men (SHIM) with disease specific quality of life scores for CRS based on the 22-item Sino-Nasal Outcome Test (SNOT-22). Pearson and Spearman correlation coefficients were calculated. Preoperative FSFI and SHIM scores were compared to 3 month postoperative scores.

Results:
A total of 102 patients were enrolled in the study. The mean SHIM score for men was 17.3 ±6.7. A total of 18 (41.9%) of men had SHIM score of less than 17, signifying at least mild-moderate sexual dysfunction. The mean FSFI score for women was 36.0 ±25.7. A total of 23 (74.2%) of women had FSFI score > 26, signifying clinically significant sexual dysfunction. The mean SNOT-22 score was 38.2 ± 20.3 for men and 34.5 ± 18.1 for women. There was a significant relationship between total FSFI and the extra-nasal rhinologic domain SNOT-22 score in women ($r= 0.360$, $p=0.047$). Postoperative scores were compared for 20 patients.

Conclusion:
We demonstrate high prevalence of sexual dysfunction in both males and females undergoing ESS. Sexual dysfunction may be an important factor for some patients seeking endoscopic sinus surgery.

10:37 am – 10:44 am
Acute exacerbations in recurrent acute rhinosinusitis: Differences in quality-of-life and endoscopic exam
Daniel Beswick, MD
Noel Ayoub, MD
Jess C. Mace, MPH
Alia Mowery, BS
Peter Hwang, MD, FARS
Timothy Smith, MD, FARS
Aurora, CO
USA

Introduction:
Research surrounding differences in outcomes for patients with recurrent acute rhinosinusitis (RARS) is scarce. This investigation aimed to explore quality-of-life (QOL) and sinonasal attributes in patients with and without acute episodes (AEs) of RARS.

Methods:
Data from patients with RARS was collected from two academic institutions between 2009-2017 using prospective and retrospective methodology. During clinical presentation, subjects were classified as with or without an AE using guideline definitions of acute bacterial rhinosinusitis (ABRS). Between-group differences in the 22-item SinoNasal Outcome Test (SNOT-22) survey and Lund-Kennedy (LK) endoscopy examination scores were assessed

Results:
423 clinical visits from 202 patients were included. Visits during an AE (168/423, 40%) were associated with significantly worse SNOT-22 total scores compared to between AEs (255/423, 60%; median=53.0 [IQR=24.0] vs. 34.0 [IQR=29.5]) and all SNOT-22 subdomain scores (all p<0.001). Endoscopy scores were available for 167 visits with 56 (34%) completed during an AE. Compared to visits without an AE, endoscopy findings associated with an AE were less frequently normal (LK score=0; 45% vs. 62%; p=0.031) with worse median LK scores (2.0 [IQR=4.0] vs. 0.0 [IQR=2.0], p=0.005).

Conclusion:
RARS AEs are associated with significantly worse QOL and mildly worse endoscopic findings. While median LK total scores were modestly elevated during AEs, almost half of visits during AEs had endoscopy without evidence of inflammation, identifying a disparity between patient reported symptoms and objective findings of disease. Confirming evidence of ABRS is crucial prior to administering appropriate treatment.

10:44 am – 10:51 am
The relationship between sinonasal and disease specific quality of life in cystic fibrosis
Chetan Safi
Emily DiMango
Claire Keating
Zian Zhou
David A. Gudis, MD, FARS

Objective:
In cystic fibrosis (CF) patients, the relationship between chronic rhinosinusitis (CRS) symptoms and pulmonary disease is poorly understood. The purpose of this study is to compare sinonasal outcome test (SNOT-22) scores and cystic fibrosis questionnaire-revised (CFQ-R) scores between CF patients with a pulmonary exacerbation and clinically stable CF patients to determine the association between sinonasal and disease-specific quality of life (QOL) in CF.

Methods:
Patients over 18 years of age seen in a CF Foundation-accredited CF care center were recruited to complete the SNOT-22 and CFQ-R surveys. Patients diagnosed with a CF pulmonary exacerbation represented the exacerbation cohort. Patients presenting for routine care represented the baseline cohort. Mean SNOT-22 scores were correlated to the average CFQ-R score for both cohorts.

Results:
103 patients were enrolled over 3 months with 30 in the exacerbation group and 73 in the baseline group. Patients' mean age was 32 years, with 56% females and 44 % males. Percent predicted forced expiratory volume in one second (FEV1) was higher for baseline patients (67.8%) compared to exacerbation patients (53.6%) (p=0.002). There was a moderate negative correlation between average SNOT-22 and average CFQ-R scores in CF patients at their baseline health and during pulmonary exacerbations (r= -0.6495 and r = -0.5791, respectively).

Conclusion:
In CF patients both at clinical baseline and during exacerbations, higher SNOT-22 scores and worse sinonasal QOL are correlated with lower CFQ-R scores and worse CF specific QOL. These findings help characterize the relationship between sinonasal and pulmonary disease in CF patients.

10:51 am – 10:58 am
Differential perception and tolerance of chronic rhinosinusitis symptoms as a confounder of gender-disparate disease burden
Katie Phillips, MD, Resident
Regan Bergmark, MD
Lloyd Hoehle
Edina Shu
David Caradonna, MD, DMD
Stacey Gray, MD, FARS
Ahmad Sedaghat
Harvard Medical School

Introduction:
Previous studies have shown that females with chronic rhinosinusitis (CRS) have a greater CRS symptom burden than males. We asked whether differential disease perception could explain this phenomenon.

Materials and methods:
A total of 500 participants (239 males, 261 females) with CRS were recruited. CRS symptom burden was assessed with the 22-item Sinonasal Outcome Test (SNOT-22). General health-related quality of life was assessed with the visual analog scale of the 5-dimensional EuroQol questionnaire (EQ-5D VAS). Participants were asked to rate their CRS symptom control as "Not at all", "A little", "Somewhat", "Very" and "Completely". "Not at all", "A little" and "Somewhat" controlled symptoms were characterized as poorly controlled.

PROGRAM ABSTRACTS

Results:
SNOT-22 score was significantly more severe (p<0.001) among females (mean:44.0, SD:22.5) than males (mean:36.3, SD:20.2) . However, there was no significant difference in CRS symptom control across gender (p=0.154). Additionally, there was no significant difference (p=0.109) in EQ-5D VAS between males (mean:70.9, SD:19.0) and females (mean:68.4, SD:19.5). While a SNOT-22 score of ≥25 was predictive of poorly controlled symptoms in males (sensitivity:82.6%, specificity:62.5%), a SNOT-22 score of ≥30 was predictive of poorly controlled symptoms in women (sensitivity:82.4%, specificity:64.5%).

Conclusions:
Females with CRS reported more severe SNOT-22 scores despite reporting a similar level of symptom control and general health-related quality of life as men. Women had a higher SNOT-22 threshold for poorly controlled symptoms. Female CRS patients may have greater perception and tolerance of CRS symptoms without a negative corresponding effect.

10:58 am – 11:05 am
Does age impact long term outcomes in chronic rhinosinusitis?
Thomas Holmes, MD
Aykut Unsal, MD
Chadi Makary, MD
Stilianos Kountakis, MD, FARS
Augusta, GA
USA

Objective:
The presence of eosinophilia and nasal polyps are well-established prognostic indicators of chronic rhinosinusitis (CRS). The importance of demographic background, such as age, as independent variables has not been elucidated while taking these factors into account.

Study Design:
Prospective observational cohort study

Methods:
CRS patients who underwent primary surgical treatment were subdivided based on age (young adults = 18-39, adults = 40-64, and elderly = 65+). Groups were then subdivided based on tissue eosinophilia and nasal polyposis. Sinonasal Outcome Test (SNOT-22), Lund-Kennedy (LK) endoscopy scores, and Lund-McKay (LM) CT scores were compared pre-operatively, and postoperatively during a 5-year period.

Results:
431 total patients with CRS were identified and then subsequently broken down into 63 young adults, 209 adults, and 159 elderly. Elderly patients were more likely to present with diabetes and hypertension. There was no statistical difference between tissue eosinophilia or presence of polyps between the groups. Although all three groups had similar SNOT-22 patterns postoperatively, young adults had higher SNOT-22 score on presentations (33.2 young adults, 25.3 adults, 23.5 elderly, p=0.029). When evaluating SNOT-22 subdomains, young adults had significantly higher rhinologic scores than the adult and elderly patients. Objective disease severity using LK endoscopy scores were only higher in young adults at 1-year time (p=0.0026). There was no statistical difference between the groups in regards to preoperative LM CT scores.

Conclusions:
Young adults are more likely to present with overall higher subjective scores over adults and elderly patients despite similar objective findings.

11:05 am – 11:10 am
Discussion

QOL II

Moderators: Douglas Reh, MD, FARS, Oswaldo Henriquez, MD, Monica Patadia, MD

11:10 am – 11:17 am
Modified Lund-Kennedy score as a predictor for significant symptom improvement after endoscopic sinonasal surgery
Yossawee Wangworawut, MD
Peter Hwang, MD, FARS
Matthew Tyler
Stanford, CA
USA

Background:
Currently available studies evaluating subjective and objective parameters as predictors of surgical outcomes have shown mixed results. In this study, we evaluated the efficacy of the Modified Lund-Kennedy (MLK) endoscopic score as a predictor for significant symptom improvement (SSI) after endoscopic sinus surgery.

Method:
We performed a retrospective review of 513 patients who underwent endoscopic sinus surgery for chronic rhinosinusitis from 2015 to 2018. Age, race, and gender were reviewed, in addition to relevant medical diagnoses, operation performed, duration of disease, and pre- and post-operative SNOT-22 scores. Objective measurements, including pre-operative Modified Lund-Kennedy endoscopic score, and Lund-Mackay CT score were also collected. We defined SSI after surgery as a postoperative improvement > 9 in the SNOT-22 score, the minimal clinically important difference.

Result:
The median pre-operative and post-operative SNOT 22 scores of the overall cohort were 41 and 17 respectively, with an SSI rate of 71.92%. The median MLK endoscopic score in the SSI group was 3 versus 0

in the non-SSI group. For every one point increase in the MLK above 3, there was a 3% increase in the rate of achieving SSI ($p<0.05$) and a 2.56 point increase in the magnitude of improvement of the post-operative SNOT-22 scores ($p<0.05$). For MLK scores below 3, there was 19% decrease in the rate of SSI.

Conclusion:
In this retrospective study, pre-operative modified Lund-Kennedy endoscopic scores correlates with significant symptomatic improvement after endoscopic sinus surgery, highlighting its utility as an objective tool for predicting surgical outcomes in patients with sinonasal disease.

11:17 am – 11:24 am
Development of a standardized assessment of patient reported outcomes following endoscopic sinus surgery for chronic rhinosinusitis
Connor Sommerfeld, MD
Justin Pyne
David Côté
University of Alberta
Canada

Endoscopic sinus surgery is a minimally invasive, mucosa-preserving treatment modality for management of chronic rhinosinusitis. Clinicians report improved patient quality of life (QoL) following endoscopic sinus surgery, but few outcome measures have been developed through direct patient participation. Patient reported outcomes (PROs) are health outcome measures developed based on patient experience. The objective of this study was to create a questionnaire to assess PROs following management of chronic rhinosinusitis with endoscopic sinus surgery.

This four-phase qualitative study employed grounded theory methodology and a modified Delphi technique. In Phase I, fifteen patients were interviewed, using open-ended questioning, for identification of QoL domains impacted by chronic rhinosinusitis. In Phase II, these QoL domains were presented to a focus group of four new chronic rhinosinusitis patients, who ranked them by order of importance. A conceptual framework of QoL domains impacted by chronic rhinosinusitis was created based on patient consensus. Itemization of the PRO questionnaire was done by a focus group of five Otolaryngologists in phase III. The questionnaire was completed in Phase IV by cognitive interviewing of ten new chronic rhinosinusitis patients; ensuring ease of understanding.

Patients identified 21 domains of QoL divided into three sub-scales: physical symptoms, psychosocial symptoms, and activity restriction. These domains provided the basis for creation of a 19-item questionnaire.

Clinical application of the novel questionnaire produced by this study will allow for an objective assessment of patient reported effectiveness of endoscopic sinus surgery for management of chronic rhinosinusitis.

11:24 am – 11:31 am
Increased abundance of Staphylococcus aureus characterizes microbiome in refractory CRS patients
Axel E. Renteria, MD, MSc
Anastasios Maniakas, MD, MSc
Emmanuel Gonzalez, PhD
Marc-Henria Asmar, MD
Leandra Mfuna-Endam, MSc
Martin Desrosiers, MD
University of Montreal
Canada

Introduction:
In chronic rhinosinusitis (CRS), the microbiome is believed to be an important component of pathophysiology, thus assessment of modification in microbiome structure following therapeutic intervention may help identify underlying mechanisms of action. We wished to compare microbiome changes associated with low-dose macrolide use in refractory CRS patients.

Method:
Prospective, placebo controlled, trial study. 46 adult CRS patients with recurrence of disease despite endoscopic sinus surgery (ESS) and continued budesonide rinses were recruited from a cohort followed prospectively after surgery. (Maniakas, 2018). Patients were randomized to either azithromycin 250 mg or placebo thrice weekly for 4 months. Endoscopically-obtained sinus swabs were obtained at beginning and end of treatment. 16S bacterial analysis using the ANCHOR technique was used to assess change in bacterial species abundance, alpha diversity and beta diversity associated with azithromycin and placebo treatments.

Results:
There were no statistically significant changes in alpha or beta diversity with either treatments, however, there was a trend towards a reduction in diversity with placebo. Impact on bacterial composition was more telling. There was a greater reduction in abundance of S. aureus in azithromycin-treated subjects than with placebo ($P = 0.0448$).
Conclusion/Implications:
With this study, we demonstrate that the post-operative microbiome of refractory CRS may be modulated by the addition of low dose azithromycin. Reduction in S. aureus abundance is unexpected and may either reflect improvement of barrier or a possible anti- S. aureus antibiotic effect. Further studies are required to explore and validate these concepts

11:31 am – 11:38 am
Voice dysfunction in patients with chronic rhinosinusitis before and after endoscopic sinus surgery
Arthur Wu, MD, FARS
Evan Walgama, MD
Anca Barbu

PROGRAM ABSTRACTS

Martin Hopp, MD, PhD
Narine Vardanyan, Administrator
Shawn Nasseri, MD
David Alessi
Los Angeles, CA
USA

Background:
Chronic rhinosinusitis (CRS) has long been a suspected risk factor for vocal dysfunction. However, studies quantifying the presence of voice dysfunction in CRS patients are sparse. We sought to determine pre- and postoperative voice related quality of life in patients undergoing endoscopic sinus surgery (ESS) for CRS using the validated Voice Related Quality of Life Survey (VRQL) and to correlate the VRQL scores with scores of CRS symptom severity based on the 22-item Sino-Nasal Outcome Test (SNOT-22).

Methods:
Patients undergoing ESS were preoperatively administered both the VRQL and the SNOT-22. Spearman (ρ) and Pearson (r) correlation coefficients were calculated. Postoperative follow up questionnaires were administered at 3 months.

Results:
A total of 102 patients were enrolled, and 81 patients completed the two surveys. A total of 51 (62.9%) patients had raw VRQL score > 10, signifying presence of vocal symptoms. The mean + standard deviation (SD) raw VRQL score of the entire study population was 12.4+4.6, and the mean SNOT-22 score was 37.8+19.2. The Spearman correlation coefficient between VRQL and the total SNOT-22 score was 0.34 (p=0.0019), and the Pearson correlation coefficient was 0.36 (p=0.001). Both correlations were similar, demonstrating that increasing CRS severity correlates with decreasing voice-related quality of life (QOL). Postoperative VRQL and SNOT-22 scores were compared for 20 patients.

Conclusion:
This study is the largest study evaluating vocal symptoms in a CRS population. This study demonstrates the increasing presence of vocal complaints with increasing severity of CRS and determines the effect of ESS on these complaints.

11:38 am – 11:45 am
Predictors of success in primary and revision endoscopic dacryocystorhinostomy
Ashton Lehmann, MD
George Scangas, MD
Catherine Banks, MD
Zoe Fullerton
Ralph Metson, MD, FARS
Boston, MA
USA

Background:
Although endoscopic dacryocystorhinostomy (endo-DCR) is commonly performed for the treatment of nasolacrimal duct obstruction, little is known about the determinants of surgical success. The purpose of this study was to identify patient-specific and technique-specific factors that influence surgical outcomes of primary and revision endo-DCR.

Methods:
A retrospective review was conducted of 597 patients who underwent endo-DCR (primary n=479, revision n=118) over a 30-year period (1989-2018). Patient demographics and surgical techniques were assessed.

Results:
Among the cohort of patients who underwent primary endo-DCR, 10% (n=48) required revision surgery. These patients who failed primary DCR tended to be younger (p=0.015), were less likely to have chronic rhinosinusitis (p=0.047), and were more likely to have a postoperative complication (p=0.023). After adjusting for demographics and comorbidities, asthma was significantly associated with primary DCR failure (t=-2.042, p=0.0412). Among the cohort of patients who underwent revision endo-DCR, 8.5% (n=10) required further revision surgery. These patients who failed revision DCR tended to be younger (p=0.022) and were more likely to have intraoperative laser usage (p=0.031) as well as an intraoperative complication (p=0.013). There were no significant associations between the likelihood of endo-DCR failure and smoking, middle turbinate resection, or intraoperative visualization of the internal common punctum (p>0.05).

Conclusion:
For both primary and revision endo-DCR, the identified factors associated with failure can help inform preoperative counseling, intraoperative technique, and postoperative care in the treatment of nasolacrimal duct obstruction.

11:45 am – 11:59 am
Discussion

12:00 pm – 1:00 pm
Lunch with Exhibitors in Salon A

Saturday, September 14, 2019
Breakout Room 4
8:00 am – 12:00 pm
Kabacoff – Riverside Building

Basic Science Session

Moderators: Benjamin Bleier, MD, FARS, Do-Yeon Cho, MD, Michael Kohanski, MD

8:00 am – 8:07 am
Barrier disruptive effects of mucus isolated from chronic rhinosinusitis
Stephen Kao, MBBS
The Queen Elizabeth Hospital
Australia

Background:
Mucus isolated from Chronic Rhinosinusitis (CRS) patients has been previously demonstrated to have elevated levels of inflammatory cytokines and neutrophil activity compared to healthy mucus samples. However, the direct effect of nasal mucus on the mucosal barrier and its relation to CRS disease phenotype and severity is not known.

Methods:
Mucus samples were collected from the nasal cavities of CRS patients and healthy controls and applied to air-liquid interface (ALI) cultures of primary human nasal epithelial cells. Membrane integrity and function was assessed via transepithelial electrical resistance (TER) and cilia beat frequency (CBF). Cell toxicity, and inflammatory response was investigated.

Results:
122 mucus samples obtained from 35 healthy controls, 48 CRS without nasal polyps (CRSsNP) and 39 CRS with nasal polyps (CRSwNP) were applied to ALI cultures. Healthy control mucus applied to ALI cultures demonstrated higher TER and CBF compared to CRS mucus and negative controls. Elevated interleukin 6 and 8 was observed following the application of CRS mucus compared to healthy control mucus.

Conclusion:
Healthy mucus appears to have a protective effect on mucosal barrier function compared to CRS mucus. Further research is required to identify the components of healthy control mucus and CRS mucus to account for these differences.

8:07 am – 8:14 am
Measuring potential difference in the sinuses more accurately predicts acquired CFTR dysfunction in chronic rhinosinusitis
Do-Yeon Cho, MD
Shaoyan Zhang, PhD
Daniel Skinner, BS
Dong Jin Lim
Jaime Peña Garcia, BS
Mark Allen
Catherine Banks, MD
John Mclemor
Steven Rowe
Bradford Woodworth, MD, FARS
Birmingham, AL
USA

Background;
The human nasal potential difference (NPD) assay is a widely accepted method for measuring CFTR activity in vivo. However, mucosa within the nasal cavity often lacks physical and histologic characteristics reflective of inflammatory disease process exhibited in the sinuses in patients with chronic rhinosinusitis (CRS). We recently developed the endoscopically directed sinus potential difference (EDSPD) assay to evaluate CFTR activity within the sinuses. The objective of this study is to compare CFTR activity at the site of inflammation within the sinuses to the nasal mucosa in patients with CRS.

Methods:
Subjects eligible for inclusion included age≥18 with a negative CF genetic test. A potential difference catheter was inserted under endoscopic visualization at the site of inflammation. CFTR-mediated Cl- transport was detected by protocol as follows: Ringer's solution (baseline potential difference (BPD)), Ringer's+100 μM amiloride (blockade of epithelial sodium channels), and Low Cl- Ringer's+10 μM isoproterenol (activation of Cl- transport). The protocol was repeated on nasal mucosa in the inferior meatus.

Results:
Twenty-four patients were included in the study. Response to amiloride was unaffected (ΔPD(mv): EDSPD,2.3+/-0.4 vs. NPD,1.8+/-0.1;P=0.4),however, the EDSPD revealed significantly diminished response to Cl- free ringers+isoproterenol (EDSPD,-7.5+/-1.2 vs. NPD,-3.8+/-0.9;p=0.02). Robust BPD indicated the presence of epithelial integrity and preserved tight junctions.

Conclusion:
Cl-secretion across in vivo sinus epithelium in CRS subjects is markedly diminished in the EDSPD assay compared to the NPD. The EDSPD assay may provide a more accurate reflection of acquired CFTR dysfunction in CRS.

8:14 am – 8:21 am
Unexpected Effects of Systemic Steroids on the CRSwNP Proteome: Is Protein Upregulation More Important than Inhibition?
Alan D. Workman, MD
Michelle Miyake
Angela Nocera
Sarina Mueller
Kristen Finn
Hasan Out
Towia Libermann
Benjamin Bleier, MD, FARS

Background:
Oral steroids, traditionally thought of as suppressive agents that are broad in their immunomodulatory and systemic effects, are a mainstay of treatment to reduce disease burden in CRSwNP. The purpose of this study was to determine how differentially expressed proteins in CRSwNP are affected by oral steroid therapy.

Methods:
Matched exosomal proteomic arrays were quantified using aptamer-based methods in systemic steroid-naive CRSwNP patients before and after a standardized oral prednisone course (n=12). Previously identified differentially expressed proteins in CRSwNP patients were compared to determine the effect of steroids on expression. Fisher's Exact Test and the t-test were applied to normalized protein expression profiles to determine significance.

Results:
Of 18 proteins previously identified to be highly underexpressed in CRSwNP, 16 (89%) had an average increase following systemic steroid treatment ($p<0.05$). Lactoperoxidase, initially present at nine-fold lower concentrations in CRSwNP subjects, increased by 209% following steroid treatment. A similar trend was observed with other proteins of interest, including PF4 and CCL28. The converse of this steroid effect was not true; of 53 proteins that are highly overexpressed in CRSwNP, only 22 (42%) decreased in quantity with steroid use.

Conclusions:
Proteomic analysis in CRSwNP demonstrates that systemic steroids cause almost uniform upregulation of transcriptionally decreased proteins, while the effects of steroids on transcriptionally increased proteins are more heterogeneous. Proteomic analysis thus may be an effective tool to understand specific therapeutic benefits of steroid use in polyp disease and to create more targeted treatments.

8:21 am – 8:28 am
Identification of significant poly-omic and functional upregulation of the PAPP-A/IGFBP/IGF axis in CRSwNP
Sarina Mueller, MD
Olaf Wendler, PhD
Angela L. Nocera, MS
Alan D. Workman, MD
Towia Libermann, PhD
Simon T. Dillon, PhD
Heinrich J. Iro, MD
Benjamin Bleier, MD, FARS
Boston, MA
USA

Background:
Chronic rhinosinusitis with nasal polyps (CRSwNP) is associated with epithelial expansion and polyp survival. However, the molecular mechanism of this aberrant proliferation is unclear. The purpose of this study was to interrogate derangements of the PAPP-A/IGFBP/IGF1 axis (Pappalysin-A, Insulin Growth Factor Binding Protein, Insulin-Like Growth Factor-1) as a major contributing factor to polyp growth in CRSwNP.

Methods:
Matched tissue and exosomal proteomic arrays including PAPP-A, IGFBP-4, IGFBP-5 and IGF-1 were quantified using aptamer-based methods/western blots for proteomic analysis (n=20 per group) and whole-transcriptome sequencing/qPCR (n= 25 per group) for transcriptomic analysis in CRSwNP and control patients. Functional PAPP-A assays were then performed in both tissue and exosomes (n=20 per group).

Results:
Tissue and exosomal PAPP-A was significantly overexpressed in CRSwNP compared to controls on both a transcriptomic and proteomic level ($p< 0.0001$). Known inhibitors of PAPP-A (Stanniocalcin-1/-2) were significantly downregulated ($p< 0.0001$) as were PAPP-A cleavage products (IGFBP-5 $p< 0.0001$). PAPP-A function was shown to be 5-6 fold increased in tissue and exosomes.

Conclusions:
Upregulated tissue and exosomal PAPP-A signaling is significantly associated with CRSwNP. We hypothesize that exosomal PAPP-A may be an important factor in the promotion of epithelial proliferation and polyp growth. This data lends further support to the emerging concept of exosomal functional and polyomic analyses as a method to study sinonasal pathology.

8:28 am – 8:35 am
Reversal of smoking induced nasal mucosal changes after quitting smoking
Samy Elwany, MD
Iman Talaat
Alexandria Univeristy

Smoking , whether active or passive, has proven deleterious effects on the nasal mucosa. There is also a link between smoking and development and/or maintenance of CRS. Reversal of smoking-induced mucosal changes after quitting smoking is still unconfirmed and controversial.

Aim:
The present study investigated the possibility of reversal of smoking-induced nasal mucosal changes back to normal after completely quitting smoking.

Patients and methods:
The study was performed on 12 male smokers who were recruited for another published research 4-8 years ago, and then they completely quit smoking. A tiny 1-mm3 biopsy was taken, under topical anesthesia, from the inferior turbinate 1 cm behind its anterior end, and immediately processed for electron microscopy. The sections were compared to the previous sections that were prepared during the previous research.

Results:
Examination of the electron microscopic sections showed variable degrees of regeneration of the ciliated cells and decreased vascular congestion. Squamous metaplasia was absent. On the other hand, goblet cells and seromucinous glands were abundant and active. There was a positive direct relationship between the degree of mucosal regeneration and the duration since quitting smoking.

Conclusions:
The nasal mucosa has excellent regeneration potentials. Quitting smoking for sufficient period of time reverses smoking-induced changes in the nasal mucosa and restores it and ,consequently, its protective clearance and defensive functions to normal. Considering the established link between smoking and CRS, quitting smoking may help smokers to overcome their recalcitrant disease.

8:35 am – 8:53 am
Discussion

Skull Base Basic Science and Clinical

Moderators: Jose Gurrola II, MD, Bradford Woodworth, MD, FARS, Jeb Justice, MD, FARS

8:53 am – 9:00 am
A metagenomic analysis of the virome of inverted papilloma and squamous cell carcinoma: Prevalence of HPV18-E6
Charles Tong, MD
Xiang Lin
Tyler Seckar
Zhi Wei
James Palmer, MD, FARS
Erle Robertson, PhD
Philadelphia, PA
USA

Introduction:
Inverted papilloma (IP) is a sinonasal tumor with a well-known potential for malignant transformation. The role of HPV in its pathogenesis has been controversial. The purpose of this study was to determine the virome associated with IP, with progression to carcinoma-in-situ, and invasive carcinoma.

Methods:
To determine the HPV-specific types, a metagenomics assay that contains 62,886 probes targeting viral genomes in a microarray format was used. The platform screens DNA and RNA from formalin-fixed, paraffin-embedded tumor tissues from 8 control sinonasal tissue, 6 IP without dysplasia, 5 IP with carcinoma-in-situ, and 13 squamous cell carcinoma ex-IP. Paired with next-generation sequencing, 48 types of HPV with 857 region-specific probes were interrogated against the tumors.

Results:
The prevalence of HPV16 was 14%, 42%, 70% and 73% in control tissue, IP without dysplasia, IP with CIS, and SCCa ex-IP, respectively. The prevalence of HPV18 had a similar progressive increase in prevalence, with 14%, 27%, 67%, and 74%. The assay allowed region-specific analysis which identified the only oncogenic HPV type 18 E6 to be statistically significant when comparing to control tissue. The prevalence of HPV18-E6 was 0% in control tissue, 25% in IP without dysplasia, 60% in IP with CIS, and 77% in SCCa ex-IP.

Conclusions:
The main cellular target of high-risk HPV E6 oncoprotein is tumor suppressor p53, which leads to an ubiquitin-dependent p53 degradation. Our study demonstrated a trend of increasing prevalence of HPV18-E6 that correlated with histology, which is novel and further supports a potential role for HPV in the pathogenesis of IP.

9:00 am – 9:07 am
Is the Dulguerov staging system superior to Kadish for olfactory neuroblastoma? An individual participant data meta-analysis
Mark Arnold, MD
Soroush Farnoosh, MD
Mitchell Gore, MD, PhD
Syracuse, NY
USA

Background:
Olfactory Neuroblastoma (ONB) is a rare tumor arising from the neuroepithelium of the nasal cavity. There has been an inconclusive debate on the prognostic utility of the current available staging systems. The purpose of this study was to compare the Kadish and Dulguerov's

modified TNM staging of individual participants in order to determine the impact of stage on disease-free and overall survival.

Methods:
Articles in the EMBASE, MEDLINE, Cochrane Library, and CINAHL databases were systematically retrieved. The Preferred Reporting Items for Systematic Reviews and Meta-analysis (PRISMA) was followed for this study. Only English-language articles that included patients with ONB and met the study's inclusion criteria were analyzed. The raw data from the corresponding authors of eligible studies, was requested to perform an individual participant data (IPD) meta-analysis of disease-free (DFS) and overall survival (OS) across groups. In addition an institutional review was performed and included in the meta-analysis.

Results:
Pooled data from 20 studies representing 350 patients with ONB undergoing treatment with curative intent showed that increasing stage for both Kadish and Dulguerov staging systems was prognostic for a worse DFS and OS ($p<0.05$). Endoscopic treatment and lower Hyam's grade also portended to an improved overall survival ($p<0.05$). Using Akaike's Information Criterion (AIC), the Dulguerov staging system had superior performance (964.51 to 965.76).

Conclusion:
In patients with ONB, this study represents the first IPD meta-analysis directly comparing the outcomes of Kadish and Dulguerov staging systems. Both systems correlated with DFS and OS, with superior performance in the Dulguerov system.

9:07 am – 9:14 am
Comprehensive Genomic Profiling Demonstrates Low Tumor Mutational Burden in Olfactory Neuroblastoma
Jacob Friedman, MD
Pete Batra, MD, FARS
Bobby Tajudeen, MD
Peter Papagiannopoulos
Rush University

Objective:
Tumor mutational burden (TMB) is a quantitative descriptor of the overall neo-antigenicity of tumor cells. High TMB has been demonstrated to predict favorable tumor response to immune checkpoint inhibitor therapies (ICI). Olfactory neuroblastoma (ON) is a rare skull base malignancy that can be associated with delayed local and regional recurrences. The objective of this study was to determine TMB by comprehensive genomic profiling.

Methods:
Next generation comprehensive genomic profiling was performed on a cohort of 18 ON cases utilizing Tempus proprietary DNA and RNA sequencing technology (Chicago, IL). TMB was tested by univariate analysis against clinical stage, pathologic grade, and recurrence risk.

Results:
Subjects ranged in age from 13 to 76 years, mean = 50, 10 male and 8 female, and were predominantly Caucasian (16/18). 9/18 tumors were classified as either Hyams II or III and 5/18 recurred. TMB for ON samples ranged from 1.3 to 9.6 mut/mb with mean of 3.8. Univariate analysis did not demonstrate association between TMB and tumor stage, pathologic grade, or risk of recurrence.

Discussion:
TMB is a novel biomarker guiding the classification of neoplasms in the emerging era of immunotherapy. It has been shown to predict response to ICI both across tumor types and among individuals with the same pathologic diagnosis. The characterization of ON as a low TMB pathology contributes to the overall taxonomy of all cancers and should guide further genomic inquiry into the treatment of ON.

Implications for Practice:
The low TMB characteristic of ON predicts poor response to ICIs such as PD-L1 inhibitors which are growing in popularity and usage, especially in the setting of recurrent disease.

9:14am – 9:21am
Constellation of cellular changes following acute exposure to external beam radiotherapy
Phillip Gall, Mr.
Tsuguhisa Nakayama
Meena Easwaran
Jing Chen
Peter Santa Maria
Jayakar Nayak

Introduction:
External beam radiotherapy (EBRT) is a valuable treatment modality for head and neck cancers. In the sinonasal region, patients can suffer from acute and/or delayed complications, including epistaxis, intranasal synechiae formation, anosmia, chronic rhinosinusitis, and osteoradionecrosis. We sought to evaluate acute responses of normal upper airway sinonasal epithelium to EBRT exposure.

Methods:
Sixteen C56BL/6J mice were divided in four groups, three of which (12 mice) received a single 20 Gy EBRT dose to the entire head and neck region. Irradiated mice were sacrificed three, five, and eight days post-exposure. All mice were injected with the thymidine nucleotide analogue, 5-Ethynyl-2'-deoxyuridine (EdU), to assess for cell proliferation. Histologic cross-sections of sinonasal sites were stained using hematoxylin and eosin (H&E), Click-iT EdU assay, and immunofluorescence staining.

Results:
Compared to controls, proliferative activity significantly diminished at the sinonasal epithelium ($p < 0.05$), olfactory epithelium ($p < 0.001$), nasolacrimal duct ($p < 0.001$), and surrounding bones ($p < 0.05$) in EBRT-treated mice. Gross structural changes were noted, including increased epithelial and submucosal gland thinning with atrophy and punctate sites of abnormal epithelial morphology. Following acute exposure to EBRT, no gross mucosal tissue loss or bone exposure were observed.

Conclusions:
These findings suggest that EBRT impedes sinonasal epithelial cell proliferation and that dramatic histologic tissue changes can be noted in vivo within days of tissue exposure to EBRT. Comparison studies to assess for the effects of chronic or hyperfractionated exposures to the upper airway epithelium are now underway.

9:21 am – 9:25 am
Discussion

9:25 am – 9:32 am
Application of holographic augmented reality for external approaches to the frontal sinus
Caio Neves, MD
Yona Vaisbuch, MD
Christoph Leuze, PhD
Bruce Daniel, MD
Nikolas Blevins, MD
Peter Hwang, MD, FARS
Stanford, CA
USA

Background:
External approaches to the frontal sinus such as osteoplastic flap are challenging because they require blind entry into the sinus, posing risks of injury to the brain or orbit. Intraoperative navigation is the current standard for planning the approach, but still necessitates blind entry into the sinus.

Aim:
To describe a novel technique for osteoplastic flap approaches to the frontal sinus using a holographic augmented reality (AR) application.

Methods:
Our team developed an AR system to create a 3D hologram of the skin, bone and frontal sinus, based on preoperative CT scan and semi-automatic segmentation using 3D Slicer. Using Magic Leap AR glasses for visualization, the boundaries of the frontal sinus hologram were wirelessly registered and aligned to the surface anatomy in 6 fresh cadaveric heads. Osteoplastic flap approaches were then performed, with removal of the frontal anterior table. The specimens were re-scanned to compare the accuracy of the osteotomy with respect to the actual frontal sinus perimeter.

Results:
Registration and surgery were completed successfully in all specimens. Registration required an average of 2 minutes. The post-procedure CT showed a mean difference of 1.4±4.1 mm between the contour of the osteotomy and the contour of the frontal sinus. One surgical complication (posterior table perforation) occurred (16%).

