PROGRAM and ABSTRACTS

of the

One Hundred Forty-Fourth Annual Meeting

AMERICAN OTOLOGICAL SOCIETY, INC.

April 30—May 1, 2011

Sheraton Chicago Hotel & Towers

Sheraton Ballroom IV/V

Chicago, IL

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Accreditation Statement: The American Otological Society is accredited under the entity *The AOS/ANS Joint Council* as a provider for continuing medical education for physicians by the Accreditation Council for Continuing Medical Education (ACCME).

Credit Statement:
The AOS/ANS Joint Council designates this educational activity for a maximum of 8 *AMA PRA Category 1 Credit (s)*™. Physicians should only claim credit commensurate with the extent of their participation in the activity.

Certificate of Attendance will be issued at the close of the meeting upon completion of the questionnaire required by us for the certifying organizations.

The AOS/ANS JOINT COUNCIL CME MISSION

Organizational Structure: *The AOS/ANS Joint Council* is the organizational entity that oversees the Continuing Medical Education activities of two sister societies, the American Otological Society and the American Neurotology Society. *The AOS/ANS Joint Council* reflects the complementary and collaborative missions of these two societies in their commitment to improving the science, knowledge and care of patients with otologic, neurotologic and skull base disorders.

The AOS/ANS Joint Council provides strategic direction and oversight for the Otology & Neurotology Journal and fosters collaboration and cross-pollination of research, advances and approaches to care that reflect the ACGME/ABMS competencies. The formalization of the long-standing collaboration between the AOS and ANS reflects our commitment to the challenges identified in recent Institute of Medicine recommendations focused on a commitment to collaborative and team based care.

Purpose: *The AOS/ANS Joint Council* is dedicated to improving public health care through the development, dialogue and dissemination of advances in evidence-based diagnosis and management of otologic, neurotologic and related skull base disorders. The focus on the scientific advances in these combined fields is translated into approaches to quality care that are consistent with ACGME/ABMS general competency areas and the Institute of Medicine recommendations.

Target Audience: The primary target audience that are served through *The AOS/ANS Joint Council* include members of both the American Otological Society and the American Neurotology Society as well as healthcare professionals in the fields of otology, otolaryngology, neurotology, and skull base research and healthcare. The members served include physicians, otologists, neurotologists, residents, fellows, researchers, nurses, occupational and speech therapists and other healthcare professionals who are involved in the care of patients with otologic and neurotologic conditions.

Activities: The educational activities under the auspice of *The AOS/ ANS Joint Council* will continue to utilize the existing and well-respected live conference/annual meeting formats that are currently provided through the AOS and ANS. Since many of the members of these societies are members of both groups, *The AOS/ANS Joint Council* plans to explore new ideas the development of educational activities that can maximize the benefits of this collaboration and leverage the science, evidence and standards of care in both otology and neurotology to the benefit of the patients with these conditions. The Otology and Neurotology Journal provides an additional vehicle for further collaboration and dissemination of new information, science and standards of care.

Content: The content areas of otology and neurotology will continue to serve as the primary educational focus for the CME program under the auspice of *The AOS/ANS Joint Council.* The educational efforts will also highlight the ACGME/ABMS general competencies within the context of this field and relate the significance of communication, professionalism, patient safety and systems-based practice within these workplace environments.

Expected Results: The reorganization of the CME program, under *The AOS/ANS Joint Council*, provides an excellent foundation for measurement of new knowledge, competence and self-assessment that reflect the core values of *The AOS/ANS Joint Council* and its subsidiary sister societies, the American Otological Society and the American Neurotology Society.

2011 AOS Spring Meeting CME Activity Planning

Each attendee of the AOS 2010 Spring meeting was asked to complete an evaluation at the close of the scientific program. Respondents provided extensive feedback on what they learned from the Program as well as what they would like to see addressed at an upcoming AOS CME activity. Responses were collected and summarized from 203 attendees.

Based on the responses, the following data regarding professional practice gaps among attendees was noted:

- Lack of information on correcting conductive hearing loss.
- A lack of proven scientific studies on preventing, reversing or treating sensorineural hearing loss as well as other vestibular disorders.
- The underutilization of recommended strategies in cochlear and vestibular disease and the lack of awareness/knowledge as to expected results and limitations of cochlear implants.
- The current status regarding the standard of care in treatment of vestibular schwannomas.
- The relationship of genetic influence on inner ear disorders.

IDENTIFICATION OF PROFESSIONAL PRACTICE GAPS

Professional practice gaps are the variations or differences in the practice patterns when compared to current evidence, standards of care or clinical guidelines that are designed to provide quality of care to patients. Authors were asked to describe how to translate identified professional practice gaps into educational needs; how the need is expressed in terms of knowledge, competence, performance and patient outcome; what should the learners be able to apply to their profession after they participate in the educational activity; list the desired results in terms of changes in physician knowledge, competence, performance and/or patient outcome.

The following competency areas will be addressed through this CME activity/scientific session.

1. **Patient Care** that is compassionate, appropriate, and effective for the treatment of health problems and the promotion of health.
2. **Medical Knowledge** about established and evolving biomedical, clinical, and cognate (e.g. epidemiological and social-behavioral) sciences and the application of this knowledge to patient care.
3. **Practice-Based Learning and Improvement** that involves investigation and evaluation of their own patient care, appraisal and assimilation of scientific evidence, and improvements in patient care.
4. **Interpersonal and Communication Skills** that result in effective information exchange and teaming with patients, their families, and other health professionals.
5. **Professionalism** as manifested through a commitment to carrying out professional responsibilities, adherence to ethical principles, and sensitivity to a diverse patient population.
6. **Systems-Based Practice** as manifested by actions that demonstrate an awareness of and responsiveness to the larger context and system of health care and the ability to effectively call on system resources to provide care that is of optimal value.

Goals & Objectives

The overall goal of this course is to provide up-to-date information that focuses on the advancement of the scientific and clinical evidence that supports advances in otologic and neurotologic care to patients. The **target audiences** are physicians, otologists, residents, fellows, and researchers in the fields of otology and neurotology, as well as nurses, occupational and speech therapists, audiologists, and other healthcare professionals with specific interests in otologic and neurotologic disorders.

Learning Objectives:

1) A complete overview of Cochlear Implants presented by an international expert drawing on his 32 years of experience.

2) A complete overview of application of Radiosurgery techniques in Otology/Neurotology by recognized experts via a panel presentation/ discussion.

3) A complete overview of genetics knowledge with regards to hearing loss and advice to parents by a nationally known pediatric geneticist.

4) Novel uses of middle ear implants in correcting conductive hearing loss in infants/children.

Desired Results:

1) The attendees will again be informed on the latest clinical information on genetic testing for hearing loss and what advice to give parents. This will build on the theme began at last year's meeting on this topic.

2) The attendees will be able to utilize the significant clinical and research experience presented by the Guest of Honor. This will allow a physician to determine the current indications, procedures and expected results in Cochlear Implants in children and adults.

3) The attendees will be instructed on the current available radiosurgical platforms and current indications/use of radiosurgery in treating temporal bone lesions.

4) The attendees will gain more extensive knowledge in the treatment of various types of conductive/sensorineural hearing loss.

***** American Otological Society, Inc.*****

All authors, presenters, panelists, guest lecturers, AOS Council members, and Program Advisory Committee members, administrative staff and any other contributing individuals who may be in a position to control content of a CME activity were required to complete a Disclosure/Conflict of Interest/Attestation declaration prior to consideration for presentation or appointment to a CME planning committee. All potential conflicts of interest were resolved by members of the AOS Council prior to this CME activity taking place. (See page 4 for complete AOS Disclosure Statement and Resolution of Conflict process)

Position Statement: Any presentations, conversations, exhibits, or other meeting communications, including description of the use of drugs or devices, does not imply nor constitute endorsement of any company, product, application or use by the American Otological Society.

All Authors/Presenters are required to comply with the following Disclosure Statement prior to submitting their paper to the American Otological Society. All authors/presenters were advised that the submitted paper becomes the property of ***Otology & Neurotology*** and cannot be reprinted without permission of the Journal.

FULL DISCLOSURE POLICY STATEMENT

In accordance with the ACCME Essential Areas and Policies, it is the policy of the American Otological Society and *The AOS/ANS Joint Council*, as the ACCME Accredited CME provider, to ensure balance, independence, objectivity and scientific rigor in all of its educational activities. **All authors, panelists, guest lecturers, CME and Program committee members, moderators, administrative staff and any other contributing individuals who may be in a position to control content of a CME activity are responsible for disclosing any potential conflict of interest or any significant financial or other relationships with the manufacturer(s) of any commercial product(s) or provider(s) of any commercial service (s) discussed in an educational presentation.** The purpose of this form is to identify and resolve all potential conflicts of interests that arise from financial relationships with any commercial or proprietary entity that produces healthcare-related products and/or services relevant to the content you are planning, developing, or presenting for this activity. This includes any financial relationships within the last twelve months, as well as known financial relationships of your spouse or partner.

To further ensure there is no relevant conflict of interest, members of the AOS Council, the Program Advisory Committee, *The AOS/ ANS Joint Council* and/or Program moderators will review manuscripts three weeks prior to the CME activity to identify, address, and resolve any potential conflict of interest. In the event a relevant conflict of interest is noted, one or more of the following actions will be initiated. The presenter will be contacted and asked for clarification or additional information; the presenter will refrain from making recommendations regarding products or services and limit presentation to current evidence/science/research; or an alternate speaker will be chosen in which no conflict of interest is disclosed. The intent of this policy is not to discourage speakers who have relationships with commercial entities from presenting, but to identify these relationships to the listeners so that they may form their own judgments. **Failure to disclose this information on submission forms, or failure to return this disclosure form will result in exclusion from this activity and from future CME activities for up to two years.** The American Otological Society is committed to the non-promotional advancement of knowledge and science and to a free exchange of medical education in otology and neurotology.

PUBLICATION STATEMENT

The material in this abstract, (Name of Abstract) , has not been submitted for publication, published, nor presented previously at another national or international meeting and is not under any consideration for presentation at another national or international meeting including another COSM society. The penalty for duplicate presentation/publication is prohibition of the author and co -authors from presenting at a COSM society meeting for a period of three years.