Discussion:
We describe proof of concept of a novel technique utilizing AR to enhance external approaches to the frontal sinus. The accuracy of AR-guided frontal osteotomy approximates the current navigation standard. Holographic AR-enhanced surgical navigation holds promise for enhanced visualization of target structures during surgical approaches to the sinuses.

9:32 am – 9:39 am
Assessment of emotional well-being in patients treated for sinonasal malignancies
Alexander Graf, BS
Chandala Chitguppi, MD
Mindy Rabinowitz, MD
Philadelphia, PA
USA

Introduction:
Cancer patients are known to be at high risk for psychiatric morbidity and impaired functioning. Patient emotional well-being is often neglected during surveillance. The impact of the diagnosis and treatment of sinonasal malignancies (SNMs) on emotional well-being has not yet been studied.

Methods:
Patients with SNMs who have completed curative treatment between 2014-18 were included. The Functional Assessment of Cancer Therapy–Nasopharyngeal Carcinoma (FACT-NP) was administered to patients at follow-up visits. Spearman's correlation coefficient was used to assess correlation between emotional well-being score with other specific aspects of FACT-NP.

Results:
49 patients were included in the study. Mean age at treatment was 58±13.69 years. The mean scores on the Physical (0-28), Social (0-28), Functional (0-28), Emotional (0-28), and Nasopharyngeal-specific Well-being subscales (0-64) were 23.10±5.65, 23.38±4.66, 19.27±4.82, 20.41±6, and 46.07±9.92, respectively. Significant correlation was noted between emotional well-being scores and physical scores ($rho=0.49$; $p<0.001$), functional being scores ($rho=0.52$, $p<0.001$), social well-being ($rho=0.42$; $p=0.002$) and other tumor site-specific concerns ($rho=0.41$, $p=0.003$). Patients who underwent surgical treatment ($p=0.02$), had squamous cell carcinoma ($p=0.04$) and those who reported alone to the clinic during follow up ($p=0.020$) had higher emotional well-being scores than their counterparts.

Conclusion:
Emotional well-being is a significant component of QOL in survivors. It has a substantial influence on physical, social, functional, and site-specific concerns. It is essential to dedicate time during surveillance to assess the emotional QOL patients with SNMs.

9:39 am – 9:46 am
The role of neoadjuvant therapy in the management of non-squamous cell carcinoma sinonasal malignancies: A national perspective
Zaid Al-Qurayshi, MD, MPH
(Presented by Andrew Liu, MD)

Objectives:
Non-squamous cell carcinoma sinonasal malignancies (NSCCSM) are relatively rare. Neoadjuvant radiotherapy and/or chemotherapy (NTx) have been proposed to improve outcomes compared to surgery alone. In this study, we aim to examine the prevalence of NTx utilization and associated outcomes.

Methods:
A retrospective study utilizing the National Cancer Database, 2004 – 2015. The study population included adult patients diagnosed with primary NSCCSM.

Results:
A total of 574 patients were included. The mean age of the study population was 61.7±16.5 years. The median follow-up time was 40.4 months (interquartile range: 15.3 – 81.3 months). The histopathology of the sample were: (i) 37.0% adenocarcinoma, (ii) 22.8% adenoid cystic carcinoma, (iii) 20.0% mucosal melanoma, (iv)11.9% esthesioneuroblastoma, and (v) 8.2% sinonasal undifferentiated carcinoma (SNUC). NTx was utilized in 70 (12.20%) of the study population. Patients who received NTx were more likely to have SNUC or esthesioneuroblastoma ($p<0.01$ each) and to have stage III or IV disease ($p<0.01$ each). NTx was most likely to be administrated in a high-volume center [OR: 3.94, 95%CI: (1.47, 10.53), $p=0.006$]. Patients who received NTx had a significantly lower prevalence of positive margin postoperatively [OR: 0.48, 95%CI: (0.26, 0.87), $p=0.016$]. In patients with NSCCSM, negative margin was associated with improved overall survival [HR: 0.55, 95%CI: (0.36, 0.82), $p=0.004$].

Conclusions:
NSCCSM are relatively rare, the utilization of national database allows for the collection of large sample size. Neoadjuvant radiotherapy and/or chemotherapy is likely to decrease the risk of positive margin which ultimately could improve survival in this population.

9:46 am – 10:00 am
Discussion

10:00 am – 10:30 am
Break with Exhibitors in Salon A

Draff III Session

Moderators: Eric Wang, MD, FARS, Jeffrey Suh, MD, Jonathan Ting, MD, FARS

10:30 am – 10:37 am
DRAF III leads to sustained improvement in sinonasal quality of life
Peter Papagiannopoulos, MD
Charles Tong, MD
Edward Kuan, MD
Michael Kohanski, MD
David Kennedy, MD, FARS
Nithin Adappa, MD, FARS
John Bosso, MD, FARS
James Palmer, MD, FARS
Philadelphia, PA
USA

Introduction:
The DRAF III frontal sinusotomy has recently been recognized as an essential tool in the treatment of patients with refractory frontal chronic rhinosinusitis. However, there is a deficiency in the literature on the sinonasal quality of life (QOL) following Draf III procedures.

Methods:
This is a single institution retrospective chart review. The rhinology surgical data base was queried for patients undergoing FESS with DRAF III procedure. Demographic information was obtained as well as SNOT-22 scores from 3 time points: pre-operative, early post-operative (obtained within 3 months) and late post-operative (obtained greater than 3 months). Paired-T test was performed to compare the groups.

Results:
There were 135 patients identified. 90% of patients had nasal polyps. All patients had inflammatory CRS, and all patients received post-operative oral steroids for 4 weeks while transitioning to topical steroid irrigations The mean pre-operative, early post-operative, and late post-operative SNOT-22 scores were 38.48, 16.50, and 22.93. There was a significant improvement between pre-operative and early post-operative SNOT-22 ($p<0.000170$) and this significance was maintained between the pre-operative and late post-operative SNOT-22 scores ($p<0.0000164$). There was no significant difference between early and late post-operative scores ($p<0.55479844$).

Conclusion:
This is the largest study to date to report sinonasal QOL following a Draf III procedure. We demonstrated that in the appropriate patient group, an aggressive frontal sinusotomy can achieve a significant reduction in patient reported symptoms in the post-operative period and this effect is durable to 12-months postoperatively using steroid irrigations.

10:37 am – 10:44 am
Eosinophilic chronic rhinosinusitis managed by the creation of functional neo-sinus cavity and post-operative corticosteroid irrigation care
William Li, MBBS candidate
Jacqueline Ho
Jessica Grayson, MD
Raquel Alvarado
Janet Rimmer
William Sewell
Richard Harvey, MD, FARS
Sydney
Australia

Background:
Eosinophilic chronic rhinosinusitis (eCRS) is an inflammatory endotype of CRS characterised by sinus tissue eosinophilia. Current surgical intervention includes the creation of a 'neo-sinus' cavity combined with post-surgical corticosteroid irrigations. This study assessed the long-term outcomes of eCRS receiving contemporary local disease management.

Methods:
A prospective case-series analysis was conducted on consecutive adult (≥18 years) post-surgical eCRS patients followed up for a minimum of 12-months. Poorly controlled patients were defined as having either polyp recurrence, revision polypectomy, continuous oral steroids and/or mepolizumab therapy. Well-controlled patients were without. Patient-reported outcomes based on 22-item sino-nasal outcomes test (SNOT22) and nasal symptom score (NSS), corticosteroid irrigation, oral antibiotic and steroid medication usage was collected.

Results:
222 post-FESS eCRS patients (54.8±13.6yrs, 43.2% female) were followed up for 2.8±1.7yrs. 88.7% were well-controlled, 6.4% had polyp recurrence, 3.2% on continuous oral corticosteroids, 2.3% on mepolizumab and 3.6% with revision polypectomy. eCRS patients had an overall decrease in SNOT22 and NSS by 45.4% and 46.7% respectively. Well and poorly controlled patients had similar weekly usage of corticosteroid irrigations. Poorly controlled patients used more course of oral steroids per year of follow-up compared to well-controlled patients (0.4±0.3 v 0.1±0.4; p=0.001).

Conclusion:
Modern wide-open surgical modification to the sinus cavity and post-operative corticosteroid irrigations can sufficiently achieve long-term disease control in approximately 90% of eCRS patients.

10:44 am – 10:51 am
Free mucosal grafts and anterior pedicled flaps to prevent ostium restenosis after endoscopic modified Lothrop (frontal drillout) procedure: A randomized controlled study
Ying-Piao Wang, MD, PhD
Ping-Hung Shen
Peter John Wormald, MD
Mackay Memorial Hospital

Background:
The endoscopic modified Lothrop procedure is used to manage ongoing refractory frontal sinusitis after failed previous endoscopic sinus surgery (ESS), but has a significant restenosis rate. We evaluated the potential benefits of mucosal grafts and pedicled flaps on the opening of the newly formed frontal ostium.

Methods:
Fifty patients with refractory frontal sinusitis or mucoceles after ESS were randomized to undergo EMLP, with (n = 27) or without (n = 23) mucosal grafts and pedicled flap reconstruction of the neo-ostium. The frontal neo-ostium was measured with LINDHOLM distending forceps, and antero-posterior (A-P) and lateral dimensions were measured intraoperatively, and at 6 weeks, 6 months, and 12 months postoperatively. Olfaction outcomes were assessed using the Taiwan smell identification test (TWSIT) and a smell visual analogue scale (VAS) score preoperatively and at 6 months postsurgery.

Results:
The initial intraoperative mean lateral and A-P dimensions were 23.2 ± 2.7 mm and 14.8 ± 2.3 mm and were significantly decreased at all timepoints postoperatively. The mucosal grafts and pedicled flaps had greater lateral and A-P dimensions than the intraoperative frontal neo-ostium area at all timepoints postoperatively (all $p < 0.05$). At 6 months postoperatively, TWSIT ($p = 0.027$), but not the smell VAS score ($p = 0.063$) was significantly improved from baseline. The TWSIT and smell VAS scores changes did not differ between the groups ($p = 0.92$, 0.85, respectively).

Conclusions:
The use of mucosal grafts and pedicled flaps reduces stenosis of the frontal neo-ostium post-surgery and should be considered after EMLP.

10:51 am – 10:58 am
Discussion

Misc

Moderators: Henry Barham, MD, FARS, Dana Crosby, MD, Stella Lee, MD

11:03 am – 11:10 am
Medial flap turbinoplasty: Revisiting safety and efficacy
Michelle Menon Miyake, MD
Alan D. Workman, MD
Benjamin Bleier, MD, FARS
Boston, MA
USA

Introduction:
Medial Flap Turbinoplasty (MFT) is an established technique for inferior turbinate reduction (ITR) by removal of the turbinate bone and lateral mucosa. MFT has fallen out of favor with the introduction of both cold and thermal submucosal resection (SMR) instrumentation which are perceived to limit bleeding, surgical time, and risk of empty nose syndrome(ENS). However, recent evidence has suggested that MFT provides superior long-term outcomes to SMR with significantly lower revision rates and need for concomitant medical therapy. The goal of this study was to therefore examine the complication rates of MFT as compared SMR in a high-volume center.

Methods:
Retrospective analysis of 1030 patients undergoing ITR(566 MFT, 464 SMR) by a single surgeon between February 2011 to May 2019. Outcomes, adverse events, and operative time were compared using a Fisher's exact test.

Results:
The follow up period for the SMR and MFT groups was 226.42+/-20.77 and 160.38+/-8.75 days; respectively. MFT was associated with statistically significantly better SNOT-22 and nasal obstruction score reduction versus SMR(-19.42+/-1.08 vs -17.6+/-2.7 and -1.99+/-0.11 vs 1.90+/-0.23, p<0.0001). There were no significant differences between groups with respect to major bleeding(0.71% vs 1.07%), epiphora(0.17% vs 0.43%), and ENS (0% vs 0%).

Conclusion:
MFT is an effective technique for ITR with adverse event rates similar or better than SMR. Concerns over increased risk of ENS, bleeding, surgical time, and epiphora are not supported by the evidence. These findings, coupled with reports of improved long-term efficacy, suggest that MFT should remain within the armamentarium as a surgical option for nasal obstruction.

11:10 am – 11:17 am
Complete middle turbinate resection is unlikely to cause empty nose syndrome in the first year postoperatively
Richard Law, MD, Resident PGY-4
Abdelwahab Ahmed, Medical Student
Meredith Van Harn, Statistician
John Craig, MD

Introduction:
Empty Nose Syndrome (ENS) is characterized by nasal crusting, dryness, and paradoxical nasal obstruction after inferior turbinate resection, but has also been reported after middle turbinate resection (MTR). Concern for causing ENS is one reason surgeons preserve MT during endoscopic sinus surgery (ESS). However, partial MTR can improve clinical outcomes, with low likelihood of causing ENS. The purpose of this study was to determine whether complete MTR caused symptoms and findings consistent with ENS.

Methods:
This was a retrospective cohort study of 100 patients undergoing bilateral complete MTR during ESS with either Draf IIB or Draf III frontal sinusotomies, for the following pathologies: chronic rhinosinusitis with or without nasal polyps (CRSwNP, CRSsNP), sinus or skull base neoplasms, and cerebrospinal fluid leaks. Demographic data, pre- and postoperative SNOT-22, and postoperative NOSE and Empty Nose Syndrome 6-item Questionnaire (ENS6Q) scores were obtained. Nasal crusting was documented on last postoperative nasal endoscopy.

Results:
The following pathologies were analyzed: CRSwNP (78), sinus/skull base neoplasms (14), CRSsNP (6), and CSF leaks (2). Fifty-nine patients underwent complete MTR during ESS with Draf IIB, while 41 underwent Draf III. Mean postoperative SNOT-22, NOSE, and ENS6Q scores were 19.6, 4.3, and 2.7, respectively. Mean follow-up was one year. There were no significant differences in SNOT-22, NOSE, or ENS6Q scores between different pathologies and Draf IIB versus III.

Conclusions:
Bilateral complete MTR during ESS was rarely associated with ENS6Q scores >10, paradoxical nasal obstruction, or nasal crusting, suggesting complete MTR was unlikely to cause ENS one-year postopera

11:17 am – 11:24 am
Characteristics and treatment outcomes of suspected mast-cell activation syndrome with sino-nasal obstruction: A single institution experience
Jeehong Kim, MD, PGY4 Resident
Elisabeth Ference, MD
Cindy Xi
Marshall Ge
Bozena Wrobel, MD, FARS
Los Angeles, CA
USA

Introduction:
Mast cell activation syndrome (MCAS) is increasingly recognized as a diverse spectrum of conditions driven by aberrant mast cell activation. Sino-nasal obstruction is common in MCAS. There is a paucity of literature describing characteristics of MCAS and treatment outcomes.

Methods:
A total of 192 patients with nasal congestion were seen from July 2017-May 2019 among 3 providers (1 Allergist, 2 Rhinologists). MCAS was suspected when:
1) ≥1 symptom in addition to nasal congestion: flushing, pruritus, urticaria, angioedema, wheezing, throat swelling, headache, hypotension, diarrhea
2) Clinical response to medications that target mast cell mediators. Outcomes were quantified using the SNOT-22

Results:
32 with nasal congestion were suspected of MCAS. The median age was 47; 24/32 were female. 13/32 had a prior history of sinonasal surgery and 11/32 allergen immunotherapy. 19/32 had a history of asthma, 10/32 drug allergy, 11/32 food allergy, and 10/32 anaphylaxis. The median number of medications targeting mast cell activation was 4 (range 2-8). 11/32 were offered surgery by a Rhinologist after adequate medical management. 14 patients completed pre-and post-treatment SNOT-22 (4/14 treated with surgery, 10/14 medical management). Pre-treatment score was 59.8 (SEM 6.2) and post 42.8 (SEM 6.7); the difference was statistically and clinically significant (P=0.0015*). Both groups showed a mean 17-point reduction.

Conclusion:
Improved recognition of suspected MCAS presenting with nasal obstruction may improve treatment outcomes. Consensus criteria for MCAS, which includes elevation in tryptase over baseline during an episode, may exclude the full spectrum of individuals with MCAS who could benefit from treatment.

11:24 am – 11:31 am
Topography of polyp recurrence in eosinophilic chronic rhinosinusitis
Jessica Grayson, MD
William Li, Mr.
Jacqueline Ho, Dr.
Raquel Alvarado
Janet Rimmer
Richard Harvey, MD

Background
Eosinophilic chronic rhinosinusitis is an inflammatory endotype of CRS. Contemporary treatment includes creation of a 'neo-sinus' cavity and post-operative corticosteroid irrigations. However, not all patients gain control with local therapy. This study aims to determine, in those patients with polyp recurrence, the most common sinuses involved and predictive factors.

Methods:
A prospective case-series was conducted on consecutive adult (≥18 years) post-FESS eCRS patients followed up for a minimum of 12-months. All patients had a neosinus cavity created and used a corticosteroid irrigation daily for 3-6 months, then tapered to disease control. Sinus cavities were assessed by endoscopy on last follow-up. Polyp recurrence was defined as a score of 5 or 6 in the mLKES in 3 or more sinus cavities. Patient-reported outcomes (SNOT 22 and NSS), frequency of corticosteroid irrigations, and antibiotic and systemic corticosteroids were collected. The pattern of sinus involvement was analyzed. Results: 342 sinus cavities were assessed (age 54.9±13.4yrs, 43.2% female). Polyp recurrence occurred in 4.3% (6.4% of patients, n=7 unilateral) of sinus cavities. The frontal and ethmoid sinus cavities were most affected in those with polyp recurrence, cf maxilla and sphenoid (100%v100%v53%v53%, p<0.01). While those patients with polyp recurrence utilized a greater number of systemic corticosteroids per year (0.4±0.4v0.1±0.3, p<0.01), the use of corticosteroid irrigations was similar (%>4/week; 66.7v48.9, p=0.13).

Conclusion:
The frontal and ethmoid sinuses were most affected in patients with polyp recurrence. Whether the disease is more active in this location or topical therapy has limited access requires further evaluation.

11:31 am – 11:36 am
Discussion

11:36 am – 11:43 am
The effect of continuous positive airway pressure on the nasal cavity
Erin Reilly, MD
Colin Huntley, MD
Maurits Boon, MD
Chandala Chitguppi, MD
Swar Vimawala
Jena Patel, BS
Gregory Epps
Mindy Rabinowitz, MD
Philadelphia, PA
USA

Educational Objective:
For patients with obstructive sleep apnea (OSA), there is a lack of knowledge regarding the impact of continuous positive airway pressure (CPAP) on the nasal cavity itself. In addition, there is a significant need for evidence-based recommendations regarding the appropriate use of CPAP following endoscopic sinus and skull base surgery. The goal of this study is to quantify the effect of positive pressurized air flow on the nasal cavity of healthy individuals.

Methods:
A previously validated cadaveric model using intracranial sensor catheters has proved to be a reliable technique for measuring sinonasal pressures. These sensors were placed halfway down the nasal cavity floor of 18 healthy individuals. Pressure within the nose was recorded at increasing levels of CPAP by 3 cm H20 applied using a full facial mask.

Results:
Overall, nasal cavity pressure was on average 85% of delivered CPAP. The amount of pressure delivered to the nasal cavity increased as the CPAP pressure increased. The percentage of CPAP delivered was 77% for 5 cm H20 and increased to 89% at 20 cm H20. There was a significant difference in mean intranasal pressures between all levels of CPAP except 5 cm H20 and 8 cm H20 (p<.001). The average pressure exerted during nose blowing was 6.6 cm H20 and during a sneeze was 4.3 cm H20.

Conclusion:

On average, only 85% of the pressure delivered by CPAP is transmitted to the nasal cavity. Higher CPAP pressures delivered a greater percentage of pressurized air to the nasal cavity floor. Our results are comparable to the cadaver model, which demonstrated similar pressure delivery even in the absence of anatomic factors such as lung compliance, nasal secretions and edema.

11:43 am – 11:50 am
A retrospective study of the efficacy and safety of balloon eustachian tuboplasty
Camilla Stepniak, MD
Leigh Sowerby, MD
Brian Rotenberg, MD, FARS
London, Ontario
Canada

Eustachian tube dysfunction (ETD) is a ubiquitous condition affecting adults and children. Inadequate middle ear ventilation can lead to otologic diseases and complications including otitis media with effusion, retractions, perforations and cholesteatomas. Within the last five years, there has been increasing research regarding a new surgical treatment, balloon dilation of Eustachian tube (BDET), as a potential solution. The objective of this study was to evaluate the subjective and objective outcomes of BDET in patients with chronic ETD. A retrospective review of 4-year results for the technique of transnasal BDET at a single tertiary centre (St. Joseph's Health Care) was carried out. The validated seven-item Eustachian Tube Dysfunction Questionnaire (ETDQ-7) was the primary outcome measure. Secondary outcome measures included tympanometry, ability to auto-insufflate, and complication rate. A total of 40 patients (66 ears) underwent BDET. All patients who had undergone the procedure were included, 75.0% of which have had prior tympanostomy tubes and 27.5% who have had other prior otologic procedures. The mean preoperative ETDQ-7 score was 29.72 (SEM 1.99) and the post-operative score was 20.83 (SEM 1.87). Comparison of the preoperative baseline and follow-up ETDQ-7 scores showed statistically significant difference ($p<0.001$) as well as clinical significance. Preoperatively, 45% (9/20) patients reported the ability to auto-insufflate the middle-ear space compared to 95% (19/20) of patients postoperatively. No device- or procedure-related serious adverse events were reported. Even in patients with otologic sequela of ETD, BDET is a safe treatment option that may result in subjective and objective patient improvements.

11:50 am – 11:57 am
Discussion

12:00 pm – 1:00 pm
Lunch with Exhibitors in Salon A

Saturday, September 14, 2019 12:00 pm – 1:00 pm Compass Room, Riverside Building

Women in Rhinology, Mentorship Program & Resident's & Fellows Combined Lunch Program
"Coaching Resiliency in Residents and Preventing Physician Burnout"
Guest Speaker: Maisie Shindo MD
Professor of Otolaryngology - Head and Neck Surgery, Surgical Director of the Thyroid and Parathyroid Center, Oregon Health and Science University

Saturday, September 14, 2019 12:00 pm – 1:00 pm Grand Balllroom A

1:00pm – 1:55pm
15th Annual David W. Kennedy Lectureship
Invited Guest Speaker: Robert Schleimer Ph.D.
"Mechanisms of Pathogenesis of Chronic Rhinosinusitis"

TOP ABSTRACTS:

Moderators: Benjamin Bleier, MD, FARS, Do-Yeon Cho, MD, Michael Kohanski, MD

2:00 pm – 2:08 pm
The presence of virus significantly associates with chronic rhinosinusitis disease severity
Rachel Goggin, MBBS
Alkis Psaltis
Peter-John Wormald, MD
Sarah Vreugde, A/Prof
Catherine Bennett, Ms.
Rajan Vediappan, Dr.
Seweryn Bialasiewicz, Dr.
Adelaide SA
Australia

Background:
Patients with chronic rhinosinusitis (CRS) often implicate a viral upper respiratory tract infection as a disease-inciting event. However, the presence and identity of these viruses and their relationship to disease phenotype and severity in CRS patients is unknown. The aim of this study was to investigate the CRS virome in relation to disease characteristics.

Methods:
Endoscopically-guided sterile cytology brushes were used to sample the mucosa immediately prior to sinus surgery. DNA/RNA extracts underwent PCR/RT-PCR testing for a panel of common respiratory viruses. Disease severity data was collected from each patient prior to sampling: Sino-Nasal Outcome Test scores (SNOT-22), Adelaide Disease Severity Scores (ADSS), Lund-Mackay computed tomography scores (LMS) and Lund-Kennedy endoscopic scores (LKS).

Results:
288 patients were included in the study; 71 controls, 133 CRS without nasal polyps (CRSsNP) and 84 CRS with nasal polyp (CRSwNP) patients. Virus was significantly more prevalent in CRSsNP patients compared to controls; 20.30% of CRSsNP versus 15.48% of CRSwNP and 7.04% of controls. LMS and LKS were worse in the CRSsNP group with virus than the CRSsNP group without virus (LMS 9.56 ± 1.07 vs. 6.5 ± 0.43, LKS 6.07 ± 0.71 vs. 4.21 ± 0.32). SNOT-22 scores and ADSS were not significantly different for patients with virus versus patients without.

Conclusion:
Virus is more prevalent in CRSsNP patients and is associated with worse objective disease. This potentially implicates viruses in the pathophysiology of CRS, and as such presents a new preventative and therapeutic target.

2:08 pm – 2:16 pm
Chronic inflammation directs an olfactory stem cell functional switch from neuroregeneration to immune defense
Andrew Lane, MD, FARS
Mengfei Chen, PhD
Randall Reed, PhD
Baltimore, MD
USA

Introduction:
The olfactory neuroepithelium is directly exposed to the external environment and serves as an important barrier to the central nervous system. In the setting of chronic inflammation, the interaction between the olfactory neuroepithelium and the local immune system may contribute critically to associated sensory impairment.

Methods:
Olfactory epithelial samples obtained from human CRS patients and mouse models of chronic inflammation were analyzed by immunohistochemistry. Neuroepithelial stem cells were flow-sorted from inflamed murine olfactory tissue and subjected to RNAseq. Genetically-modified mice were used to study the role of NF-kB in olfactory stem cell function during chronic inflammation.

Results:
Olfactory inflammation initially damages neurons and activates stem cell-mediated regeneration, but chronic inflammation locks long-lived stem cells (HBCs) in an undifferentiated state. Global gene expression reveals upregulation of NF-κB-regulated cytokines, accompanied by enhancement of “stemness”-related transcription factors. Loss-of-function studies identify an NF-κB-dependent role of HBCs in amplifying inflammatory signaling and immune cell proliferation. Chronically-activated HBCs signal macrophages to maintain immune defense and prevent development of regulatory T cells. In diseased human olfactory tissue, activated HBCs similarly contribute to inflammation through chemokine production.

Conclusions:
These observations establish a mechanism of CRS-associated olfactory loss, caused by a functional switch of neuroepithelial stem cells from regeneration to immune defense. Insights into olfactory stem cell regulation may suggest pharmacotheraputic targets to restore the sense of smell.

2:16pm – 2:24pm
Longitudinal stability of chronic rhinosinusitis endotypes
Kristen Yancey, MD
Ping Li, MD
Rakesh Chandra , MD, FARS
Naweed Chowdhury, MD
Justin Turner, MD, FARS
Nashville, TN
USA

Background:
The identification and characterization of chronic rhinosinusitis (CRS) endotypes has advanced the understanding of CRS pathophysiology with potentially important clinical implications. We previously described CRS inflammatory endotypes in 147 patients with medically refractory CRS undergoing endoscopic sinus surgery (ESS). The aim of this study was to evaluate the stability of these endotypes after ESS and postoperative medical therapy.

Methods:
Repeat sampling of 17 mucus cytokines and inflammatory mediators was performed in 20 consecutive adults following initial sampling and ESS. Hierarchical cluster analysis was performed to characterize and evaluate potential changes in CRS endotypes in comparison to the prior analysis.

Results:
Median follow-up resampling was 15.5 months (range 10-41). The overall cohort had significant increases in IL-7 (p=.02) and IFN-γ (p=.003) and reductions in IL-13 (p=.01) and RANTES (p=.001). Most changes were driven by patients with nasal polyps (CRSwNP).

CRSwNP patients showed substantial reductions in IL-5 (p=.01), IL-13 (p=.01), and RANTES (p=.01), while CRSsNP patients were characterized by an increase in IFN-γ (p=.02). Regarding endotypic classification, 13 of 20 subjects (65%) switched clusters, with a notable convergence into cluster 5, which is characterized by mild-moderate disease, good olfactory function, and low eosinophilia. Likelihood of cluster switching was independent of demographic factors and polyp and asthma status.

Conclusion:
To our knowledge, this is the first study to evaluate stability of CRS inflammatory endotypes. Our data suggests that ESS results in longitudinally durable alterations in CRS inflammatory burden that modify endotypic assignment.

2:24pm-2:30pm
Discussion

2:30pm – 2:38pm
Controlled delivery of ciprofloxacin and ivacaftor via sinus stent in a preclinical model
Do-Yeon Cho, MD
Justin McCormick, MD
Dong Jin Lim
Daniel Skinner, BS
Shaoyan Zhang, PhD
Jeffrey Elder
John Mclemor
Nicholas Rivers
Mark Allen
Steven Rowe
Bradford Woodworth, MD, FARS
Birmingham, AL
USA

Introduction:
Pathogenic gram-negative bacteria (Pseudomonas aeruginosa) are common in CRS and frequently resistant to antibiotics. We recently described the ciprofloxacin and ivacaftor releasing biodegradable sinus stent (CISS): a drug delivery system that administers ciprofloxacin and the mucociliary activator (ivacaftor) at high local concentrations with prolonged mucosal contact time and sustained delivery. The objective of this study is to evaluate the efficacy of the CISS in a rabbit model of P. aeruginosa (PAO1 strain) sinusitis.

Methods:
Ciprofloxacin/ivacaftor (double layer) was coated on biodegradable poly-D/L-lactic acid. A total of 10 CISSs (5 controls, 5 CISSs) were placed unilaterally in rabbit maxillary sinuses via dorsal sinusotomy after inducing infection for 1 week with PAO1. Animals were assessed 3 weeks after stent insertion with sinus culture, CT scan, histopathology, and in vivo sinus potential difference (SPD) assay.

Results:
Insertion of the CISS in PAO1 infected rabbits for 3 weeks resulted in significant improvement in sinusitis according to the CT scoring changes between week 1&4 (ΔCT-control=-0.41+/-0.6, ΔCT-CISS=7.43+/-2.5, p=0.03). Histology revealed marked improvement in the structure of the mucosa and submucosa in rabbits in the treatment group. SPD revealed significantly increased Cl-transport in the CISS group compared to controls (Cl-free+isoproterenol ΔPD(mv):-24.0+/-5.0 vs.-4.1+/-1.3; p=0.005).

Conclusions:
The CISS had robust clinical efficacy in treating P. aeruginosa rabbit sinusitis. The innovative design using a double layered drug coating on the surface of the biodegradable stent may provide therapeutic advantages over current treatment strategies for P. aeruginosa sinusitis.

2:38pm – 2:46pm
Loss of BMI1 in mature olfactory sensory neurons leads to increased olfactory basal cell proliferation
Rhea Choi, MD/PhD Candidate
Sarah Kurtenbach
Bradley J. Goldstein
Miami, FL
USA

Background:
Damage to olfactory sensory neurons (OSNs), situated within the neuroepithelium of the olfactory cleft, may be associated with anosmia. Although their direct contact with the nasal airspace make OSNs vulnerable to injury and death, multiple mechanisms maintain epithelium integrity and olfactory function. We hypothesized that BMI1, a Polycomb protein found to be enriched in OSNs, may function in neuroprotection. Here, we explored BMI1 function in a mouse model

Methods:
Utilizing a mouse genetic approach to delete Bmi1 selectively in mature OSNs, we investigated changes in epithelium homeostasis by performing RT-qPCR, immunostaining, and electro-olfactograms to compare gene expression, cell composition, and olfactory function (n=3-5). Chromatin studies were also performed to identify protein-DNA interactions between BMI1 and its target genes (n=3).

Results:
OSN-specific BMI1 knockout led to increased neuron death and basal cell activation. Chromatin studies suggested a mechanism of increased neurodegeneration due to de-repression of a pro-apoptosis gene, p19ARF. Despite the increased turnover, we found that olfactory neuroepithelium thickness and olfactory function remained intact. Our studies also revealed the presence of additional Polycomb group proteins that may compensate for the loss of BMI1 in mature OSNs.

Conclusion:
The olfactory neuroepithelium employs multiple mechanisms to maintain epithelial homeostasis. Our findings provide evidence that in a mouse model of BMI1 deletion, the overall integrity and function of the olfactory neuroepithelium are not compromised, despite increased neuronal turnover, reflecting a remarkable reparative capacity to sustain a critical sensory system.

2:46pm-2:54pm
Gene correction of the dF508 CFTR mutation in human airway stem cells as a novel cell-based treatment strategy for cystic fibrosis
Jayakar Nayak, MD, PhD
Sriram Vaidyanathan
Dawn Bravo
Zachary Sellers
Tushar Desai
Matthew Porteus
Stanford, CA
USA

Introduction:
Cystic fibrosis (CF) is a lethal, monogenic disease caused by CFTR chloride channel mutations, most notably dF508. Gene editing of dF508 using CRISPR technology has not been employed for CFTR mutational correction, but if successful, may generate a promising stem cell-based treatment platform for CF.

Methods:
Sinonasal tissues were obtained from CF and non-CF control patients undergoing functional endoscopic sinus surgery (FESS), and enriched for primary upper airway basal stem cells (UABCs). Correction templates, Cas9 recombinase and adeno-associated virus (AAV) were then introduced to edit/correct the dF508 CFTR mutation at exon 11. Genetically-corrected UABCs were then expanded and tested for maintenance of stem cell properties and behavior, and restoration of CFTR chloride transport.

Results:
In UABCs derived from homozygous dF508 and compound heterozygous (dF508/Other) CF patients, 28±5 % and 42±15% mutational corrections were achieved respectively at the dF508 locus. UABCs retained the expression of numerous biomarkers of stem cell phenotyping despite the CFTR gene-editing process, and still embedded onto extracellular matrix scaffolds. Upon differentiation in air-liquid interface cultures, genetically-corrected CF epithelial cells displayed marked functional restoration of 31±5% of chloride currents relative to unedited CF samples (negligible chloride transport).

Conclusions:
We present an efficient, clinically compatible approach to generate a cell-based therapy for CF using CRISPR gene editing of autologous UABC airway stem cells. This strategy represents a promising step towards development of patient-specific, autologous airway stem cell transplant as a novel platform for CF treatment.

2:54pm-3:00pm
Discussion

3:00pm – 3:30pm
Break with Exhibitors in Salon A

3:30pm-4:15pm
Skull Base Panel #2
"How I do it: Providing Endoscopic Exposure and Resection of Skull Base Neoplasms"
Moderator: Roy Casiano, MD, FARS
Panelists: Corinna Levine, MD, FARS, Bradford Woodworth, MD, FARS, Adam Zanation, MD

4:15pm – 6:00pm
AAO Panel 'Ask the Experts – An Endoscopic Potpourri
Moderator: David Kennedy, MD, FARS
Panelists: Peter J. Wormald, MD, Benjamin Bleier, MD, FARS, Eugenia Vining, MD, Elina Toskala, MD, FARS, James Palmer, MD, FARS, Timothy Smith, MD, FARS

Cocktails from 6:00pm - 7:00pm

POSTERS

Poster #001
30-Day readmission and coordination of care following endoscopic transsphenoidal pituitary surgery
Michael Ghiam, MD
Zoukaa Sargi
Darius Chyou
Simon Menaker

Background:
30-day readmission are an important indicated of health care quality. Studies have identified an 8.5% 30-day readmission rate in patients undergoing endoscopic transsphenoidal pituitary surgery [TSPS]. The most common causes being epistaxis, hypernatremia, hyponatremia, and cerebrospinal fluid leak.

Objectives:
Estimate the rate of 30-day readmission after TSPS. Identify causes and risk factors for readmission. Understand how care was coordinated with endocrinologist following discharge.

Methods:
Quality improvement Review of electronic medical record of all patients undergoing TSPS from January 2015 until December 2018.

Results:
234 patients were included. Most patients were female (53%) and white (64.1%). 30-day unplanned readmission rate was 8.6% (20/234). The mean time to readmission was 8.1 days from discharge. The most common diagnoses on readmission were hyponatremia (45%), CSF leak (20%), adrenal insufficiency (20%), hypernatremia (15%) and epistaxis (10%). Patients with hyponatremia were readmitted earlier than others [4 2.07 vs 11.3 11.4, p= 0.047). Distance to the hospital and coordination of care with an outpatient endocrinologist did not increase risk of readmission on multivariate regression analysis (P=0.41)

Conclusion:
Readmission rate of 8.6% parallels that reported in the literature of 8.5%. Metabolic causes of readmission are more common than surgical complications. Most patients were readmitted within 10 days of discharge. Efforts to reduce readmission should emphasize early follow up. Follow up with an outpatient endocrinologist is a safe option for patients traveling from afar.

Poster #002
A case of refractory cerebrospinal fluid rhinorrhea
Atsushi Ishibashi, MD
Yasuyuki Hinohira, Professor
So Watanabe
Tomoaki Mori, MD
Yojiro Kawamura, MD, PhD
Hirokazu Chokki
Kojiro Hirano
Isao Suzaki
Japan

Background:
A cerebrospinal fluid (CSF) rhinorrhea occurs when there is a fistula between the dura and the skull base. CSF could be due to trauma, raised intracranial pressure, tumors, erosive diseases, and congenital skull base defects. Endoscopic sinus surgery (ESS) is now prevalent in the treatment of CSF rhinorrhea than rest and spinal drainage. We report a case of refractory CSF rhinorrhea who underwent three times ESS.

Case:
A 48 year-old male came to us complaining of left watery rhinorrhea after head injury. He was diagnosed as left CSF rhinorrhea using computed tomography (CT) and endoscope. Conservative treatment such as bed rest and spinal drainage was first done, but CSF rhinorrhea recurred 3 months later. ESS was performed, and CSF rhinorrhea arising from fistula of the lateral side in the left sphenoid sinus was treated using fascia lata and fat tissue.
2 years after the first ESS, CSF rhinorrhea recurred by blowing his nose. ESS was performed, and CSF rhinorrhea arising from the same portion as the first ESS was stopped by closing fistula with fascia lata and fat tissue. However, CSF rhinorrhea again recurred when taking off nasal packing 2 days after ESS. ESS was again performed, and CSF rhinorrhea arose from the left ethmoid plate fistula. Fat tissue was inserted using bath plug method, and CSF rhinorrhea was stopped. After 3 times ESS, recurrence is not seen.

Discussion:
We experienced the difficult case that needed 3 times ESS to stop CSF rhinorrhea. In the third ESS, CSF rhinorrhea arose from the ethmoid plate that was different place in the first and the second ESS. In general CSF rhinorrhea has single-fistula, but a few CSF rhinorrhea cases may have plural fistulas in the same time.

Poster #003

A comparative analysis of sphenoid sinus osteoneogenesis in aspirin exacerbated respiratory disease

Madison Malfitano
Griffin Santarelli, MD
Zainab Farzal
Stephen Hernandez, MD
Adam Kimple, MD
Brian Thorp, MD
Adam Zanation, MD
Charles Ebert, MD, MPH, FARS

Background:
Aspirin exacerbated respiratory disease (AERD) is characterized by excessive leukotriene production, diffuse polyp burden and osteitic bone changes. These bony changes have been characterized in comparison to non-diseased controls but not yet compared to disease states.

Objective:
The aim of this radiographic study is to further characterize the bony changes noted on computed tomography (CT) scans of the sphenoid sinus in patients with AERD compared to non-diseased and diseased controls.

Methods:
A retrospective review of 34 patients with clinically confirmed AERD were included and compared to 5 non-diseased controls and disease states including 9 AFS, 23 CRS without polyps, and 8 CRS with polyps. Comparative measurements were performed using fine-cut CT scans. Sites of comparison were the intersinus septum, the lateral sphenoid walls, the roof and floor of the sphenoid sinus.

Results:
Patients with AERD had an average bone thickness of 3.53+/-1.52 mm for the intersinus septum, 9.86+/-2.03 mm for the left sphenoid wall, 8.82+/-2.66 mm for the right sphenoid wall, 5.55+/-1.60 mm for the sphenoid floor, and 3.02+/-1.48 mm for the sphenoid roof. Sphenoid bone thickness in AERD compared to non-diseased and diseased controls exhibited statistically significant increases with the most pronounced changes occurring in the lateral sphenoid walls ($p<0.05$).

Conclusion:
Patients with AERD have increased thickness of the sphenoid bone compared to control groups with the greatest difference in the lateral sphenoid wall. These findings may help clinicians increase suspicion for a diagnosis of AERD who clinically have CRS.

Poster #004

A comparison of chronic rhinosinusitis recurrence rates after unilateral versus bilateral functional endoscopic sinus surgery

Devon Webb
William Mak
Rami Al-Salman, MD
Sara Derikvand
Amin Javer, MD

Introduction:
Chronic rhinosinusitis (CRS) is defined as sinonasal epithelium inflammation lasting >12 weeks. Endoscopic sinus surgery is a treatment mainstay for pharmacologically-resistant cases. It is unknown if unilateral CRS can be managed as a less severe form or rather an earlier stage that will progress bilaterally, requiring pre-emptive extensive management. This study aims to report recurrence rates for CRS cases treated with unilateral functional endoscopic sinus surgery (UNIFESS) and bilateral functional endoscopic sinus surgery (BIFESS), while evaluating the effect of patient factors on recurrence.

Methods:
This chart review focused on primary UNIFESS or BIFESS cases from Jan 2009 to Dec 2015 at St. Paul's Sinus Centre. Patient demographics, relevant medical history, and recurrences were collected and analyzed.

Results:
51 UNIFESS and 426 BIFESS managed patients had a mean follow-up period of 29.6 months (range: 0-97). 23 patients had recurrences (4.8%). Recurrence rates for UNIFESS and BIFESS were 3.9% and 4.9% respectively, with a value of 0.79 ($p>0.05$) using two-way chi-squared analysis. Odds ratios (95% CI) for patient factors on recurrence were: smoking 1.14 (0.38-3.44), asthma 3.54 (1.51-8.28), ASA sensitivity 4.23 (0.87-20.53), AFRS 3.76 (1.40-10.08), and polypoid disease 3.65 (1.52-8.76).

Conclusion:
Recurrence rates were comparable to published literature. A statistically insignificant difference in recurrence rates between UNIFESS and BIFESS cases indicated similar post-surgical outcomes. Thus, advocacy for pre-emptive extensive treatment for unilateral CRS cannot be established. A statistically significant increase in recurrences was observed for patients with asthma, AFRS, or polypoid disease.

Poster #005

A comparison of the cytokines involved in Chronic Rhinosinusitis and sickness behavior: A meta-analysis

Wasiq Nadeem, MS2 Student
Philip Chen
Eric Shattuck
Simone Barker

Background:
Chronic rhinosinusitis is a persistent inflammation of the sinuses that can impact quality of life. Sickness behavior is a term used for a combination of different manifestations that include sleep disturbances and depression that also effect quality of life.

Methods:
A term search was done across varying databases which included but was not limited to terms such as “Chronic rhinosinusitis, “cytokines”, “sickness behavior”. A table of cytokines were arranged to analyze possible trends in CRS vs sickness behavior and cross analyzed. Certain articles and studies that demonstrated opposing and qualifying correlations were also acknowledged.

Results:
CRS literature search results yielded IL-4, IL-5, and IL-13 as being the predominant cytokines present as correlative agents seen in a multitude of studies in chronic rhinosinusitis. A dominant Th2 response as well as IgE response was also noted in some literature. In regards to sickness behavior, IL-4 did show a positive correlation with multiple sources when searched with sleep disturbances. IL-5 showed positive correlations with depression in three articles, although a source did have it negatively associated with depression in Korean breast cancer patients. IL-13 showed increased correlations in patients with depression with some articles describing a negative correlation. Other cytokines are further discussed later.

Conclusion:
It was evident that some of the major cytokines involved in CRS had an overlap between those of sickness behavior. Though no clear relationship was defined, this may prompt further investigations in a potential cause-effect relationship between the two, which could improve patient outcomes through a multi-faceted treatment.

Poster #006

A perioperative assessment of acute invasive fungal sinusitis symptoms and each prognostic value: A retrospective study

Courtney Hunter, Medical Student
Donald Vickers, Resident Physician
Alissa Kanaan, Assistant Professor, COM
Otolaryngology Faculty Physician
University of Arkansas for Medical Sciences
USA

Background:
Acute invasive fungal sinusitis (AIFS) is a rare disease caused by abnormal fungal proliferation and invasion in the immunocompromised patient. The ability to spread directly by angioinvasion allows the fungi to quickly propagate from the paranasal sinuses into the orbit, palate, and intracranially. The survival rate for AIFS has been estimated in previously performed studies to be near 50 to 60 percent even when treated with aggressive surgical and medical therapy.

Objective:
The purpose of this study is to identify perioperative prognostic factors that aid in determining prognosis in the individualized patient.

Methods:
Patients considered for this retrospective review had biopsy-proven AIFS and were admitted to the the University of Arkansas for Medical Sciences between 2015-2018. Twenty-one patients were included. Kaplan Meier graphs were created, and a Breslow test was used to compare the likeness of the curves. If significantly different, a univariate Cox regression analysis was performed on the data at 3 months after diagnosis.

Results:
17 patients (76%) had an underlying hematologic malignancy. Overall survival was 71% and 52% at one and three months, respectively. Factors associated with decreased survival included current smoking and absence of subspecialty care by a rhinologist in surgical debridement (HR= 3.03). ANC values, beta-glucan levels, and disease extension were not found to be associated with difference in prognosis.

Conclusion:
Subspecialty level of care likely improves overall survival in these patients, whereas current smoking may imply a worse prognosis.

Poster # 007

A semitransparent 3D-printed paranasal sinus model: A novel tool for studying medication and irrigation delivery

Ari Stone, BS
Michael Bartellas, MD, MSc
Jack Byrne
Krista Brackman
Kristen Murdoch, DNP, FNP-BC
Sammy Khalili, MD, MSc, FRCSC

Background:
Large-volume nasal saline irrigations are frequently used in sinonasal disease. However, despite the abundance of irrigation systems available on the market, little data exists comparing their anatomic delivery of irrigant. The purpose of this study was to determine the feasibility of using a novel three-dimensional (3D) printed model to assess irrigation delivery to the paranasal sinuses.

Methods:
A 3D model of a complete paranasal sinus system was created from a de-identified normal patient CT scan using Meshmixer, 3D Slicer, and Cura software. It was then printed using semitransparent polylactic acid and polyvinyl alcohol as a dissolving agent. The model was used to compare the ability of several irrigation devices to reach each of the paranasal sinuses with dyed normal saline. Each delivery was recorded and reviewed at multiple angles by a three-person panel.

Results:
A realistic 3D model of the nasal cavity and paranasal sinuses was successfully printed, with clear visualization of its internal components and partitions. Saline was shown to be delivered to multiple paranasal sinuses. However, depending on the device, not all sinuses were reached equally. Delivery also varied based on head position, regardless of device.

Conclusion:
This represents one of the first semitransparent 3D-printed models of the nasal cavities and paranasal sinuses to be described as a tool for understanding medication and irrigation delivery. This study shows that this is a promising model in assessing the true distribution of irrigation. Additionally, it offers many advantages over cadaver models, including: relative affordability, supply, and infinite customization." University of Wisconsin School of Medicine and Public Health.

Poster #008

A single surgeon experience with nasal defect reconstruction using the melolabial flap

Fergal Cadden, MBBS, Dr
Daniela Bondin, Miss
Timothy Woolford, Prof
Manchester Royal Infirmary

Objectives:
The Melolabial flap is regarded as one of the work horse flaps for nasal reconstruction. It is commonly used in reconstructing nasal defects in the subunits of the ala, soft tissue triangle and columella. We aim to review the senior authors experience with using Melolabial flaps and review the current literature regarding its use.

Methods:
A retrospective review of the senior authors case series on using Melolabial flaps for nasal reconstruction. A review of the literature using MEDLINE was also carried out. Key words: Melolabial flap, nasal reconstruction, Mohs, facial flaps.

Results:
40 cases of nasal reconstruction using Melolabial flaps were performed. The following subunits were reconstructed: 31 alar margin, 8 tip, 13 soft triangle, 7 lateral side wall, 1 columella. There were no instances of flap failure and no post op infections or haematoma. 3 minor post-op complications were noted. 3 cases required a third procedure to refine the flap. There were 10 full thickness defect repairs. The remaining 30 defects were partial thickness defects.

Conclusion:
In conclusion, the Melolabial flap proves to be a reliable flap. Given the low rate of complications, it is proven to be a safe option for nasal reconstruction. The cases discussed above and our review on the literature reflects this. The advantages are, the avoidance of performing a larger procedure e.g. paramedian forehead flap, patients have shorter operating times and the flap is less cumbersome. Disadvantages include, less reliable vascularity compared to the forehead flap, and a more visible scar in patients with less pronounced Melolabial creases.

Poster #009

A traumatic cerebrocyst presenting as severe pneumocephalus, secondary to chronic intranasal cocaine abuse with an anterior skull base defect in the setting of acute trauma

Daniel Spielman, MD
Apoorva Ramaswamy, MD
Aaron Pearlman, MD

Introduction:
Pneumocephalus is a common sign of skull base damage. We present a case of massive pneumocephalus secondary to a traumatic CSF leak in the setting of hydrocephalus ex vacuo. Initial imaging was suspicious for a small skull base defect. However, long term cocaine use and prior trauma resulted in an extensive segment of poor quality skull base bone that was only fully appreciated intraoperatively. This case highlights the importance of preparedness for multiple reconstructive options in a patient with risk factors for a large skull base defect.

Methods:
Case Report.

Results:
A 57 year old male with a history of intranasal cocaine use and prior frontal sinus trauma presented after a fall down stairs. CT revealed frontal lobe encephalomalacia and a large area of pneumocephalus. The overlying frontal bone had evidence of a long standing fracture. A scan from the prior year demonstrated that the site of pneumocephalus was the result of drained CSF from a cystic lesion that developed secondary to ex vacuo dilation in response to encephalomalacia.
The patient was taken to the OR with the neurosurgical service. A 2.0 x 2.5 cm skull base defect was noted with very thinned bone. The defect was repaired with an overlay graft using abdominal fat, DuraGen, and a nasal septal flap. Bone was harvested from the nasal septum to bolster the reconstruction. Postoperatively his pneumocephalus resolved and he was discharged to a nursing facility for rehabilitation of his traumatic brain injury.

Conclusion:
The vasoconstrictive effects of cocaine coupled with head trauma can lead to significant skull base compromise. This case highlights the importance of preparation for repair of large skull base defects in this setting.

Poster #010

Abducens Nerve Palsy in the setting of sphenoid sinusitis and clival metastasis

Lauren Luk, MD,Associate
SCPMG

Abducens palsy is a documented complication of both sphenoid sinusitis as well as rare clival metastases. We present a case report of an immunosuppressed 47 year old man with history of malignant melanoma treated with Opdivo/Yervoy who presented with severe headache, fevers, neck pain and diplopia. On exam, he was found to have a right abducens palsy. CT and MR imaging revealed bilateral sphenoid sinusitis with more severe disease on the contralateral side as well as a moth-eaten appearance of the clivus. Initially, sinus surgery was performed to rule out invasive fungal sinusitis but clival biopsies revealed metastatic melanoma. He was treated with palliative radiation therapy to the clivus to 3000 cGy in 300 fractions. Though the patient's diplopia and other symptoms resolved after sinus surgery and radiation, the patient eventually succumbed to his disease 4 months later. The prognosis of patients with clival metastases with an associated cranial nerve palsy is very poor with an average survival of only 5 months.

Poster #011

Acute bacterial rhinosinusitis treatment

Mark Gelpi, MD
Claudia Cabrera
Kenneth Rodriguez, Assistant Professor
Brian D'Anza, MD
Nicole Maronian
University Hospitals Cleveland Medical Center/Case Western Reserve School of Medicine

Background:
The economic burden of acute bacterial rhinosinusitis (ABRS) morbidity is significant, estimated at approximately $3 billion per year. A clinical care pathway (CCP) was implemented to address this. This was based on the 2015 American Academy of Otolaryngology–Head and Neck Surgery (AAO-HNS) guideline for the diagnosis/treatment of ABRS. The purpose of this study is to evaluate if adherence to AAO-HNS guidelines reduces the use of sinus imaging and antibiotics and lessens the economic burden of ABRS.

Methods:
We performed a retrospective case series of patients before (Nov 2016-Oct 2017) and after clinical care pathway was implemented (Nov 2017-Oct 2018); we evaluated the diagnostic and treatment selections including CT scans ordered, antibiotics selected and diagnoses provided. Our primary endpoints were determining the rate of adherence to the guidelines, including utilization of recommended first line antibiotics and appropriate imaging selection when indicated.

Results:
During the study period, 64,817 patients were diagnosed with ABRS, and of those our CCP affected 30,070 patients. Prior to CCP implementation, 62%of antibiotics prescribed were considered first-line medical therapy by AAO-HNS guidelines and 1% of patients had sinus imaging. After CCP implementation, 65% of the antibiotics prescribed were first-line therapy and sinus imaging was <1%.

Conclusions.
Passive implementation of care pathways are insufficient/ineffective. Directed and active education is key to get the pathways across different specialties in order to observe a larger change. Even though we observed a trend towards improvement, further data is needed to assess the economic impact.

Poster #012

Acute invasive fungal rhinosinusitis: Factors contributing to improved survival

Jaimin Patel, MD,Dr.
Young Jae Byun, Mr.
Shaun Nguyen, Dr.
Rodney Schlosser, MD

Background:
Acute invasive fungal sinusitis (AIFS) is an aggressive and potentially fatal infection most commonly affecting immunocompromised patients, such as hematologic malignancies (HM), diabetes mellitus (DM) and transplant recipients. Our goal was to determine if patient survival was associated with changes in the prevalence of these immunocompromised conditions, altered pathogenic fungi, improved anti-fungal medications or variations in surgical treatment. Methods: A literature search for AIFS was performed and outcomes from 1986-2016 were collected. Studies were divided into pre- and post-2010 groups. Patient factors were collected and compared between groups. Results: A total of 26 studies with 786 patients were included. Post-2010 group demonstrated improved survival rate compared to pre-2010 (64 v 52%, p = 0.001). Demographics and extent of disease did not change over time. Statistically significant temporal changes included an increase in DM and decreases in HM and transplant. The proportion of Aspergillus decreased, while Rhizopus and Mucor increased. Treatment with posaconazole, voriconazole, isavuconazole, and orbital exenteration increased. Factors associated with improved survival were Rhizopus (survival rate 84%) vs Mucor (59%, p=0.02) or Aspergillus (67%, p=0.09). Treatment with posaconazole was favorable (survival rate 87%) vs amphotericin B (64%, p=0.03) and voriconazole (67%, p=0.10). While DM had improved survival compared to HM (63% vs 57%) this did not reach statistical significance (p=0.23).Conclusion: Post-2010 AIFS survival has improved, but the precise reason remains elusive. Changes in underlying immune state, pathogenic fungi and treatment approaches have all occurred and may play a role.

Poster #013

Administrative burden of prior authorizations for computed tomography of the paranasal sinuses ordered by the otolaryngologist

Thomas Higgins, MD, MSPH, Assistant Professor
Shawn Jones, Jr., Medical Student
Kenneth Kennedy, MD, Resident
Kevin Potts, MD, Associate Professor
University of Louisville

Background:
Prior authorizations are used by payers to limit unnecessary tests, yet provider administrative work associated with these requirements causes significant cost and stress. The aims of this study were to analyze the denial rates of prior authorization for computed tomography (CT) of the paranasal sinuses ordered by the otolaryngologist and to analyze the administrative burden required by staff and the physician in obtaining prior authorization.

Methods:
Clinical administrative records were reviewed of consecutive patients for whom a CT scan of the paranasal sinuses was ordered. Insurance carrier and type, CT scan facility, and administrative times for requesting prior authorization, including staff and physician times, were assessed. The nonparametric Kruskal-Wallis test was used to compare median work times among variables.

Results:
Records were reviewed of 206 unique CT scans of the paranasal sinuses involving 36 different payers with a mix of commercial carriers, Medicare, and Medicaid. 47.1% of the tests required prior authorizations. Two peer-to-peer discussions were requested. All of the test requests were approved. The median administration time for obtaining prior authorization was 4 minutes per request [N = 97, IQR 3-5] and was not significantly different than the median time required to determine if prior authorization would even be necessary in those not requiring authorization [4 minutes, N=43, IQR 3-5, p=0.226].

Conclusion:
The current process of prior authorization for CT scans of the paranasal sinuses causes unnecessary administrative burden and workflow disruptions to the otolaryngologist. Streamlined processes should be developed that lessen administrative burden.

Poster #014

Analysis of practice trends in office nasal endoscopy based on Medicare provider utilization and payment data

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Background:
Nasal endoscopy is important extension of the physical exam in the field of rhinology and skull base surgery. There are anecdotal reports of changes in the provider mix performing this procedure, both in training and in specialty. In order to better understand the landscape for this office procedure, we studied the volume of nasal endoscopy, training, specialty, geography, and reimbursement characteristics of providers performing nasal endoscopy.

Methods:
We reviewed the Medicare Provider Utilization and Payment Data Public Use Files for 2014 to 2016 for individual providers with claims for nasal endoscopy. We extracted provider specialty, training, volume of services, geography, and both raw and standardized reimbursement rates normalized to geography.

Results:
The total number of providers captured by the database increased each year, as did the total volume of services rendered. Providers with an MD provided the vast majority of the services, with the proportion dropping minimally from 88.6% in 2014 to 87.3% in 2016. Although growing in volume, PA/NP credentialed providers made up only 5% of the provider mix in 2016. While an analysis of raw reimbursement rates appears to indicate that allergy medicine is reimbursed at a higher rate per procedure than otolaryngology ($175 versus $160 respectively), this difference vanishes when examining standardized reimbursement rates, indicating a difference in the geographic distribution of this procedure by these specialties.

Conclusion:
While the landscape continues to evolve, otolaryngologists with an MD currently dominate the market for nasal endoscopy.

Poster #015

Anesthesiologist opinions on inhalational anesthesia and total intravenous anesthesia for endoscopic sinus surgery

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Veronica Lao
Sam Schechtman
Douglas Colquhoun
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Background:
Inhalational anesthesia (IA) and total intravenous anesthesia (TIVA) are both used by anesthesiologists for endoscopic sinus surgeries (ESS). There is growing evidence that TIVA may result in decreased bleeding and improved surgical fields, yet it is used in a minority of sinus surgery cases. The objective of this study was to investigate perceptions of anesthetic techniques in ESS.

Methods:
A total of 719 anesthesiology residents, faculty, and certified registered nurse anesthetists (CRNAs) at three academic institutions in the United States were provided an original survey via email regarding use of IA and TIVA for ESS. We described overall practice and training patterns.

Results:
Responses were received from 200 participants (28%). 65% of respondents were not familiar with current literature on TIVA for ESS. Many were comfortable with performing TIVA but stated they would participate in additional training.

Conclusion:
Given the complexities of ESS, anesthesiology training programs would benefit from further education and training specific to ESS. Surgeons have a responsibility to understand the literature and have a collegial dialogue with their anesthesiologist colleagues.

Poster #016

Assessing public interest in nasal and sinus surgery: A five-year analysis

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Objective:
Online sources are an important source of information for patients considering nasal and sinus surgical procedures. Analysis of online search trends can be an important way of assessing public interest and information needs.
Study Design: A five-year analysis of internet searches for common Rhinologic surgical procedures was conducted using the Google Trends analysis tools.

Methods:
Internet search activity from 2014-2018 was extracted for the terms “sinus surgery,” “balloon sinuplasty,” “septoplasty,” and “turbinate reduction.” Related search topics, geographic trends, and changes in search density over time were assessed.

Results:
The most commonly searched topics were sinus surgery and septoplasty. The most common related searches focus on information about surgery and associated recovery. Search density for sinus surgery, septoplasty, and turbinate reduction has increased over a five-year period (15.7%, 21.8%, 23.3%, respectively), whereas it has remained stable for balloon sinuplasty (-0.72%). For sinus surgery and balloon sinuplasty, Southern states had the highest search density. Geographic search density for septoplasty and turbinate reduction was spread broadly.

Conclusion:
Internet search activity for sinus surgery, septoplasty, and turbinate reduction has increased over a five-year period, while searches for balloon sinuplasty have remained stable. Most searches focus on information about surgery and recovery after surgery. Cost was also a commonly searched topic for those searching balloon sinuplasty. Understanding these trends can help gauge overall interest in Rhinologic procedures. It is also helpful in directing future online content development to help meet patients’ information needs.

Poster #017

Assessment of internal nasal valve using anatomically-accurate 3D airway models

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Objective:
The internal nasal valve (INV) is delineated by the plane including the head of the inferior turbinate (IT), upper lateral cartilage (ULC), and nasal septum, and is by definition the narrowest point within the nasal airway. The optimal method for analysis of the INV on computed tomography (CT) imaging has not been established. The objective of this study was to use anatomically-accurate 3D airway models developed from high-resolution CT scans of adults with healthy nasal airways in order to identify the most accurate plane for assessing the cross-sectional area and angle of the INV.

Methods:
Axial CT images of the paranasal sinuses were used to create digital nasal airway models for twenty adult subjects with healthy nasal airways (50% female, 50% age ≥ 50). The healthy airway criteria was excluding the population with pathological symptoms such as sinonasal opacification/mass, trauma, septal perforation, evidence of prior surgery, presence of foreign body, and Lund-Mackay>3. A primary cutting plane was defined in the coronal axis that passed through the edge of the nasal bone, ULC, and the head of the IT. The primary coronal cutting plane was then rotated in 5-degree increments, ensuring the anatomic criteria for the INV were still met. The cutting plane resulting in the minimum INV area was identified.

Results:
The angle between the optimal cutting plane and nasal dorsum resulting in the minimum INV area, equal to 200.91±53.23 mm2, was 71.39±7.37° (n=20). The corresponding nasal valve angle at this location was 10.32±5.19°.
Conclusions: Employing a novel method, we used 3D anatomical airway models to establish an optimal coronal plane for INV analysis.

Key Words:
Computed Tomography, Internal Nasal Valve

Poster #018

Association between smell dysfunction and nutritional eating

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Introduction:
Studies suggest a relationship between anosmia and decreased nutrition. This study aimed to characterize the association between objective olfactory dysfunction and dietary quality in adults aged 40 to 80, using objective smell data from the NHANES database and the Healthy Eating Index (HEI).

Methods:
Participants were designated as anosmic or not, based on the results of a Pocket Sniff Test (score ≤ 3). The HEI 2015 scoring criteria was used to assess how well each patient's diet follows the U.S. Dietary Guidelines for Americans on a 100 point scale. The NHANES two day dietary recall data was used to generate the HEI scores. Patients were then categorized as above or below the average U.S. HEI score, which was 59 for 2013-2014. Comorbidity, demographic, and socioeconomic variables were included in multivariate logistic regression models to account for the complex, multistage probability sampling design of NHANES.

Results:
1,374 subjects were included in the weighted analysis dataset, 44 were anosmic and 1330 were not. The anosmic group tended to be older (69.5±11.1 vs 59.4±11.2 years, p=<0.001) and to have fewer smokers (22.7% vs 38.2%, p=0.037). Both groups were similar in terms of alcohol usage (27.3% vs 26.8%, p=0.94) and history of persistent flu in the past year (4.5% vs 7.6%, p=0.45). A multivariate logistic regression model using the previously listed factors demonstrated that anosmia decreases the odds of having a higher HEI score (OR = 0.813 [0.67, 0.98], P = 0.06).

Conclusions:
In a representative sample of U.S. adults aged 40 to 80 that has been adjusted for comorbid, demographic, and socioeconomic variables, anosmia can contribute to a poorer status of nutrition.

Poster #019

Average nasal cartilage framework thickness estimation for reconstructive purposes- A cadaveric study

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Introduction:
Nasal reconstruction is a complex process that requires precise analysis and reconstitution of the missing layers and subunits, or the structural defect in cases of revision or reconstructive rhinoplasty. Several principles have to be followed to achieve sound functional and aesthetic outcomes; including the nasal subunit principle, reconstruction ladder (less to more complex) (weber and wang), the '10 commandments' of Gillies and Millard, and availability of healthy adjacent tissues. Considering that the concept of restoring three main layers is of paramount importance for achieving a nasal 3D-structured construct with satisfactory results. Other factors including the defect characters regards site, size, depth and relation to a free margin.

Aim of work:
Evaluate the variations of the thickness of the different regions of the cartilaginous framework the nasal septum , ulc, llc .

Materials and methods:
This study was performed on 16 heads, An external approach was used to harvest different cartilaginous components. Zoning of the cartilages was done for measurement. A digital caliper was used to assess the thickness of the cartilage.

Results & conclusion:
The harvestable part of the nasal septum was of average thickness of 1.23-1.29 mm , with a range of 0.8-1.8 mm with SD of 0.33933
One way anova testing of the 9 zones marked was 0.555733564 which is insignificant.
The range of ulc thickness i the 3 zones used was 0.1-0.7 mm and the range of llc in the 3 zones used was 0.2-0.7 mm.
One way anova testing of the varaibility of the cartilage thickness in ulc zones was 0.45268979 which is insignificant.
One way anova testing of the zones of the llc was 0.172618707 which is insignificant."

Poster #020

Balloon dilatation for the management of pyriform aperture stenosis: A case report

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Objectives:
We describe the use of balloon dilatation as conservative management in different types of Congenital Nasal Stenosis including Congenital Nasal Pyriform Aperture Stenosis (CNPAS), Mid-nasal stenosis, and Choanal Atresia (CA).

Study design:
Case series involving 4 patients.

Methods:
A retrospective review of patients who underwent repair of CNPAS/CA using dilation with high-pressure, non-compliant airway balloons between January 2018 and January 2019 was performed.
Results: 2 patients underwent balloon dilation repair alone for CNPAS, and 2 patients underwent balloon dilations as an adjunct to surgery for CA. 4 patients presented, with a mean age of 1.8 months. The average number of total procedures was 4 per patient, with an average of 2.6 balloon dilatations. There were no complications stemming from balloon dilatation. Follow-up ranged from 10 days to 5 months. All patients demonstrated nasal patency on last follow-up.

Conclusion:
Balloon dilatation can be used as a minimally invasive method of repair of CNPAS or as an adjunct to surgery for CA.

Poster #021

Cadaveric study of unilateral nasal saline irrigation after surgery with and without posterior septectomy

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Introduction:
Nasal saline irrigation (NSI) is strongly recommended for chronic rhinosinusitis based on grade A evidence. NSI has also become a popular means of delivering topical therapies after surgery. The delivery of NSI to the paranasal sinuses has been studied using endoscopic analysis in cadavers and computational fluid dynamics models. None of these studies have looked at the penetration of irrigant into the contralateral sinuses when irrigating only one side. The aim of this cadaver study is to analyze the ability of NSI to penetrate the contralateral sinuses after complete functional endoscopic sinus surgery (FESS) with and without posterior septectomy.

Methods:
A total of 9 cadaver heads were studies. Bilateral maxillary, total ethmoid, sphenoid and frontal sinus surgery was performed on all cadaver heads. Five were performed without a posterior septectomy (woS) and 4 with (wS). Each head was then irrigated on only one side using artificial coloring with the head angled at both 45 and 90 degrees. Each sinus cavity was visualized after irrigation to evaluate for presence of dye.

Results:
All cadavers wS had penetration into the contralateral maxillary, ethmoid, and sphenoid sinuses when positioned at 90 degrees. At 45 degrees, all but one cadaver had penetration into the contralateral sinuses. None of the cadavers woS had penetration into the contralateral ethmoid sinus at 45 degrees but there was at 90 degrees in one head.

Conclusion:
This study has shown that NSI has very little penetration to the opposite side unless a posterior septectomy has been performed. This information may allow us to design future studies where patients can serve as their own controls when evaluating various topical therapies.

Poster #022

Case report of a pleomorphic adenoma of the nasal septum

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Introduction:
Pleomorphic adenomas are common benign tumors, typically of major salivary glands. Rarely, they can occur in minor salivary glands throughout the upper respiratory tract, including the nasal cavity, nasopharynx, hard palate, soft palate, oropharynx, hypopharynx, and larynx.

Methods:
Case report and literature review.

Results:
We present an unusual case of a 31-year-old female who presented with a nasal mass with symptoms of nasal obstruction, headache, and epistaxis. Endoscopy revealed a fleshy nasal mass and computed tomography showed a 24 mm x 19 mm x 25 mm mass of the right nasal cavity with remodeling of bone. The mass was removed endoscopically and found to be attached to the septum. Pathology and immunohistochemistry demonstrated that this lesion was a pleomorphic adenoma. This tumor followed a similar pattern and presentation as the 26 other reported nasal septal pleomorphic adenomas found in the literature.

Conclusion:
We suggest that pleomorphic adenoma be included in the differential diagnosis of a benign appearing nasal mass and should continue to be followed after resection due to risk of recurrence and malignant transformation.

Poster #023

Case report: An unusual cause of eustachian tube dysfunction: Nasopharyngeal oncocytic cysts

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Introduction:
Nasopharyngeal oncocytic lesions are a rare, poorly studied spectrum of lesions that represent a reactive or hyperplastic response to chronic inflammation like smoking, or aging, by oncocytes. They differ by location, origin, and presence of cystic or inflammatory components. Though often asymptomatic and benign, larger lesions can result in significant symptoms.

Methods:
We report a case of a 67 year old male with 57 pack year history of smoking presenting with one year of left sided hearing loss and aural fullness. Examination demonstrated persistent serous middle effusion. Audiological evaluation demonstrated primarily sensorineural hearing loss with negative middle ear pressure and type C tympanogram bilaterally. Nasopharyngoscopy demonstrated irregular, lobular, submucosal enlargement of bilateral tori tubarius. CT demonstrated no discrete nasopharyngeal masses; MRI with contrast showed cystic lesions within the bilateral tori tubarius. Histological assessment demonstrated retention cyst of minor salivary gland with cyst lining showing papillary projections lined by oncocytic cells.

Results:
Given the lesion's diffuse involvement of the torus tubarius and eustachian tube orifice, surgical excision would result in scarring and worsened eustachian tube dysfunction. To manage the patient's symptoms, myringotomy with pressure equalizing tube was offered, and he was counseled on tobacco cessation and serial nasopharyngoscopy.

Conclusion:
The large oncocytic cysts demonstrated in this case represent an unusual cause of eustachian tube obstruction and chronic otitis media with effusion. Oncocytic cysts should be in the differential diagnosis for nasopharyngeal masses causing eustachian tube dysfunction.

Poster #024

Case report: Complete occlusion of the contralateral cavernous carotid artery due to extrinsic compression of the lateral sphenoid wall, in the setting of a symptomatic pseudoaneurysm.

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Rabih Tawk, Dr.

Background:
Carotid pseudoaneurysm is a rare complication of pituitary surgery and can present with epistaxis. Nasal packing is considered first line treatment for the immediate control of carotid bleeding. We describe a case of complete occlusion of the contralateral cavernous carotid artery due to nasal packing placed to control hemorrhage from a cavernous carotid pseudoaneurysm.