Submitting Author's Signature (required)

FACULTY DISCLOSURES

American Otological Society Council

C. Phillip Daspit, MD – No Disclosure

Herman A. Jenkins, MD – Otologics LLC - Research Grant Recipient - Implantable middle ear devices

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Joseph B. Nadol, Jr., MD – Gyrus - Product Royalty - Stapedectomy Prosthesis

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John W. House, MD – No Disclosure

D. Bradley Welling, MD, PhD – No Disclosure

Steven A. Telian, MD – Cochlear Americas - Medical Advisory Board - Cochlear Implants-No recent activity in 2 years

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Kristen Bordignon –No Disclosure

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Douglas A. Chen, MD—Medtronic Neurologic Tech-Lab Support

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Marlan Hansen, MD—No Disclosure

Bradley W. Kesser, MD—Nasco, Inc.- Receives Royalties from a product (ear simulator) he developed - Medical Education

Harold H. Kim, MD—No Disclosure

Edwin M. Monsell, MD—No Disclosure

D. Bradley Welling, MD—No Disclosure

Primary Authors/Contributing Authors were informed and required to comply with the following prior to submitting their abstract:

1. Disclose financial relationships with a commercial entity producing health-care related products and/or services.

2. Authors were informed a member of the AOS Program Advisory Committee and *The AOS/ANS Joint Council*, as the ACCME Accredited CME provider, would review the content of the presentation prior to the CME activity taking place; Primary author would provide educational content and resources in advance as requested. (if applicable)

3. If Author/Presenter has been trained or utilized by a commercial entity or its agent as a speaker (e.g., speaker's bureau) for any commercial interest, the promotional aspects of that presentation will not be included in any way with this activity.

4. If discussing any product use that is off label, Author/Presenter required to disclose that the use or indication in question is not currently approved by the FDA for labeling or advertising.

5. If discussing specific healthcare products or services, will use generic names to the extent possible. If need to use trade names, will use trade names from several companies when available, not just trade names from any single company.

6. If providing recommendations involving clinical medicine, they will be based on evidence that is accepted within the profession of medicine as adequate justification for their indications and contraindications in the care of patients. All scientific research referred to, reported or used in CME in support of justification of a patient care recommendation will conform to the generally accepted standards of experimental design, data collection and analysis.

7. If presenting research funded by a commercial company, the information presented will be based on generally accepted scientific principles and methods, and will not promote the commercial interest of the funding company.

*****Disclosures—Oral Presentations *****
Saturday April 30, 2011, Scientific Session
Oral Presentations: Authors/Presenters/Panel Participants Disclosures (listed in order of presentation)

7:43
Guest of Honor
Richard T. Miyamoto, MD—Cochlear Corp-Advisory Committee, Advanced Bionics-Advisory Committee

8:10
Justin S. Golub, MD—No Disclosure
Jong Ho Won, PhD—No Disclosure
Ward R. Drennan, PhD—No Disclosure
Tina D. Worman, MS—No Disclosure
Jay T. Rubinstein, MD, PhD—Paid consultant for Cochlear Americas

8:18
Anil K. Lalwani, MD—No Disclosure
Noel L. Cohen, MD—No Disclosure

8:26
Marco Mandalá—No Disclosure
Liliana Colletti, PhD—No Disclosure
Vittorio Colletti, MD—No Disclosure

8:34
Simon I. Angeli, MD—Medtronics, recepient of research grant
Hamlet Suarez, MD—No Disclosure
Xue Liu, MD—No Disclosure

8:42
Henryk Skarzynski, MD, PhD—No Disclosure
Artur Lorens, PhD—No Disclosure
Anna Piotrowska, MD, PhD—No Disclosure
Piotr H. Skarzynski, MD, MSc—No Disclosure
Monika Matusiak, MD, PhD—No Disclosure

Disclosures—Oral Presentations

Saturday April 30, 2011, Scientific Session (Cont)

8:50

Kyle P. Allen, MD, MPH—No Disclosure
Angela G. Shoup, PhD—No Disclosure
Peter S. Roland, MD—Consultant: Med-El, Advanced Bionics Cochlear Corporation, Alcon.

8:58

Herman A. Jenkins, MD—Otologics LLC; grant recipient for basic and clinical trials research
Kristin Uhler, PhD—Otologics LLC; grant recipient for basic and clinical trials research

9:14

Basic Science Lecture
Kirk Aleck, MD–No Disclosure

10:15

Hillary A. Snapp, AuD—Consultant to Cochlear Corporation. As a consultant receive travel expenses for meetings attended. Do not receive any other compensation from this company
David Fabry, PhD—No Disclosure
Fred F. Telischi, MD—Serve as a consultant to cochlear corporation, as a consultant receive travel expenses for meetings attended.
Simon I. Angeli, MD— No Disclosure

10:23

Robert A. Battista, MD—No Disclosure
R. Mark Wiet, MD— No Disclosure
Vasilike Rauch, AuD—No Disclosure
Krystine Mullins, AuD—No Disclosure
Joyce Kim, BS—No Disclosure
Richard J. Wiet, MD—No Disclosure

10:31

Bjorn Herman, MD—No Disclosure
Daniel M. Zeitler, MD—No Disclosure
Simon I. Angeli, MD—No Disclosure
Ann W. Plum—No Disclosure
Hillary A. Snapp, AuD—Consultant to Cochlear Corporation
Fred F. Telischi, MD, MEE—Consultant to Cochlear Corporation

10:39

Suhael R. Momin, BA—No Disclosure
Sami J. Melki, MD—No Disclosure
Joy O. Obokhare, MD—No Disclosure
Souha A. Fares, MS—No Disclosure
Kumar N. Alagramam, PhD—No Disclosure
Cliff A. Megerian, MD—No Disclosure

10:47

Maroun T. Semaan, MD—No Disclosure
Qing Y. Zheng, MD—No Disclosure
Heping Yu—No Disclosure
Fangchan Han, MD—No Disclosure
Cliff A. Megerian, MD—No Disclosure

Disclosures—Oral Presentations

Saturday April 30, 2011, Scientific Session (Cont)

10:55
Eric Monteiro, MD—No Disclosure
Prodip Das, DM—No Disclosure
Mike Daly, MS—No Disclosure
Harley Chan, PhD—No Disclosure
Adrian James, DM, MA—No Disclosure

11:03
A. Robier, MD—Cochlear Consultant
P. Lecerf, MD—No Disclosure
JP. Cottier, MD, PhD—No Disclosure
D. Bakhos, MD—No Disclosure
E. Lescanne, MD, PhD—No Disclosure

11:19
J. Eric Lupo, MD, MS—No Disclosure
Kanthaiah Koka, PhD—No Disclosure
Herman A. Jenkins, MD—Otologics LLC research Grant
Daniel J. Tollin, MD—Otologics LLC research Grant

11:27
Jayant Ramakrishna, Hons BHSc—No Disclosure
Joel A. Goebel, MD—No Disclosure
Lorne S. Parnes, MD—No Disclosure

11:35
M. Geraldine Zuniga, MD—No Disclosure
Kristen Janky, AuD, PhD—No Disclosure
Michael Schubert, PT, PhD—No Disclosure
John P. Carey, MD—No Disclosure

11:43
Angela S. Peng, MD—No Disclosure
Meghan Thompson—No Disclosure
Aristides Sismanis, MD—No Disclosure
Daniel H. Coelho, MD—No Disclosure

Sunday, May 1, 2011, Scientific Session

*****Oral Pressentations: Authors/Presenters/Panel Participants Disclosures (listed in order of presentation)**

1:00
John J. Rosowski, PhD—No Disclosure
Jeffery Tao Cheng, PhD—No Disclosure
Saumil N. Merchant, MD—No Disclosure
Ellery Harrington, MS—No Disclosure
Cosme Furlong, PhD—No Disclosure

1:08
Lucas M. Viana—No Disclosure
André Luiz Lopes Sampaio, MD—No Disclosure
Nilda Agostinho Maia, Audiologist—No Disclosure
Alessandra Ramos Venosa, MD—No Disclosure
Rozania M. P. Junqueira—No Disclosure
Carlos Augusto Costa Pires de Oliveira, MD, PhD—No Disclosure

Disclosures—Oral Presentations

Sunday, May 1, 2011, Scientific Session (Cont)

1:16
Joseph B. Nadol, Jr., MD—AOS Council Member
Joe C. Adams, PhD—No Disclosure
Jennifer O'Malley—No Disclosure

1:24
Michael Murray, MD—Consultant to Sonitus Coroporation stock options in Sonitus Corporation
Gerald R. Popelka, PhD—Consultant to Sonitus Corporation

1:32
Bryan K. Ward, MD—No Disclosure
Christine G. Gourin, MD—No Disclosure
Howard W. Francis, MD—No Disclosure

1:40
Brian D. Westerberg, MD—No Disclosure
Anne E. Conlin, MD—No Disclosure
Patrick W. Doyle, MD—No Disclosure
Michael A. Nobel, MD—No Disclosure
Robert P. Rennie, PhD—Scientific consultant for Innovotech, manufacturer of Biofilm-PA

1:56
Stanley Pelosi, MD—No Disclosure
George B. Wanna, MD—No Disclosure
Eric E. Smouha, MD—No Disclosure

2:04
David J. Eisenman, MD—No Disclosure
Hernan Goldsztein, MD—No Disclosure

2:12
Olivier Sterkers, MD, PhD—No Disclosure
Reka Ablonczy, MD—No Disclosure
Alexis Bozorg-Grayeli, MD, PhD—No Disclosure
Daniele Bernardeschi, MD, PhD—No Disclosure

2:20
Bob Lerut, MD—No Disclosure
Alain Pfammatter, MD—No Disclosure
Johnny Moons, MScN—No Disclosure
Thomas Linder, MD, PhD—No Disclosure

2:28
Loren J. Bartels, MD—OmniGuide: unpaid consultant, program moderator, speaker. Advanced Bionics Medical Advisory Board Member. Patent holder with Grace Medical Inc for a Bartels titanium slotted bucket prosthesis.
Christopher J. Danner, MD—OmniGuide: unpaid speaker

2:36
R. Mark Wiet, MD—No Disclosure
Joyce Kim, BS—No Disclosure
Richard J. Wiet, MD—Consultant to Medtronic
Robert A. Battista, MD—No Disclosure

Disclosures—Oral Presentations

Sunday, May 1, 2011, Scientific Session (Cont)

2:42
Brandon Isaacson, MD—Medtronic Midas Rex Institute - Course Instructor and Consultant
Ryan Neilan, MD—No Disclosure

3:15
Bassem M. Hanna, MD—No Disclosure
Dennis S. Poe, MD—No Disclosure

3:23
P. Ashley Wackym, MD—Member, Surgeons Advisory Board, Cochlear Americas. Member, Surgical Advisory Board, Med-El Corporation. Member, Advisory Board, Otomed, Inc.
F. Owen Black, MD—No Disclosure

3:31
David R. Friedmann, MD—No Disclosure
Jan Eubig, MD—No Disclosure
Megan McGill—No Disclosure
Bidyut K. Pramanik, MD—No Disclosure
Anil K. Lalwani, MD—No Disclosure

3:39
Candice C. Colby, MD—No Disclosure
Ian Crocker, MD—No Disclosure
Douglas E. Mattox, MD—No Disclosure

3:52
Panel Presentation
Edwin M. Monsell, MD, PhD—No Disclosure
Nikolas H. Blevins, MD—No Disclosure
P. Ashley Wackym, MD—Member, Surgeons Advisory Board, Cochlear Americas. Member, Surgical Advisory Board, Med-El Corporation. Member, Advisory Board, Otomed, Inc.