Case Report:
A 55 year-old man presented with a history of recurrent epistaxis requiring multiple emergency room visits and nasal packing over a 9-month period. Nasal endoscopies failed to show a source of bleeding therefore the patient underwent bilateral sphenopalatine artery ligations. Postoperative CT angiogram showed no evidence of extravasation or aneurysm, but did report indistinctness of the lateral walls of the sphenoid sinus. Symptoms remained controlled for 4 months, but ultimately, he presented to the ER with massive epistaxis. A magnetic resonance angiogram noted a 2-3mm left cavernous carotid pseudoaneurysm and the patient underwent embolization of bilateral internal maxillary arteries. Epistaxis was noted immediately afterwards and he was taken to the OR for control of hemorrhage. A 4cm bioabsorbable nasal packing was placed in the sphenoid cavity after noting profuse bleeding from the left sphenoid sinus. After control of bleeding, cerebral angiogram showed complete occlusion of bilateral internal carotid arteries (ICA). The packing was readjusted and right ICA profusion improved.

Conclusion:
To our knowledge, this is the only report that describes complete occlusion of the contralateral cavernous carotid artery due to extrinsic compression of the lateral sphenoid wall, in the setting of a symptomatic pseudoaneurysm.

Poster #025

CBD as a potential post-operative pain treatment; Patient interest in CBD post-operative pain therapies in otolaryngology

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Wmc

Opiate addiction is a nationwide crisis, as painkillers are overprescribed, and misuse becomes prevalent. Recently, cannabidoil, or CBD, has been studied for its nociceptive and anti-inflammatory properties. To test the interest for a CBD pain treatment study at Weill Cornell Medical College/New York-Presbyterian Hospital, 29 pre-operative patients in the Otolaryngology department completed a survey in regard to CBD and opiates. The survey asked patients about their likelihood to take CBD post-op, opiates post-op, and a combination of the two. The results from this survey show that patients are either very likely or somewhat likely to take CBD as a pain treatment. 55% (16) patients responded that they were likely or somewhat likely, 17% (5) were neutral, and 27% (8) were somewhat unlikely or very unlikely. The results also show that patients are less likely or neutral towards taking opiates for their post-op pain treatment. 27% (8) responders said they were very likely or somewhat likely, 24% (7) were neutral, and 48% (14) were somewhat unlikely or very unlikely. In regard to a combination of opiates and CBD, 31% (9) patients responded very likely or somewhat unlikely, 38% (11) were neutral, and 31% (9) were somewhat unlikely or very unlikely. In addition, patients aged 65 or less were more likely to take CBD or a CBD/opioid combination post-op than patients aged 65+. The results indicate that a study designed to test the efficacy of CBD solely as a post-operative pain treatment and in combination with opiates is reasonable. Overall, patients showed interest in CBD as a substitution for opioids, suggesting that a future study could lead to further research about the role of CBD in acute pain.

Poster #026

Challenging the need for opioids in management of post-operative pain after functional endoscopic sinus surgery

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Introduction:
Pain and analgesic requirements after functional endoscopic sinus surgery (FESS) vary widely. Our initial study quantified pain after routine FESS and determined the most commonly used pain management regimen. This adjunct study provides more data to investigate pain levels and analgesic requirements after FESS.

Methods:
Retrospective chart review of 99 patients who underwent FESS from Oct 2017 to May 2019 at a single tertiary care facility. Patients completed a daily pain diary up to 7 post-op days (POD). Primary outcome measures were reported pain levels using a visual analog scale (range 0-10) before and after analgesic use. Patients were categorized into no pain (0), mild (1-3), moderate (4-7), or severe (8-10) based on POD1 pain scores.

Results:
Sixty-eight patients were included. Median POD1 pain level was 4, with the following distribution: no pain (13), mild (17), moderate (33), and severe (5). Mean POD1 pain score was 1.8 for those who used opioids (n=38), 3.16 for non-opioids (n=28), 5.42 for a combination of both (n=7), and 1.6 for no pain meds used (n=19). Mean number of days analgesics were used within the first post-op week was 2.6. On POD0 and 1, 15% and 29% of patients used no pain meds respectively. Age, gender, smoking, sinus involved, nasal polyps, concomitant septoplasty/turbinectomy and use of preop steroids were not significantly associated with POD1 pain intensity.

Conclusion:
Pain after FESS is mild to moderate, and pain scores are inconsistent with opioid, non-opioid, or no analgesic use. Our findings suggest opioid use is often unnecessary after FESS, and its use may be attributable to reasons other than perceived pain level, such as fear of pain or anticipated difficulty sleeping.

Poster #027

Characteristics of patients enrolled in two identical trials of Omalizumab in chronic rhinosinusitis with nasal polyps

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Background:
Chronic rhinosinusitis with nasal polyps (CRSwNP) can frequently prove refractory despite recommended initial therapies. Omalizumab (OMA), an IgE monoclonal antibody, reduced nasal polyp scores (NPS) in clinical trials and real-life studies of CRSwNP. We describe baseline patient (pt) characteristics from 2 identical Phase 3 trials of OMA (POLYP 1 [NCT03280550], POLYP 2 [NCT03280537]) to address an unmet need in CRSwNP patients with significant QOL burden.

Methods:
Two randomized, double-blind, placebo-controlled trials (24-week treatment) of CRSwNP pts inadequately controlled despite daily high-dose intranasal corticosteroids (ICS). Randomized pts received OMA or placebo and continued background mometasone therapy. Coprimary endpoints: change from baseline at Week 24 in mean NPS and nasal congestion score (NCS). Numerous secondary endpoints were also evaluated.

Results:
Pts (mean age 50.1–51.0 years; male 64–65%) from POLYP 1 (n=138) and POLYP 2 (n=127) had significant nasal polyps/symptoms (mean [SD] NPS 6.2[1.0]–6.3[0.9]; NCS 2.3[0.7]–2.4[0.6]; Sino-Nasal Outcome Test-22 score 59.5[19.3]–60.1[17.7]; University of Pennsylvania Smell Identification Test 13.0[7.4]–13.3[7.7]), consistent with CRSwNP-related QOL impairment. Many pts had chronic disease (>5 years, 66–69%; >10 years, 44–48%) and had undergone ≥1 sinonasal surgery (57–62%). Comorbid conditions included a history of asthma (60–62%; ongoing with treatment in 87–92%), allergic rhinitis (43–44%; ongoing with treatment in 62–67%), and aspirin sensitivity (20–35%).

Conclusions:
Two Phase 3 trials of OMA enrolled pts with severe CRSwNP and various comorbidities, significant QOL burden and impaired control despite high-dose ICS therapy ± previous surgeries.

Poster #028

Characterization of WTC relief workers with post-exposure chronic rhinosinusitis

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Introduction:
The World Trade Center (WTC) collapse on September 11, 2001 (9/11) resulted in a production of a dust cloud containing environmental irritants that cause exposure-related disease to the upper airway, including sinonasal mucosa. This study further characterizes exposure factors and other medical comorbidities in WTC workers who developed chronic rhinosinusitis (CRS) after 9/11.

Methods:
Retrospective review of patients enrolled in the WTC Health Program and treated by physicians in the Mount Sinai Department of Otolaryngology through June 2018. Patients who developed CRS at any point after the WTC collapse were included. Data reviewed included demographics, site exposure details, and the development of additional chronic sinopulmonary conditions.

Results:
There were 2,145 WTC responders with newly developed CRS in our cohort. Average time between exposure and diagnosis of CRS was 5.9 years. The majority patients worked in protective services (44%) or construction (26%). Average amount of time spent working onsite was 1,028.5 hours. During the first week after the attacks, 52% reported wearing a disposable surgical/dust mask, 22% wore a half-face respirator, and 22% did not wear a mask. Common exposures included dust (96%), smoke (90%), and diesel exhaust (77%). Common newly developed sinopulmonary comorbidities were rhinitis (92%), GERD (84%), sleep apnea (64%), and asthma (54%).

Conclusions:
Development of CRS in WTC recovery workers occurred over several years. Comorbid development of rhinitis and GERD was common. Occupation and onsite mask usage were variable amongst this cohort; regardless, the vast majority reported significant exposure to dust, smoke, and diesel exhaust.

Poster #029

Chemotherapy, radiation or resection? The use of neoadjuvant radiochemotherapy to treat sinonasal teratocarcinosarcoma

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Sinonasal teratocarcinosarcoma (SNTCS) is a rare, aggressive sinonasal neoplasm with characteristics of both teratoma and carcinosarcoma. Previous treatment attempts of patients with SNTCS have failed, with a high rate of recurrence even after total resection, radiation, and chemotherapy, alone or in combination. Almost half of reported cases died of tumor within 3 years of diagnosis, despite aggressive therapy. This tumor is particularly difficult to treat because SNTCS has the ability to rapidly spread intracranially causing some tumors to be deemed inoperable. Although there is not a set treatment regimen for SNTCS, most patients who survived for more than one year had combined surgery and adjuvant therapies.

In 2015, neoadjuvant chemotherapy was trialed to treat SNTCS in patients with originally inoperable tumors. The addition of neoadjuvant chemotherapy allowed for complete resection in these patients. This is a report of a 23-year-old male who presented with epistaxis and nasal obstruction found to have a rapidly progressive SNTCS with intracranial and periorbital extension. Our patient required dual approached using bifrontal craniotomy and endoscopic resection. Finally he received adjuvant fractionated radiotherapy and cisplatin.

Poster #030

Chronic invasive fungal sinusitis due to scedosporium apiospermum causing orbital apex syndrome and mandibular neuropathy

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Introduction:
Chronic invasive fungal sinusitis (CIFS) is defined as fungal invasion of the sinonasal submucosa for greater than 12 weeks. Common causes are dematiaceous molds and Aspergillus species. Once considered a rare cause of opportunistic infection, Scedosporium apiospermum is increasingly found as a pathobiont in immunocompromised patients. Here we present the case of an immunocompetent patient with CIFS and resultant cranial neuropathies.

Case:
A 71-year-old immunocompetent male farmer presented with a 3-month history of facial and retro-orbital pain, diplopia, and cranial neuropathies. He initially presented to an outside facility with headache and was treated with broad spectrum antibiotics, oral steroids, and limited endoscopic sinus surgery. He improved initially but soon recurred, developed cranial neuropathies, and was transferred to our medical center. Exam revealed neuropathies of cranial nerves II, III, IV, and VI as well as V2. Imaging was significant for bony erosion and soft tissue fullness with enhancement of the left anterior cavernous sinus, supraorbital fissure, orbital apex, and pterygopalatine fossa.

The patient began broad-spectrum antimicrobials and underwent biopsy and debridement. Pathology demonstrated branching septate hyphae invading the submucosa with focal necrosis. Fungal cultures revealed S apiospermum and all other cultures were negative.

Discussion:
The final diagnosis was CIFS with multiple neuropathies due to S apiospermum infection. He was treated with systemic antifungals and made near-complete recovery at 6 weeks. The diagnostic and treatment dilemmas involved with this rare but emerging clinical entity will be discussed.

Poster #031

Chronic lymphocytic leukemia with orbital manifestations: A rare presentation of progressive disease

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CLL is the most common leukemia in western countries, responsible for 1.2% of all new cancer diagnosis in the US. CLL is a slowly progressive disease, typically affecting older adults. Diagnosis is typically made based on blood work, however, rare presentations of CLL have been described. For example, sinonasal and orbital symptoms have been described in otherwise asymptomatic patients, leading to a diagnosis, or a sign of progression in what was considered stable disease. We are presenting two cases presenting with orbital complaints. A 78 year old male with a history of CLL diagnosed in 2002. His CLL was managed with active surveillance through blood work performed every 6 months, with stable values. Over the course of 2 months, he developed diplopia and mild proptosis. A CT and MRI showed a right frontal sinus mucocele measuring 2.7 cm contacting the medial aspect of the right globe with mass effect causing mild proptosis. Pansinusitis was also noted. A biopsy of polypoid tissue from the middle meatus was performed showing CLL. He subsequently underwent ESS with final pathology showing CLL. At follow up he was noted to have resolution of diplopia, and is currently followed by Oncology. A 73 year old female with a history of CRS was evaluated for dacrocystitis and epiphora. She was diagnosed with CLL 15 years earlier, managed with IVIG for infection prophylaxis. A biopsy of the conjunctiva showed CLL. A CT was performed which showed pansinusitis. She underwent DCR and ESS. At follow up her symptoms had resolved. We described two cases of CLL, in active surveillance with no primary management of the disease for over 10 years. Suspicion should be high in patients with a history CLL with sinonasal or orbital complaints.

Poster #032

Clinical characteristics and patient-reported outcomes (PROs) among chronic rhinosinusitis with nasal polyps (CRSwNP) patients with a history of sinus surgery

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Introduction:
Patients with CRSwNP, a type 2 (T2) inflammatory disease, experience persistent symptoms including nasal congestion/obstruction (NC) and discharge, and decreased sense of smell. This real-world study describes clinical characteristics and PROs in patients with CRSwNP who had previously undergone sinus surgery.

Methods:
Medical records data were collected from a convenience sample of CRSwNP patients from 52 specialist physicians in the U.S. from Q4 2018 to Q1 2019. Cross-sectional PRO data were collected from a subgroup of patients using the Sinonasal Questionnaire (SNQ; sino-nasal symptom frequency), Sino-Nasal Outcome Test (SNOT-22; sino-nasal symptoms and impacts, 0–110 total score), EuroQoL Visual Analogue Scale (EQ-VAS; 0–100 point scale [worst–best imaginable health]), and Work Productivity and Activity Impairment (WPAI; 0%–100% impairment) in working patients.

Results:
181 patients with CRSwNP were identified (59.1% male; mean [sd] age 48.5 [±16.0] years) with most recent sinus surgery performed 2.9 (±4.5) years ago, and common T2 comorbidities: allergic rhinitis (72.4%), asthma (49.7%), and aspirin exacerbated respiratory disease (17.1%). In the subgroup of patients with PRO data, mean EQ-VAS score was 66.4 (±21.9; n=45), which is lower than EQ-VAS scores in the general population. Mean WPAI score was 31.9% (±25.5; n=26). Based on the individual items of the SNQ and SNOT-22 (n=45), 33.3% of patients reported daily symptoms of moderate-to-severe NC during the past week.

Conclusions:
CRSwNP patients with prior sinus surgery had high comorbidity burden, sub-optimal QoL, and work productivity impairment; some of these patients also experienced moderate-to-severe NC symptom burden.

POSTERS

Poster #033

Clinical characteristics, treatment patterns, and healthcare resource utilization (HCRU) in patients with chronic rhinosinusitis with nasal polyps (CRSwNP)

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Background:
CRSwNP patients experience high symptom burden and health-related quality of life impairment. This study assessed clinical characteristics and treatment patterns in CRSwNP patients and compared HCRU-related burden in patients with CRSwNP vs patients without CRS/NP.

Methods:
This retrospective analysis used UK Clinical Practice Research Datalink and Hospital Episode Statistics dataset (2007–2014). CRSwNP patients were identified using medical diagnosis codes for NP. First occurrence of NP code was the index date (ID). Patients had to have ≥1 year (yr) baseline and ≥1 yr follow-up (f/u) data for inclusion. A reference group of patients without CRS/NP was matched 1:1 to CRSwNP patients on age, gender, and physician practice site. Clinical characteristics of CRSwNP patients were reported at baseline. Treatment patterns were evaluated over 1-yr f/u. HCRU (physician office visits and inpatient visits) was compared between CRSwNP patients vs the matched reference group over 1-yr f/u.

Results:
Of 12,401 patients with CRSwNP (mean age 47.0 yrs; 60.6% male), 18.1% had a medical diagnosis of comorbid asthma during 1-yr baseline period. During 1-yr f/u, 62.0%, 16.3%, and 22.0% used nasal corticosteroids, systemic corticosteroids (SCS), and had sinus surgery, respectively. Annualized rates of all-cause physician visits and inpatient admissions were higher in CRSwNP patients vs reference group (7.01 vs 4.13; 0.71 vs 0.25, respectively; both $P<0.0001$).

Conclusions:
A high proportion of CRSwNP patients present to physician offices with severe disease as shown by SCS use or sinus surgery within a yr of CRSwNP diagnosis. Also, results show incremental HCRU-burden of patients with CRSwNP compared to patients without CRS/NP.

Poster #034

Clinical validation of an automated, deep learning-based protocol for quantitative sinus CT analysis

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Objective:
Computed tomography (CT) of the sinuses is critical for diagnosis of chronic rhinosinusitis (CRS). While CT is a sensitive instrument for detecting mucosal disease, automated methods to objectively quantify sinus opacification are lacking. We present a new technique of CT analysis using a deep learning-based algorithm. This technology produces volumetric segmentations that permit calculation of percent sinus opacification (%SO), as well as mean Hounsfield units (mHU) of opacities. Here, we present our efforts to clinically validate the algorithm.

Methods:
Subjects with CRS were retrospectively enrolled if they had the following: sinus CT images, perioperative serum eosinophil count, endoscopic Lund-Kennedy scores (LKS), and SinoNasal Outcomes Test-22 (SNOT-22). Demographic and clinical data were collected. CT scans were scored using the Lund-Mackay system (LMS). CT images were segmented by our algorithm, allowing for calculation of %SO and mHU of opacities. The readouts were then correlated with LMS and to disease parameters using Spearman's ρ.

Results:
41 subjects were enrolled. There was a strong correlation between %SO and LMS (ρ=0.82; 95% CI 0.68-0.90). Both %SO and LMS exhibited, weak to moderate correlations with LKS (ρ=0.34; 95% CI 0.04-0.59, and ρ=0.43; 95% CI 0.14-0.65, respectively), no correlation was seen between %SO or LMS and SNOT-22 score (ρ=-0.17; 95% CI -0.45-0.15, and ρ=-0.26; 95% CI -0.53-0.05, respectively). No correlation was seen between eosinophil counts and mHU (ρ=-0.14, 95% CI -0.43-0.18).

Conclusions:
Our algorithm is capable of objectively analyzing sinus CT images in a quantitative fashion. Future work will focus on expanding the validation to other clinical parameters.

Poster #035

Combined robotic transorbital and transnasal approach to the nasopharynx and anterior skull base: Feasibility study

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Robotic technology for accessing the anterior skull base holds tremendous potential, however its application in surgery of the paranasal sinuses and anterior skull base is still in an investigatory phase. The main obstacle is narrow funnel effect which can be avoided by choosing surgical portals that are adequately spaced apart.

Methods:
A cadaveric model was chosen to assess the feasibility of transorbital and transnasal approaches to the nasopharynx and anterior skull base. Feasibility was evaluated using a 1--10 Likert scale (10 being optimal) and standardised qualitative feedback.

Results:
Combined transorbital and transnasal approach allowed and adequate access to the anterior skull base and nasopharynx. The hypophysis was mobilized, exposing the suprasellar region. Optic nerve and carotid arteries were mobilised without causing obvious damage. The postero-lateral nasopharynx was removed with the cartilaginous tube, the peritubaric muscles (levator and tensor veli palatine), and the upper portion of the pterygoid muscles. Both procedures rated favourably in terms of procedural steps, haptics, ergonomics, equipment and visualisation.

Conclusions:
Combined robotic transorbital and transnasal approach to the nasopharynx is a first-in-cadaver study which demonstrated procedural, ergonomic and visual equivalence compared with existing systems. Using transorbital corridors to allowed sufficient range of movement.

Poster #036

Contour map point distribution and surgeon experience level affect accuracy of surgical navigation

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Background:
Reliable use of surgical navigation technology depends upon execution of the registration process. The gold standard technique is paired-point registration with bone-anchored fiducial markers, but contour-map registration is more practical. In practice, surgeons employ variable contour maps, and often less experienced team members perform this critical step. The impact of these practices on target registration error (TRE) is not well-studied.

Methods :
A dry lab navigation set-up consisting of a surgical navigation system (Fusion ENT, Medtronic, Jacksonville, FL) and a sinus phantom in which 2 mm radiopaque spheres were affixed in the sphenoid and ethmoid regions as targets, was developed. A CT (0.625 mm slice thickness) of the phantom was obtained. Registration was performed in accordance with the instructions for use. Accuracy was determined by using the software's distance measurement tool. Registration was performed using a narrow-field (NF; points medial to the mid-pupillary line) and wide field (WF; entire forehead) contour map. An experienced rhinologist and resident surgeon performed each registration in triplicate and then TRE at the sphenoid and ethmoid markers was measured in triplicate.

Results:
WF mapping had a lower TRE than NF mapping (1.58 vs. 1.04 mm, $p<0.01$). The experienced surgeon had a lower TRE compared to the resident surgeon (1.21 vs. 1.41 mm, $p<0.06$).

Conclusions:
In this navigation model, wide field mapping offers better accuracy than narrow-field mapping, and an experienced surgeon achieved better accuracy than a resident surgeon. This observation has clear implications for the use of this technology in the operating room.

POSTERS

Poster #037

Correlation between physician-assessed cosmetic changes with patient-assessed quality of life following orbital reconstruction

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Background:
There is a paucity of data on the association between patient-reported quality of life (QOL) and cosmetic changes following orbital reconstruction. This purpose of this study is to assess the correlation between physician-assessed cosmetic changes with patient-assessed changes in QOL.

Methods:
Patients with sinonasal and periorbital tumors with orbital involvement who required free flap reconstruction were included. Postoperative patient photographs were assessed by 21 otolaryngologists with a cosmetic survey. In addition, a QOL survey (QOLEX) was administered to patients evaluating appearance, anxiety, mood, and vision. Correlation between cosmetic and QOL scores was analyzed using Spearman correlation coefficient.

Results:
Nineteen patients were included in the study. Ten had undergone exenteration while nine had orbital preservation. Change in appearance (as per patient) was noted to correlate with change in shape of eyebrows (rho= 0.47, p=0.04), orbital rim (rho=0.56, p=0.01), extent of flap required (rho=0.54, p=0.03) and flap thickness (rho=0.57, p=0.02). However, color of the flap has no correlation with change in appearance as perceived by the patient. Additionally, both the mean (rho=0.63, p=0.004) and total cosmetic score (rho=0.6, p=0.006) had a strong correlation with change in appearance scores on QOL survey. Cosmetic changes did not correlate with patient-reported pain, vision and mood changes.

Conclusion:
In patients who underwent orbital reconstructive surgery, physician-assessed cosmetic changes correlate with patient-assessed change in appearance and increased anxiety levels but not with patient-reported pain, vision or mood changes.

Poster #038

Correlation of Interpupillary Distance (IPD) and width of nasal cavity

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Background:
Endonasal sinus and skull base surgery relies on adequate access and visualization of sinonasal anatomy. No external anatomical queues have been demonstrated to provide information about the likely narrowness of the nasal cavity which may impact surgery or the need for adjunct procedures. It would be reasonable to assume that a narrower distance between the eyes might predict narrowness of the nasal cavity.

Objective:
To determine if interpupillary distance can predict nasal cavity width.

Methods:
A retrospective chart review was conducted of computed tomography (CT) scans that were obtained for stroke over a one-year period. IPD was measured radiographically along with series of representative measurements of nasal cavity width including maximal piriform aperture diameter, maxillary line, distance between lamina papyrecea, insertions of inferior and middle turbinates, and width at the anterior and posterior ethmoid arteries.

Results:
444 patients treated for stroke between the above-mentioned times were identified; of these, 84 patients with adequate quality of imaging and no history of facial trauma or sinus surgery were randomly selected. Correlation of IPD and all nasal cavity measurements was seen (Pearson's correlation coefficient with significance $p<0.001$). The strongest correlations were widths at the anterior and posterior ethmoid arteries with coefficients of 0.722 and 0.558 respectively. Maximal width at the maxillary line had the next highest coefficient at 0.547 .

Conclusion:
There is a correlation with IPD to width of the nasal cavity. Further evaluation should be performed to determine if there is any correlation of sinus disease to these measurements.

Poster #039

Correlation with self-reported allergies and quality of life as determined by rhinosinusitis disability index in patients with sinonasal complaints

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Introduction:
Quality of life (QOL) tools like the Rhinosinusitis Disability Index (RSDI) are utilized as primary endpoints in clinical trials. How various factors may influence QOL tools is poorly understood. We have anecdotally noted that patients with high RSDI scores (low QOL) have higher numbers of self-reported allergies. These allergies frequently include multiple medications, food and other atypical allergens (i.e. snails, tape, fructose). The goal of this research project was to determine if the number of self-reported allergies was elevated in patients with poor QOL in an outpatient rhinology practice.

Methods:
This was an IRB approved, retrospective chart review including patients seen in clinic in the last 12 months. An unpaired t-test was used to compare mean RSDI subdomain scores between two cohorts; patients without any self-reported allergies and patients with >3 self-reported allergies.

Results:
A total of N=365 self-reported surveys were analyzed independent of patient diagnosis. In patients with >3 self-reported allergies, the physical subdomain mean RSDI scores were elevated to 12 from a baseline of 9 for patients with no self-reported allergies ($p = 0.0398$ with 95% CI) . The emotional and functional subdomains were without a statistically significant increase in mean RSDI score as self-reported allergies increased.

Conclusion:
These data suggest that patients with >3 self-reported allergies have worse reported QOL scores, particularly within physical symptoms. Self-reported allergies might be a factor that impacts reported sinonasal QOL, as determined by a RSDI score. Awareness of this relationship may be an important consideration in caring for patients with sinonasal concerns.

Poster #040

Cross reactivity in skin prick test results of members within Pooideae subfamily in the Middle Missouri population

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Background:
Molecular similarities of grass antigens has led to suspicions that cross-reactivity exists within members of the Pooideae sub-family, resulting in practices of only testing for the most representative member of Pooideae, Timothy grass [Phleum pretense], despite little literature to support the assumptions that Phleum is the representative member and in-vivo cross-reactivity.

Question:
Do patients with allergic rhinitis symptoms with positive skin prick test to Meadow fescue [Festuca pratensis] also have positive skin prick test to Phleum? Methods: This is a retrospective chart review using CPT code 95004 to find patients ≥12 years that underwent skin prick testing at a single tertiary institution between 03/2016-07/2018. Wheal production of ≥3mm than control was noted as a positive result. Results: 1239 patients had a positive test to Phleum or Festuca of 1587 reviewed. Of these, 342 (27.6%) had positive test for Phleum only, 479 (38.6%) had positive test for Festuca only, and 418 (33.7%) were positive to both. 55% of Phleum positive patients were positive to both. Only 46.6% of Festuca positive patients were positive for both.

Discussion:
Depending on prevalence of grass allergy, only 62 (95% CI 47-78) would be expected to have a “Festuca only” result. A much higher than expected 53.4% of positive Festuca patients were not sensitized to Phleum. If Festuca is not tested, it is possible that 38.6% of patients with grass allergy symptoms will not have their allergen identified.

Conclusion:
Cross-reactivity among Pooideae members may not be as complete is traditionally thought. Phleum pretense may not be the most representative sub-family member and other grasses may need to be included in skin prick testing.

POSTERS

Poster #041

Cross-sectional market analysis of innovation within the field of rhinology

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Introduction:
Since its nascency four decades ago, the field of Rhinology has been fueled by significant innovation in the medical device space. This study sought to characterize market trends and characteristics of companies that treat otolaryngologic ailments.

Methods:
A cross-sectional market analysis was performed using Crunchbase Pro®, an online platform with a validated database of companies and investments. Specific keywords were used to obtain an archive of Otolaryngology-focused companies. Data were extracted and analyzed to evaluate for annual company revenue, headquarter location, market focus (medical device vs pharmaceutical), ownership (public vs private), founder gender, and most relevant otolaryngology subspecialty. Special emphasis was placed on Rhinologic companies for this analysis.

Results:
168 otolaryngology-focused companies were included with an overall annual revenue of over $12 billion USD. Ninety-eight (58%) concentrated on otology, 38 (23%) sleep, and 12 (7%) rhinology. Of the rhinology-specific companies, 2 (17%) are public, 4 (33%) have been acquired, 9 (75%) manufacture medical devices, 3 (25%) develop pharmaceutical products, and 11 (92%) companies offer therapeutic goods. Eight are based in the United States, and 11 have all-male founding teams. Median reported annual revenue was $10.4M (range $1M to $86.2M) with a median capital funding of $5.8M (range $0.5M to $182M).

Conclusion:
A majority of active otolaryngologic companies address ear and sleep disorders. However, there is significant ongoing innovation occurring to treat complex rhinologic conditions. Analysis of recent innovative trends may help optimize resource allocation and opportunities for advancement within the field.

Poster #042

CRS in ethnic groups: Are there differences in CRS Presentation?

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Background:
Chronic rhinosinusitis (CRS) is a common debilitating inflammatory disease. Few CRS studies include a significant proportion of minorities, leaving a gap in our knowledge about the role of sociodemographics. This study focuses on differences between Hispanics and Non-Hispanics presenting with CRS.

Methods:
This cohort study reviewed prospectively collected data. Patients receiving endoscopic sinus surgery (ESS) for CRS from 1/2017-6/2019 with complete ethnicity data were included. Data on CRS severity, quality of life, patient reported symptoms, and potential social determinants of health were compared. T-tests and linear regression compared continuous outcomes; chi-square tests and logistic regression compared categorical outcomes.

Results:
483 patients (190 Hispanic; 293 Non-Hispanic) were included. Age, sex, comorbidity scores, and income were similar between cohorts. 20% of Non-Hispanics are Black vs. 1% of Hispanics. Hispanics were more likely to stop education after high-school (33% Hispanic vs. 15% Non-Hispanics p=0.02). Hispanics had worse presenting SNOT-22 scores (mean[std. dev.]): Hispanic =48[24]; Non-Hispanic =41[24], $p<0.01$ adjusted for disease severity and demographics (80% power). Among primary ESS, Hispanics presented with a mean SNOT-22 score of 49 [21] compared to Non-Hispanics 39 [24]. Disease severity and type was similar. Hispanics were more likely to report symptoms lasting >5 years ($p<0.01$), seeing the PCP multiple times without improvement ($p=0.05$), and were less likely to report seeing a specialist ($p=0.02$).

Conclusions:
At presentation Hispanics have longer symptom duration and tend to have worse SNOT-22 scores than Non-Hispanics with similar comorbidities and income.

Poster #043

Cystic Fibrosis possibly protective against orbital complications of acute sinusitis

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Objective:
To evaluate the clinical, surgical, and economic differences between pediatric patients admitted for acute sinusitis with and without cystic fibrosis (CF).

Methods:
The Kids' Inpatient Database was queried for all cases of acute sinusitis from 2003 to 2012. 20,425 cases of inpatient acute sinusitis were identified of which 410 had CF. A 1:1 matching algorithm yielded 337 pairs matched on all significant demographics, comorbidities, and facility factors. Sinus involvement, rate of orbital complications, rate of surgical interventions, length of stay and total hospital charges was compared between the two cohorts. A comparison of polynomial regression coefficients was used to assess differences in the seasonality of admission.

Results:
Patients with CF were significantly less likely than their non-CF peers to have pre-septal cellulitis (0.3 vs 4.2%, P<0.001), orbital cellulitis (0.3% vs 13.6%, P<0.001), sinusitis affecting multiple sinuses (43.6% vs. 57.9%; P<0.001) and sinusitis requiring orbitotomy (0.3% vs. 3.9%, P<0.001). Despite this, patients with CF had higher rates of surgical intervention (21.4% vs. 9.2%; P < 0.001) a longer length of stay (9.4 days vs 5.7 days, P<0.001) and higher total hospital charges ($58,950 vs $30,333, P<0.001). After comparison of polynomial regression coefficients, seasonality of admission was found to be significantly different between CF and their non-CF peers (p<0.001).

Conclusion:
Despite lower rates of orbital complications, patients with CF have more surgical interventions, longer lengths of stay, and higher overall costs.

Poster #044

Demographic characteristics between adults with obstructive sleep apnea who received nasal surgery

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Background:
The primary treatment for obstructive sleep apnea (OSA) is continuous positive airway pressure (CPAP), but nasal obstruction can impact CPAP tolerance. Nasal surgery (NS) can improve CPAP tolerance in this population. This retrospective cohort study examined demographic characteristics between adult OSA patients who did and did not undergo NS.

Methods:
The Kaiser Permanente Northern CA (KPNC) databases were queried for adults aged 18-89 that had an OSA diagnosis linked to a clinical encounter from 2009-2016. Qualifying NS procedures were performed on or after the index OSA diagnosis through 2017. Bivariate analysis compared demographic characteristics between OSA patients with and without NS.

Results:
A total of 174,825 patients met inclusion criteria for an OSA diagnosis. Among these, 3,285 (1.9%) underwent NS, including septoplasty (54.7%), sinus-related (24.5%), turbinate (11.8%), and rhinoplasty (9.0%). Relative to the non-surgery group, NS subjects were more likely to be male (75.7% vs 62.1, p <0.0001) and younger (48.2 ± 13.0 vs 54.7 ± 14.1, p<0.0001). Compared to the ethnic distribution of the full OSA cohort, NS subjects had higher proportions of Caucasians (61.4% vs. 57.4%) and Hispanics (18.8% vs 15.7%) and lower proportions of African-Americans (5.4% vs 9.3%) and Asians (10.7% vs 13.6%, overall p <0.0001).

Conclusions:
This study found 1.9% of all patients with OSA underwent NS, with septoplasty comprising the majority. We also observed racial/ethnic differences between the non-surgery and NS groups, which has not previously been reported. Further studies are indicated to elucidate factors associated with these differences and their relation to physiological and socioeconomic diversity.

POSTERS

Poster #045
Diagnosis and management of orbital fat during endoscopic sinus surgery
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Background:
More than 250,000 endoscopic sinus surgeries will be performed in the United States in the upcoming year. Relatively rare surgical complications can still affect thousands of patients annually. Orbital complications are a well described during ESS, however; there is sparse literature regarding management of orbital fat exposure. This study aims to provide a current practice consensus for intra- and post-operative management of orbital fat exposure during endoscopic sinus surgery.

Methods:
A 24-point survey focused on surgeon experience, encounters with orbital fat, intra- and post-operative management was distributed to members of the American Rhinologic Society. In addition, a review was performed of 24 cases of orbital fat exposure drawing from the principal investigator's 20,000+ sinus surgeries.

Results:
A total of 235 surgeons responded. The median case volume among respondents was 1000. 94% of respondents have encountered orbital fat during ESS. The large majority of respondents identify orbital fat by its appearance endoscopically and the "bulb press test maneuver". Over 90% of surgeons immediately stop manipulating the area. However, a minority of surgeons (10%) elect to perform bipolar cautery to the area. Half the surgeons responding report that orbital fat exposure immediately alters surgical management, but the overwhelming majority (>90%) of surgeons either do not significantly change post-operative management.

Conclusions:
Breach of the lamina papyracea with orbital fat exposure is a complication that can be managed conservatively. The consensus response from experts in the field is to properly identify fat exposure, avoid further manipulation, and close observation following surgery.

Poster #046
Diagnostic utility of the opacification/ pneumatization (O/P) ratio on quality of life after endoscopic sinus surgery Sean Parsel, DO, Resident
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Introduction:
Prior study demonstrates that the ratio of paranasal sinus opacification to pneumatization (O/P) is a validated method that correlates with the percentage of sinus opacification; however, clinical utility has not been defined. The objective was to determine a correlation between the O/P ratio and change in patient reported quality of life measures before and after sinus surgery.

Methods:
A retrospective study was performed to assess the relationship between preoperative O/P values and the posttreatment change in SNOT-22 scores. The endpoint for significance was achieving minimal clinically important difference (MCID). Patients were included if they underwent sinus surgery. SNOT-22 scores were evaluated at 3, 6, and 12 month postoperative intervals.

Results:
248 patients were included in the study. There was no correlation between disease phenotype and O/P. Polypoid CRS patients were the only group to achieve MCID (OR = 2.1; 95% CI: 1.05, 4.40) at 3 months. There was a weak correlation between O/P and changes in SNOT-22 scores; however the strongest correlation was noted with RARS and noneosinophilic CRS (AUC = 0.61). At 6 months, there was a fair correlation between O/P and decreasing SNOT-22 scores for purulent CRS (AUC = 0.72). The average O/P ratio was 1.13 compared to 0.86 in those with significant SNOT-22 score changes (p = 0.07).