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Harold H. Kim, MD
Edwin M. Monsell, MD
D. Bradley Welling, MD

145th AOS Annual Spring Meeting

April 21-22, 2012
Manchester Grand Hyatt
San Diego, CA

Abstract Deadline: October 15, 2011

Abstract Instructions and submission form will be available on website after July 1, 2011
Website—www.americanotologicalsociety.org
All primary and contributing authors are required to sign a disclosure/conflict of interest document at time of abstract submission in order for the abstract to be considered by the Program Advisory Committee

Journal Requirements/Instructions to Authors/Presenters

The journal of ***OTOLOGY & NEUROTOLOGY*** no longer accepts paper manuscripts. All manuscripts must be submitted online **three weeks** prior to the annual meeting, via the journal's website: https://www.editorialmanager.com/on/. Instructions for registering, submitting a manuscript, and the author guidelines can all be found on the Editorial Manager site: https://www.editorialmanager.com/on/.
One copy of the manuscript (.pdf format) is to be submitted electronically to the AOS Administrative Office **a minimum of three weeks** prior to the Annual Meeting for content and conflict of interest review and resolution.

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NOTES

Saturday, April 30, 2011

7:00 **Business Meeting** *(Restricted to Members)*
Room: Sheraton Ballroom IV/V

Minutes of the Annual Meeting 2010

Introduction of New Members

Election of Nominating Committee

Report of the Secretary-Treasurer

Report of the Editor-Librarian

7:30 **Scientific Program**
(Open to Registered Members & Non-Members—Badge required for admission)
Room: Sheraton Ballroom IV/V

Moderators: *C. Phillip Daspit, MD*
Paul R. Lambert, MD

7:30 **Remarks by the President**
C. Phillip Daspit, MD

7:35 **Presidential Citation**
Derald E. Brackmann, MD
Newton J. Coker, MD
Karl L. Horn, MD
Fred D. Owens, MD
Andrew G. Shetter, MD
David F. Wilson, MD

7:43 **Introduction of Guest of Honor**
Richard T. Miyamoto, MD

Guest of Honor Presentation
Cochlear Implants: Past, Present and Future?
Richard T. Miyamoto, MD

8:02 **DISCUSSION**

Moderators: *C. Phillip Daspit, MD*
Paul R. Lambert, MD

Cochlear and Other Implants

8:10 **Spectral and Temporal Measures in Hybrid Cochlear Implant Users: On the Mechanism of Electroacoustic Hearing Benefits**
Justin S. Golub, MD
Jong Ho Won, PhD
Ward R. Drennan, PhD
Tina D. Worman, MS
Jay T. Rubinstein, MD, PhD

NOTES

8:18 **Meningitis following Cochlear Implantation Continues to be a Problem in 2010**
Anil K. Lalwani, MD
Noel L. Cohen, MD

8:26 **The Atretic Ear and the Value of Round Window Vibrant Sound Bridge Implantation in Children and Infants**
Marco Mandalá, MD
Liliana Colletti, PhD
Vittorio Colletti, MD

8:34 **The Influence of Genotype in the Language Growth of Children with Cochlear Implants**
Simon I. Angeli, MD
Hamlet Suarez, MD
Xue Liu, MD

8:42 **Results with New SRA Electrode - Hearing Preservation in PDT**
Henryk Skarzynski, MD, PhD
Artur Lorens, PhD
Anna Piotrowska, MD, PhD
Piotr H. Skarzynski, MD, MSc
Monika Matusiak, MD, PhD

8:50 **Cochlear Implantation in Children with Auditory Neuropathy**
Kyle P. Allen, MD, MPH
Angela G. Shoup, PhD
Peter S. Roland, MD

8:58 **Speech Perception Comparisons of the Otologics Implanted Carina and the Freedom Microphones in Cochlear Implant Patients**
Herman A. Jenkins, MD
Kristin Uhler, PhD

9:06 **DISCUSSION**

9:14 **Basic Science Lecture**
Patterns of Inheritance as Illustrated by Disorders of Hearing
Kirk Aleck, MD

9:44 **DISCUSSION**
9:50 **BREAK WITH EXHIBITORS**

Cochlear and Other Implants-Continued, Animal Research, Radiology

10:15 **Bone Anchored Implant Validation for Single-Sided Deafness**
Hillary A. Snapp, AuD
David Fabry, PhD
Fred F. Telischi, MD
Simon I. Angeli, MD

NOTES

10:23 **Sound Localization in Unilateral Deafness after Treatment with the TransEar or BAHA**
Robert A. Battista, MD
R. Mark Wiet, MD
Vasilike Rauch, AuD
Krystine Mullins, AuD
Joyce Kim, BS
Richard J. Wiet, MD

10:31 **Ethnic Disparity in Skin Complications following Bone-anchored Implantation**
Bjorn Herman, MD
Daniel M. Zeitler, MD
Simon I. Angeli, MD
Ann W. Plum
Hillary A. Snapp, AuD
Fred F. Telischi, MD

10:39 **Hearing Preservation in Guinea Pigs with Long-Standing Endolymphatic Hydrops**
Suhael R. Momin, BA
Sami J. Melki, MD
Joy O. Obokhare, MD
Souha A. Fares, MS
Kumar N. Alagramam, PhD
Cliff A. Megerian, MD

10:47 **Characterization of Neuronal Cell Death in the Spiral Ganglia of a Mouse Model of Endolymphatic Hydrops**
Maroun T. Semaan, MD
Qing Y. Zheng, MD
Heping Yu
Fangchan Han, MD
Cliff A. Megerian, MD

10:55 **The Utility of Cone-Beam Computed Tomography in Determining the Position of Ossicular Prostheses in a Cadaveric Model**
Eric Monteiro, MD
Prodip Das, DM
Mike Daly, MS
Harley Chan, PhD
Adrian James, MA, DM

11:03 **Trans-modiolar CT Scan Plane: Cadaveric Temporal Bone Study for the Localization of the Electrode Array in Cochlea Implanted**
A. Robier, MD
P. Lecerf, MD
JP. Cottier, MD, PhD
D. Bakhos, MD
E. Lescanne, MD, PhD

11:11 **DISCUSSION**

NOTES

Disorders of Hearing and Balance

11:19 **Third Window Vibroplasty: Assessment of Physiologic Responses in a Model of Stapes Fixation**
J. Eric Lupo, MD, MS
Kanthaiah Koka, PhD
Herman A. Jenkins, MD
Daniel J. Tollin, MD

11:27 **Efficacy and Safety of Bilateral Posterior Canal Occlusion in Patients with Refractory Benign Paroxysmal Positional Vertigo: Case Report Series**
Jayant Ramakrishna, Hons BHSc
Joel A. Goebel, MD
Lorne S. Parnes, MD

11:35 **What Happens to the Contralateral Ear as Meniere's Disease Progresses? A Study Using Vestibular Evoked Myogenic Potentials**
M. Geraldine Zuniga, MD
Kristen Janky, AuD, PhD
Michael Schubert, PT, PhD
John P. Carey, MD

11:43 **Cartilage Tympanoplasty in Smokers**
Angela S. Peng, MD
Meghan Thompson
Aristides Sismanis, MD
Daniel H. Coelho, MD

11:51 **DISCUSSION**

12:00 **Adjourn**

12:05 **AOS Members Group Photograph**
(Location to be announced)

6:30 **President's Reception & Dinner Dance**
Sheraton Ballroom V
(Members and Invited Guests Only)

Sunday, May 1, 2011

12:30 **Business Meeting** *(Restricted to Members)*
Room: Sheraton Ballroom IV/V
Report of the
A. Board of Trustees of the Research Fund
B. American Board of Otolaryngology
C. Award of Merit Committee
D. American College of Surgeons
E. American Academy of Otolaryngology-HNS
F. AAO-HNS Board of Governors

Report of Audit Committee

Report of the AOS Education Committee

Report of the Membership Development Committee

Report of the Nominating Committee

Unfinished Business

New Business

1:00 **Scientific Program**
(Open to Registered Members & Non-Members—Badge Required for admittance)
Room: Sheraton Ballroom IV/V

Moderators: *C. Phillip Daspit, MD*
Paul R. Lambert, MD

Disorders of Hearing and Balance – Continued

1:00 **New Data on the Motion of the Normal and Reconstructed Tympanic Membrane**
John J. Rosowski, PhD
Jeffery Tao Cheng, PhD
Saumil N. Merchant, MD
Ellery Harrington, MS
Cosme Furlong, PhD

1:08 **ABR Changes in Children after Treatment with High Dose Cisplatin**
Lucas M. Viana
André Luiz Lopes Sampaio, MD
Nilda Agostinho Maia, Audiologist
Alessandra Ramos Venosa, MD
Rozania M. P. Junqueira
Carlos Augusto Costa Pires de Oliveira, MD, PhD

NOTES

1:16 **Temporal Bone Histopathology in a Case of Sensorineural Hearing Loss Caused by Superficial Siderosis of the Central Nervous System**
Joseph B. Nadol, Jr., MD
Joe C. Adams, PhD
Jennifer O'Malley

1:24 **Long Term Clinical Findings for a Novel Bone Conduction Device for Single Sided Deafness**
Michael Murray, MD
Gerald R. Popelka, PhD

1:32 **Impact of Case Volume on Short-term Surgical Outcomes and Costs of Vestibular Schwannoma Care**
Bryan K. Ward, MD
Christine G. Gourin, MD
Howard W. Francis, MD

1:40 **In Vitro Assessment of Efficacy of Ciprofloxacin-Dexamethasone and N-Acetylcysteine on Bacteria and Biofilms Associated with Chronic Suppurative Otitis Media**
Brian D. Westerberg, MD
Anne E. Conlin, MD
Patrick W. Doyle, MD
Michael A. Nobel, MD
Robert P. Rennie, PhD

1:48 **DISCUSSION**

Temporal Bone Surgical Interventions

1:56 **Canal Wall Reconstruction in the Surgical Management of Cholesteatoma**
Stanley Pelosi, MD
George B. Wanna, MD
Eric E. Smouha, MD

2:04 **Transmastoid Repair of the Sinus Wall for Pulsatile Tinnitus Due to Sigmoid Sinus Diverticulum and Dehiscence**
David J. Eisenman, MD
Hernan Goldsztein, MD

2:12 **Continuous Facial Nerve Stimulating Burr for Otological and Neurotological Surgeries**
Olivier Sterkers, MD, PhD
Reka Ablonczy, MD
Alexis Bozorg-Grayeli, MD, PhD
Daniele Bernardeschi, MD, PhD

NOTES

2:20 **Size Matters: New Insights in an "Old" Pathology**
Bob Lerut, MD
Alain Pfammatter, MD
Johnny Moons, MScN
Thomas Linder, MD, PhD