Conclusions:
The O/P ratio has modest utility in predicting decrease in SNOT-22 scores at 3 and 6 months after surgery. Further analysis with a larger sample size is necessary to ultimately define the clinical application for this method.

Poster #047

Differences in preoperative CT findings in patients with chronic rhinosinusitis with polyps

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Background:
Chronic rhinosinusitis with polyps (CRSwNP) has several phenotypes. Preoperative CT scans may be useful in differentiating between groups.

Methods:
Patient charts between August, 2007 and March, 2019 were retrospectively reviewed. Patients groups, including Allergic Fungal Rhinosinusitis (AFRS), Aspirin-Exacerbated Respiratory Disease (AERD), Central Compartment Atopic Disease (CCAD) and CRSwNP not otherwise specified (CRSwNP) were determined by standard criteria and the treating rhinologist. The oldest CT scan available was reviewed for Lund-Mackay (LM) score, septal involvement of inflammatory disease, opacification of olfactory clefts and oblique positioning of the middle turbinates. Non-parametric ANOVA analyses were performed with correction for multiple comparisons.

Results:
356 patients had scans available for review. 80 (23%) patients were categorized into the AFRS group, 101 (28%) in the AERD group, 43 (12%) in the CCAD group and 132 (37%) in the CRSwNP group. Septal inflammatory involvement and oblique middle turbinate orientation on CT scans was higher in both AERD patients and CCAD patients as compared to AFRS and CRSwNP patients ($p<0.04$). Olfactory fossa opacification was increased in the AERD group compared to all other diagnoses ($p<0.02$). The CCAD group showed lower LM scores compared to all other groups ($p<0.001$) and the AFRS group revealed the greatest differences between left and right LM grades, representing unilaterality of disease ($p<0.001$).

Conclusion:
CRSwNP encompasses many subsets of disease which have varying treatments. Preoperative CT findings can be used to differentiate between these groups to improve prediction of diagnoses and patient counseling.

Poster #048

Dupilumab efficacy in patients with severe chronic rhinosinusitis with nasal polyps with or without prior sinonasal surgery: Pooled results from the SINUS-24 and SINUS-52 phase 3 studies

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Dupilumab (DPL), a fully human mAb, blocks the shared receptor component for IL-4/IL-13, key drivers of type 2 inflammation. SINUS-24 and SINUS-52 (NCT02912468/NCT02898454), two randomized phase 3, 24- and 52-week placebo (PBO)-controlled studies, evaluated DPL in patients (pts) with severe chronic rhinosinusitis with nasal polyps (CRSwNP) receiving standard of care. We report DPL efficacy and safety in pts with and without prior sinonasal surgery.

Methods:
Pts were treated with DPL 300mg or PBO every 2 weeks in SINUS-24 (n=276) and SINUS-52 (n=448). Change from baseline to Week 24 vs PBO in nasal polyp score (NPS), nasal congestion (NC), CT Lund–Mackay (CT-LMK), total symptom score (TSS), UPSIT, loss of smell, and SNOT-22 scores are reported in pooled SINUS-24 and SINUS-52 pts (n=724) with/without prior NP surgery.

Results:
459 pts (63.4%) had prior NP surgery. In pts with/without prior surgery, DPL improved NPS (–1.99/–1.75 vs PBO), NC (–0.98/–0.71), CT-LMK (–6.27/–5.73), TSS (–2.69/–2.19), UPSIT (10.57/10.45), loss of smell (–1.07/–0.96), and SNOT-22 (–20.89/–15.64) scores (all nominal $P<0.0001$). Of the most common adverse events (in ≥5% pts), headache was more frequent with DPL vs PBO in pts with prior surgery (8.4% vs 8.1%), and injection-site erythema was more frequent with DPL in pts without prior surgery (6.0% vs 4.1%). Upper respiratory tract infection and acute sinusitis in pts without prior surgery, and nasopharyngitis, NP, asthma, and epistaxis in both groups, were more frequent with PBO vs DPL.

Conclusion:
DPL improved endoscopic, clinical, radiographic, and patient-reported outcomes vs PBO after 24 weeks of treatment in pts with severe CRSwNP both with and without prior NP surgery and was well tolerated.

POSTERS

Poster #049

Effect of the human Cathelicidin LL-37 on nasal epithelial barrier integrity

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Background:
It has been reported that epithelial barrier and expression of tight junction (TJ) proteins are decreased in chronic rhinosinusitis with nasal polyps (CRSwNP). Regulation of TJ proteins to improve barrier integrity may represent a new treatment strategy for CRSwNP. Cathelicidin LL-37 has various immunomodulatory properties.
Objectives: Our aim here was to investigate the effect of LL-37 on the epithelial barrier integrity of human nasal epithelial cells (HNECs).

Methods:
LL-37 expression was evaluated in nasal polyps (NP) and control tissues by immunofluorescence staining. HNECs from normal sinus tissue of control subjects (normal-HNECs) and NP (NP-HNECs) were exposed to LL-37, and its effects on epithelial barrier integrity and expression of TJ proteins were determined.

Results:
We demonstrated that LL-37+ cells were elevated in NP compared with control (P=0.034) and predominantly located in the subepithelial layer as well as in the epithelium. LL-37 treatment (10μg/ml) of both HNECs increased mRNA expression of TJ proteins ZO-1, claudin-1 and occludin and enhanced epithelial barrier integrity as demonstrated by an increasing TEER and a reduced paracellular permeability. NP-HNECs showed a decreased TEER and mRNA expression of claudin-1 and occludin following LL-37 treatment (10μg/ml) compared to normal-HNECs.

Conclusion:
LL-37 enhances the epithelial barrier integrity in both normal-HNECs and NP-HNECs.

Poster #050

Effects of essential oils to inhibit biofilm formation by sinonasal pathogens

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Objective:
Rhinosinusitis affects millions of Americans annually costing upwards of $3 billion. Bacterial biofilms attach to sinonasal mucosal lining, forming microenvironments which allow for antibiotic resistance through persister cells and difficulty for immune clearance. Essential oils have shown promising effects in in vitro in regards to their antimicrobial effects. This study examines the effects of essential oils to inhibit biofilm formation by sinonasal pathogens including methicillin resistant Staphylococcus aureus (MRSA).

Methods:
Pyrrla pure aromatherapy essential oils (orange, lemongrass, peppermint, lavender, eucalyptus, tea tree, clove leaf, cinnamon leaf, frankincense, and rosemary) were tested on clinical isolates of patients with MRSA, Moraxella catarrhalis, Klebsiella pneumonia, Staphylococcus epidermidis, and Acinetobacter baumannii and Pseudomonas aeruginosa Green-fluorescent-protein strain (Pa-01). Zone-of-inhibition and colony-forming-unit assays were used to analyze the antimicrobial efficacy of the oils. Confocal laser scanning microscopy was utilized to confirm P. aeruginosa inhibition.

Results:
Aforementioned essential oils were examined for inhibition of biofilm formation. Clove leaf and cinnamon leaf oil inhibited biofilm formation on all bacterial strains ($p<0.05$). Tea tree oil inhibited biofilm formation on all bacterial strains except P. aeruginosa ($p<0.05$). Gram-positive microorganisms growth was inhibited by more essential oils than Gram-negative bacteria.

Conclusion:
These studies suggest that essential oils are able to inhibit biofilm formation of sinonasal pathogens, more effectively on Gram-positive than Gram-negative microbes.

Poster #051

Effects of pharyngeal packing in sinonasal surgeries: a randomized controlled trial

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Background:
Pharyngeal packing in nasal surgeries is thought to protect against post-operative nausea and vomiting (PONV) that might be the result of blood aspiration. The effectiveness of different methods of pharyngeal packing in preventing PONV and altering the post-operative sore throat (POST) has been controversial in the literature as combined analysis of all forms of pharyngeal packing in sinonasal surgery studies can be troublesome. Hence, the current study was designed in a three-arm-model: hypopharyngeal pack, nasopharyngeal pack and having no pharyngeal pack in a single trial.

Methods:
This study was conducted at our tertiary care center in Riyadh between March, 2018 to May, 2019. Participants were randomly allocated using the sealed envelope method into three arms: Group A had nasopharyngeal packing, group B had hypopharyngeal packing, and group C had no packing. Both the participants and the assessing person were blinded with regard to the arm the participant was allocated in. All participants were anesthetized using TIVA technique and were assessed at several post operative points regarding PONV, POST, and dysphagia scores.

Results:
Our results showed significantly higher mean POST scores among the hypopharyngeal packing group compared to the other groups at day one post-op and at 1st clinic visit 7 days post op. There were no significant differences in PONV and dysphagia across the three different groups.

Conclusion:
Given that hypopharyngeal packing increases POST in the postoperative period, and that there is no statistical significant difference in PONV among the groups, we recommend against using pharyngeal packing in nasal surgeries.

Poster #052

Emerging trends in nasal surgery: what is the impact of a bioabsorbable nasal implant?

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Background:
A bioabsorbable nasal valve implant (NVI) was introduced in 2016 as a minimally invasive solution to nasal valve collapse. Historically the introduction of newer, less invasive procedures performable in-office has resulted in an increase in procedural volume. Our objective is to evaluate this trend as it relates to NVIs and its impact on healthcare utilization.

Methods:
We interrogated the Medicare Part B national database for Nasal vestibular repair (CPT code: 30465), Unlisted nasal procedure (30999) and Septoplasty (30520) from 2010 to 2017, the most recently available year. Septoplasty was used as a surrogate for overall nasal procedural rate. Linear regression modeling was used to examine the changes in reported vestibular repair rate adjusting for septoplasty rate.

Results:
In the Medicare population, the rate of septoplasty was stable from 2010 to 2017, increasing from 26,962 to 30,194 at an annual rate of 1.5%. Coding for unlisted nasal procedure increased from 272 to 333 at an adjusted annual rate of 1.1% over this time period. Coding for nasal vestibular repair increased from 2,026 to 5,331 over this interval at an adjusted annual rate of 0.9% from 2010 to 2016 but significantly increased to 5% between 2016 to 2017 ($p<0.0001$).

Conclusion:
The reported volume of nasal vestibular repair increased significantly in the year following FDA approval of NVIs. In the absence of a corresponding increase in septoplasty, this temporal relationship suggests that the introduction of NVIs impacted the utilization of this procedural code. Further research following the coding patterns of 30465 and 30999 is warranted in the setting of recent AAO-HNS recommendations to change coding for NVI placement to 3099.

POSTERS

Poster #053
Endoscopic DCR versus endoscopic laser-assissted DCR, comparative study
Wasam Albusalih, MD

Design:
Prospective interventional clinical trial study for 24 months (from February 2013 to February 2015) at Diwanyia teaching hospital.

Subject:
Fifty patients aged 10-62 years with chronic nasolacrimal duct obstruction not resolved by conservative measures.

Methods:
All the patients were received medical treatment and coservative measures for several weeks before starting surgical treatment, then patient divided into two groups:
Group 1: treated by endonasal DCR (25 patients).
Group 2: treated by endonasal laser assisted DCR (25 patients).

The procedure was performed under general anasthesia for both groups. In both groups bicanalicular silicone stent was used, success of procedure was determined by the absence of epiphora (subjective) and patency of lacrimal system on irrigation (objective). Patients in both groups followed for 7-14 months.

Result:
Endonasal DCR was done to 25 patients (group 1), and endonasal assisted- DCR for 25 patients (group2), the average time of procedure in group 1 was 38 minutes, while in group 2 was 25 minutes, the silicone stent was removed 4-6 months after the surgery.

Absence of epiphora was in 20 patients out of 25 (80%) in group 1, while it was in 16 patients out of 25 (64%) in group 2 which was significant ($P<0.001$).

Five patients in group 1 develop postoperative adhesion (20%), while in group 2 was 9 patients (36%).All recurrent cases in group 1 due to adhesions , after revision surgery only 2 patients improved raising the success rate to 88% , in group 2 two patients improved after revision surgery raising success rate to 72% .

Conclusion:
We conclude that endonasal DCR is effective as is endonasal laser – assisted

Poster #054
Endoscopic management of CSF rhinorrhea in children: A systematic review with meta-analysis
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Jad Ramadan
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Objectives:
To critically review the management of cerebrospinal fluid (CSF) rhinorrhea in children using the endoscopic endonasal repair. Rhinorrhea in children is a frequent complaint for children presenting to the Otolaryngologist. In rare instances, cerebrospinal fluid (CSF) may be associated with nasal drainage, typically in the setting of congenital anatomic anomalies or traumatic injury to the skull base.

Study design:
Systematic review

Methods:
PubMed database and the Cochrane Library were thoroughly searched using well-defined compehensive MESH terms. The PubMed search included all English-language literature published between January 1990 and May 2019 discussing diagnosis and management of CSF rhinorrhea in children under the age of 18. Patients treated through a combined open and endoscopic repair approach were excluded.

Results:
Of all the studies reviewed, there was no randomized controlled trials or prospective studies. 7 studies were included, mainly retrospective reviews of consecutive case series and case reports. A total of 121 children with CSF leak who underwent purely endoscopic repair were included. The youngest infant who underwent endoscopic repair reported is 1.5 months old. 57 patients had congenital encephalomeningoceles, and 64 had post-traumatic CSF leak (accidental or iatrogenic). Rate of successful closure of the leak ranged from 95-100% with a post-operative follow-up ranging from 6 to 123 months. Post-operative care and need for lumbar drain will also be reviewed.

Conclusion:
Pediatric CSF leak is rare, hence the rarity of available studies. However, similar to adults, endoscopic repair offers a highly successful treatment approach in children. Higher level of evidence is needed.

Poster #055

Epithelial-myoepithelial carcinoma of the lacrimal sac: Case report and literature review

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Epithelial-myoepithelial carcinomas make up less than 1% of head and neck malignancies, and are regarded as rare, low-grade malignant neoplasms of the salivary gland. They are thought to arise from intercalated ducts with histopathology showing a classic biphasic morphology of an outer layer of myoepithelial cells and inner layer of epithelial cells. These tumors most commonly occur in the parotid gland; however, rare cases have also been described in the nasal cavity, nasopharynx, subglottis, base of tongue, and the lacrimal gland. Although the histopathology of this tumor is distinct, unusual location and clinical presentation may pose significant diagnostic difficulties. We report a case of a 72-year-old male presenting with epiphora and a lacrimal sac mass with intranasal extension on imaging and nasal endoscopy. A combined endoscopic endonasal and open approach provided successful definitive treatment, with orbital reconstruction and lacrimal stenting providing good cosmetic and functional results. After PubMed database search for any case series or reports of lacrimal system epithelial-myoepithelial carcinomas, we believe this is the first documented case originating from the lacrimal sac.

Poster #056

Eustachian tube symptoms in patients with chronic rhinosinusitis before and after endoscopic sinus surgery

WITHDRAWN

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Background:
Chronic rhinosinusitis (CRS) has long been a suspected risk factor for Eustachian tube dysfunction (ETD). We sought to determine the cross-sectional prevalence of ETD symptoms in patients undergoing endoscopic sinus surgery (ESS) for CRS using the validated 7-item Eustachian Tube Dysfunction Questionnaire (ETDQ-7) and to correlate the ETDQ-7 scores with scores of CRS symptom severity based on the 22-item Sino-Nasal Outcome Test (SNOT-22) before and after FESS.

Methods:
Patients were preoperatively and postoperatively administered both the ETDQ-7 and the SNOT-22 validated quality of life instruments. Pearson and Spearman correlation coefficients were calculated.

Results:
A total of 103 patients were enrolled in the study, and 82 patients completed the two surveys preoperatively. A total of 39 (47.6%) patients had ETDQ-7 score > 14.5, signifying clinically significant ETD symptoms. The mean + standard deviation (SD) ETDQ-7 score of the entire study population was 15.8+8.8, and the mean SNOT-22 score was 37.5+19.7. The Pearson and Spearman correlation coefficients between ETDQ-7 and the total SNOT-22 score were 0.52 ($p>0.0001$) and 0.51 ($p<0.0001$), respectively. Postoperative ETDQ-7 and SNOT-22 scores were compared for 20 patients.

Conclusion:
While the association between ETD and CRS has long been known, this is one of the few prospective patient studies evaluating otologic symptoms in a CRS population. We found a significant percentage of CRS patients suffer from ETD symptoms based on patient-reported subjective outcome measures. This study demonstrates that otologic symptoms increases with CRS severity and determines the effect of ESS on these symptoms.

POSTERS

Poster #057
Evaluation of PD-L1 expression in sinonasal inverted papilloma.
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Matthew Taylor, MD, Assistant Professor
Timothy Smith, MD, FARS
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Background:
Sinonasal inverted papilloma (SNIP) is a neoplasm typically managed with surgery, though some patients are not surgical candidates or have incompletely resectable disease. Immune checkpoint inhibitors targeting the programmed death-1 receptor (PD-1) and ligand (PD-L1) pathway have recently been approved for advanced head and neck squamous cell carcinoma (SCC). SCC arise from SNIP with various degrees of dysplasia between, and the expression of PD-L1 is unknown for SNIP and SNIP-related SCC. In this pilot study we evaluated expression of PD-L1 in SNIP and SNIP-related SCC.

Methods:
Sinonasal pathology specimens obtained from 3/2007 - 9/2015 at an academic institution were reviewed and 10 representatives were selected. Cases included SNIP without dysplasia, with dysplasia and SNIP-related SCC. Immunohistochemistry (IHC) for PD-L1 was performed on archived tissue for each case. Cases with >1% of tumor cells staining for PD-L1 were considered positive.

Results:
Of the selected representative cohort (n=10), 30% (n=3) were SNIP, 30% (n=3) SNIP with dysplasia, and 40% (n=4) SCC arising from SNIP. None of the cases demonstrated PD-L1 staining on tumor cells, nor on infiltrating immune cells and surrounding tissue.

Conclusions:
In this pilot study of PD-L1 IHC on specimens ranging from SNIP to SNIP-related SCC, there was no identified PD-L1 expression. Given the potential value of immunotherapy to cases of SNIP and SNIP-related SCC which are not amenable to complete surgical resection, additional studies of larger sample size, including PD-1 IHC and tumor mutational burden, are recommended.

Poster #058
Experiences with diagnostic and management surprises in AFRS
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AFRS involves allergic responses to fungal antigens present in sinunasal cavities of young atopic individuals presenting with nasal polyposis, presence of allergic mucin and fungal hyphae with absence of mucosal or vascular invasion in histology.

Standard Treatment:
Treatment includes surgical extirpation of disease with adjuvant treatment including topical/systemic steroids, antifungals and immunotherapy. Experiences regarding presentation, diagnosis and management of AFS are presented.

Experience:
1.Paediatric population had less mean duration of symptoms, extensive disease as shown by multisinus involvement, proptosis, telecanthus, higher IgE levels and LM scores and early recurrences. 2.“AFRS with granuloma” showed higher rates of aggressive features. 3.FRS and AFRS are associated with worse QOL, increased disability and distress compared to controls. 4. Preoperative Itraconazole administration improves LM scores, SNOT scores and NE grades decreasing disease load and making surgery easier. 5. Itraconazole either in preoperative/post-operative period improves the disease parameters than steroids alone, preoperative administration showed significantly better results. 6.Proteomic analysis reveals interactions of Itraconazole with CYP3A4 and p-glycoprotein as possible mechanisms of action of Itraconazole.

Conclusions:
AFRS is severe in children, affects QOL of patients, granulomas in histology can be used as a marker for prognosis, Itraconazole as a second adjunct along with routine post-operative steroid therapy produces significant improvement in disease parameters, more so when administered preoperatively.

Poster #059

Extended endoscopic sinus surgery for revision eosinophilic rhinosinusitis cases with asthma

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Introduction:
Eosinophilic rhinosinusitis (ECRS) is known as intractable sinusitis with nasal polyps showing remarkable eosinophil infiltration. Nasal polyps frequently recur especially in cases complicated by asthma including aspirin exacerbated respiratory disease (AERD) even if endoscopic sinus surgery (ESS) was performed. We have applied extended ESS to such recurrent cases to prevent more ESS for recent years. The outcome of extended ESS is demonstrated, and details of the surgical procedures are shown.

Cases & methods:
Revision ESS was performed on 15 ECRS cases who underwent ESS before. All cases were complicated by asthma including 9 AERD. Cases who underwent nasal surgeries except ESS were excluded. All operations were performed under general anesthesia and image-guided system. Extended ethmoidectomy as a new approach we advocate was done in all cases. This approach aimed to extend the middle nasal meatus that have closed due to polyp recurrence and the middle turbinate lateralization. From the lateral to the anterior part of the middle nasal meatus was punched and/or drilled out up to the nasolacrimal duct like dacryocystorhinostomy to clearly open the remained ethmoid cells, and this procedure facilitate to manage the frontal sinus lesion. 12 Draf IIb or 3 Draf III surgeries were then performed.

Outcomes and conclusion:
Postoperative CT and Endoscopic scores 1 year after surgery remarkably reduced from 77.5 and 80.3% to 24.5 and 21.1% respectively although long-term follow-up study is necessary. Our extended ESS is acceptable for revision ECRS cases with asthma.

Poster #060

Extended frontal sinus endoscopic approach. University of Chile Clinical Hospital Experience

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Introduction:
Nasosinusal endoscopic surgery has increased its use in recent years. Depending on the type of lesion, as well as its location within the frontal sinus, the endoscopic approach is the best choice for most cases.

Objectives:
Describe and analyze the clinical and epidemiological characteristics of patients undergoing extended endoscopic frontal sinus surgery in the otolaryngology service of the Clinical Hospital of the University of Chile (HCUCH).

Material and methods:
Retrospective, descriptive study, including patients with otolaryngological pathology who have undergone extended endoscopic surgery of frontal sinus, between 2013 and 2018 in HCUCH. Epidemiological variables, clinics, results and complications were analyzed.

Results:
The series consists of 60 patients, with an average age of 44.5 years; 28 men and 32 women. The most frequent diagnoses that motivated this intervention were: Chronic Rhinosinusitis with Nasal Polyps. (36.6%) and non polyps chronic rhinosinusitis (23.3%). All patients were studied with nasal endoscopy and images, with computed tomography being the choice. In the preoperative analysis with images, anatomy of the frontal sinus is very variable. No intra-surgical complications were reported. During the postoperative period, only 1.7% of patients progressed with complications, septal perforation was the only one. In the follow-up period, one patient required revision surgery.

Discussion and conclusion:
Those patients with frontal sinus pathology should be evaluated in a complete way, with anamnesis, physical examination and images, to select properly. It's a safe procedure, but should be performed in a center with specialized otolaryngologists, with adequate surgical instruments.

POSTERS

Poster #061

Factors considered important in the rhinology match

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Objective:
To evaluate factors considered important by program directors and fellows in the rhinology match.

Methods:
Fellowship program directors were asked to complete an anonymous electronic survey and forward a separate one to their current and past fellows. Participants were asked to rate on a 5-point Likert scale the importance of several factors associated with rhinology fellowship. Demographic characteristics were also analyzed.

Results:
41 program director responses and 32 fellow responses were analyzed. Strength of letters of recommendation, personal knowledge of letter writers, and applicant interview performance were considered the most important factors while in-service examination scores, age, and sex of the application were least important. Research was considered moderately important. Among fellows, operative volume, faculty reputation, and job candidacy after fellowship were considered most important while basic science research opportunities, salary, and gender-specific mentorship were considered least important.

Conclusion:
Based on the results of this survey, it appears that program directors heavily weigh the professional relationships developed by prospective fellows; fellows seek programs with a robust operative experience and one that will place them in the best position for a job post-fellowship. Fellowship applicants are encouraged to develop strong relationships with their rhinology mentors while in residency.

Poster #062

Frontal Ostium Grade (FOG): A novel CT grading system for a safe endoscopic approach to the frontal sinus

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Introduction:
The location and size of the internal frontal sinus ostium is critical in endoscopic sinus surgery. The frontal ostium, defined as the narrowest point between the anterior buttress and upturn of the skull base, can be variable in its location and size based on the position of these 2 anatomical points. This variability is evident on a sagittal CT scan cut placed at the most medial aspect of the lacrimal bone just inferior to the frontal ostium. We propose a novel CT grading system (FOG) that is easy and specific to the anatomical position of the frontal sinus ostium on the sagittal plane.

Method:
FOG is based on marking two vertical lines parallel to each other on the defined sagittal CT cut. The first line (Reference/R-line) is standardised and drawn at the level of the anterior buttress. The Second line (S-line) is variable and drawn at the point of upturn of the anterior skull base. If the R-line is anterior to the S-line, we term this frontal ostium grade as positive. If the R and S-lines overlap, we classify it as FOG Neutral (0-grade). If the R-line is posterior to the S-line, we classify it as a FOG –ve. A FOG +ve grade is predicted to be a surgically easier dissection than a FOG neutral, which is predicted to be an easier dissection than a FOG -ve grade.

Results:
Using this grading method, 90 frontal sinuses underwent primary endoscopic frontal sinusotomies. Of these 48 were FOG +ve, 21 were FOG neutral and 21 were FOG -ve. A statistically significant difference in mean surgical time was found between the FOG +ve (9.96 min.), FOG neutral (11.42 min.) and FOG –ve (16.05 min.) groups ($p<0.05$).

Conclusion:
This novel FOG system indicates applicability in predicting difficulty during frontal ostium.

Poster #063

Functional endoscopic sinus surgery and other rhinologic surgery after face transplantation

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Background:
Chronic rhinosinusitis (CRS) is a known complication after face transplantation (FT), but data on its management is limited. The aim of this study was to describe indications for and outcomes after functional endoscopic sinus surgery (FESS) and other rhinologic procedures after FT.

Methods:
The FT patient cohort (n=8) at Brigham and Women's Hospital was reviewed retrospectively for post-FT sinonasal operations including FESS. Operative reports and clinical notes were analyzed. Pre- and postoperative CT scans were analyzed with Lund-Mackay scores by two independent reviewers.

Results:
No FT recipient had pre-FT history of chronic rhinosinusitis, asthma, or aspirin/NSAID sensitivity. Five of eight FT patients underwent rhinologic procedures. Three patients with full or partial osteomyocutaneous FT for severe ballistic injury underwent post-FT FESS for CRS (n=3 patients, 5 cases total). Of these, one was performed for mucocele and one had concurrent endoscopic dacrocystorhinostomy for dacrocystitis. Patients reported symptom improvement after FESS but Lund-Mackay scores were relatively stable (preop mean 9.8, standard deviation [SD] 2.4 vs post-op mean 8.2, SD 2.5). Two patients with myocutaneous FT for burn injuries underwent endoscopic septoplasty and division of nasal synechiae (n=2 patients, 4 total cases), with each patient undergoing one scar revision due to incongruence of donor and recipient septum. Myocutaneous FT patients did not need FESS in our cohort.

Conclusions:
Indications for post-FT rhinologic surgery relate to the type of FT and included CRS, dacrocystitis, mucocele, redundant septum, and nasal synechiae. Surgical intervention generally provided symptom relief for FT patients.

Poster #064

Geographic variation in epistaxis interventions among Medicare beneficiaries

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Background:
Epistaxis is a common otolaryngologic problem that can lead to significant complications in elderly patients. The purpose of this study is to quantify the utilization of epistaxis procedures in the elderly population and assess whether geographic variability is associated with hypertension and direct oral anticoagulant (DOAC) use.

Methods:
A cross-sectional study was performed on Medicare procedure and beneficiary data from 2013-2016 for all epistaxis procedures categorized by Common Procedural Technology (CPT). Epistaxis procedures were analyzed by state, complexity, and provider type. Linear regression analysis was performed.

Results:
Over 4 years, 219,827 epistaxis procedures were performed on Medicare patients, 44.3% of which were categorized as primary (control of nasal hemorrhage: anterior simple or posterior primary). Otolaryngologists performed 92.6% of all epistaxis procedures. The frequency of epistaxis procedures performed by state ranged from 0.99 procedures per 10 thousand beneficiaries (PP10K) in Hawaii to 25.7 procedures PP10K in New Jersey. The percentage of interventions categorized as secondary (anterior complex, posterior subsequent, with nasal endoscopy, or open procedures) in each state varied from 0% in North Dakota to 68.8% in New Mexico. Epistaxis procedure utilization was weakly correlated with the prevalence of hypertension ($R^2=0.08$, $p<0.05$) and higher percentage of DOAC use ($R^2=0.08$, $p<0.05$) in a state's Medicare population. Conclusion: Otolaryngologists perform the vast majority of epistaxis procedures in elderly patients. However, practice patterns vary across the United States. Hypertension and DOAC use are weakly associated with utilization of epistaxis interventions.

POSTERS

Poster #065

Hidden-port approach to endoscopic pericranial scalp flap for septal perforation closure.

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The pericranial flap is a strong, elastic tissue with a large surface that is useful for closure of large septal perforations. To date, the main drawback to its use has been the need for a bicoronal incision to both extract the flap and to perform an osteotomy in the anterior table of the frontal sinus through which the flap is inserted into the nasal cavity after performing a modified Lothrop procedure.

We have developed a technique to elevate the pericranial flap endoscopically using a single 3-cm incision hidden in the scalp. Additionally, we have verified that despite using this approach, an incision in the glabella can be avoided by also performing the frontal osteotomy via the endoscopic route. In our view, this is an advantage, especially in patients with a benign pathology such as septal perforation. Additionally, we used the transseptal route to perform the frontal sinusotomy, thus avoiding injury to the healthy drainage pathways of both frontal sinuses.

First, two cadavers prepared by the Thiel technique were dissected to assess the feasibility of performing an osteotomy with a 70° burr in the anterior wall of the frontal sinus from the interior of the sinus was ascertained. Next, this technique was applied in the reconstruction of the nasal septum of three patients with septal perforation. This completely endoscopic technique permitted full coverage of the septal perforation with the pericranial flap in all patients.

Poster #066

Human papillomavirus–related multiphenotypic sinonasal carcinoma: A case study and literature review

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Human papillomavirus (HPV)–related multiphenotypic sinonasal carcinoma (HMSC), first described as HPV-related carcinoma with adenoid cystic carcinoma-like features, is a recently described neoplasm that is isolated to the sinonasal tract. Its clinicopathologic features are presently being defined, and a limited number of cases are described in the literature. We report a case of a 67-year-old man with a 14-month history of a slowly enlarging right naso-orbital mass. Radiographic imaging revealed a massive sinonasal and extraconal orbital mass with bony destruction and intracranial extension without transdural violation. Incisional biopsy favored high-grade adenoid cystic carcinoma. Surgical excision was recommended and achieved with an anterior craniofacial resection and subsequent anterolateral thigh free flap reconstruction. Histological analysis and immunohistochemistry ultimately favored HMSC. Radiation was recommended for isolated involvement of the margin at the orbital apex. While HMSC presents at advanced tumor stage and high-grade histologic appearance in nearly half of reported cases, it behaves in a fairly indolent manner. Moreover, there have been no reported tumor deaths and only rare cases of metastases. Yet, tumor location can lead to insidious involvement of the orbit and the intracranial space, presenting a daunting treatment approach to the surgical team and the patient. Herein, we present an advanced-stage case of HMSC treated by a multidisciplinary team of Head and Neck, Neurosurgical, and Oculoplastic surgeons as well as a review of the current literature. It is our aim to further illustrate the indolent clinical behavior of this neoplasm and highlight several treatment questions regarding HMSC.

Poster #067

Improvement of nasal morbidity following nasoseptal flap reconstruction of skull base defects using reverse rotation flap

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Introduction:
The workhorse for endonasal reconstruction of skull base defects is the posteriorly based nasoseptal flap (NSF). Postoperative nasal deformities and decreased olfaction are potential complications of the NSF. The reverse septal flap (RSF) minimizes the donor site morbidity of the NSF by covering the exposed cartilage of the anterior septum. The impact of the RSF on nasal morbidity has not been addressed.

Materials and Methods:
Adult patients undergoing endoscopic endonasal surgery (EES) of the skull base (transsellar/transplanum/transclival approaches) with NSF reconstruction were identified. Follow up was at least 6 months. Patients were photographed preoperatively and postoperatively using standard rhinoplastic nasal views. Patients completed the UPSIT smell identification test and SNOT-22 questionnaire pre-operatively and postoperatively, and were also queried regarding subjective changes in nasal appearance and plans for reconstructive surgery following EES.

Results:
6 patients were reconstructed with a NSF with RSF. Improvements in both UPSIT and SNOT-22 scores were noted postoperatively. One patient reported a change in nasal appearance; none were considering reconstructive surgery. Of a separate cohort of 15 patients reconstructed with a NSF without RSF, 6 reported a change in nasal appearance. The proportion of patients reporting changes in appearance was lower in the NSF with RSF group, although the difference was not statistically significant.

Conclusion:
The use of a RSF to limit donor site morbidity of the NSF is not associated with olfactory loss and may prevent nasal deformities associated with NSF reconstruction.

Poster #068

Increase in IL-17-positive cells in sinonasal inverted papilloma

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Objective:
Infiltration of neutrophils in patients with sinonasal inverted papilloma (SNIP) is significantly high. Whether IL-17, a potent factor mediating neutrophilic inflammation, would be involved in the neutrophilic phenotype of SNIP is investigated in the current study.

Study Design:
Laboratorial study
Participants
Nasal papilloma and inferior turbinate were collected from patients with SNIP (n=50) and control subjects with septal deviation (n=15).

Methods:
IL-17+ cells were evaluated in the tissue obtained from patients with SNIP (n=50) and control subjects with septal deviation (n=15), by means of immunohistochemistry, flow cytometry.

Main outcome measures:
IL-17+ cells were evaluated in papilloma and turbinate tissues by means of immunohistochemistry, flow cytometry. IL-17+ cells mainly localized in the mononuclear cells and neutrophils, and were up-regulated in SNIP samples versus controls. IL-17+ T cell subsets were mainly CD4+ (Th17, 60.0%) and CD8+ (Tc17, 30.0%), which both were enhanced in SNIP than controls. The level of total IL-17+ cells was significantly correlated with the infiltration of neutrophils in SNIP tissues. Furthermore, the SNIP homogenates could significantly promote IL-17 production in peripheral blood mononuclear cells (PBMCs).

Conclusions:
Increase of IL-17+ cells was evident in SNIP and may be involved in the neutrophil infiltration in the local tissues.

Key words:
IL-17, sinonasal inverted papilloma, neutrophils, inflammation.

POSTERS

Poster #069

Inflammatory infiltration characteristics of nasal inverted papillomas

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Objective:
To investigate the histopathological patterns and local inflammatory infiltration characteristics in patients with nasal inverted papilloma. [Methods] Tissues of 50 patients with nasal inverted papilloma and 20 controls which all underwent surgery in the department of otolaryngology, the first affiliated hospital of sun yat-sen university between June, 2016 and June, 2018. The histological patterns and inflammatory cell infiltration were evaluated and analyzed for association with clinical characteristics by immunohistochemistry and flow cytometry.

Results:
Eosinophils, neutrophils, macrophages were significantly elevated in nasal inverted papilloma compared with control ($P<0.001$). CD4+T cells ($P=0.005$), TH1 cells (CD4+IFN-γ T cells) ($P=0.005$) were also elevated in inverted papilloma, except CD8+T cells ($P=0.990$) and TC1 cells (CD8+IFN-γT cells) ($P=0.538$) compared with controls. The predominating T lymphocytes in nasal inverted papilloma were CD4+T cells; while CD8+T cells in control evaluated by flow cytometry. IFN-γ protein level was significantly increased in papilloma tissues compared with control samples analyzed by Luminex, $P<0.001$. IFN-γ protein level was also significantly increased in non-recurrence compared with recurrence analyzed by Luminex, $P<0.001$. The remaining clinical pathological features were not significantly correlated with the degree of local inflammatory cells infiltration in NIP.