2:28 **Comparison of Hollow Core CO2 Laser Fiber to KTP Laser Fiber in Stapes Surgery**
Loren J. Bartels, MD
Christopher J. Danner, MD

2:36 **Fascia, Vein, or Fat for Oval Window Grafting in Primary Partial Stapedectomy**
R. Mark Wiet, MD
Joyce Kim, BS
Richard J. Wiet, MD
Robert A. Battista, MD

2:42 **Total Ossicular Chain Reconstruction: Transmastoid Facial Recess Approach Versus Transcanal Approach**
Brandon Isaacson, MD
Ryan Neilan, MD

2:50 **DISCUSSION**

2:58 **INTERMISSION**

SSC Dehiscence, Jugular Bulb and Radiosurgery

3:15 **Minimally Invasive Functional Approach for Cholesteatoma Surgery**
Bassem M. Hanna, MD
Dennis S. Poe, MD

3:23 **Dehiscent Superior Semicircular Canal Patients: Phenotypes, Surgical Findings and Outcomes**
P. Ashley Wackym, MD
F. Owen Black, MD
David A. Siker, MD

3:31 **Development of the Jugular Bulb and Its Abnormalities: A Radiologic Study**
David R. Friedmann, MD
Jan Eubig, MD
Megan McGill
Bidyut K. Pramanik, MD
Anil K. Lalwani, MD

3:39 **Stereotactic Radiosurgery for Glomus Jugulare Tumors**
Candice C. Colby, MD
Ian Crocker, MD
Douglas E. Mattox, MD

3:47 **DISCUSSION**

3:52 **Panel: Stereotactic Radiosurgery in Otology & Neurotology**
Moderator: *Edwin M. Monsell, MD, PhD*

Panel Presentations:
Stereotactic Radiosurgery: Vestibular Schwannoma and Other Lesions, Overview
Edwin M. Monsell, MD, PhD

Radiosurgery for Vestibular Schwannomas: Results and Complications
Nikolas H. Blevins, MD

Hearing Preservation in Radiosurgery for Vestibular Schwannomas and Credentialing
P. Ashley Wackym, MD

4:45 **DISCUSSION**

5:00 **Introduction of Incoming AOS President**
Herman A. Jenkins, MD

5:05 **ADJOURNMENT**

IDENTIFICATION OF PROFESSIONAL PRACTICE GAPS

When submitting the abstract, the authors were asked to identify the professional practice gap (s), i.e., educational needs, learning objectives, and desired results; as well as competency areas to be addressed. These practice gaps and competency areas are stated at the end of each abstract listed in the order of presentation.

8:10 am

Spectral and Temporal Measures in Hybrid Cochlear Implant Users: On the Mechanism of Electroacoustic Hearing Benefits

Justin S. Golub, MD, Jong Ho Won, PhD
Ward R. Drennan, PhD, Tina D. Worman, MS
Jay T. Rubinstein, MD, PhD

Objective: Compare auditory performance of Hybrid and standard cochlear implant users with psychoacoustic measures of spectral and temporal sensitivity and correlate with measures of clinical benefit.
Study design: Cross-sectional study.
Setting: Tertiary academic medical center.
Patients: Hybrid and standard cochlear implant users over five months post implantation. Hybrid recipients all had preservation of low-frequency hearing.
Interventions: Administration of psychoacoustic, music perception, and speech reception in noise tests.
Main outcome measures: Performance on spectral ripple discrimination, temporal modulation detection, Schroeder-phase discrimination, Clinical Assessment of Music Perception (CAMP), and speech reception in steady-state noise.
Results: CAMP pitch and melody performance were significantly better in Hybrid users compared to standard implant controls. Timbre measures showed no difference between groups. There was no significant difference on speech reception in noise but results suggested that with a larger sample size, Hybrid users will show a significant advantage. Surprisingly, neither Schroeder-phase discrimination at two frequencies nor modulation detection thresholds across a range of frequencies revealed any advantage in Hybrid users. This contrasts with spectral ripple measures that were significantly better in the Hybrid group. The spectral ripple advantage was preserved even when using only residual hearing.
Conclusions: These preliminary data confirm existing data demonstrating that residual low-frequency acoustic hearing is advantageous for pitch and melody perception. They also suggest that clinical benefits enjoyed by Hybrid recipients are due to improved spectral discrimination provided by the residual hearing. No evidence was found that residual hearing provided temporal information beyond that provided by electrical stimulation.

IRB or IACUC Approval: UW IRB #28355, #28589
List outside funding: supported by NIH grants R01-DC007525, P30-DC04661, F31-DC009755, L30-DC008490

Define Professional Practice Gap & Educational Need: lack of awareness of the existence of Hybrid cochlear implants in clinical trials as well as the suggested mechanisms for their superior performance in well chosen candidates
Learning Objective: to appreciate mechanisms that may explain superior performance in Hybrid cochlear implant patients
Desired Result: learners will be able to appreciate mechanisms that may explain superior performance in Hybrid cochlear implant patients, resulting in a better understanding of why certain patients may benefit from Hybrid implantation

Patient Care
Medical Knowledge
Practice-Based Learning

Meningitis following Cochlear Implantation Continues to be a Problem in 2010

Anil K. Lalwani, MD, Noel L. Cohen, MD

Objective: In 2002, an unusually high occurance of bacterial meningitis following cochlear implantation was noted. Most cases were attributed to a two-part electrode
array (positioner) that was voluntarily discontinued by the manufacturer. In addition, sealing of the cochleostomy and prophylactic vaccination prior to implantation became the standard of care. The objective of this report was to determine if meningitis remains a risk with cochlear implantation in 2010.

Data sources: The MAUDE Database was followed over 8 years. Additional information was gathered from governmental agencies, the Centers for Disease Control and Prevention (CDC), the AAO-HNS and American Academy of Pediatrics (AAP), publications in the American and European literature and the Vaccination Awareness Campaign.

Results: Between 2002 and Sept 2010, 253 cases of bacterial meningitis, with 25 deaths (10 %) have been reported; half of these were reported in the first two years. Significant efforts have been made by implant centers to promote vaccination with some success, but difficulties remain in achieving universal vaccination despite diligence. Despite discontinuation of the positioner, preoperative vaccination and sealing of the cochleostomy, meningitis at a rate of 19.4 +/- 5 cases/year with a mortality rate of 10% or 2 deaths, occur annually.

Conclusions: In 2010, post-implantation bacterial meningitis continues to occur and is associated with significant morbidity and mortality. Renewed efforts at obtaining universal appropriate vaccination and ongoing vigilance are necessary to further reduce this infrequent but serious complication of cochlear implantation.

IRB or IACUC Approval: Not required

Define Professional Practice Gap & Educational Need: Following initial heightened awareness of increasted incidence of meningitis following cochlear implantation, the current risk of meningitis-following removal of the positioner,preoperative vaccination, and sealing of the cochleostomy-is not well known.

Learning Objective: To learn the risk factors associated with meningitis and practice habits that will lead to its reduction

Desired Result: All members of the cochlear implant teamOtolaryngologist, Pediatrician, must be aware of the potential for this complication. Parents of pediatric CI candidates as well as adult patients ust be counselked concerning the need for vaccination, and surgeons must be aware of techniques needed to lessen this risk.

Patient Care
Medical Knowledge
Practice-Based Learning
Interpersonal and Commun
Professionalism
System-Based Practice

The Atretic Ear and the Value of Round Window Vibrant Sound Bridge Implantation in Children and Infants

Marco Mandalá, MD, Liliana Colletti, PhD
Vittorio Colletti, MD

OBJECTIVE: External auditory canal and middle ear malformation, accompanied by more or less severe conductive or mixed hearing impairment characterize children and infants with congenital aural atresia (CAA). Several atresiaplasty procedures have been proposed without evidence of long term air-bone gap closure despite initial satisfactory outcome. The present paper was performed to evaluate if the placement of the floating mass transducer (FMT) of the Med-El Vibrant Sound Bridge (VSB) on the round window (RW) in infants and children with CAA allows optimal amplification and enables the restoration of good hearing.

STUDY DESIGN: Prospective study.

SETTING: Tertiary referral center.

PATIENTS: 5 infants and 9 children with CAA. The patients were judged not to be candidates for air and bone conductive hearing aids and their parents declined bone-anchored hearing aids.

INTERVENTION: RW implantation with the Med-El VSB.

MAIN OUTCOME MEASURES: Pure tone audiogram and free-field speech testing, free-field Auditory Brainstem Response (ABR).

RESULTS: Significant improvements were observed in pure-tone threshold and speech perception immediately after surgery and at follow-up intervals (12 to 65 months) in older children ($p<0,01$). In infants and younger children free-field ABRs showed a significant shift of the mean air conduction threshold from 115 dB SPL preoperatively to 45 dB SPL ($p<0.05$) and 35 dB SPL ($p<0.01$), respectively postoperatively and at the last follow-up. No complications or instances of device extrusion were observed in this series of patients.

CONCLUSIONS: RW implantation offers a viable and improved treatment option for infants and children with CAA.

Define Professional Practice Gap & Educational Need

Lack of awareness regarding the possibilities of treating effectively hearing loss in congenital aural atresia in children and infants with round window implantation.

Learning Objective: Demonstrate the value of round window implantation in children and infants with congenital aural atresia.

Desired Result: Increase the knowledge about results of round window implantation in congenital aural atreia in children and infants.

Patient Care
Medical Knowledge
Interpersonal and Commun

8:34

The Influence of Genotype in the Language Growth of Children with Cochlear Implants

Simon I. Angeli, MD, Hamlet Suarez, MD, Xue Liu, MD

Objective: The objective of this study was to compare the language growth of children with connexin-related deafness (DFNB1) who received cochlear implants versus the language growth of implanted children with non-DFNB1 deafness.

Study Design: A prospective longitudinal observational study and analysis.

Setting: Two tertiary referral centers.

Patients: There were 35 children with severe to profound hearing loss who received cochlear implants before the age of 4 years.

Interventions: A standardized language measure, the Reynell Developmental Language Scale (RDLS) was used to assess the receptive and expressive language skills at different times post-implantation. Molecular screening for DFNB1 gene variants.

Main outcome measures: Language quotient scores (i.e. age equivalent score obtained on the RDLS divided by the child's chronological age), results of genotyping.

Results: All children demonstrated a growth of their language skills. When divided by genotypes, DFNB1 children exhibited a steeper growth and less variability in scores than non-DFNB1 children. The scores of non-DFNB1 children were more affected by age of implantation than those of DFNB1 children.

Conclusion: The language growth of implanted children with non-syndromic deafness appears to be influenced by the etiology of the hearing loss, with DFNB1 children exhibiting more consistent and quicker growth than non-DFNB1 children.

IRB or IACUC Approval: governing IRB #20010738, October 7, 2002 List outside funding: partly funded by NIH grant DCR01 05575 (Xue Z. Liu, MD)

Define Professional Practice Gap & Educational Need: there is mounting evidence (albeit insufficient) that the etiology of hearing loss contributes to the language development of children using cochlear implants, and there is a need to make practitioners aware of the implications of genetic testing when counseling families of children receiving implants
Learning Objective: Attendants to this lecture will recognize the difference of the language growth of children with connexin-related deafness (DFNB1) who received cochlear implants versus the language growth of implanted children with non-DFNB1 deafness
Desired Result: Be able to discuss the influence of the etiology of hearing loss in language development after cochlear implantation, particularly the favorable outcomes in children with connexin-related deafness (DFNB1) versus other etiologies.

Patient Care

8:42

Results with New SRA Electrode - Hearing Preservation in PDT

Henryk Skarzynski, MD, PhD, Artur Lorens, PhD
Anna Piotrowska, MD, PhD, Piotr H. Skarzynski, MD, MSc
Monika Matusiak, MD, PhD

Cochlear implants are considered as a solution for hearing impaired subjects with 'ski-slope' audiogram, whose benefit from hearing aids is limited and doesn't provide the satisfactory speech perception. As minimal insertion trauma is critical for preservation of residual hearing, the new Straight Research Array electrode has been designed, and round window approach proposed, especially for partial deafness treatment.

The aim of this study was to compare post- to pre-operative benefit in terms of speech recognition in quiet and in noise and preservation of residual hearing over time. Thirty four adult hearing impaired subjects with partial deafness were selected for cochlear implantation. Speech recognition using the CI and HA in both ears was assessed at intervals according to protocol up to 12 months post implantation. Hearing threshold levels were also measured over time. At 12 months post-op the majority of implanted subjects had significant improvements in speech recognition scores (>20% age points) in both conditions: in quiet (71% subjects) and in noise (100% subjects). The average post-op score or words presented in quiet was 79%, pre-op 41%, in 10dB SNR noise 68%, pre-op 12%. 13/34 retained hearing in the implanted ear within 10dB of pre-op levels, while 6/34 cases lost >25dB hearing. The mean increase in thresholds was 15dB up to 12 months post-operatively.

Speech recognition performance of subjects implanted with the Nucleus SRA CI was significantly improved. A round-window approach seems to be an adequate surgical technique to achieve a high rate of hearing preservation.

Learning Objective: Presenting results of PD patients implanted with new type of electrode.

Desired Result: Improved treatment options for partially deafened patients.

Medical Knowledge
Practice-Based Learning

8:50

Cochlear Implantation in Children with Auditory Neuropathy

Kyle P. Allen, MD, MPH, Angela G. Shoup, PhD
Peter S. Roland, MD

Objective: To determine speech perception abilities of patients children with auditory neuropathy who have undergone cochlear implantation.

Study Design: Retrospective case review.

Setting: Tertiary referral center.

Patients: Children under 18 diagnosed with auditory neuropathy who received a cochlear implant.

Interventions: Children with auditory neuropathy who received cochlear implants underwent pre and postoperative audiologic testing to determine speech perception abilities in these patients.

Main outcome measure: Speech perception category (SPC).

Results: 17 patients were identified with auditory neuropathy that underwent cochlear implantation at a single institution. With a mean device usage period of 35.3 months, 6 patients (35.3%) developed open-set speech recognition (SPC 5,6), 6 patients (35.3%) developed closed-set speech recognition (SPC 3,4), and 4 patients (23.5%) were unable to develop pattern perception (SPC 1) with the device. There were no statistically significant differences in duration of device usage and age at implantation between the group that obtained open-set speech and the group that did not develop pattern perception. The mean birth weight of the group who did not develop pattern perception was significantly lower than that of the open-set speech perception group (1629 g and 3399 g respectively) ($p=0.042$).

Conclusions: A majority of patients with auditory neuropathy who underwent cochlear implantation developed some degree of speech recognition. Those patients with a lower birth weight may have less success with cochlear implantation. Cochlear implantation in children with auditory neuropathy is often useful but it does not reliably result in open set speech recognition.

IRB or IACUC Approval: UTSW IRB Approval Number: 072009-066

Define Professional Practice Gap & Educational Need: Need for more reports of auditory neuropathy patient results with cochlear implantation.

Learning Objective: To determine speech perception abilities of patients children with auditory neuropathy who have undergone cochlear implantation.

Desired Result: Better understanding of results of cochlear implantation in children with auditory neuropathy.

Patient Care
Medical Knowledge

8:58

Speech Perception Comparisons of the Otologics Implanted Carina and the Freedom Microphones in Cochlear Implant Patients

Herman A. Jenkins, MD, Kristin Uhler, PhD

Objective: To compare speech understanding abilities in listeners using two microphone technologies, Otologics fully implantable Carina and the Cochlear Freedom microphones.

Study Design: Feasibility study using direct comparison of the two microphones, non-randomized, non-blinded for both within and between subjects.

Setting: Tertiary referral center hospital outpatient clinic

Patients: Four patients with > one year of unilateral listening experience with the Freedom Cochlear Implant with a CNC word score of >40%.

Intervention: A Carina microphone coupled to a percutaneous plug was implanted on the ipsilateral side of the cochlear implant. Two months were allowed for healing prior to connecting to the Carina microphone. The percutaneous plug was connected to a body worn external processor with leads inserted into the auxiliary port of the Freedom processor. The patients were instructed to use each of the two microphones for half of their daily use.

Main outcome measures: Aided pure tone thresholds, CNC, BKB-SIN and APHAB

Results: All patients had sound perceptions using both microphones. The loudness and quality of the sound was judged to be less with the Carina in the first two subjects and equivalent in the second two listeners. CNC word scores averaged 62% with the Freedom and 18% with the Carina. The third subject showed BKB-SIN scores of 7.5 dB SNR with the Freedom and 11dB SNR with the Carina. Results of the APHAB in this patient showed equivalency in the ease of communication, reverberation and adversiveness measures, but performed less well with the Carina in the background noise situation.

Conclusions: Early observations indicate that it is feasible to drive the Freedom Cochlear Implant with the fully implanted Carina microphone. Outcomes have improved with each listening session as more knowledge is gained.

IRB or IACUC Approval: WIRB # 20091732
List outside funding: Otologic LLC Clinical Trials Support

Define Professional Practice Gap & Educational Need:
Introduction of new technology in cochlear implantation

Learning Objective: A fully implantable cochlear implant is feasible

Desired Result: New candidates may be identified that will benefit from this technology

Patient Care
Medical Knowledge
System-Based Practice

10:15

Bone Anchored Implant Validation for Single-Sided Deafness

Hillary A. Snapp, AuD, David Fabry, PhD
Fred F. Telischi, MD, Simon I. Angeli, MD

Objectives: Bone anchored implants have recently become an established form of treatment for individuals with single-sided-deafness (SSD). The degree of benefit, however, varies across individuals. The purpose of this study is to investigate the clinical utility of speech in noise testing as an objective validation measure of the benefit of bone anchored implants (BAI) in the SSD population.

Methods: Retrospective review of a large series of adult subjects with SSD who received speech-in-noise testing as part of the BAI post-operative validation protocol. Subjects performance with and without their BAI was evaluated for comparison using SNR loss as measured by the QuickSIN test, word recognition ability in noise, and subjective questionnaires.

Results: Wilcoxon sign-rank test resulted in no significant difference between the pre-operative and post-operative methods for measuring benefit on listening in noise tasks. Significant improvement was seen in all patients ($p < 0.05$). Perceived benefit was not directly correlated to degree of improvement on speech in noise measures. Wilcoxon sign-rank test showed significant improvements in self-reported disability post-operatively ($p<0.05$)

Conclusions: Post-operative performance using BAIs can be effectively validated using a clinical protocol that includes speech-in-noise measures. The results of this study concur with earlier results suggesting pre-operative speech-in-noise measures allows for more accurate assessment of benefit over standard functional gain measures and can more accurately predict benefit in BAI recipients.

IRB or IACUC Approval: IRB approval was obtained

Define Professional Practice Gap & Educational Need: There is a lack of standardized, evidence based validation and verification measures for bone anchored implant recipients.

Learning Objective: Attendees will learn an evidence based approach to validating benefit in bone anchored implant recipients.

Desired Result: Attendees be able to apply a clinically feasible validation protocol for bone anchored implant recipients.

Patient Care
Practice-Based Learning

Sound Localization in Unilateral Deafness after Treatment with the TransEar or Baha

Robert A. Battista, MD, R. Mark Wiet, MD
Vasilike Rauch, AuD, Krystine Mullins, AuD
Joyce Kim, BS, Richard J. Wiet, MD

Objective: To evaluate the sound localization capabilities of patients with unilateral, profound sensorineural hearing loss (UPSNHL) who have been treated with either a TransEar or Baha bone-conduction hearing device.

Study design: Non-randomized, prospective study

Setting: Tertiary referral private practice

Patients: Ten patients each with UPSNHL treated with a TransEar or with a Baha. Patients wore the hearing device for at least one month and had normal hearing in the contralateral ear. Ten patients with normal, bilateral hearing were used for control.

Interventions: Sound localization of a three-second recorded sound with and without a TransEar or Baha was assessed using an array of 7 speakers at head level separated by approximately 45 degrees. The recorded sounds were that of a barking dog or a police siren. Randomized trials of 4 presentations per speaker were given for each hearing condition.

Main outcome measures: Sound localization was assessed both by the accuracy in response and the generalized laterality of response.

Results: The average accuracy of speaker localization was 21% and 32% in the unaided condition for the TransEar and Baha patients, respectively. There was no improvement with use of either bone-conduction hearing device. Laterality response was poorer than 63% in both aided and unaided conditions.

Conclusions: Neither the TransEar or Baha improved sound localization or laterality judgment ability in patients with unilateral, profound sensorineural hearing loss compared to performance in the unaided condition.

IRB or IACUC Approval: Adventist Hinsdale Hospital IRB 3451
Define Professional Practice Gap & Educational Need: Many single-sided deaf (SSD) patients treated with the latest bone-conduction hearing devices, such as the TransEar and the Baha, have anecdotally reported the ability to localize sound. There have been no reports in the medical literature regarding the localization capabilities of patients with SSD using the latest bone-conduction technology. This study was designed to quantify this localization ability.
Learning Objective: To better elucidate the sound localization capabilities of patients with single-sided deafness when using up-to-date bone-conduction technologies.
Desired Result: After this presentation, attendees will have a more qualitative and quantitative understanding of single-sided deaf patients' ability to localize sound with and without bone-conduction devices.