Conclusion:
Inflammation may have potential roles in nasal inverted papilloma.

Key words:
nasal inverted papilloma; inflammation; IFN-γ; recurrence

Poster #070

Infracochlear pneumatization of the sphenoid - Evidence of the "Fifth Sinus"

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Background:
Recently, evidence supporting balloon dilation of the Eustachian tube has been increasing. Some individuals have euphemistically referred to the Eustachian tube and middle ear as the ""Fifth sinus"" given the commonality of benefit between dilating the Eustachian tube and paranasal sinus transition spaces and ostia. Here we present a unique case of an anatomical variation of sphenoid bone pneumatization.

Case Description:
A 50-year-old woman with a history of chronic sinusitis with nasal polyposis and aspirin sensitivity (i.e. aspirin exacerbated respiratory disease) failing optimal medical therapy presented with a CT scan of the paranasal sinuses in preparation for surgical work-up. Initial evaluation of the CT was notable for a Lund-Mckay Score (LMS) of 23/24 with opacification sparing the left lateral sphenoid. More careful inspection revealed that the pneumatization of the left lateral sphenoid bone was continuous with an air cell tract that originated in the middle ear, coursing below the cochlea and extending anteriorly just lateral to the petrous carotid.

Discussion:
While authors have previously described enlarged bony eustachian tubes, to our knowledge this is the first description of a similar finding that resulted in sphenoid bone pneumatization from the middle ear.

Learning point:
Variations in paranasal sinus anatomy continue to be discovered. This case uniquely demonstrates evidence that the Eustachian tube can lead to a "fifth sinus."

Poster #071

In-hospital costs associated with expanded endonasal approach to meningioma resection

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(Presented by Theodore Lin, MD)
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Darren Ebesutani
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Introduction:
Meningiomas are the most commonly occurring intracranial tumor in adults. Definitive treatment is accomplished via surgery, traditionally using an open approach. The expanded endonasal approach (EEA) to the anterior skull base has been increasingly utilized for resection of complicated skull base tumors, including meningiomas. In our study, we seek to quantify the in-hospital cost of an EEA for anterior skull base meningioma resection.

Methods:
All meningioma resections performed using an EEA at this institution over a period from January 1st 2015 to October 24th 2017 were evaluated. The electronic medical record was reviewed for patient factors, tumor characteristics, and cost variables associated with each hospital stay and univariate regression was performed using Stata software.

Results:
13 patients underwent an EEA to anterior skull base meningioma resection. There was 1 patient each with post-operative CSF leak and syndrome of inappropriate antidiuretic hormone secretion. Average total cost of in-hospital stay was $39155 (95% confidence interval $30759-47552) with average total direct cost of $26150 ($20587-31713) and indirect cost of $13005 ($10155-15855). Average fixed direct cost was $10763 ($4237-15587). Average variable direct labor cost was $8731 ($6353-11108) while average variable supply cost was $6656 ($5258-8055).

Discussion:
There is a paucity of literature available regarding costs of endoscopic anterior skull base surgery. Understanding in-hospital costs and the drivers of variability associated with an EEA to anterior skull base meningioma resection will enable future initiatives for cost control and value creation.

Poster #072

Investigation of allergic rhinitis epidemics by baidu index in China

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Background:
Allergic rhinitis (AR) is a common disease seriously affecting quality of life of patients. However, China lacks a traditional surveillance system to monitor the epidemics of AR. Baidu is the largest searching engine in China. Baidu Index is a web-based tool to investigate search volume (SV) of specific queries.

Objective:
Thus, we asked whether Baidu Index can reflect the epidemiology of AR in mainland China.

Methods:
We investigated the seasonal and regional pattern of SV of AR and related search terms in China. Then, we investigated the correlation of SV of AR and related search terms with real-world data including pollen count and outpatient visit volume.

Results:
SV of AR showed repetitively seasonal pattern, with the first peak in May and the second peak from August to September. SV of AR in northern China was correlated with both SV of pollen allergy and dust mite allergy (all $P \leq 0.001$). In southern China, SV of AR showed significant correlation only with SV of dust mite allergy (all $P<0.001$), but not with SV of pollen allergy (all $P>0.05$). The pollen count in Beijing was positively correlated with SV of AR ($r=0.692$, $P<0.001$) and pollen allergy ($r=0.713$, $P<0.01$). SV of AR in Guangzhou was closely correlated with the outpatient visit volume of AR (one month later, $r=0.523$, $P=0.001$ and two months later, $r=0.503$, $P=0.002$) in the First Affiliated Hospital of Sun Yat-sen University.

Conclusion:
Big data collected from Baidu index may reflect the epidemiology of AR in a nearly real-time manner, and broadcast the pollen season.

POSTERS

Poster #073
Lacrimal sac blue nevus
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Introduction:
Endoscopic dacryocystorhinostomy (DCR) is becoming an increasing more popular and effective treatment modality for nasolacrimal duct obstruction (NLDO). During the procedure, the lacrimal sac is opened to create a direct opening to the nasal cavity and bypass the nasolacrimal duct. In this process, the previously non-visible lacrimal sac mucosa is revealed allowing for visualization of any lesions. We present the first reported case of a blue nevus in the lacrimal sac.

Case Presentation:
A 36 year old female presents with history of one year history of left epiphora. Ophthalmologic exam (Jones dye tests) and nasal endoscopy revealed no dye visible under the inferior turbinate after injection on the left side.
During endoscopic DCR, there was noted to be a 2x2m pigmented lesion with ill defined borders and speckled appearance along the anterioinferior portion of the lacrimal sac mucosa. Pathologic analysis of the excised tissue revealed blue nevus.

Discussion:
Pigmented mucosal lesions of the lacrimal sac are rare. Differential diagnosis include blue nevus, melanoma, tattoing effect, pigmented dermatofibroma, and metastases. Blue Nevi are solitary blue colored moles that are present at birth or can develop later in life. Generally, most blue nevi are benign, however they rarely can undergo malignant transformation to transform to malignant cellular blue nevus. Therefore, it is particularly important to monitor for any change in size, pigmentation, or nature of lesions. Surgical excision is generally curative.

Conclusion:
Pigmented lesions of the lacrimal sac are rare entities which necessitate further workup and possible surgical excision.

Poster #074
Life-threatening epistaxis: a case of ruptured intra-sphenoidal internal carotid artery aneurysm, complicated by orbital apex syndrome following endovascular treatment
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Introduction:
Non-traumatic ICA aneurysms represent 3% of all intracranial aneurysms. Their rupture can present as massive epistaxis with high mortality rates. This case details the complications arisen from a ruptured cavernous ICA aneurysm presenting with life threatening epistaxis.

Case description:
A 75 year-old man presented with 3 episodes of massive epistaxis over a 2-week period. Angioscan showed a right cavernous ICA aneurysm protruding extracranially through a sphenoidal bony dehiscence. A Pipeline Flex Embolization Device (Medtronic Neurovascular, Irvine, California, USA) was implanted to isolate the aneurysm. Three months after hospital leave, the patient progressively developed an ipsilateral orbital apex syndrome. A cerebral MRI showed an ill-defined inflammatory process involving the right orbital apex, cavernous sinus and sphenoid sinus. Cultures came back positive for polymicrobial pathogens and negative for fungi. Despite aggressive antibiotic and antifungal therapy, an intra-stent complete ICA occlusion developed calling for antithrombotic treatment as well .

Discussion:
Considering the possibility of rare pathologies when confronted with common symptoms is a fastidious task. In this case, the sphenoidal bony dehiscence may have exposed the cavernous ICA and aneurysm to sinonasal microbiological environment. This seems to have led to the catastrophic infection of both orbital apex and endovascular devices. Without evidence to support further surgical intervention, and considering the prohibitive risk associated with such treatment, the team opted for a conservative approach. At last follow-up appointment, the patient seemed to be recovering some extraocular muscle function and vision.

Poster #075

Living with nasal polyps in the US: A study to understand the patient journey

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Delays in diagnosis (Dx), negative impacts on QoL, lack of disease education, and breaks in care highlight a clear need to better understand the patient (Pt) journey with nasal polyps (NP).
In this US, non-interventional, qualitative study, Pts with recurrent NP ≤18 mo prior to study start, treated with oral steroids, were recruited with the assistance of two patient advocacy groups. Specialist HCPs (allergists [ALLs] or ENTs) with experience of managing NP were recruited from a national database. Interviews with HCPs and Pts focused on their experience of NP, and Pts documented disease impact in 3-day written/video diaries. Interview notes, audio transcriptions, and diaries were analyzed to identify key insights.
Twenty-five Pts (24–65 y) and 20 HCPs (10 ALLs, 10 ENTs) took part in the study. Key stages explored in the Pt journey were: Onset; Dx; Disease management; Living with NP. Time from disease onset to Dx varied broadly from 1 mo to 18 y, with Pts experiencing frustration at delayed Dx, ongoing symptoms, and cycling through multiple generalists before referral to a specialist. Pts and HCPs found treatment options limited and unsatisfactory. Pts commonly experienced loss of normalcy due to symptoms, and a cycle of suffering, treatment, and symptom recurrence, often with protracted breaks in care, with gradual adaption to NP over time. Study findings exposed unmet needs for: comprehensive educational materials for Pts and generalists, Pt guidance on what to expect at office visits, and improved Pt access to support groups.
Understanding the Pt journey and addressing the unmet needs identified in this study may help improve HCP and Pt management of the burden of NP and mitigate breaks in care.

Sponsor: Novartis

Poster #076

Management of acute invasive fungal sinusitis with orbital involvement – When can the eye be saved?

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Background:
Acute invasive fungal sinusitis (AIFS) is a life-threatening infection afflicting immunocompromised patients. Currently, there is little consensus regarding the degree of orbital preservation during surgery for cases of AIFS with orbital involvement.

Methods:
Single-institution retrospective chart review and case report.

Results:
33 cases of AIFS were identified, and 16 were noted to have confirmed orbital involvement. 7 patients underwent orbital exenteration and 9 patients underwent debridement with orbital preservation. Exenterated patients had more involvement of orbital apex (6), optic nerve (2), and extraocular muscles (4) compared to patients in whom orbit was preserved. However, these structures were involved in some patients with orbital preservation. One patient underwent serial debridement of superior oblique and skull base dura with successful orbital preservation and eradication of disease.

Ophthalmologic findings at presentation were worse for patients who underwent orbital exenteration (e.g., reduced visual acuity, ophthalmoplegia, proptosis). Uncontrolled diabetes mellitus (100%) and Aspergillus (44%) were more common in the orbital preservation group, whereas hematologic malignancy or immunosuppression (72%) and Mucor or Rhizopus (71%) were more common in exenterated patients. Both groups received an average of 4 debridements throughout their treatment course. There were no significant differences in survival between orbital preservation and orbital exenteration.

Conclusions:
We advocate for repeated debridements with comprehensive sampling of orbital tissues as opposed to upfront exenteration, particularly in patients with AIFS due to Aspergillus species or diabetes mellitus.

POSTERS

Poster #077

Management of recurrent acute rhinosinusitis (RARS): A systematic review

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Objective:
To review current management practices for recurrent acute rhinosinusitis (RARS).

Study Design:
Systematic review

Methods:
Cochrane, PubMed, clinicaltrials.gov, EMBASE, Google Scholar, and Web of Science databases were queried for articles related to RARS management dating from 1990 to present, according to PRISMA statement guidelines. Inclusion criteria: articles specifically addressing RARS; studies with 3+ patients; and articles in English.

Results:
A total of 979 titles/abstracts potentially related to RARS management were identified. Of these, sixty-two full texts were selected for review, and 10 met inclusion criteria (5 with level 5 evidence, 4 with level 3 evidence, 1 with level 2 evidence). The studies included a total of 890 patients (Age range 5.8 to 53.5), with follow up ranging from 1 to 19 months. Endpoints were primarily based on symptomatic improvement, although some articles also reported post-treatment endoscopic and radiographic findings. Management options included medical therapy (intranasal steroids, antibiotics, nasal saline irrigations, N-acetylcysteine, allergy treatment, and decongestants), balloon sinus dilation (BSD), and endoscopic sinus surgery (ESS). Surgical patients (BSD and ESS) had better mean improvement in RSDI (-30.94 vs -17.2) and SNOT22 (-39.7 vs -24) compared with medical patients.

Conclusion:
Despite increasing interest in the treatment of RARS, there remains a lack of consensus regarding optimal management. The literature thus far suggests that surgical management, either through balloon sinus dilation or endoscopic sinus surgery, is helpful in improving symptoms and quality of life in those who do not respond to initial trials of medical management.

Poster #078

Managements of inferior turbinate hypertrophy by: Endoscopic inferior turbinoplasty and inferior turbinectomy (comparative study)

Wasam Abusalih, MD

Background:
Inferior turbinate hypertrophy is one of the most common causes of nasal obstruction .Many different surgical methods are available for treatment of this condition .

Study design and objectives:
This is a comparative retrospective study carried out on patients who underwent surgical turbinate reduction of the inferior turbinates in the period between March 2015 and March 2017.
This study compares between the rate of complications between partial inferior turbinectomy and endoscopic powered turbinoplasty. The study carried out at Otolaryngology department ,at Ad Diwanyia teaching hospital , Diwanyia city, Iraq.

Results:
A total of 50 patients with nasal obstruction had been included in this study. The patients were divided into two groups. The first group treated by surgical inferior turbinectomy while the second group by powered endoscopic turbinoplasty. The gender distribution was(15(52%) male and 10(48 %) female and 14(48%) male and 11(62 %)female) for the first and second group respectively with no significant difference between the two groups($p>0.05$). The mean age of first group was 27.40±7.7 years while the mean age of second group was 26.68±6.82 years with no significant difference between the two groups ($p>0.05$).There is significant difference between the two groups in occurrence of severe bleeding and crustation which is higher in group 1 ($p<0.05$).There is no statistically significant difference in atrophic rhinitis but it is clinically important.

Conclusion:
Powered endoscopic turbinoplasty associated with less post operative complications than partial inferior turbinectomy

Poster #079

Markers of eosinophilic inflammation are associated with response to the DP2 antagonist GB001

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Cindy-Ann Tompkins
Mary Fitzgerald
Dave Singh
Gossamer

Background:
GB001 is an oral antagonist of the prostaglandin D2 receptor 2 (DP2). DP2 is expressed on a variety of cells including Th2 and eosinophils. DP2 antagonists may inhibit recruitment of eosinophils, with consequent reduction in inflammation.

Objectives:
Characterize the effect of GB001 by using baseline fractional exhaled nitric oxide (FeNO) and blood eosinophil (Eos) thresholds in post-hoc analysis in a sample of asthma patients to establish the utility of FeNO or Eos as patient-selection criteria.

Methods:
In this study 36 subjects with mild atopic asthma were randomized (2:1) to 30 mg of GB001 or placebo once daily for 28 days. Subjects received a total daily dose of fluticasone propionate ≤500 mcg or equivalent. Outcomes were analyzed by baseline FeNO (<35 & ≥35ppb) and Eos (<250 & ≥250/μL) subgroups when assessing FEV1.

Results:
Mean baseline FEV1 was 3.8 L. Effects on FEV1 were observed in the high baseline FeNO and Eos subgroups (differences of 207 ml, n=13 and 133 ml, n=11, respectively). These effects were observed as early as Day 2 (difference of 0.23L and 0.16L for high baseline FeNO and Eos subgroups, respectively) and were sustained through completion of treatment on Day 28.

Conclusions:
The results from this small study suggest the use of markers of eosinophilic inflammation may provide a unique opportunity to characterize the optimized patient group for the treatment with GB001. Prospective and larger studies are needed to confirm these findings in patients with eosinophilic driven disease such as CRSwNP or CRSsNP.

Poster #080

Maxillary giant cell reparative granuloma: case report and review of the literature

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Introduction:
Giant cell reparative granulomas (GCRG) are rare, non-neoplastic, fibrous lesions found most often within the mandible and maxilla of children and young adults.

Case presentation:
We describe the case of a 42 year-old man who presented with two years of progressive left facial pain and swelling, epiphora and nasal obstruction, who was found to have a large mass obstructing the entire the left nasal airway, with a corresponding ossified mass occupying the entire left maxillary sinus. The patient underwent an endoscopic modified medial maxillectomy (EMMM) with near total resection. A rim of residual disease was left at the interface of the orbital floor to prevent postoperative enophthalmos or injury to the infraorbital nerve. Six months postoperatively, the patient was asymptomatic and was without regrowth of residual disease.

Discussion:
There is limited data on the treatment and management of GCRG. Based upon several small case series, recurrence rates of GCRG range from 10-25% following surgical resection. While the vast majority of reported GCRG cases have been treated with surgical resection, there are several reports of primary radiotherapy for lesions not amenable to definitive surgical removal. Reported cases of recurrent GCRG have been well managed with revision surgery. The literature suggests that primary surgical management of this benign lesion should aim to ameliorate symptoms and resect as much of the lesion possible without incurring undue morbidity. There is limited data describing or comparing methods of post-operative surveillance for GCRG, however, periodic endoscopic surveillance and symptom assessment has been described by several authors for GCRG of the paranasal sinuses.

POSTERS

Poster #081

Medicare reimbursement for balloon catheter dilations among high volume surgeons

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Background:
Chronic Rhinosinusitis (CRS) is one of the most common and costly pathologies treated by physicians. After failure of medical treatment, surgical intervention, traditionally in the form of endoscopic sinus surgery (ESS), is offered. Balloon catheter dilation (BCD) has become an alternative to ESS, with increasing popularity among otolaryngologists.

Methods:
Using Medicare's Part B National Summary Data Files, we examined balloon dilations from 2011-2017, including CPT codes 31295 (maxillary sinus dilation), 31296 (frontal sinus dilation), and 31297 (sphenoid sinus dilation). Specifically, we determined the trend in total and average reimbursement to physicians for BCD. We also obtained data on high volume ENT surgeons (HV ENTs) - defined as performing >10 procedures per year - from the 2012-2016 Medicare Provider Utilization and Payment Data, focusing on the percentage of BCD performed by, and reimbursed to, HV ENTs.

Results:
The total number of BCD rose from 7,496 in 2011 to 43,936 in 2017 (486%), with a more gradual increase in 2016 and 2017 (7.1% and 4.7%). The overall reimbursement increased from $11,773,049.04 in 2011 to $63,927,590.92 in 2017 (433%).
There were 382 HV ENTs in 2016, an increase of approximately 270% from 2011 (101 surgeons). In 2016, 60.1% of all BCDs were performed by HV ENTs, compared to 42.7% in 2012. Those high-volume surgeons in the 75th percentile had an average increase of 4.2 procedures per year compared to an increase of 1.5 procedures per year among other HV ENTs.

Conclusion:
Balloon catheter dilation continues to increase in popularity among otolaryngologists treating CRS. The majority of balloon dilations are performed by high volume balloon surgeons.

Poster #082

Modified endoscopic denker's approach in management of inverted papilloma of the anterior maxillary sinus

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Introduction:
Inverted Papilloma (IP) is a benign epithelial tumor of the sinonasal cavity that is locally aggressive and has a propensity for recurrence. Tumors involving the anterior maxillary sinus can be challenging to access endoscopically, and have historically been approached through a Caldwell-Luc or canine fossa trephination. We present a case series of 22 patients with maxillary IPs which were successfully resected using a modified endoscopic Denker (MED) procedure. This technique enables access to the anterior portion of the maxillary sinus without the need for a separate transseptal or sublabial incision.

Methods:
A retrospective chart review of patients who underwent the MED approach for management of maxillary IPs was performed from 2012-2018. The demographic data, clinical presentation, radiographic findings, pathology, and surgical outcomes were reviewed.

Results:
Twenty-two patients were identified, 13 male and 9 female. Eighteen of the 22 patients had prior surgery and all had Krouse stage 3 disease. After a mean follow-up of 24 months (range 4-63 months), only 1 patient (4.5%) developed a recurrence which was successfully treated with endoscopic resection. Complications included epiphora in 1 patient, epistaxis in another, and 1 patient with transient upper lip numbness. No patients developed alar notching or pyriform aperture stenosis.

Conclusion:
The MED technique is a highly effective approach for surgical resection of primary and recurrent IPs, providing complete access to the entire maxillary sinus. In many cases, the MED can obviate the need for an adjunctive sublabial or transseptal incision, while also providing excellent exposure for postoperative surveillance.

Poster #083

Monitoring the trends of popular homeopathic remedies for sinusitis on internet search engines

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Background:
With the rise of homeopathic remedies, the internet has become a major source of health information for patients and sinusitis and its associated symptoms are no exception. This study sought to identify the most common homeopathic remedies for sinusitis and to track their popularity on internet search engines.

Methods:
A marketing keyword analyzer was used to determine the number of hits, or search volume, on Google that each of the most popular homeopathic sinus remedies were searched over the 12 month period from November 2017-October 2018.

Results:
The overall search volume for the term “natural sinus remedies” increased 22%. The biggest increases in search volume were seen in stinging nettles (27%) and intranasal capsaicin spray (8%). Decreases in search volume were noted for the following remedies: bromelain (29%), manuka honey (25%), quercetin (22%), saline irrigation (15%), butterbur (15%), and oil pulling (12%). However, when combining the remedy with key words such as “sinus” and “benefits” many of these had increased searches. For instance, “bromelain + sinus” had a 19% increase in volume, in contrast to a 29% decrease for searches of bromelain alone.

Conclusion:
Overall, this data shows that patients are searching more frequently for natural remedies to sinusitis. While the popularity of certain remedies has decreased when looked at individually, their popularity has increased in the context of sinusitis treatment. These remedies have quickly spread among the population and are often sought out from sites without association to the medical field. Otolaryngologists should be aware of which remedies are gaining popularity, as some of them may have unintended side effects.

Poster #084

Occupational chronic rhinosinusitis: A review

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Chronic rhinosinusitis (CRS), is an important public health issue, affecting 12.5% of the population, and costing an estimated 8.6 billion per year in the United States. Despite the literature associating occupational risk factors to CRS prevalence, occupational CRS receives relatively limited attention. While the medical literature has provided many important reports and analyses regarding occupational CRS, its broad clinical and research definition has resulted in suboptimal clarity. Clinical practice has shown that occupational CRS and other upper airway diseases very frequently co-exist with, and their incidence substantially exceeds that of occupational lower airway diseases (LAD). The latter, however, receive considerably more attention. Given the above considerations, a systematic review of the current literature on occupational CRS is necessary. This article aims to outline the current diagnostic framework for occupational CRS, and propose revised clinical/ research guidelines for occupational CRS.

POSTERS

Poster#085

Our experience with cone beam CT and it's utilization in rhinology practice - 3-year retrospective review of our practice

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Introduction:
Ever increasing demand for health care services and limited resources prompt us to re-evaluate the way we provide care to our patients. Current pathways seem no longer fit for purpose and can, in fact, lead to an inaccurate and delayed diagnosis and treatment.

Objectives:
Cone beam CT (further CBCT) is an advanced imaging technology which uses divergent cone-shaped radiation and a flat panel detector (Leung, Chaung et al. 2011). As a result, high-resolution images are obtained. These are particularly good when visualising bony structures and are superior to the conventional CT scan when looking at small detail and in minimizing metal artifacts.

Further advantages of the CBCT is low radiation dose and a possibility of dose adjustment especially when imaging children.

Rapid innovation and improvement of the CBCT technology significantly reduced the size and cost of the machine which allowed a point of care, in-office CT imaging possible.

Methods:
We carried a retrospective review of our rhinology practice utilizing a cone beam CT scan between February 2016 and February 2019.

Discussion:
The new pathway, utilizing the point of care cone beam CT, benefits patients with chronic rhinosinusitis, facial pain, post nasal discharge, chronic cough.

It has direct positive effect on the patient's quality of life, reduction in time off work, increased activity and productivity and overall increased satisfaction and experience with the service.

Advances in the cone beam technology bring a reduction in radiation exposure together with an immediate and accurate diagnosis. Point of care imaging embraces the "get it right first time" national initiative.

Poster #086

Outcomes and complications of concurrent FESS and rhinoplasty: A systematic review

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Introduction:
Chronic rhinosinusitis (CRS) has been reported to affect approximately 14-16% of the U.S. population. In certain instances, patients often benefit from concomitant functional septorhinoplasty, or elect for cosmetic rhinoplasty, in addition to functional endoscopic sinus surgery (FESS) and prefer combining both procedures. Determining outcomes of combined surgery is important when discussing risks and benefits with patients.

Methods:
A systematic literature search was performed in PubMed. Patients were categorized as either having FESS or rhinoplasty alone or combined. Evaluation of postoperative complications included the incidence of postoperative bleeding, revision, synechiae, structural failure, and infection.

Results:
Of the 15 screened articles published from 1991 to 2018, 15 (581 patients), 2 (45 patients) and 3 (102 patients) provided data for complication rates of combined FESS and rhinoplasty, FESS alone or rhinoplasty alone respectively. 87 (14.97%) total reported complications were seen in combined procedures, whereas 3 (6.67%) and 14 (13.72%) complications were noted in FESS and rhinoplasties respectively ($p=0.304$). Synechiae and revision were the most common postoperative complications and occurred in 38 (7.02%) and 12 (5.88%) of combined cases, in 0 (0%) and 3 (6.67%) of FESS cases, and in 3 (2.94%) and 8 (7.84%) of rhinoplasty cases ($p=0.057$, $p=0.807$), respectively.

Conclusion:
Evidence demonstrates complication rates in combined or stand-alone FESS and rhinoplasty procedures are similar. If a patient elects treatment for CRS and desires concurrent improvement of the functional airway and/or cosmetic surgery, combined surgeries may be appropriate with no apparent increased risk.

Poster #087

Paediatric sino-nasal masses: Diversity and the challenges in a developing country

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Background:
Mumbai has a population of over 22 million with most tertiary referral hospitals located in this densely populated city. Each centre sees an average of 0.57 million out-patients per year. A huge diversity of gross paediatric sino-nasal masses (SNM) presents to these centres. This study reviews the variety and the challenges that we face in paediatric SNM. A different modality of taking health-care to the rural population, in form of a mobile hospital for early intervention has been described.

Materials & Methods:
A retrospective review of 18 paediatric SNM presenting at the King Edward Memorial Hospital (KEMH), from August 2018 to February 2019 was carried out. The incidence, challenges in the management and histo-pathology of the masses is presented.

Results:
The 18 SNM included - Rhinosporidiosis (3), meningo-encephalocoeles (6), chondromyxoid fibroma (1), extensive angiectatic polyps (1), chronic rhinosinusitis with polyposis (2), Nasal glioma (1), Dacryocystocoele (2), Dentigerous cyst (2).

Conclusion:
Management of advanced paediatric SNM is very challenging due to the limited working space and the age-group itself. One venture to take healthcare facilities to rural India, for early intervention in paediatric cases, is in form of the 'Life-line express', which is the world's first mobile hospital train which conducts diagnostic and surgical camps in remote areas, all over the country.

Poster #088

Patterns of cervical lymph node metastasis in sinonasal squamous cell carcinoma

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Introduction:
Squamous cell carcinoma (SCC) predominates as the most common tumor histology in the sinonasal cavity. Most patients present with local spread but cervical lymph node metastases can indicate more aggressive disease. Analyzing the pattern of nodal metastases provides insight into therapeutic management and prognosis of these malignancies.

Methods:
The National Cancer Database (NCDB) 2004-2016 datasets were queried for SCC of the nasal cavity and paranasal sinuses with confirmed regional lymph node metastasis. Patterns of cervical lymph node metastasis were analyzed and the results were tabulated. Kaplan-Meier and Cox Proportional-Hazards analyses were performed to determine impact of specific lymph node levels on survival.

Results:
A total of 1437 cases met inclusion criteria. The majority of tumors were located in the maxillary sinus (57.1%) and didn't have metastasis to distant sites (82.0%). Analysis of lymph node spread revealed that 92.4% of cases had spread to Level I nodes, 63.6% to Level II, 22.5% to level III, 9.7% to Level IV, 8.4% to level V, 1.3% to level VI, 1.1% to Level VII, and 4.0% to retropharyngeal lymph nodes. On Cox Proportional-Hazards analyses, lymph node level was not a significant predictor of survival when accounting for other variables.

Conclusions:
Several studies have documented that nodal metastases are a significant prognostic indicator in SCC of the head and neck, decreasing the overall survival by half. In this study we show the most common lymph node levels involved in SCC metastasis. Understanding the specific patterns of metastasis can help guide surgical management. However, specific level of metastasis does not significantly impact survival.

POSTERS

Poster#089
Perivascular epithelioid cell tumor (PEComa) of the pterygopalatine Ffossa
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Perivascular epithelioid cell tumors (PEComas) are a rare group of mesenchymal tumors associated with tuberous sclerosis. These tumors are typically treated with resection and rarely recur or exhibit malignant behavior. Upon review of the literature, there have been 43 reported cases of PEComa of the head and neck. There is only one previously reported case of PEComa in the skull base and none reported in the pterygopalatine fossa. Of note, the previously reported case of skull base PEComa involved an aggressive tumor with widespread metastasis. Here we report the first case of a PEComa of the pterygopalatine fossa, which was treated conservatively. This rare pathology should be considered in the differential diagnosis for atypical skull base tumors.

Poster #090
Persistent pneumocephalus following cranialization of the frontal sinuses: An endoscopic approach for skull base repair
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Emily Eischen
Puya Alikhani
Harry Van Loveren
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Objective:
To describe the transnasal endoscopic management of persistent pneumocephalus following cranialization of the frontal sinuses.

Study design:
Case series with chart review.

Setting: Tertiary referral center.

Methods:
Retrospective chart review of patients who underwent endoscopic repair of an anterior skull base defect causing pneumocephalus following cranialization of the frontal sinuses.

Results:
Four patients were identified that met inclusion criteria. Craniotomy was performed for trauma in two patients and for anterior skull base tumor resection in two patients. The average time from craniotomy to repair of pneumocephalus was 41.7 days. All four patients were treated endoscopically by a single surgeon (MHT). The patients underwent either a Draf IIb or Draf III frontal sinusotomy with abdominal fat graft to obliterate dead space and a free mucosal graft or vascularized pedicled nasoseptal flap. Successful closure was achieved on all four patients with resolution of pneumocephalus.

Conclusion:
Persistent pneumocephalus following cranialization of the frontal sinuses can be effectively repaired with a transnasal endoscopic approach, thus avoiding the potential risk and morbidity of revision open craniotomy.

Poster #091

Perspectives and expectations in endoscopic sinus surgery for patients with chronic rhinosinusitis: A description of the patient journey

Nadim Saydy, MD, Mr.
Martin Desrosiers, MD
Sami Moubayed

Background:
A deep understanding of the "patient experience" is central to the physician-patient relationship. Despite novel medical therapies and improving surgical techniques, a minority of primary stakeholders (patients) continue to be dissatisfied after endoscopic sinus surgery (ESS). This is in part due to a lack of understanding of their goals and expectations, and a paucity of clinically-relevant outcome measures. Our objective was to determine which principal factors are conducive to patient satisfaction after ESS.

Methods:
Face-to-face semi-structured 20-minute interviews (9 questions, with specific prompts) were conducted with 22 patients with chronic rhinosinusitis (CRS) from a single institution. Participants had all previously benefited from ³ 1 ESS. Various themes pertaining to ESS were addressed, with an emphasis on the definition of operative success. Interviews were recorded and data was compiled. A thematic analysis was undertaken.

Results:
Data resulting from the thematic analysis will be presented in a comprehensive manner through key concepts, clinical pearls, as well as patient quotes and testimonies.

Conclusions:
Quality care in CRS is contingent on the collaboration between patients and healthcare providers. By illustrating patients' perspective, this qualitative study will allow clinicians to communicate more effectively with patients on the topics of goals, expectations and outcomes after ESS. This presentation will also provide physicians with a patient-centered approach to evaluating the outcome of an ESS.

Poster #092

Physical intervention outcomes for epistaxis control in pediatric coagulopathy

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Background:
In pediatric patients with bleeding disorders, epistaxis can be severe or even life-threatening. Medical management (MM) of epistaxis is the standard of care in treating children with coagulopathies. Our objective is to review our experience with physical intervention as a method of epistaxis control for pediatric patients with an identified coagulopathy.

Methods:
Children with a known coagulopathy and treated for epistaxis at a tertiary pediatric institution were identified, and retrospective chart review was performed. Medical records from 2000-2011 were reviewed and abstracted. Number of bleeding episodes, methods of management used, type of coagulopathy, complications, and success rates for controlling hemorrhage were recorded.

Results:
Thirty-four children with a total of 102 encounters for epistaxis met study criteria. Sixty-nine total procedures (67.6%) did not require further surgical intervention during the intervention success period, defined as 21 to 28 days after initial procedure. Physical intervention was successful 57% (21/37 procedures) of the time in patients with Glanzmann thrombasthenia. In children with von Willebrand disease, physical intervention prevented recurrent epistaxis 75% of the time (21/28 successful procedures). For patients with acquired coagulopathy due to chemotherapy for hematogenous malignancies, physical intervention proved successful in 76% (13/17) of procedures.

Conclusion:
Though MM is the traditional treatment for refractory epistaxis in children with known coagulopathies, physical intervention may be a safe, effective, and minimally invasive option. These interventions may decrease the frequency of recurrences or bleeding severity in children with known coagulopathy.

POSTERS

Poster #093
Pleomorphic adenoma of the nasal septum: A case report
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Introduction:
Pleomorphic adenomas are the most common benign tumor of the salivary glands, accounting for approximately 65% of all salivary gland tumors. Most of these tumors are found in the parotid gland, submandibular gland, and a small fraction in the minor salivary glands. When these tumors arise in the minor salivary glands, they tend to occur in the hard palate, soft palate and the nasopharynx. This case report illustrates a rare case of pleomorphic adenoma occurring in the nasal cavity, with associated clinical symptoms, diagnostic workup, and treatment options.

Case Presentation:
A 42-year-old man with history of GERD, asthma, and multiple sclerosis presented 12 years ago to an otolaryngologist for a right nasal lesion, and an in-office biopsy showed pleomorphic adenoma with positive margins. He was lost to follow up and presented 8 years later as the lesion began to grow back. He was given the option of conservative observation versus removal and elected to observe for 4 years. He then underwent right partial septectomy, resection of recurrent pleomorphic adenoma and placement of Alloderm graft. Final pathology showed a 0.6 cm salivary gland neoplasm consistent with cellular pleomorphic adenoma and negative margins.

Conclusion:
Pleomorphic adenomas are the most common type of benign tumors of the salivary glands. These tumors have the capacity to undergo malignant transformation, recur after resection, and metastasize to distant sites. This case report highlights a rare site for these tumors to develop, namely the minor salivary glands in the nasal cavity, and the subsequent management and follow-up.

Poster #094
Post-operative pain management and perceived patient outcomes following endoscopic pituitary surgery
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Purpose:
There are no studies evaluating prescribing patterns and utilization of post-operative pain medication following endoscopic pituitary surgery. The goal of this study is to determine prescribing tendency, patient usage, and perceived patient outcome regarding post-operative pain management.

Methods:
100 patients undergoing endoscopic pituitary surgery at one institution from 2016–2018 were identified. Post-operative pain medication regimens were obtained, and patients were queried on the state narcotic database to determine if their narcotic prescription was filled. Patients were contacted via phone interview to determine the utilization and perceived outcome of their pain management regimen.