Patient Care
Medical Knowledge
Practice-Based Learning

10:31

Ethnic Disparity in Skin Complications following Bone-anchored Implantation

Bjorn Herman, MD, Daniel M. Zeitler, MD
Simon I. Angeli, MD, Ann W. Plum
Hillary A. Snapp, AuD, Fred F. Telischi, MD

Objective: Early processor loading after single-stage bone anchored implantation (BAI) surgery is often delayed by skin-site complications. The purpose of this study was to examine the frequency of skin-site complications in various ethnic groups, and to determine whether other comorbidities may lead to higher rates of skin-site complications and subsequent delayed processor loading.
Study design: Retrospective review
Setting: Tertiary academic referral center
Subjects: All adult, English speaking patients (>18 years) undergoing BAI from 2007-2010 were examined, and 57 patients met inclusion criteria.
Intervention: Therapeutic.
Main outcome measures: Demographic data including patient ethnicity (African-American,Hispanic, Caucasian, Other), history of smoking, diabetes, immunosuppressive disorders, and chronic steroid use were determined. Major and minor skin-site complications as well as time to processor loading were recorded for each patient.
Results: The mean time to processor loading for all patients was 9.52 weeks, and there were no cases of osseointegration failure. African-American patients had a significantly higher rate of major skin-site complications ($p<0.005$) and time to processor loading (mean, 18.45 weeks; SD+/-12.24, $p=0.001$) than all other ethnic groups. There was no difference in minor skin complication rates among ethnic groups. Additionally, there was no correlation between diabetes mellitus, immunosuppression, or tobacco use and skin-site complications.
Conclusions: Skin complications can delay processor loading following BAI surgery. There is a higher rate of major skin-site complications in African-American patients and this can often result in delayed processor loading. Increased risk of skin-site complications is an important consideration for pre-operative counseling for these patients.

IRB or IACUC Approval: This study was approved by the University of Miami IRB.

Define Professional Practice Gap & Educational Need:
1. Lack of studies examining disparities in post- bone anchored implant skin complications and their relationship to ethnicity and medical comorbidities.
Learning Objective: The objective will be to examine the frequency of skin-site complications in various ethnic groups, and to determine whether medical comorbidities may lead to higher rates of skin-site complications and subsequent delayed processor loading.
Desired Result: Attendees will learn of increased risk of skin-site complications in certain ethnic populations, which is an important consideration for pre-operative counseling of these patients.

Patient Care
Medical Knowledge
Interpersonal and Commun
Professionalism

10:39

Hearing Preservation in Guinea Pigs with Long-Standing Endolymphatic Hydrops

Suhael R. Momin, BA, Sami J. Melki, MD, Joy O. Obokhare, MD
Souha A. Fares, MS, Kumar N. Alagramam, PhD
Cliff A. Megerian, MD

Hypothesis: Interruption of the excitotoxic and inflammatory pathways implicated in endolymphatic hydrops (ELH)-associated hearing loss (HL) should afford hearing protection at the neuronal level.
Background: Previous work shows that DMSO, an anti-inflammatory solvent, can slow the progression of HL before neuronal degeneration occurs. Riluzole, a glutamate release inhibitor, may provide synergistic benefit. This study was designed to quantify the effects of DMSO and riluzole in a long-term model.
Methods: Guinea pigs with surgically-induced ELH were sorted into three groups: riluzole+DMSO (1), DMSO alone (2) and untreated controls (3). Animals in Groups 1 and 2 received daily injections of the study drug(s). All animals underwent ABR evaluation every 4 weeks until 24 weeks, when they were sacrificed. Cochleae were preserved; spiral ganglion density was quantified. Animals without hydrops were excluded from the study as surgical failures.
Results: Animals from all groups developed unilateral HL. Using a repeated measures ANOVA test, we found that HL was significantly lower in Groups 1 and 2 relative to 3 ($p=0.006$ and $p=0.021$, respectively), although not between Groups 1 and 2 ($P=0.619$). Similarly, the spiral ganglion is preserved in Groups 1 and 2 relative to 3 ($p=0.069$ and $p=0.085$, respectively). There is no difference between Groups 1 and 2 ($p=0.924$).
Conclusions: These results confirm the hearing protection observed in short-term studies, with DMSO conferring functional and cellular protection. No additional effect can be attributed solely to riluzole. This study provides additional evidence that anti-inflammatory drugs may preserve or slow the progression of ELH-associated HL.

This study was approved by the IACUC protocol #2008-0059
This project was supported by internal funding and NIDCD award 5R03DC006562, for study of "Molecular biology of deafness in the Meniere's Model."

Define Professional Practice Gap & Educational Need: The pathophysiology of Meniere's Disease (MD) is not well understood. While endolymphatic hydrops (ELH) has long been identified as the signature histologic finding in patients with MD, the pathologic sequence connecting ELH and sensorineural hearing loss (SNHL) is unclear. However, evidence from human and animal studies suggests that glutamate excitotoxicity and associated inflammation may be responsible for the neuronal degeneration (and SNHL) seen in patients with MD. This study examines that hypothesis by testing whether anti-glutamate and anti-inflammatory drugs can slow the progression of hearing loss in an animal model of ELH.
Learning Objective: To understand the hypothesis of glutamate excitotoxicity and how it may explain the SNHL associated with ELH and MD. This study/presentation does not have immediate clinical application. However, it will enhance physicians' understanding of a common and debilitating condition.
Desired Result: For researchers and clinicians who are studying ELH/MD, this presentation will help inform future studies that attempt hearing preservation in ELH models.
Medical Knowledge

10:47

Characterization of Neuronal Cell Death in the Spiral Ganglia of a Mouse Model of Endolymphatic Hydrops

Maroun T. Semaan, MD, Qing Y. Zheng, MD
Heping Yu, Fangchan Han, MD
Cliff A. Megerian, MD

Hypothesis: spiral ganglia neurons (SGN) in the Phex Hyp-Duk male, a mutant mouse that develops post-natal endolymphatic hydrops, undergo progressive apoptosis.

Background: the male mouse carrying the Phex Hyp-Duk gene (Phex/Y), a mutant allele of the phosphate-regulating gene Phex, exhibits craniofacial and skeletal abnormalities, vestibular dysfunction and hearing loss. Histological analysis of the cochlea demonstrated endolymphatic hydrops by post-natal day (P) 21 and SGN loss by P90. The SGN loss exhibited topographic organization with loss beginning at the cochlear apex.

Methods: Immunohistochemical analysis of activated caspase 3, 8 and 9 was performed on mid-modiolar cochlear sections obtained from four mutants (Phex/Y) and 2 controls (+/Y) at P14, P21, P40, P60 and P90. Terminal deoxynucleotidyl transferase-mediated dUTP -biotin nick-end labeling assay (TUNEL) was carried out on 2 affected mice and 2 controls.

Results: the Phex/Y demonstrated expression of activated caspase 3, 8 and 9. This expression was seen as early as P14. Topographically, in the younger mice expression of activated caspase was mostly confined to the apex. With time, the activity gradually decreased in the apex and increased in the basal turn of the cochlea. TUNEL staining demonstrated induction of apoptosis at P90 in the apical and basal turn of the mutant.

Conclusion: immunohistochemical studies and TUNEL staining demonstrated induction of apoptosis in the Phex Hyp-Duk male mouse, an animal model of post-natal endolymphatic hydrops. The pattern observed in this model is reminiscent of the SGN loss seen in human temporal bone specimen of endolymphatic hydrops.

IRB or IACUC Approval: IACUC approved

Define Professional Practice Gap & Educational Need:
Neurona fate in the mouse model of endolymphatic hydrops (Phex mouse) has not been characterized

Learning Objective: Demonstrate the induction of apoptosis in a mouse model of post-natal endolymphatic hydrops, the Phex mouse.

Desired Result: Understand that apoptosis is the mechanism of spiral ganglia neuronal death in the animal model of endolymphatic hydrop.

Medical Knowledge

10:55

The Utility of Cone-Beam Computed Tomography in Determining the Position of Ossicular Prostheses in a Cadaveric Model

Eric Monteiro, MD, Prodip Das, DM, Mike Daly, MS
Harley Chan, PhD, Adrian James, DM, MA

Hypothesis: Cone beam computed tomography (CT) is proving useful in various operative settings. We hypothesize that it has great potential as an intra-operative test of ossicular prosthesis positioning.
Background: Results from prosthetic ossiculoplasty are frequently disappointing. Undetected intra-operative displacement of the prosthesis may be caused, and obscured, by placement of an overlying cartilage graft.
Methods: A right cadaveric temporal bone was prepared with a tympanomeatal flap, and an extended posterior tympanostomy through a cortical mastoidectomy. Each of three commercially available prostheses were positioned in three different locations: (1) optimal, (2) markedly displaced, and (3) marginally displaced. The intended prosthetic positions were confirmed by endoscopy prior to, and following cone beam CT image acquisition. The primary outcome measure was the position of the prosthesis in relation to the stapes and tympanic membrane, as assessed by three blinded expert reviewers. Secondary outcome measures included optimal dosing for adequate image resolution and radiographic scatter associated with different prosthetic materials.
Results: Cone-beam CT accurately demonstrated the position of ossicular reconstruction prostheses with respect to the stapes and tympanic membrane. Prosthesis displacement, whether minimally or marked, was also accurately demonstrated. Although all prostheses were adequately visualized, resolution varied depending on the composition of the individual prosthesis.
Conclusions: Cone-beam CT is a useful tool for determining the position of ossicular reconstruction prostheses in situ. We suggest it has potential for intra-operative assessment to check positioning after the prosthesis has been covered with a cartilage graft and tympanomeatal flap.
IRB or IACUC Approval: N/A
Define Professional Practice Gap & Educational Need: 1. Lack of awareness of whether intra-operative displacement of ossicular prostheses is contributing to the disappointing hearing outcomes that are frequently reported in various series of ossicular reconstruction with PORPs and TORPs; 2. It is often difficult to directly visualize the position of the prosthesis after replacement of the tympanomeatal flap, particularly following cartilage grafting, allowing unexpected intraoperative changes in position to go unnoticed.
Learning Objective: 1. To demonstrate the utility of cone beam CT as an intra-operative test of ossicular prosthesis placement; 2. To discuss clinical situations where such imaging may be helpful to the surgeon.
Desired Result: Our desired result is to demonstrate the potential of cone beam computed tomography as an intra-operative test of prosthesis placement. We hope to spark discussion surrounding the appropriate clinical situations where such imaging may prove helpful. We hope attendees will evaluate their individual practices and decide in which patients and clinical situations such a test may aid in improving surgical and patient outcomes
Patient Care
Medical Knowledge
Practice-Based Learning

11:03

Trans-modiolar CT Scan Plane: Cadaveric Temporal Bone Study for the Localization of the Electrode Array in Cochlea Implanted

A. Robier, MD, P. Lecerf, MD
JP. Cottier, MD, PhD, D. Bakhos, MD
E. Lescanne, MD, PhD

Hypothesis: A trans-modiolar CT scan plane could potentially be used clinically to determine cochlear implant electrode array position if a cadaveric temporal bone study validate the technique.

Background: Several radiological studies using sophisticated techniques (3D reconstruction and CT-MRI fusion) have been described. This study is design to validate a standard CT scan technique to evaluate the electrode position.