Results:
53 different pain regimens were prescribed to study patients. 92% of study patients were prescribed an opioid post-operatively and 85.9% of those patients filled said prescription. The average quantity of opioids prescribed per patient was 636 MME, with a range of 30–4,200 MME and standard deviation of 580 MME. 44% of study patients participated in a telephone survey. 93% of surveyed patients received an opioid prescription, of whom 88% filled that prescription. While 83% of responders who filled their opioid prescription reported utilization, 70% of users reported using less than 25% of their prescription. 60% of responders who utilized their opioid prescription reported majority use within the first 24-48 hours following surgery. 83% of responders who used prescription opioids found that the narcotic adequately controlled pain and aided recovery.

Conclusions:
The variability in pain management prescribing patterns and likely overprescribing of opioids in this patient population warrant further investigation.

Poster #095

Predictors of survival in patients with acute invasive rhinosinusitis: A retrospective review

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Introduction:
Acute invasive fungal rhinosinusitis (AIFS) is a subset of sinonasal fungal disease that affects immunocompromised patients and is associated with a high mortality rate. We aim to characterize our outcomes and identify predictors of survival.

Methods:
We performed a retrospective review of patients with AIFS at UCSF from 2007–19. Chart review was completed to obtain patient demographics, key clinical data, subsite of involvement (sinonasal cavity, infratemporal fossa (ITF), pterygopalatine fossa (PPF), intracerebral, intraorbital). Univariate analysis with Kaplan Meier survival curves was used.

Results:
We reviewed 46 patients with AIFS. The most common underlying immunosuppression present was diabetic ketoacidosis (30%), followed by hematologic malignancy (28%), and immunosuppressive medications (22%). The majority of patients were infected with Mucorales (61%), followed by Aspergillus (22%). Overall survival at 1 month was 70%, and at 1 year, it was 46%. 41% had intracranial extension and 39% had intraorbital extension of their disease. Patients with intracranial extension of disease had significantly worse survival (HR 2.9, $p<0.05$). Patients with sinonasal disease alone versus extension into the ITF or PPF had no difference in survival. Intraorbital extension of disease was not significant. Survival based on underlying immunosuppression demonstrated that patients with poorly controlled diabetes had better survival than patients who presented in DKA($p<0.05$).

Conclusion:
While intracranial extension of disease is associated with decreased survival, survival at one year is better than reported in the literature. Extension of fungal disease into the orbit, ITF, and PPF is not associated with decreased survival.

Poster #096

Prescription patterns and opioid usage in sinonasal surgery

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Introduction:
Excess post-operative opioids contributes to narcotic misuse and diversion. Understanding opioid prescribing and utilization patterns following sinonasal surgery is critical in designing practice protocols that can effectively control pain while minimizing excess opiates. Our objective was to identify factors associated with opioid use in sinonasal surgery as well as further delineate optimal prescribing patterns.

Methods:
Following sinonasal surgery, patients were sent postoperative surveys. Data was collected on the amount of narcotic required, pain control, presurgical opioid use, and narcotic disposal. Additional data collected included demographics, surgeries performed, distance traveled, and total narcotic prescribed, including refills. Results: 364 patients were included. On average, 25.3 tablets were prescribed while the mean taken was just 11.8. Excess opioids were prescribed 84.9% of the time with a mean excess narcotic of 152.5 (in OME). 11.8% reported using no opioids while 52.1% used <50%, and 36.1% used > 50% of their narcotic prescription. Only 2.6% required a refill. The total amount of narcotic used was not associated with extent of ESS, type of opiate prescribed, gender, distance living from hospital, or narcotic usage prior to surgery ($p>0.05$). The addition of septoplasty and/or turbinoplasty as well as age were associated with variation in narcotic usage ($p<0.001$). 76.1% of patients incorrectly discarded/stored excess opioids.

Conclusion:
Narcotics are over prescribed for patients undergoing sinonasal surgery. The type of surgery performed best predicts postoperative opiate use. Improved patient education regarding disposal of excess narcotics may help to curtail future opioid diversion.

POSTERS

Poster #097
Prevalence of eustachian tube dysfunction in the U.S. elderly population
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Introduction:
Eustachian tube dysfunction (ETD) prompts more than two million adult visits annually in the United States. Despite this, limited data exists examining associations between ETD, other upper aerodigestive inflammatory processes, and upper aerodigestive tract (UADT) malignancies.

Methods:
A cross-sectional study was performed by querying the SEER-Medicare linked database for patients diagnosed with UADT malignancies between 2003 and 2011 compared to a matched population. The prevalence of inflammatory diseases among these patients was compared.

Results:
A malignancy of the UADT was diagnosed in 13,805 patients over age 65, while 148,517 patients were included in the control cohort. Among patients with malignancy, the prevalence of ETD was 9.08% versus 5.44% in the control population (Odds Ratio (OR) 1.73, 95% confidence interval [95% CI] 1.63-1.84). An increased OR (95% CI) between inflammatory conditions and UADT malignancy was identified in patients with chronic rhinitis (2.35, 2.22-2.49), chronic rhinosinusitis (1.91, 1.82-2.01), chronic adenoiditis (6.8, 3.66-12.86), acute otitis media (1.21, 1.03-1.42), and gastroesophageal reflux disease (1.65, 1.59-1.71). No association with UADT malignancy was identified for allergic rhinitis, acute sinusitis, and upper respiratory tract infection.

Conclusions:
Over 5% of patients older than 65 in the United States are diagnosed with ETD in the absence of UADT malignancy. A proportion of these patients may benefit from treatment of inflammatory disease as a cause of ETD. Prospective studies and screening trials are necessary to confirm this relationship.

Poster #098
Primary skull base lymphoma: A case series
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Primary Skull Base Lymphoma (PSBL) is a rare pathology of extranodal lymphoma. Due to limited cases in the literature, outcomes and survival endpoints have not been closely examined. We retrospectively analyzed data from 8 patients treated at our institution from 2006 to 2016 to better characterize PSBL manifestations, treatments and outcomes.

Subjects included 5 females and 3 males with ages of diagnosis ranging from 27 to 84 with a median age of 55.5. The most common subtype was NK/T-cell lymphoma. Of the 6 patients that completed treatment at our institution, all demonstrated a complete response to treatment with a combination of radiation, chemotherapy and/or surgical resection. In these patients, there was 100% survival at 1 and 5 years from diagnosis and only one recurrence, which completely resolved with chemotherapy. The presenting symptoms of these patients included diplopia, headaches, increased imbalance, worsening congestion, tooth pain, facial edema and gradually enlarging masses on the face and gums. 87.5% of these 8 cases presented with low stage, non-metastatic disease. Of these patients, the Karnofsky scores available demonstrated that PSBL had no impact on their daily functioning.

While PSBL can present with a variety of symptoms that make it difficult to diagnose, current treatment strategies were effective in achieving complete resolution and impressive long-term survival rates in our series of patients. PSBL appeared to demonstrate a gradual progression with limited impact on these patients' daily functioning. Further research should be done to investigate whether the Karnofsky scores, treatment strategies and optimistic outcomes described in our study are generalizable across a larger population.

Poster #099

Prolonged hospital stay following definitive surgical resection of sinonasal malignancies: Causes, predictors and survival

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Marc Rosen, MD, FARS
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Introduction:
Prolonged hospitalization after surgical resection for sinonasal malignancies (SNM) has been correlated with significant comordibities, advanced tumor stage, extra-sinonasal extension, need for complex reconstruction, and 30-day readmissions. This study aims to evaluate the causative factors leading to prolonged post-operative hospital stay after resection of SNM.

Methods:
A retrospective review of all SNM cases undergoing surgical resection at a single tertiary care center between 2005-2018 were included. Patients were divided into two groups - prolonged hospital stay (PHS) (>7 days) and standard hospital stay (SHS) (< or =7 days). Results: 181 cases were included and 22% (n=40) had a PHS following definitive resection. Age, gender, race, smoking status and comorbidities were not associated with PHS. Non-endoscopic surgeries, bilateral sinonasal tract involvement, neck dissection, extra sinonasal extension (especially orbit, dura and intracranial cavity), intra operative cerebrospinal (CSF) leak, lymphovascular invasion, and advanced TNM staging were significantly associated with PHS ($p<0.0001$). Overall survival was not affected by PHS. Mean BMI was significantly higher for those with PHS ($p=0.01$; 27.3 vs 31.9). Primary site, histopathological type, tumor grade, perineural invasion, extent of surgical resection, margin status, and type of reconstruction were not associated with PHS ($p>0.05$). No association was seen between 30-day readmission and PHS.

Conclusion:
Prolonged hospitalizations were associated with non-endoscopic surgeries, bilateral sinonasal involvement, neck dissection, extra sinonasal extension, intra operative CSF leak, lymphovascular invasion, and advanced TNM staging at our institution.

Poster #100

Pseudo frontal sinus due to incomplete frontal sinus cranialization

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Background:
Frontal sinus cranialization was initially described in 1978 for management of complex frontal sinus trauma. Cranialization is also incorporated into the skull base reconstruction after craniofacial resection of advanced sinonasal malignancies with frontal sinus and intracranial involvement. The frontal lobes should advance and fill the frontal sinus space during cranialization to separate the intracranial and sinonasal cavity. However, we have encountered several cases of incomplete cranialization with development of a pseudo frontal sinus with complete exposure of the frontal lobes without subsequent intracranial complications.

Patients and Results: 4 patients with T4N0M0 sinonasal malignancies who underwent craniofacial resection with frontal sinus cranialization and post op chemoradiation developed a pseudo frontal sinus. Follow up ranged from 6 to 48 months without surgical management of the pseudo frontal sinus. All patients had complete mucosalization of the exposed frontal lobe dura and skull base reconstruction grafts without development of mucoceles, CSF leaks, or intracranial infections.

Conclusions:
Incomplete frontal sinus cranialization after craniofacial resection can result in a pseudo frontal sinus without separation of the intracranial and sinonasal cavity. The mucosalization of the frontal lobe dura and skull base reconstruction grafts likely plays a role in preventing intracranial complications. Future studies with larger numbers can investigate the risk factors for developing a pseudo frontal sinus.

POSTERS

Poster #101
Psychiatric morbidity in sinonasal malignancies: Analysis of incidence, predictors, and role of social support
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There is paucity of data regarding the psychiatric morbidity in sinonasal malignancies (SNM) cancer survivors.

Methods:
HADS scale was utilized to screen for anxiety and depression post definitive therapy in SNM. In addition, the modified MOS scale was used to assess social support.

Results:
Fifty-one patients were included. The most common modality of treatment was surgery followed by XRT (88%). 29% of patients met criteria for referral to psychiatry. Of these, 30% were reluctant to undergo a psychiatric consultation. 29% patients reported unmet needs in at least one aspect of social support. The majority of the patients who identified themselves as religious did not suffer from anxiety or depression (p=0.05). Patient-related factors such as demographics, employment status, marriage status were not associated with increased incidence of post-treatment anxiety or depression. Furthermore, disease-related factors such as primary site, histopathology, TNM staging, treatment modality, recurrence and current status were not predictive of psychological impact (p>0.05).

Conclusion:
This is the first study to characterize psychiatric morbidity in SNM. On an average, one in three patients of SNM suffer from either anxiety or depression. It can be seen in patients long after completion of definitive therapy and is independent of age, gender, tumor stage, cancer treatment and outcome. Social stigma against receiving psychiatric help is observed even after objective evidence of psychological disorders is provided. Social support strongly correlated with anxiety but not with depression. We recommend that screening for psychological issues in patients with SNM at regular intervals should be made a standard of.

Poster #102
Quality of YouTube videos as an educational tool for maxillary antrostomy
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Background:
YouTube is a common source for educational videos. Content is not organized by quality, but rather ranked by popularity and view count, creating a potential for dissemination of videos demonstrating poor or inappropriate surgical techniques. We sought to evaluate quality of sinus surgery videos on YouTube. Additionally, we compared these videos with those on American-Rhinologic.org.

Methods:
YouTube search for “endoscopic sinus surgery” and “maxillary antrostomy” was performed. Top videos by views, as well as an ARS representative video, were deidentified and cropped to show the maxillary antrostomy. Three reviewers rated each video using a validated surgical global rating scale (GRS), and a rating of uncinectomy and maxillary antrostomy, based on a 5-point likert scale. A “total score” was made by combining the GRS with the two Likert scales.

Results:
14 videos were included. Median total score and GRS was 40/50 (SD ±9.6, range: 17 to 50) and 24/30 (SD ±5.8, range: 10-30), respectively. The ARS video scored 48 and 29, respectively. There was a trend toward a negative correlation between score (quality) and view count (Spearman r2 = -0.5, p=0.08).

Conclusions:
Top ranked YouTube videos show variable technique with some displaying mastery of maxillary antrostomy, while others demonstrated poor respect for tissue, poor use of endoscopes, and incomplete surgery. We observed no significant correlation between number of views and the quality of videos. Dissemination of a high-quality basic sinus surgery videos would aid surgical education.

Poster #103
Radiation sinusitis: Head and neck radiation induces paranasal sinus mucosal thickening
Taha Mur, MD
Christopher Brook

Introduction:
Radiation therapy to the head and neck is a commonly performed modality in the treatment of malignancies in the region. The authors investigated the change in mucosal thickness in the paranasal sinuses after radiation therapy.

Methods:
We performed a retrospective review of 33 patients who underwent head and neck radiation therapy for the treatment of cancer. We evaluated pre- and post-radiation mucosal thickness on CT imaging. Several defined landmarks from each of the sinuses were used to measure mucosal thickness at the same points in all subjects. These included the anterior and posterior maxillary sinus, anterior and posterior ethmoids, sphenoid floor and anterior frontal sinus. Using radiation mapping, the dosage to each of these locations was quantified and compared to the change in mucosal thickness.

Results:
Average radiation dosage was noted to be 2486 +/- 2818 cGy to each sinus, with an average increase in mucosal thickness of 3.62 +/-10.85 mm post radiation. Pearson's correlation coefficient demonstrated a weak significant positive linear correlation between increased mucosal thickening and radiation dose (r=0.31, p=0.01). One cGy increase in radiation dose to the sinus was associated with a 0.001mm increase in mucosal thickness.

Conclusion:
There is a relationship between radiation therapy in the head and neck and increased post-treatment paranasal sinus mucosal thickness.

Poster #104
Rapid detection of cerebrospinal fluid leaks at the point of care
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Fistulous tracts between intracranial and pneumatized cavities can place patients at significant risk of intracranial complications, including bacterial meningitis. Timely and accurate diagnosis of CSF leaks is of paramount importance in minimizing morbidity/mortality and facilitating patient treatment planning. Current biomolecular assays are time consuming (~3-5 days) and expensive (~$250). Alternatively, lateral flow immunochromatographic assays (LFAs) are commonly utilized binary diagnostic techniques that contain inherent advantages, including: ease of use, low cost (~<$5), rapid results (<10 minutes), and the ability to operate without supporting equipment. The purpose of this investigation was to develop an LFA for beta-2 transferrin (B2TF, a CSF-specific biomarker), and to collect initial clinical efficacy data.

This assay had a limit of detection of 16 µg/mL purified B2TF in a 100 µL sample, while also providing a readout within ~10 minutes. Assay components (i.e., nitrocellulose membrane, anti-B2TF antibody) were optimized, and an enzymatic reporter was used for increased assay sensitivity. The assay was validated against a commercially-available B2TF ELISA. The assay was also confirmed with pure human CSF. We are now testing the effect of bodily fluid contaminants (i.e., blood, nasal fluid) and different molecular reporters (i.e., gold) on assay functionality. We have also collected ~20 clinical samples from patients, which will be tested with our B2TF LFA. Ultimately, this point-of-care assay may improve timely clinical decision making, facilitate accurate patient counseling, reduce the rate of misdiagnosis, and reduce adverse events associated with untreated CSF fistulae, such as bacterial meningitis.

POSTERS

Poster #105

Readability of patient-reported outcome measures for chronic rhinosinusitis and anterior skull base diseases

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Charles Ebert, MD, MPH, FARS

Background:
Outcome measures in healthcare that presume a higher level of patient health and overall literacy may inadequately estimate the disease experiences of less educated patients, and further disadvantage them. Patient-reported outcome measures (PROMs) are widely used communication tools for clinical practice and are often used to evaluate and guide management for chronic rhinosinusitis (CRS) and skull base diseases. However, their readability and subsequent incomprehensibility for patients has not been assessed. The aim of this study is to evaluate the readability of commonly used PROMs for these conditions and whether they meet recommended readability levels.

Methods:
Three readability measures: Gunning Fog, Simple Measure of Gobbledygook (SMOG), and FORCAST were used in the evaluation of commonly used PROMs for CRS and skull base disease. PROMs with 6th grade readability level or lower were considered to meet health literacy experts' recommendations.

Results:
A total of 11 PROMs were reviewed (8 CRS, 3 skull base). Gunning Fog consistently estimated easiest readability, whereas FORCAST most difficult. 100% of CRS and 67% of skull base PROMs were above National Institutes of Health and health literacy experts' recommended reading levels. PROMs developed more recently had easier readability.

Conclusions:
PROMs are important clinical tools in otolaryngology that help guide management of disease for improved patient-centered care. Like many other fields of medicine, those used in otolaryngology are beyond recommended reading levels. Development of PROMs in the future should meet recommended readability levels to fully assess the disease experience of our patients.

Poster #106

Recurrent benign vascular papillary neoplasm of the sphenoid sinus and sella with markers of both pindle cell oncocytoma and pituicytoma – A case report

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Pituitary tumors often have similar clinical presentation (headaches, sinus drainage issues, panhypopituitarism) and imaging (tumors in the sellar and suprasellar regions, as well as sphenoid sinus), making them difficult to diagnose without histopathology. This case is the first known report of a rapidly recurrent tumor that shows clinical presentation and radiological imaging similar to pituicytomas and spindle cell oncocytomas (SCO). This is a report of a 66 year old Caucasian woman who initially presented with bitemporal hemianopsia and congestion (drainage issues and nasal obstruction). MRI scans showed a pituitary lesion indicating a large pituitary tumor which was confirmed with a post-surgery pathology diagnosis of a benign vascular papillary epithelial neoplasm of the sella. The tumor has recurred 4 times and been resected via TSA 4 times in the past 12 years. Surgeries were complication free, but each reoccurrence was preempted with presentation of bitemporal hemianopsia, congestion, and slight headache. A biopsy of the tumor was performed and under the microscope, the tumor is a moderate to highly cellular epithelioid neoplasm with papillary and trabecular architecture. Immunohistochemical stain results were used to narrow the broad categories of malignant and benign tumors of the pituitary. Chest X-Ray and MRI also shows no other lesions outside of the primary pituitary lesion. Spindle cell oncocytoma and pituicytomas are rare tumors that are normally positive for S100, but this tumor was negative for S100, while still maintaining similar characteristics. In this report, we review literature, diagnosis, and treatment options.

Poster #107

Repeated intranasal fentanyl use in the setting of lamina papyracea and periorbita dehiscence: A case report and review of literature

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Introduction:
Fentanyl is a lipophilic μ-opioid receptor agonist with a potency 50-100 times greater than morphine.1 In 2017, 28,466 deaths in the United States were attributed to non-methadone synthetic opioids, mostly fentanyl, exceeding deaths secondary to prescription opioids and heroin.2.

Methods:
Case report with review of the literature.

Results:
We review the case of a 36-year-old male with a history of habitual intranasal opiate use who presented with acute rhinosinusitis complicated by ophthalmoplegia and worsening visual acuity. Patient underwent urgent endoscopic sinus surgery with medial orbital wall decompression and incision of the periorbita. He did well postoperatively until being found using intranasal fentanyl in his hospital room, at which time he left against medical advice. The patient presented at a separate hospital 7 days later with abscesses within his ipsilateral frontal lobe and superior orbit as well as intracranial and intraorbital air. Patient had a prolonged medical course characterized by continued intranasal fentanyl use as well as nine hospitalizations at three hospitals (leaving against medical advice on multiple occasions), and five emergency surgeries.

Conclusion:
Repeated intranasal opioid use in the setting of lamina papyracea and periorbital dehiscence can lead to intracranial and intraorbital abscesses and devitalization of cerebral tissue. Otolaryngologists should be cognizant of the risks associated with opioid addiction when deciding the extent of endoscopic sinus surgery particularly with regards to anatomic barriers of the orbit and intracranial cavity.

Poster #108

Respiratory epithelial adenomatoid hamartoma: An underdiagnosed benign condition

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Background:
Respiratory epithelial adenomatoid hamartoma (REAH) is a benign lesion occurring in the sinonasal tract that may clinically mimic more concerning pathology. Clinical factors associated with REAH have not been well characterized. We report our findings on patients with this pathologic diagnosis.

Methods:
A retrospective chart review of patients with REAH at our institution was conducted. Data collected included clinical allergic rhinitis (AR) and asthma symptoms, history of positive allergy testing, additional sinonasal diagnoses, smoking status, prior sinus surgery and the location of the REAH within the sinonasal cavity.

Results:
24 REAH patients were identified (54.2% male, mean age 62y [range 29-93]). Bilateral REAH occurred in 59.1% cases. Clinical AR was identified in 62.5%. REAH was located at the superior nasal septum in 83.3% cases, with the remainder identified in fragmented sinus contents submitted for surgical pathology. Concurrent sinonasal inflammatory disorders were identified in 66.7%, including CRSwNP (6), CRSsNP (4), AERD (2), AFRS (1), central compartment atopic disease (3), and IgG4-related sclerosing disease (1). Eight patients had REAH as the only pathology present, with 50% having AR symptoms.

Conclusions:
REAH is a benign sinonasal lesion that may be underrecognized. Affected patients have a high incidence of allergy and chronic inflammatory conditions. The most common anatomic location of REAH is within the central compartment, a site of significant allergic changes. The coexistence of REAH within inflammatory mucosa, in a consistent anatomic location, suggests REAH may be related to respiratory glandular ingrowth within long-standing reactive changes of ethmoid mucosa.

POSTERS

Poster #109

Review of Cystic Fibrosis transmembrane conductance regulator modulator therapy for chronic rhinosinusitis in Cystic Fibrosis patients

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Background:
Cystic fibrosis (CF) is a genetic disease resulting in severe respiratory compromise and eventually respiratory failure. The advent of cystic fibrosis transmembrane conductance regulator (CFTR) modulators have radically changed the management of CF for patient with select mutations. Though the pulmonary effect and safety of CFTR modulators have been well studied, the effect on the sinuses are poorly understood. CF patients universally have chronic rhinosinusitis (CRS) and frequently seek the care of rhinologists. It is important that we understand the mechanisms of these new drugs, patient population who are candidates, and pursue future research of the effects on the sinonasal cavity.

Methods:
The clinically approved and available CFTR modulators and specific indications for their use are reviewed in detail. Additionally, a literature review of CFTR modulators and effects on CRS in CF was performed.
Results: Three FDA approved CFTR modulators are available with a new triple therapy expected to be approved in the next year. Current drugs are approved for gating or residual function mutations, or F508del homozygotes. Multiple reports describe CFTR modulators increasing transepithelial ion transport in nasal epithelial cultures; however, clinical studies regarding effects of these modulators on sinonasal health are limited to several case reports and a quality of life study.

Conclusions:
CFTR modulators have radically changed management of CF. Initial studies of these medications demonstrate promising results in CF, with further developments ongoing. However, there is currently little literature describing the effect of CFTR modulators on CF associated CRS, but initial results are encouraging.

Poster #110

Revision sinus surgery in the era of balloon dilation

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Background:
Revision rates after endoscopic sinus surgery (ESS) have been reported to be as high as 20%. Therefore, it is critical to understand practice patterns behind revision surgery. The advent of balloon sinus dilation (BSD) poses two important questions: (1) do revision rates differ between BSD and ESS, and (2) how is BSD utilized as a tool in revision surgery?

Methods:
Data from Marketscan (Truven Health) over a five-year period (2012-2016) were analyzed. Patients who underwent a sinus procedure with at least two years of follow-up were included.

Results:
62,304 patients met inclusion criteria. 6,847 (10.99%) underwent revision. Overall revision rates were similar between ESS, BSD, and hybrid procedures, although revision rates were higher for ESS of the frontal and sphenoid sinuses vs BSD. The median time to revision was shorter for ESS versus BSD (278 vs 343 days). Age >55, the Southern region of the U.S., and medical co-morbidities such as asthma, allergies, diabetes, and reflux increased the odds of revision on multivariate analysis. The balloon was used 11%, 21%, and 13% of the time for revisions of the maxillary, frontal, and sphenoid sinuses, respectively. For a sinus that underwent revision after an initial BSD, a repeat BSD was done close to 40% of the time.

Conclusion:
BSD was not associated with higher revision rates. However, BSD was used frequently in the revision setting, especially for the frontal sinus and for patients who had an initial BSD. Our findings highlight the prevalent role of BSD in revision surgery and the need to assess outcomes for these practices.

Poster #111

Short course acetazolamide may be a safe and effective alternative to lumbar drains in repairing moderate to high flow CSF leaks after expanded approaches to suprasellar tumors

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Background:
Repair of complex CSF leaks following expanded endonasal skull base surgery can be challenging, often requiring lumbar drains to accelerate healing of skull base reconstruction. Lumbar drains can be associated with significant patient morbidity and other serious complications. In this study, we examine the safety and efficacy of a short 10day tapering course of acetazolamide in lieu of lumbar drains as an adjunct for CSF leak repair.

Methods:
A retrospective review of expanded endonasal sellar and suprasellar tumor resections from 2012-2018 was performed and cases with CSF leaks repaired using adjunctive postoperative acetazolamide with no lumbar drains were identified. Demographic factors and comorbidities were determined. Adverse events and postoperative CSF leak rate was determined, and statistical analysis was performed to identify predictive factors.

Results:
Forty cases were identified, primarily suprasellar pituitary tumors or craniopharyngiomas with significant intraoperative CSF leaks. Skull base reconstructions were performed in a multilayer fashion using a nasoseptal flap or mucosal graft. All patients underwent a short course of acetazolamide (250mg BIDx5 days then 250mg qDayx5 days). Mean follow-up was 3.5 years. There were no cases of electrolyte abnormalities or adverse events except for 1 patient with headache. Three patients (all revision cases) had a postoperative CSF leak while on acetazolamide that required either a lumbar drain or revision duraplasty (>90% success rate, $p<0.05$).
Conclusions: Postoperative short course acetazolamide may be a safe, tolerable, and effective alternative to lumbar drain placement in the repair of moderate to high flow suprasellar CSF leaks.

Poster #112

Silent sinus syndrome with an accompanying benign deep masticator space mass: A case report and literature review

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Introduction:
Silent sinus syndrome (SSS) is a condition characterized by ophthalmologic features, such as spontaneous enophthalmos and hypoglobus, as well as remodeling of the orbital floor, secondary to chronic, asymptomatic maxillary sinusitis. SSS has been documented secondary to a number of external causes, including trauma or surgery, but to our knowledge has not been described in the setting of a mass in the deep masticator space.

Case Presentation:
A 56-year-old woman with a history of chronic headaches with prior normal sinonasal imaging presented with increasing right-sided facial pain and headaches that radiated to her occiput, subjective visual changes, sharp ear pain, and diminished smell. Physical exam was unremarkable, while nasal endoscopy demonstrated lateral bowing of the medial maxillary wall on the right. Computed tomography revealed an atelectatic and opacified maxillary sinus with inward bowing of the posterior maxillary wall and increased orbital volume on that side. Magnetic resonance imaging demonstrated a homogenous 2x2x2.4 cm T1- and T2-weighted, hyperintense lesion in the deep masticator space splaying the right medial and lateral pterygoid muscles. Following maxillary antrostomy and biopsy of the mass, the patient experienced near immediate resolution of symptoms. Histologic examination of the mass demonstrated mature adipose tissue with few aggregates of benign small vessels, and a diagnosis of benign lipoma was made.

Discussion:
This is an unusual presentation of SSS, with an accompanying lipoma of the deep masticator space. We herein review our clinical experience with SSS and provide a literature review of the presentation, management and perioperative considerations for SSS.

POSTERS

Poster #113

Sinonasal Adenocarcinoma: A Population-Based Analysis of Cancer Disparities

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Background:
The objective is to identify cancer disparities in patients diagnosed with sinonasal adenocarcinoma (SNAC).

Subjects and Methods:
The Surveillance, Epidemiology, and End Results database was queried for cases of SNAC from 1973-2005. Patient demographics and county associated socioeconomic variables were characterized. The Cox proportional hazards model was used for multivariate analyses of survival, AJCC stage at diagnosis and to assess factors in patients receiving surgery if recommended.

Results:
SNAC was identified in 630 patients. In a multivariate model of overall survival, age (HR=1.03 [1.03 – 1.04], p<0.0001), male sex (HR=1.26 [1.01 – 1.59], p=0.0452), and year of diagnosis (HR=0.97 [0.96 – 0.98], p<0.0001) were significantly related to time-to-death, while non-Hispanic black race showed some evidence of being related to shorter time-to-death (HR=1.39 [1.00 – 1.93]; p=0.0503). In regards to non-cancer related death, the percentage of residents with less than a high school education were significantly related to time-to-death (HR=1.09; p=0.0333). In the rural-urban analysis, there is a higher rate of SNAC-related death up to the point where the county urban percentage reaches >40%, implying that patients in rural areas have decreased cancer related survival (HR = 0.96 [0.92 – 0.99]; p=0.0270). No demographic or socioeconomic variables were predictive of more advanced AJCC T, N, M or overall stage, or in modeling whether a patient received surgery if recommended.

Conclusion:
Future interventions targeting rural and some minority populations may improve cancer care with the goal of increasing the span of healthy life and reducing survival disparities related to cancer.

Poster #114

Sinonasal complications in nasopharyngeal cancers following chemoradiotherapy

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Introduction:
Primary chemoradiation has been the standard of care for patients diagnosed with primary nasopharyngeal squamous cell carcinoma (NPC) for decades. However, the treatment is not without complications. Our study examined the nature and frequency of post-treatment co-morbidities associated with chemoradiation in the setting of NPC.

Methods:
A retrospective chart review was performed of patients diagnosed with NPC at a single tertiary care center between 2012 and 2018. 54 patients were included in the study. In addition to demographics and treatment details, post treatment complications were analyzed.

Results:
Fifty-four patients were identified which included 13 (24%) females and 41 (76%) males. The age at diagnosis of the patients ranged from 19 to 86 years old, with an average age of 52. Among these, dryness and crusting was the most common post-treatment complication by a significant margin. Our study found that 43 (79%) patients developed crusting of either the nasopharynx or nasal cavity that required regular debridement. 17 (31%) patients developed otitis media while epistaxis occurred in 15 (28%) patients. Among the 54 patients examined, 11 developed significant chronic sinusitis that required frequent antibiotic treatment. Four of these patients were successfully treated with functional endoscopic sinus surgery while one was treated with balloon sinuplasty.

Conclusion:
In conclusion, we recommend close surveillance of patients in the post-treatment period after completion of primary chemoradiation for nasopharyngeal squamous cell carcinoma. This is done for the purpose of ruling out recurrence, for debridement of crusting, as well as to rule out epistaxis and worsening chronic sinusitis.

Poster #115

Sinonasal neuroendocrine carcinoma: A single institution experience

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Background:
The objective is to describe the natural history and management patterns of patients with sinonasal neuroendocrine carcinoma (SNEC) treated at a single institution.

Methods:
An institutional database was queried to identify patients diagnosed with SNEC between 2000 and 2018 and a retrospective chart review was performed to record patient and tumor characteristics as well as treatment and survival data.

Results:
Twenty-one patients were identified with SNEC. The mean age was 57.0 years (SD = 11.5) and 11 patients were male (52.4%). The most common symptoms at presentation include facial pain (71.4%), headache (47.6%) and nasal obstruction (47.6%). The tumors most commonly involved the nasal cavity (66.6%) and ethmoid sinus (61.9%). MRI was used to evaluate the mass in all patients (100%) while CT (80.9%) and PET (76.2%) were utilized as well. There was involvement of the anterior cranial fossa in 10 patients (47.6%) and the orbit in 5 patients (23.8%). Nine patients (42.8%) were treated with primary surgery and adjuvant therapy, 6 patients (28.6%) with primary radiation and/or chemotherapy, 2 patients (9.5%) with neoadjuvant chemoradiotherapy followed by surgery and 4 patients (19.0%) received therapy with palliative intent. At a mean follow up of 37 months (range 1 - 128), 9 patients (42.8%) were alive without disease, 5 patients (23.8%) were alive with disease, 4 patients (19.0%) were dead of disease, and 3 patients (14.3%) were dead of other cause.

Conclusion:
This is among the largest institutional reports of SNEC. Until multi-institution prospective data is available for these rare tumors, reporting of institutional data is important. The prognosis is poor and treatment involves multimodality therapy.

Poster #116

Sinonasal scalp hair growth from paramedian forehead flap for skull base reconstruction

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Background:
We present case of intranasal hair removal not previously described. A 69 female presented to our rhinology practice with a history of sinonasal melanoma who had undergone resection with paramedian forehead flap reconstruction of an anterior skull base defect. Patient had consistent sinonasal growth of scalp hair from the flap causing chronic sinusitis symptoms and requiring frequent debridement.

Methods:
Patient was taken to the OR and underwent endoscopic de epithelialization of the paramedian forehead flap using an endoscopic sino nasal drill. A coblator wand was then used to destroy remaining hair follicles.

Results:
At follow up patient had 95% reduction in sinonasal hair growth at flap site. Remaining hair is planned to be removed with in office KTP laser.

Conclusions:
Endonasal de epithelization with an endoscopic drill and coblation is an effective technique for removal of inappropriate hair growth from a rotational flap.

POSTERS

Poster #117
Sinonasal squamous cell carcinoma presentation and outcome: A national perspective
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Objectives:
Examine the presentation and outcomes of sinonasal SCC.

Methods:
A retrospective study utilizing the National Cancer Database, 2004 – 2015. The study population included adult patients diagnosed with primary sinonasal SCC.

Results:
A total of 537 patients were included. The mean age of the study population was 62.6±12.7 years. The median follow-up time was 35.6 months (interquartile range: 8.6 – 55.9). The sample histological variants included: (i) 66.7% keratinizing SCC, (ii) 21.6% non-keratinizing SCC, (iii) 8.0% papillary SCC, and (iv) 3.7% spindle cell carcinoma. Stage at presentation was: (i) 33.3% T1-2, N0, (ii) 31.8% T3-4a, N0, (iii) 13.8% T1-4a, N+, (iv) 17.0% T4b,N0-3, (v) 4.1% M1. Human papilloma virus (HPV) status was available for 96 patients and it tested positive in 24 (25.0%) patients. Five-year overall survival for the whole sample was 52.2%. By histological variants, 5-year survival was lowest for spindle cell carcinoma (40.0%), and highest for papillary SCC (70.1%) (p=0.024). HPV negative tumors had a 5-year survival of 26.4%, while HPV positive tumors had a 5-year survival of 57.1% (p=0.002). Of the 255 patients with T1-4a, N0-3, M0 who had surgery of the primary site, 31 (12.2%) patients underwent endoscopic approach. The risk of positive postsurgical margin was not significantly different comparing endoscopic to open approach (29.0% vs. 28.6%, p=0.96).

Conclusions:
Sinonasal SCC could present at advanced stages in two-thirds of the population and exhibit a wide variety of histological subtypes. Like other sites of head and neck, HPV positive tumors are associated with a favorable prognosis. Endoscopic approach is comparable to open approach in terms of post-surgical margins.