Methods: This ex-vivo study was conducted on 18 cadaveric temporal bones without malformation. Cochlear© electrode dummies were implanted by one experimented surgeon with the "advance off-stylet" technique. After randomisation, the placement was processed through an antero-inferior or superior cochleostomy for respectively into scala tympani or vestibuli positioning with visualisation of the basilar membrane. Cadaveric temporal bones were then scanned (Philips Brilliance 40 CT) and reconstructed into the trans-modiolar plane (+/- 45, z axis in the cochlear coordinate system). Two independent radiologists, unaware of the implanted scala, evaluated the electrode position on a CT scan through the trans-modiolar plane. At the end, the microanatomical study was the gold standard to determine the exact scalar localization of the electrode array.

Results: Nine were inserted in scala tympani and nine in scala vestibuli. According to our gold standard, the transmodiolar CT scan sensibility and specificity for scala tympani were 89% and 100% respectively and were 100% and 100% respectively for scala vestibuli.

Conclusion: Our cadaveric study validates that transmodiolar CT scan plane could determine the position of the cochlear implant electrode array. It opens further clinical studies.

Define Professional Practice Gap & Educational Need:
Lack of comtemport knowledge about the use of CT scan for determining the electrode position.

Learning Objective: Anatomo-radiological cadaveric temporal bone study.

Desired Result: Use Transmodiolar CT scan in clinical practice.

System-Based Practice

11:19

Third Window Vibroplasty: Assessment of Physiologic Responses in a Model of Stapes Fixation

J. Eric Lupo, MD, MS, Kanthaiah Koka, PhD
Herman A. Jenkins, MD, Daniel J. Tollin, MD

Hypothesis: Mechanical stimulation through a cochlear third window in the scala tympani (ST) in a chinchilla model with normal and fixed stapes can generate cochlear responses equivalent to acoustic stimuli.

Background: An alternate route of cochlear stimulation via the round window (RW) using active middle ear implants (AMEIs) has been shown to produce physiological responses similar to normal acoustic stimulation including in a model of stapes fixation. Pathological conditions such as advanced otosclerosis can preclude delivery of sound energy to the cochlea through the oval window (OW) and/or the RW.

Methods: Cochlear microphonic (CM) and laser Doppler vibrometer (LDV) measurements of stapes and RW velocities were performed in 6 ears of 4 chinchillas. Baseline measurements to acoustic sinusoidal stimuli (0.25 to 8 kHz) were made. The measurements were repeated with an AMEI driving either the RW or a third window to the ST before and after stapes fixation.

Results: AMEI stimulation of the cochlear third window into the ST produced CM waveforms with morphologies similar to acoustic stimuli. CM thresholds with RW and third window stimulation were frequency-dependent but ranged from 0.25 to 10 and 0.5 to 40 mV, respectively. Stapes fixation, confirmed by LDV measurements, resulted in a mild frequency dependent impairment in CM thresholds up to 13 dB for RW stimulation and mild frequency dependent improvement of up to 15 dB via third window stimulation.

Conclusions: Mechanical stimulation with an AMEI through a surgically created cochlear third window into the ST produces CM responses that are nearly identical to those via traditional acoustical stimulation.

IRB or IACUC Approval: PHS A3269-01, Protocol B-73509(12)1D approved 12/1/09
List outside funding: American Academy of Otolaryngology - Head and Neck Society Foundation CORE Resident Research Grant, Otologics LLC research grant

Define Professional Practice Gap & Educational Need: Utilization of standard and novel strategies for treating conductive and mixed hearing loss

Learning Objective: Understand the effects of direct cochlear third window stimulation on physiological responses in setting of normal stapes and stapes fixation in a live animal study

Desired Result: The attendee will be able to understand the physiological effects of third window stimulation and consider how this relates to treatment options of conductive and mixed hearing loss

Medical Knowledge

11:27

Efficacy and Safety of Bilateral Posterior Canal Occlusion in Patients with Refractory Benign Paroxysmal Positional Vertigo: Case Report Series

Jayant Ramakrishna, Hons BHSc, Joel A. Goebel, MD
Lorne S. Parnes, MD

Objective: To highlight the effectiveness, safety and adverse effects of treating intractable benign paroxysmal positional vertigo (BPPV) in six cases with bilateral posterior canal occlusion.
Study design: Retrospective case review of six cases.
Setting: Tertiary hospital referral center in London, Ontario, Canada and Saint Louis, Missouri, USA.
Patients: Six patients diagnosed with bilateral BPPV refractory to medical treatment and particle repositioning maneuvres (PRM), who underwent bilateral posterior semicircular canal occlusion.
Interventions: Pre-operative and post-operative audiogram testing to monitor long-term changes in hearing; CT Head to rule out central lesions, confirm normal inner ear anatomy pre-operatively, and confirm occlusion of posterior semicircular canals post-operatively; MRI Head to rule out posterior fossa lesions causing persistent vertigo; Dix-Hallpike maneuver to diagnose BPPV; PRM and physiotherapy vestibular rehabilitation to attempt treating BPPV prior to surgical intervention; sequential transmastoid posterior semicircular canal occlusion for treatment of intractable BPPV.
Outcome measures: Post-operative resolution of vertigo induced by head movement, hearing preservation and postural stability.
Results: All patients with severely debilitating, bilateral BPPV refractory to medical treatment and PRM had complete resolution of their symptoms following bilateral posterior semicircular canal occlusion, with maintained hearing and no long-term complications post-operatively. Adverse side effects included temporary, mild hearing loss and transient imbalance without long-term complications.
Conclusions: Bilateral sequential posterior semicircular canal occlusion is a definitive, effective and safe treatment modality for intractable bilateral BPPV, providing patients with complete resolution of their vertiginous symptoms without long-term deleterious effect on hearing or postural stability.

Define Professional Practice Gap & Educational Need:
1) Lack of awareness surrounding the efficacy and safety of bilateral posterior canal occlusion in the treatment of benign paroxysmal positional vertigo, due to minimal cases in practice and literature.

Educational Need: To educate physicians about the efficacy and safety of bilateral posterior canal occlusion in the treatment of benign paroxysmal positional vertigo.

Desired Result: By outlining six cases highlighting the efficacy and safety of bilateral posterior canal occlusion in the treatment of benign paroxysmal positional vertigo, we hope to educate physicians on the value of this treatment modality and hope that other Otologists can adopt this treatment in their own practice to help their patients suffering from refractory benign paroxysmal positional vertigo.

Patient Care
Medical Knowledge
Professionalism

11:35

What Happens to the Contralateral Ear as Meniere's Disease Progresses? A Study Using Vestibular Evoked Myogenic Potentials

M. Geraldine Zuniga, MD, Kristen Janky, AuD, PhD
Michael Schubert, PT, PhD, John P. Carey, MD

Hypothesis: Using vestibular evoked myogenic potentials (VEMP) we sought to determine the involvement of the contralateral ear in clinically unilateral Meniere's Disease (uMD) in different stages.

Background: Lin et al 2006 reported altered tuning of VEMP responses of the contralateral ear in MD, raising concern that this finding might predict bilateral involvement.

Methods: In response to air conducted clicks and 500 Hz tone bursts, cervical and ocular VEMPs (c-,oVEMPs) were evoked in healthy subjects (n=43) and patients with definite uMD (n=23) as defined by the American Academy of Otolaryngology Head and Neck Surgery (AAOHNS) guidelines. MD ears were staged based on AAOHNS guidelines: stage 1 (n=7), stage 2 (n=2), stage 3 (n=9), or stage 4 (n=5). Corrected peak-to-peak amplitudes and asymmetry ratios (AR) were measured for cVEMPs and n10 amplitudes and ARs for oVEMPs.

Results: None of the contralateral MD ears had symptomatic involvement regardless of stage. In contrast, their mean (+/-SE) click -evoked cVEMP corrected peak-to-peak amplitudes (0.59+/-0.09microvolts) and oVEMP n10 amplitudes (0.67+/-0.19microvolts) were similar to those from the ear with MD and reduced relative to normal ears (cVEMPs: 1.96+/-0.14microvolts; oVEMPs: 3.26+/-0.34microvolts). ARs were increased only for stages 3-4. In contrast, tone-evoked c- and oVEMPs were not abnormal in contralateral ears.

Conclusions: In response to clicks but not 500 Hz tone bursts, contralateral ears in uMD were abnormal in all stages. Contralateral effects may cause ARs for clicks to be normal, but absolute measures may be abnormal bilaterally in stages 1-2. Tone-evoked VEMPs may discriminate the affected from the contralateral ear in uMD.

IRB Approval: NA_00035749
List outside funding: NIH/NIDCD R01 DC005040
Professional Practice Gap: The value of vestibular evoked myogenic potentials (VEMP) in Meniere's Disease (MD) is uncertain.

Educational Need: Clinicians need to know the information that can and cannot be gleaned from VEMPs in patients with Meniere's disease. Knowledge and competence needs.

Desired Result:
1) Understand the potential information that can be gleaned from cervical and ocular VEMPs to different stimuli in Meniere's disease
2) Understanding better how to use VEMPs in the diagnosis of Meniere's disease

Patient Care
Medical Knowledge
Practice-Based Learning
System-Based Practice

11:43

Cartilage Tympanoplasty in Smokers

Angela S. Peng, MD, Meghan Thompson
Aristides Sismanis, MD, Daniel H. Coelho, MD

Objective: To compare cartilage tympanoplasty (CT) in smokers (S) and nonsmokers (NS).

Study designs: Retrospective chart review from 1992-2009.

Setting: Tertiary academic medical center

Patients: 184 operations were performed in patients over the the age of eighteen. All patients had CT confirmed by CPT code search as well as operative report review. Smoking history at the time of surgery was recorded for 144 operations in 133 patients, of whom 48 were S and 95 were NS.

Intervention: Cartilage tympanoplasty

Main outcome measures: The primary outcome measure was tympanic membrane status at interval and most recent follow up visits. Secondary measures include need for revision surgeries and audiometric outcomes.

Results: Smokers and non-smokers had comparable rates of graft success, as defined by absence of perforation at their 3 months (87.8 vs 84.8%; $p = 0.099$), and 12 months (75 vs 78%, $p = 0.770$) follow up visits. Both groups also had similar improvement of air bone gap (7.5 dB in and 8.2 dB in NS; $p = 0.942$). Rates of success in smokers appear superior to previously published rates of non cartilage tympanoplasty.

Conclusions: CT has success rates and post-operative audiologic measures that are comparable between in S and NS.

IRB or IACUC Approval: HM 12644

Define Professional Practice Gap & Educational Need: Lack of adequate tympanoplasty technique in smokers.

Learning Objective: To determine wheter cartilage tympanoplasty success rate in smokers and nonsmokers

Desired Result: Attendees will be able to understand that cartilage tympanoplasty success rate is comparable in smokers and nonsmokers.