Poster #118
Sjogren's syndrome sequelae: Nasal synechiae and nasopharyngeal stenosis
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Background:
Multi-organ system diseases, such as Wegener's disease and Sarcoidosis, may manifest within the nasal cavity with crusting, congestion, rhinorrhea, epistaxis, olfactory impairment, and mucosal inflammation. Sjogren's syndrome, an autoimmune disorder caused by exocrine gland dysfunction and destruction has been shown to cause mucosal dryness of the upper respiratory mucosa resulting in similar sinonasal symptoms. We present a unique case of acquired nasal cavity synechiae and nasopharyngeal stenosis associated with Sjogren's syndrome.

Methods:
Case report and literature review.

Results:
A 55-year-old female with no history of sinonasal surgery presented with 2 years of bilateral nasal obstruction, facial pressure, oral dryness and nasal drainage. Nasal endoscopy revealed extensive synechiae between the nasal septum and inferior/middle turbinate, with near complete nasopharyngeal stenosis. Mucosal biopsies revealed non-granulomatous fibrosis and inflammation. Laboratory analysis was positive for anti SS-A/B/Ro autoantibodies, and remaining work up confirmed Sjogren's syndrome. The patient underwent endoscopic repair of nasopharyngeal stenosis and lysis/division nasal synechiae with nasal splinting and post-operative oral steroids. Follow-up demonstrated complete patency of her nares and nasopharynx, with improvement in SNOT-22 score from 46 to 10. The patient was tapered off oral corticosteroids post-operatively and Rheumatologic care was initiated.

Conclusion:
Sjogren's syndrome frequently presents with Otolaryngologic symptoms. In the setting of nasal congestion, crusting, and synechiae, sinonasal manifestations of Sjogren's syndrome should be considered as a part of the differential and work up.

Poster #119

Spontaneous nasal polypectomy induced by EDS-FLU (XHANCE®) and Ziluetin (Zyflow®)

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Background:
Nasal polyps are inflammatory outgrowths of paranasal sinus mucosa that occur in 1-4% of the population and most commonly cause congestion, obstruction, or hyposmia. Intranasal corticosteroids, along with short courses of oral corticosteroids, are most often recommended for symptomatic nasal polyposis, prior to consideration of surgical intervention. We present the first reported case of spontaneous nasal polypectomy, occurring after use of fluticasone propionate (XCHANCE®) and ziluetin (Zyflow®).

Methods:
A 43-year-old Asian-Indian male with history of allergic rhinitis, asthma, and nasal polyposis had been prescribed subcutaneous immunotherapy for 5 years without effectiveness before another polypectomy was scheduled. After the polyps resurfaced, the patient was prescribed prednisone and underwent another polypectomy. He later presented with persistent nasal polyps and congestion, as well as diffuse lymphadenopathy and pruritic eyes and ears. Fluticasone propionate was continued as maintenance therapy and ziluetin was prescribed in place of monteluekast (Singulair®).

Results:
After several weeks of the new treatment regimen, the patient reported polyp irritation and movement, as well as influenza-like symptoms. Epistaxis soon occurred, followed by a spontaneous polypectomy. Three more polyps were expelled with bloody discharge. The patient reported resolved hyposmia and reduced symptoms thereafter. The treatment regimen was continued without change or further episodes of epistaxis and polypectomy.

Conclusion:
Few case reports in the literature describe polyp autoamputation. We report the first instance of spontaneous nasal polypectomy in the literature, induced by fluticasone propionate and ziluetin.

Poster #120

Surgical anatomy and management of the internal carotid artery in expanded endoscopic endonasal approaches to the cranial base

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The Internal carotid artery (ICA) is the most important and dangerous structure in EEA to skull base. Injury of the ICA can be a fatal complication of endoscopic endonasal approaches.
This presentation was undertaken to describe the area of surgical exposure of the ICA in the skull base area afforded by transnasal approaches with an endoscope.

Methods:
A complete and systematic understanding of the ICA anatomy is a rate-limiting step in
any attempt to minimize complications. 5 injected adult cadaver heads (all Chinese) were dissected for a simulated endoscopic transnasal approach to the ICA located in skull base. Anatomical correlations were analyzed.

Results:
Based on anatomical correlations and related to endoscopic surgery , the ICA may be described as six distinct segments: 1)parapharyngeal; 2) petrous; 3) paraclival; 4) parasellar; 5) paraclinoid; and 6) intradural.The Eustachian tube is the most important surgical landmarks for the parapharyngeal , petrous and clivalsegment. According to the relationship with the ET, we can divide the paramedian skullbase to 6 different regions. Other corresponding surgical landmarks included: levator veli palatini for the parapharyngeal segment; the vidian canal and V3 for the petrous segment; the fibrocartilage of foramen lacerum, foramen rotundum, maxillary strut, lingular process of the sphenoid bone, for the paraclival segment; the sellar floor and petrous apex for the parasellar segment. These landmarks can help surgeon to avoid unexpected injury to the ICA.

Conclusion:
An endonasal endoscopic approach to the skull base with exposure of the ICA is feasible. The anatomical landmarks can serve as both radiographic and surgical landmarks in this approach.

POSTERS

Poster #121
Synchronous inverted papilloma, oncocytic papilloma and pleomorphic adenoma: A case report and review of the literature
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Introduction:
Schneiderian papillomas account for 0.5-4.7% of all nasal tumors. Pleomorphic adenomas arising from minor salivary glands are rarely encountered in the sinonasal cavities and the literature is limited to case reports and small case series. Two or more neoplasms identified at the same time in the same patient are referred to as synchronous tumors and are exceedingly rare in the sinonasal cavities. We present the first known case report of synchronous inverted papilloma, pleomorphic adenoma, and oncocytic papilloma. The literature on synchronous sinonasal tumors was also reviewed.

Methods:
Case report and literature review

Results:
The patient presented with a 3-month history of right sided nasal obstruction and intermittent epistaxis. The patient had a history of smoking, woodworking hobby, and served in the Korean War. Endoscopy revealed a soft tissue mass filling the right nasal passage. MRI demonstrated a heterogeneous enhancing mass filling the right nasal cavity with what appeared to be contiguous soft tissue extending into the right maxillary and sphenoid sinuses. The patient was taken to the operating room where the soft tissue mass was found to be separate from the contents of the maxillary and sphenoid sinuses. Frozen sections from the maxillary and sphenoid sinuses were consistent with inverted papilloma. Final pathology demonstrated inverted papilloma of the maxillary sinus, pleomorphic adenoma of the nasal cavity, and oncocytic papilloma of the sphenoid sinus. The patient is free of disease 2.5 years out from surgery.

Conclusion:
We present a very rare case of three separate synchronous tumors of the sinonasal cavities managed surgically.

Poster #122
Telehealth in otolaryngology: Where is the evidence for cost-effectiveness?
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Background:
Telehealth is commonplace in many health care fields and has the potential to transform otolaryngology. The benefits of using Tele-otolaryngology include improving outcomes, better access, decreasing costs, and elevating the patient's experience. Cost analysis is performed as an effort to explore the value of integrating tele-otolaryngology in clinical practice. The objective was to evaluate the evidence for cost-savings of telemedicine in various ENT subspecialties in the United States.

Methods:
We performed a systematic review, identifying the cost-effectiveness of telehealth in otolaryngology. A search of electronic databases (PubMed, EMBASE, and Cochrane), and related articles was performed to identify original, longitudinal studies with a cost analysis of telemedical care. Two investigators reviewed titles, abstracts, and articles independently. Data was abstracted sequentially and the quality was evaluated independently.Results:A 168 original articles were evaluated, from which only 6 evaluated cost. The cost of using tele-otolaryngology was evaluated in general otolaryngology, sleep medicine, audiology, head and neck cancer, and parathyroid surgery. The cost-savings ranged from $190 to $900 per visit. From the services evaluated head and neck cancer was the most cost-effective. Data were insufficient for a meta-analysis.

Conclusion:
Telemedicine has been trialed across various ENT subspecialties primarily in otology. This research suggest that the delivery of virtual care provides real cost-saving advantages. The limited data suggests the use tele-otolaryngology is cost-effective and safe across all ENT subspecialties. Further studies are needed to better discern the value of telemedicine in ENT.

Poster #123
Telemedicine in ENT maintains patient satisfaction and improves in accuracy over time
Anne Ning, BA
Claudia Cabrera
Brian D'Anza, MD

Background:
There is widespread interest in adopting telemedicine in clinical practice; however, its impact on the physician-patient relationship, diagnostic strength, and patient acceptance has not been fully explored. The purpose of our study was to evaluate the diagnostic potential of telemedicine in otolaryngology and its impact on overall patient satisfaction.

Methods:
We performed a systematic review to identify original scientific research assessing image validity, diagnostic value, and patient and provider satisfaction in tele-otolaryngology care. We performed a search on electronic databases (PubMed, EMBASE, Cochrane Database, and Ovid MEDLINE) and a manual independent search. Two investigators independently reviewed, extracted, and analyzed data. Data was insufficient for a meta-analysis.

Results:
We identified 168 original articles, from which 11 met established criteria. Studies on diagnostic concordance reported ranges from 70-100% with an upward trend over time. Patient satisfaction was consistently reported as over 90%.

Conclusions:
Concern over diagnostic accuracy of tele-otolaryngology has led to reluctance to adopt telemedicine. However, technological advancement has provided means for adequate remote assessment and diagnosis without compromising overall patient satisfaction. To date, studies report high rates of diagnostic concordance, provider satisfaction, and patient satisfaction across all models and patient populations. We recommend focusing future research on optimizing technique and comfort level of referring providers in performing the full otorhinolaryngologic exam. Overall, data supports telemedicine as a reliable, well-received method of delivering otolaryngology care.

Poster #124
The effect of upper vs lower nostril irrigation – A post-surgical cadaver study
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Objective:
Conventional irrigation involves a head-side-tilt with fluid entering the upper nostril and exiting the lower nostril, following gravity. Here, we investigated the difference by reversing the conventional method: fluid propelled through the lower nostril and exiting the upper nostril against gravity, on one pre and post-surgery cadaver.

Method:
Irrigation was done with either a head tilt 45° to the side or a tilt that is both 45° to the side - 45° forward using a 240mL squeeze bottle through either the upper or lower nostril with respect to head tilt direction. Video recordings, captured via endoscope sealed trephinations in the maxillary sinuses, were done at multiple stages: pre-surgery, small and large maxillary antrostomies as well as inferior meatal windows.

Results:
Preoperatively, there was little penetration into the maxillary sinus for all head positions regardless of nostril selection. Postoperatively, penetration improved significantly, with better outcomes for larger antrostomy and lower nostril irrigation. For example, 45° to the side - 45° forward head tilt with a small antrostomy resulted in a light fill during upper nostril vs. half filling during lower nostril entry. With large antrostomy, full fill was achieved with both entry nostrils, with faster speed for lower nostril. However, the addition of an inferior meatal window had mixed results, improving outcomes for small antrostomy but worsening for large antrostomy.

Conclusion:
The unconventional lower nostril irrigation consistently had similar or better outcomes in both fill speeds and penetration than upper nostril irrespective of head position or surgery. The degree of surgery had a larger yet mixed impact on irrigation outcome.

POSTERS

Poster #125

The effects of daily intranasal probiotic irrigation on olfaction in normosmic and healthy participants

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Martin Desrosiers, MD
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Background:
Probiotic intranasal irrigation has been proposed as a treatment for chronic rhinosinusitis (CRS), as they could promote a shift towards commensal bacteria and enrich the microbiome. Though the safety of intranasal probiotic therapy has been documented in a clinical trial in CRS patients, participants had demonstrated hyposmia. The aim of this study was to assess the impact of Lactococcus Lactis W136 on healthy participants with a normal sense of smell.

Methods:
Selected patients were asymptomatic, had normal nasal endoscopy, normal olfaction scores (UPSIT > 34) and normal eustachian tube function scores (EDTQ-7). Participants used saline irrigation BID for the first 7 days (V1). After a week of washout (V2), patients were given a probiotic (Lactococcus Lactis W136) BID for the following 7 days (V3). Participants were monitored every week for 5 weeks using UPSIT, sinonasal symptoms, EDTQ-7, ENT examination, and sinus cultures. One week after discontinuation of probiotics, patients were evaluated with a phone call.

Results:
There was no effect on UPSIT and EDTQ-7 scores. No participant (n = 16) presented signs or symptoms of rhinosinusitis. One participant noted mild facial pressure at V4 visit, without other infectious signs or symptoms; the patient was asymptomatic at V5 without treatment. There was no bacterial overgrowth with pathogens or probiotics.

Conclusions:
In healthy subjects, intranasal application of Lactococcus Lactis W136 for 7 days was well tolerated, with no impact on olfaction, nor notable nasal or middle ear symptoms This suggests that intranasal application of intranasal in healthy subjects is safe and does not pose a risk to olfaction.

Poster #126

The effects of sphenoid surgery on nasal irrigation delivery.

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Background:
Nasal irrigation is an important component of the medical management in chronic rhinosinusitis (CRS). Nasal irrigations facilitate topical medication of therapies and lavage of mucin. In this study we compare the influence of increasing surgical sphenoid openings on the distribution, force and clearance of nasal irrigations.

Methods:
A study was performed on fresh frozen adult cadaver heads. The surgical ostium was modified on one side via a simple sphenoidotomy, then a sphenoid sinusectomy (Type 1), and sphenoid sinusectomy (Type 3a). The corresponding nasal cavity was irrigated using a 240ml squeeze bottle with bottle with 0.1% fluoroscein. An endoscope passed through the contralateral side through the sphenoid septum recorded the irrigation penetration. Videos were blindly assessed. The distribution was defined as no irrigation, <1/3 of the sinus, <2/3 of the sinus, and complete sinus. The force was defined as minimal, minor, and major. The clearance was defined as no residual, < 1/3 of volume, </=2/3 of volume, and, >2/3 volume. Ordinal correlation scores were assessed using Kendall's tau-B.

Results:
9 specimens were assessed (44.4% female, age 75.0±12.7 years.) The use of a sphenoethmoidectomy or larger produced better distribution (%>1/3; 100% v 59%, $p<0.01$), more force (%major; 83% v 29%, $p<0.01$) and better clearance (%1/3 or less remaining; 56% v 18%, $p<0.01$).

Conclusion:
Increasing sphenoid ostial size improves nasal irrigation penetration. We propose that greater sphenoid sinusectomy size allows for improved lavage and topical delivery of medications. Complete removal of the anterior face appears to mitigate mucostasis and sumping of irrigation.

Poster #127

The extended anterior inferior approach to endoscopic medial maxillectomy for lesions of the anterior and inferior maxillary sinus

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Objectives:
Describe the nasolacrimal duct (NLD) sparing extended anterior inferior approach to endoscopic medial maxillectomy. Evaluate the efficacy and outcomes of patients with anterior and inferior medial maxillary sinus lesions treated with this approach at a single institution.

Methods:
Nine patients with benign and malignant lesions involving the anterior or inferior medial maxillary sinus between January 2016 and June 2019 were reviewed. The endoscopic technique and postoperative outcomes are reported.

Results:
Nine patients were treated with the extended anterior inferior approach to endoscopic medial maxillectomy. Adequate exposure with gross total tumor resection or margin negative tumor resection was achieved in all cases. Sparing of the NLD was achieved in 2 patients. In 7 patients, the NLD was transected sacrificed and thinning of the piriform aperture was performed. No patients required a Caldwell-Luc or endoscopic Denker's procedure. Postoperative symptoms were minimal, including unilateral V2 numbness for one patient at 1-month follow-up. No patients reported persistent epiphora or facial contour changes. Postoperative tumor surveillance was achieved by endoscopic exam in all patients and there was no evidence of tumor recurrence after a median follow-up of 9 months (range: 1-28 months).

Conclusion:
The extended anterior inferior approach to endoscopic medial maxillectomy provides improved access to the inferior and anterior maxillary sinus. The use of a stepwise surgical approach for these lesions allows for preservation nasolacrimal duct function and cosmesis without compromising tumor outcomes.

Poster #128

The growth of the advanced practice provider's Role in otolaryngology

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Objective:
To evaluate the current role of advanced practice providers (APP) in otolaryngology and its growth over the last decade.

Data Source:
The CMS Physician Supplier Procedure Summary (PSPS) was used to extract Medicare Part B claims data from 2010-2017.

Methods:
CPT codes were used to query the PSPS for commonly performed procedures in eight different categories: endoscopy, laryngoscopy, allergy, audiometry, vestibular testing, nasal bleed control, otology, and sialolithotomy. Procedures were evaluated by category and select procedures were individually evaluated. An otolaryngologist group, an APP group, and an 'other provider' group were created. Both nurse practitioners and physician assistants were considered APPs.

Results:
Annual claims for procedures by APPs increased from 2010 (5,564) to 2017 (9,595), with a total increase of 72%. APPs had more total procedures and a larger share of all procedures for all categories except vestibular testing. Endoscopic procedures performed by APPs increased by 105%, laryngoscopic by 67%, allergy by 16%, audiometry by 13%, sialolithotomy by 89%, nasal bleed by 39%, and otology by 972%. Vestibular testing procedures decreased by 31%. Procedures performed by otolaryngologists, however, decreased from 2010 (66,637) to 2017 (56,896), with a total decrease of 15%. Otolaryngologists performed less total procedures in every category.

Conclusion:
There has been considerable growth in the number of procedures that APPs perform in the otolaryngology setting over the last decade with a concurrent decrease in the number of claims by otolaryngologists. These findings represent the growing multidisciplinary approach to meet the healthcare needs of the national population.

POSTERS

Poster #129
The impact of resident involvement in endoscopic sinus surgery
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Background:
Resident participation in surgical cases is an essential component of training. While resident involvement does not appear to impact mortality or intraoperative complications the residents' impact on minor postoperative complications and outcomes is not well known. Patients' suspicions in this area may make them reluctant to have residents involved. The objective of this study was to determine whether resident involvement in endoscopic sinus surgery (ESS) has an impact on quality of life (QOL) outcomes or surgical complication rates.

Methods:
178 patients with chronic rhinosinusitis who elected ESS were identified in a surgical database. Minor complications (synechiae, infection, bleeding) in the postoperative period and Sino-Nasal Outcome Test-22 (SNOT-22) scores at baseline and six months postoperatively were measured. Resident involvement was determined through review of intraoperative records. SNOT-22 scores and minor complication rates were compared between cases with and without residents involved.

Results:
Regression analysis demonstrated that resident involvement did not increase the risk of minor complications. The mean improvement in SNOT-22 scores following surgery was 29.68 points in the resident group versus 15.13 points in the no-resident group ($p=0.0283$).

Conclusion:
When accounting for patient variations in cases, resident involvement is not a significant independent predictor of complication rates. Cases with resident involvement had greater improvements in SNOT-22 scores at six months, suggesting residents also do not adversely affect QOL outcomes. Understanding the impact of resident involvement in ESS may reassure patients about resident-related concerns.

Poster #130
The many noses of opioid abuse – Case report and review of literature
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The increase in opioid abuse is a well-known problem in the United States. Recently, there have been progressive use of alternative drug delivery methods, including intranasal inhalation of crushed tablets, likely due to the enhanced onset of action and euphoric effects.
Intranasal opioid inhalation leads to a spectrum of sequela from benign to lethal, including intranasal tissue necrosis and chronic invasive fungal rhinosinusitis.
Here we present case reports of 2 otherwise healthy young patients, each illustrating one of the above mentioned pathologies. Both presented with facial pain and had similar findings on imaging and endoscopy. Neither of the patients initially admitted to drug use but were later found to have engaged in intranasal inhalation of crushed medications.
Our cases illustrate 2 clinically distinct manifestations of intranasal opioid abuse that differ drastically in severity and treatment but are similar in imaging and physical exam. Misdiagnosis can result in negative outcomes either in side effects from unnecessary usage of anti-fungal medications, or further tissue destruction due to invasive fungal disease.
Therefore, the clinician should be aware of the full spectrum of pathologies, especially when approaching the suspected intranasal drug user.

Poster #131

The trends and risk factors of biphasic and recurrent anaphylaxis in the U.S. using ICD-10 CM codes

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Background:
Studies have not yet examined the trends and risk factors of biphasic and recurrent anaphylaxis in the U.S. using ICD-10 CM codes. The goal of this study is to examine the trends of biphasic and recurrent anaphylaxis in all patient care settings (inpatient, outpatient, emergency department, and observation).

Methods:
We used the Clinformatics database from 2015-2017. Our main outcome measure was recurrent anaphylactic events occurring within one year of the index anaphylaxis visit. We used Proportional hazards model to assess the factors associated with recurrent anaphylaxis.

Results:
There were a total of 18,739 patients with incident anaphylaxis in 2016 and 2,737 (14.6%) with recurrent anaphylaxis in 2017. The most common trigger for recurrent anaphylaxis is venom followed by food. Patients 65 years and older were 1.3 times more likely to develop recurrent anaphylaxis compared to pediatric patients (<18 years). Patients with allergic rhinitis and/or asthma were 1.18 times more likely to develop recurrent anaphylaxis.

Conclusion:
This is the first national study using ICD 10 CM codes looking at rates of biphasic and recurrent anaphylaxis in all patient care settings. Recurrent anaphylaxis is more common in the first three days after the initial event, in older patient (>65 years), and in patients with allergic rhinitis and/or asthma.

Poster #132

WITHDRAWN

The value of 68Ga-DOTATATE PET/CT in sinonasal [illegible] neuroendocrine carcinoma ma[illegible] and detection of local and distant [illegible]stases: Case study and review of literature

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Background:
68Gallium-dotatate (Netspot ®) is a newer somatostatin analogue that can be used as a PET tracer to successfully identify neuroendocrine tumors (NETs). It has been shown to detect neuroendocrine tumors that traditional imaging failed to identify and offers superior image quality, spatial resolution of small lesions, and diagnostic utility. Due to the rarity of sinonasal NETs there are few recommendations for 68Ga-dotatate imaging and management options in these patients.

Case Presentation:
We report the cases of four patients diagnosed with sinonasal small cell neuroendocrine carcinomas (SNEC) and discuss their management utilizing 68Ga-dotatate imaging. The first patient had a left sinonasal mass identified on CT. 68Ga-dotatate PET/CT identified a NET and revealed a pancreatic primary. Biopsy and immunostaining confirmed sinonasal SNEC. The second patient had a right sinonasal mass identified on MRI. 68Ga-dotatate PET/CT staging demonstrated NET primary malignancy, as well as T3 vertebral metastatic disease. Biopsy and immunostaining confirmed sinonasal SNEC. The third and fourth patients both had right-sided sinonasal SNECs, confirmed by biopsy. 68Ga-dotatate PET/CT was used after surgical resection in these patients to scan for residual tumor and metastases, and the third patient was found to have potential residual tumor. Neither had evidence of local or distant metastases.

Conclusions:
68Ga-dotatate is a superior imaging modality for extrapulmonary SNEC, with potential to improve diagnostic accuracy and clinical decision making. This report demonstrated the utility of 68Ga-dotatate in sinonasal SNEC detection. Future studies are required to determine the role 68Ga-dotatate in sinonasal SNEC management.

POSTERS

Poster #133

Two cases of IgG4-related disease in the nasal ala associated in the setting of chronic inflammation

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Background:
IgG4-related disease (IgG4-RD) is a recently recognized systemic chronic inflammatory disease that has organ-specific diagnostic criteria for many systems but these are lacking for the nasal cavity. Furthermore, only recently has this disease been identified within the nasal cavity and paranasal sinuses, but to date has not been reported to occur in the lower third of the nose. The etiology of this disease is currently unknown.

Case Description:
We present two cases of IgG4-RD presenting at the nasal ala. The first case was a 23 year old woman with progressive right ala and nasal sidewall swelling of one year duration that occurred following a localized infection from a new nasal piercing. Initially this was thought to be a gangrenous process given the appearance of the intranasal tissue. The second case was a 47 year old male with a prior history of IgG4-RD isolated to the posterior wall of the maxillary sinus. The patient presented with progressive enlargement of the right nasal ala for which radiographic imaging confirmed an enlarging mass.

Treatment:
Final diagnosis in both cases was confirmed after partial excision of the lesions and staining for IgG4. Rhematologic consultation was sought and the patients initiated on long course of prednisone followed by rituximab.
Learning Point: IgG4-RD can affect the lower third of the nasal cavity, including the nasal ala and sidewalls. In our one case, the nasal piercing and subsequent infection may point to the possible association of an inciting event with this disease.

Poster #134

Two cases of sinonasal necrosis concerning for invasive fungal sinusitis with no fungal elements on final pathology

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Background:
Acute Invasive fungal sinusitis (AIFS) is a severe infection with high morbidity and mortality affecting the paranasal sinuses of immunocompromised patients. Optimal management requires rapid diagnosis and treatment. Frozen section analysis has been demonstrated to expedite diagnosis with high sensitivity/specificity. We present two cases with clinical and pathological concern for AIFS with necrosis seen on frozen section but for which a diagnosis of fungal sinusitis was not seen on final permanent pathology.

Case Descriptions:
The first case is a bilateral orthotopic lung transplant patient on chronic immunosuppression with severe neutropenia. Endoscopic exam and frozen section analysis revealed necrotic tissue with concern for fungal involvement. Emergent surgical debridement was performed however, pathology was negative for fungal elements. Final pathology confirmed pseudomonal ecthyma gangrenosum.
The second patient had a history of acute myeloblastic leukemia status-post bone marrow transplant on daily prednisone. Exam of the nasal cavity revealed diffuse necrosis. The frozen sections were highly suggestive of AIFS due to abundant microthrombi. Her general condition was considered too unstable for surgical debridement, however. Final pathology revealed no fungal elements seen and she was ultimately diagnosed with thrombotic thrombocytopenic purpura (TTP).

Learning Point:
The clinician must be aware of other sources sinonasal necrosis. In these instances, relying on frozen section confirmation of necrosis alone was not reliable for a final diagnosis. When possible confirmation of fungal elements should be considered before AIFS is diagnosed.

Poster #135

Understanding isolated sphenoid sinusitis and its management: Case report and literature review

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Objectives:
-Discuss the presentation, epidemiology, microbiology, differential diagnosis, workup, imaging findings, risk factors, and complications of Isolated Sphenoid Sinusitis (ISS)
-Determine the appropriate treatment plan for ISS, including surgical approaches

Methods:
A systematic review of the literature was performed on the PubMed database (NLM). A total of 24 peer-reviewed manuscripts met inclusion criteria.

Results:
We present a case of chronic ISS found incidentally on imaging. Upon further questioning, patient revealed non-specific sinus symptoms of headache, postnasal drip, and dry cough for many years. In the literature, medical management of ISS resulted in resolution of symptoms in 36.36%-65.3% of patients, while surgical intervention resulted in resolution of symptoms in 89.8-100% of patients. Of the two most described surgical methods, the endoscopic transethmoid approach yielded superior results—lower recurrence rate, decreased synechiae formation, improved post-operative care—in comparison to the endoscopic transnasal approach.

Conclusions:
While relatively rare, ISS should be considered in the differential diagnosis of any patient presenting with nonspecific complaints of headache or sinus symptoms. To date, the literature lacks consensus on optimal treatment of ISS. Although further studies are warranted, we suggest the following: patients presenting with acute or chronic ISS without orbital, intracranial, or severe symptoms should first attempt a 2-8 week trial of medical management. In cases that either fail medical management or are concerning for fungal ISS, surgical management should be pursued. In surgical cases, the transethmoid approach demonstrates superior outcomes.

Poster #136

Update on non-rhinologic facial pain: Single institutional experience

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Background:
A better understanding of the patients presenting with “sinus headache” or non-rhinologic pain will lead to more appropriate diagnosis, referrals and avoidance of unnecessary medical and surgical interventions.

Methods:
Patients with non-rhinologic facial pain who referred from a tertiary Rhinology clinic to a headache specialist were reviewed. Patients with clinical or radiologic evidence of sinus/rhinologic disease were excluded from the study. All patients were non-responsive to trial of sinus therapy. Severity of pain was graded on a scoring scale from 1-10.

Results:
75 patients were referred to headache specialist for non-rhinologic pain. 41 patients were evaluated by specialist and included for analysis. Mean age of population was 47.8 ± 16.7 years (Range, 20-89 years). 73% (n=30) of patients were females. Mean SNOT-22 score at the time of referral was 33.87 ± 21.49 (range, 4-83) and mean Lund Mackay score was 1.43 ± 2.26 (range, 0-9). Most common complaint was headache / migraine-like symptoms seen in 60% (n=25).

On evaluation by headache specialist, 51% (n=21) were diagnosed as chronic headache. 63% (n=26) were treated with Nortriptyline. Of the 20 patients who had more than one clinic follow up, 50% required treatment change. Patients who had more than one clinic follow up visit, 75% (n=15) showed improvement. Mean duration until improvement was 2.42 ± 2.36 months.

Conclusion:
The majority of patient with non-rhinologic facial pain are women and present with headache symptoms. After referral, over half of these patients are diagnosed with chronic headache and the majority show improvement with medical management using Nortiptyline.

POSTERS

Poster #137

Use of off-label steroid irrigations in chronic rhinosinusitis: A survey of the American Rhinologic Society

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Background:
Topical nasal steroid irrigation (NSI) for the treatment of chronic rhinosinusitis (CRS) has become highly prevalent despite its off-label usage and limited insurance coverage. The purpose of this study was to explore the prescription patterns of NSI among American Rhinologic Society (ARS) members and perception of non-ENT use of NSI.

Methods:
An 11-item web-based survey was distributed to 909 ARS members. Associations between demographic variables and NSI use across CRS subtypes was performed. Secondary outcomes included perception of non-ENT prescription and insurance coverage.

Results:
A survey completion rate of 30.9% (n=281) was achieved representing all regions of the USA as well as internationally. Among patients with CRS with nasal polyposis (CRSwNP), CRS without nasal polyps (CRSsNP), and Allergic Rhinitis, 81%, 40%, and 17% were treated with NSI, respectively. International providers utilized NSI more frequently in CRSsNP relative to the South, Midwest, and Northeast ($p < 0.05$). Fellowship trained rhinologists utilized NSI more than their non-fellowship trained counterparts ($p < 0.05$). The estimated use of NSI by non-ARS members and non-Otolaryngologists was 42% and 11%, respectively. The estimate of insurance coverage was 43%. 68.2% of respondents would be more likely to utilize NSI if FDA approved.

Conclusion:
NSI is a frequently used treatment for patients with both CRSwNP and CRSsNP despite being offlabel. Regional variations and fellowship training status may play a role in NSI usage. Further studies should be performed to create guidelines for NSI use so it can continue to be safely adopted by non-rhinologists and non-otolaryngologists.

Poster #138

Vascular anatomy of the inferior turbinate and its clinical implications

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Background:
Published reports on the vascular anatomy of the inferior turbinate (IT) are limited. Most place the IT artery as a tributary off the posterior lateral nasal artery (PLNA). The purpose of this study was to examine the arterial supply to and the branching pattern within the IT. A secondary goal was to highlight our surgical technique for IT reduction and relate it to postoperative bleeding complication rates.

Methods:
Endoscopic dissection was performed on sixteen cadaver heads (24 sides) to determine the origin of the IT artery. Intraoperative surgical videos were analyzed in fifty patients (100 sides) to uncover the vascular branching pattern within the IT. A retrospective review of bleeding complications in patients undergoing IT reduction surgery was conducted.

Results:
In 17 of 24 sides (70.8%) the IT artery arose either exclusively (54.2%) or partly (16.6%) off the descending palatine artery (DPA). The PLNA alone gave off the IT artery in 7 of 24 sides (29.2%). As a branch off the DPA, the IT artery exited the pterygopalatine fossa through a foramen located 7.7 +/- 3.0 mm from posterior edge of the IT, 8.4 +/- 3.1 mm above the nasal floor and 1.6 +/- 2.1 mm below the insertion of the IT bone onto the lateral nasal wall. Three arteries cascaded within the IT in 68.0% of cases. The most common arrangement was a superomedial (96.0%), inferolateral (82.0%) and inferomedial (70.0%) branch. 112 patients underwent IT reduction and two (1.8%) experienced postoperative epistaxis.

Conclusion:
The IT artery has major contributions from the DPA and most commonly branches into 3 arteries. Turbinate reduction surgery can be performed with minimal bleeding complication rates with knowledge of this vascular anatomy.

Poster #139

Volumetric analysis of the maxillary sinus and orbit in silent sinus syndrome

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Introduction:
The term silent sinus syndrome (SSS) is used to describe spontaneous enophthalmos observed secondary to subclinical maxillary sinus atelectasis. We performed a volumetric analysis of the maxillary sinuses and orbits for clinical correlation.

Methods:
Four patients with SSS were identified for retrospective review. Computerized tomography (CT) scans were used for volumetric analysis of the maxillary sinus and orbit using 3D Slicer 4.10.2 software.

Results:
Mean age of the four patients was 48.5; three patients were male. One patient demonstrated bilateral disease. Among the patients with unilateral SSS, there was a mean decrease of 4.35 cm3 in the maxillary sinus volume and a mean increase of 1.96 cm3 in the orbital volume of the affected side compared to contralateral side. Patients with lesser changes in these volumes exhibited enophthalmos, ptosis, or hypertropia compared to the patient with the largest change in maxillary sinus volume (9.68 cm3) who exhibited no abnormal findings. All patients underwent uncomplicated endoscopic maxillary antrostomy while the patient with bilateral SSS also underwent orbital floor reconstruction with placement of porous polyethylene implants. All patients had complete resolution of visual symptoms and two patients had improvement in sinus and orbital volumes on CT.

Conclusion:
Silent sinus syndrome results in significant changes in the volumes of the maxillary sinus and orbit, but this may not correlate with the extent of ophthalmologic or facial changes. Endoscopic maxillary antrostomy is an effective management option for resolving maxillary sinus atelectasis and orbital floor displacement. Assessment of post-surgical volumes for comparative analysis is in progress.

Poster #140

YouTube as an information source for endoscopic sinus surgery

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Objectives:
An increasing amount of medical content is available on the internet through venues such as the video-sharing website YouTube. A cross sectional analysis of video content pertaining to sinus surgery on YouTube was performed.

Methods:
The website YouTube was searched using the keywords “sinus surgery.” The first 250 videos in our search query were assessed for content pertaining to endoscopic sinus surgery. Recorded variables included video length, total number of views, authorship (academic, private practice physician, patient, or third party), objective (advertisement, informative, or patient perspective), inclusion of intra-operative footage, and discussion of balloon sinuplasty.

Results:
222 of the first 250 videos were pertinent to our study. 113 (51%) videos were authored by private physicians, 11 (5%) by academics, 70 (32%) by patients and 28 (13%) by a third party. 92 (41%) videos were over 5 minutes and 130 (59%) videos were under 5 minutes. 106 Videos (48%) had intra operative footage with 86 (39%) of the videos pertaining to balloon sinuplasty. 11 (5%) videos were advertisements, 145 (65%) videos were informative, and 66 (30%) videos were from the patient’s perspective. 71 (32%) of videos had over 10,000 views. 16 videos account for ~75% of total views. When comparing all videos, a significant difference was noted by authorship with regard to video length, content type, and discussion of balloon sinuplasty ($p<0.05$). For videos with >10k views, only content type differed by authorship ($p<0.05$).

Conclusions:
There is a plethora of information on YouTube regarding sinus surgery. Physicians should be aware of the nature of these resources so that patients can be counseled appropriately.

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Important Dates to Remember

ARS at COSM 2020 – Atlanta, GA
April 24-26, 2020

Abstract Submission Opens:	October 1, 2019
Abstract Deadline:	December 13, 2019
Manuscript Deadline:	March 6, 2020

ARS 66th Annual Meeting – Boston, MA
September 11-12, 2020

Abstract Submission Opens:	April 6, 2020
Abstract Deadline:	May 29, 2020
Manuscript Deadline:	August 14, 2020

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