Patient Care
Medical Knowledge
Practice-Based Learning

1:00

New Data on the Motion of the Normal and Reconstructed Tympanic Membrane

John J. Rosowski, PhD, Jeffery Tao Cheng, PhD
Saumil N. Merchant, MD, Ellery Harrington, MS
Cosme Furlong, PhD

There are two major theories concerning the motion of the tympanic membrane (TM). An older theory suggests the TM acts like a microphone diaphragm where the response to sound is characterized by modal motions produced by uniform stimulation of the entire TM surface. This model predicts simple TM motions in response to low-frequency sound, and more complicated motions with high-frequency stimulation. The modal model also predicts different sections of the TM are uncoupled from each other, such that the middle ear's response to high frequency sound is dominated by the motion of sections of TM area near the ossicular connections.

A newer theory suggests the middle ear's response depends on surface waves that travel from the rim of the TM to the ossicular connections, where at moderate and high stimulus frequencies the surface waves are highly dependent on the microstructure of the TM. The two models have different implications for TM reconstruction: The modal model suggests the TM may be replaced by tissues with simple mechanical properties similiar to those of the TM, while the traveling-wave model suggests more careful selection of the replacement materials and the reconstruction techniques are needed. We use computer-aided opto-electronic holography to measure the phasic motion of the TM surface in animals and human temporal bones. Our data demonstrate the presence of both modal TM displacements and surface traveling waves.

Preliminary results suggest the TM motions associated with wave travel are of smaller magnitude and may be of less significance.

IRB or IACUC Approval: Animal protocol 06-08-010 was approved by the MEEI on 14-Jul-2010.

List outside funding: Training and research grants from the NIDCD

Define Professional Practice Gap & Educational Need: The talk concerns theory and data relevant to a choice of eardrum reconstruction material, where the theory and data are not commonly discussed in clinical meetings.

Learning Objective: To make the otologic surgeon aware of the different ideas regarding eardrum function and how they might affect his surgical judgment in planning reconstructions of the TM.

Desired Result: To have the surgeon understand the bases for the competing theories of eardrum motion so that they may judge for themselves how it affects their practice.

ABR Changes in Children after Treatment with High Dose Cisplatin

Lucas M. Viana, André Luiz Lopes Sampaio, MD
Nilda Agostinho Maia, Audiologist, Alessandra Ramos Venosa, MD
Rozania M. P. Junqueira
Carlos Augusto Costa Pires de Oliveira, MD, PhD

Hypothesis/Background: Cisplatin is a drug useful for the treatment of solid malign tumors. It causes cochlear damage by oxidative stress in hair cells. Neurotoxicity has been described but not in the auditory pathway.

Methods: We performed distortion product otoacoustic emissions (DPEOA), audiometric evaluation and auditory brainstem evoked response (ABR) in 13 children aged 3 to 19 years old. They had undergone chemotherapy with high-dose cisplatin (60-120mg/m2/ cicle) for solid tumors. The control group consisted of 13 healthy children matched by gender and age and studied following the same protocol. The parameters used were: the absolute latencies of waves I, III, V and interpeak I - III, III - V and I - V in auditory brainstem response. We compared the EOA and ABR results.

Results: The percentage of altered ears compared to the total was 7.6% for waves I and V and 3.8% for wave III in the study group. Four ears showed increased interpeak I-III and 2 interpeak III-V, with the percentage of ears changed equal to 23%. The results of the 2 groups were compared using the Mann-Whitney test. Statistical significance was found only in the interpeak III-V of the left ear, with normal EOA.

Conclusion: Isolated abnormal values in the interpeak I-III, with normal DPEOA in these patients suggest a possible neurotoxicity in low brainstem. The significant change in interpeak III-V only in the left side is probably due to small number of cases. These results have not been described previously.

Define Professional Practice Gap & Educational Need: there are no current studies that clarify if cisplatin in high dose can cause damages to the central auditory pathways. The present study attempted to contribute to the current literature in this topic.

Learning Objective: Cisplatin in high dose might interfer with the central auditory pathways. Therefore other studies must be performed in this area.

Desired Result: All children treated wiht high dose cisplatin should have their central auditory pathway evaluated after completed their treatment

Practice-Based Learning

Temporal Bone Histopathology in a Case of Sensorineural Hearing Loss Caused by Superficial Siderosis of the Central Nervous System

Joseph B. Nadol, Jr., MD, Joe C. Adams, PhD
Jennifer O'Malley

Background
Superficial siderosis of the central nervous system is due to chronic or repeated subarachnoid hemorrhage and results in sensorineural deafness in 95% of affected individuals in addition to other neurologic findings. The deposition of hemosiderin in the meninges and around cranial nerves is thought to be causative. There have been no previous reports of temporal bone pathology in this disorder.

This 57 year old man developed progressive, bilateral hearing loss starting in his 30's with loss of pure tone thresholds and word recognition. He underwent a right cochlear implant at age 51 with full insertion of the device.

Methods
The temporal bones and brainstem were fixed in formalin and prepared for histologic study by standard techniques. Special stains, including Gomori stain for iron were performed on sections of the temporal bones and cochlear nucleus.

Results
There was severe bilateral degeneration of the organ of Corti, spiral ligament, stria vascularis, and spiral ganglion cells. Gomori stain revealed iron deposits within the spiral ligament, stria vascularis and in the subepithelial mesenchymal tissue of the maculae of the vestibular system. Evaluation of the cochlear nucleus revealed iron deposits within glial cells and larger cells, probably macrophages, near the CSF surface. On the right side, the track created by the cochlear implant entered the scala tympani and continued to mm17, as measured from the round window.

Discussion and Conclusions
This is the first known case of superficial siderosis with documented temporal bone histopathology. Hearing loss was likely caused by severe degeneration of spiral ganglion cells in both ears, despite the presence of remaining hair cells in the middle and apical turns. This was consistent with cochlear neuronal degeneration and retrograde degeneration of spiral ganglion cells within the inner ear, or alternatively, consistent with primary degeneration of hair cells and neural structures within the cochlea. Despite the presence of neural degeneration, the patient achieved a word recognition score of 28% six months following implantation.

IRB or IACUC Approval:
IRB #01-03-014x
List outside funding: NIH (NIDCD)

Define Professional Practice Gap & Educational Need
Histopathology of the temporal bone previously not known.

Learning Objective: To evaluate the histopathology of the temporal bones of a patient with documented superficial siderosis of the central nervous system who underwent right cochlear implantation six years before death.
Desired Result:
Medical Knowledge
Practice-Based Learning

1:24

Long Term Clinical Findings for a Novel Bone Conduction Device for Single Sided Deafness

Michael Murray, MD, Gerald R. Popelka, PhD

A new device (SoundBite by Sonitus Medical) for single sided deafness (SSD) differs substantially from existing devices. It picks up sound on the poorer hearing side but capitalizes on the spatial sound qualities of the external ear. It delivers a bone conduction signal directly to the skull but via the teeth with a removable, non surgical oral device rather than a surgically implanted percutaneous post, and with a much wider bandwidth. Initial short term studies indicated that this device was safe, comfortable, and effective.

Objective: To report a clinical study that measured the long term effectiveness and safety of this device.

Study design: Prospective, non randomized clinical trial.

Setting: Ambulatory outpatient clinic.

Patients: Adults (N=22) diagnosed with SSD and not current users of an SSD device.

Intervention(s): Wearing the new device on a daily basis. The end points were measured at 3 and 6 months.

Main outcome measure(s): The auditory endpoint was whether aided thresholds changed for five frequencies. The safety endpoint was whether oral or dental changes were observed. Quality of life was assessed with the Abbreviated Profile of Hearing Aid Benefit (APHAB) and responses to an SSD questionnaire.

Results: There were no significant differences in the aided thresholds at the midpoint or endpoint of the study compared to baseline values. There were no detectable changes in oral or dental health.

Conclusions: Results suggest that this new device is an effective, safe, long term non-surgical alternative to existing SSD devices.

IRB or IACUC Approval: IRB Study #10007-01A
Under IRB approval (Independent Review Consulting, San Anselmo, CA)
List outside funding: Fees paid for by Sonitusl Medical.

Define Professional Practice Gap & Educational Need: 1. Lack of contemporary evidence-based knowledge of long term effectiveness and safety of new approach to single sided deafness.

Learning Objective: 1) Become aware that a new device for single sided deafness is safe and effective for long term use.

Desired Result: 1) Be able to recommend or offer to patients all approaches to single sided deafness, including contemporary devices.

Medical Knowledge

Impact of Case Volume on Short-term Surgical Outcomes and Costs of Vestibular Schwannoma Care

Bryan K. Ward, MD, Christine G. Gourin, MD
Howard W. Francis, MD

Objective: To evaluate the impact of hospital case volume and related variables on short term outcomes after surgery for vestibular schwannoma.

Methods: The Maryland Health Service Cost Review Commission database was queried for vestibular schwannoma surgical case volumes from 1990-2009. Multivariate logistic regression analyses and multiple linear regression models were used to evaluate for associations between surgeon and hospital case volume, as well as other independent variables and the risk of in-hospital death, postoperative central nervous system (CNS) complications, length of hospital stay, and hospital-related cost of care.

Results: Overall, 1,155 vestibular schwannoma surgeries were performed by 57 surgeons at 12 hospitals. There were 6 deaths during the time period captured by the study. Readmission within 30 days, urgent admission, African-American race, and self-pay status were associated with higher risk for in-hospital mortality. The rate of CNS complications after vestibular schwannoma surgery has decreased from 2000-2009 compared to 1990-1999 (OR=0.4, $P<0.01$). The development of a CNS complication in the immediate post-operative period was associated with higher scores of APR-DRG mortality risk (OR>3.1, $P<0.05$) and case complexity (OR>6.3, $P<0.05$), and hospital readmission within 30 days (OR=4.1, $P<0.05$). After controlling for all other variables, a significant negative correlation was observed between hospital surgical volume and hospital-related costs (= -$7,153, $P<0.001$).

Conclusions: After controlling for other factors, high-volume hospital care is associated with lower hospital-related cost of care for vestibular schwannoma surgery. A better understanding of risk factors for poor surgical outcomes and appropriate patient selection may produce further declines in CNS complication.

IRB or IACUC Approval: Yes

Define Professional Practice Gap & Educational Need: Lack of contemporary knowledge of cost and trends in vestibular schwannoma care.

Learning Objective: To understand trends in outcome and cost of surgical vestibular schwannoma in the state of Maryland.

Desired Result: May alter referral patterns of vestibular schwannoma surgical treatment.

System-Based Practice

1:40

In Vitro Assessment of Efficacy of Ciprofloxacin-Dexamethasone and N-Acetylcysteine on Bacteria and Biofilms Associated with Chronic Suppurative Otitis Media

Brian D. Westerberg, MD, Anne E. Conlin, MD
Patrick W. Doyle, MD, Michael A. Nobel, MD
Robert P. Rennie, PhD

Hypothesis: That there is no difference in efficacy, sterility, and stability between Ciprodex otic solution (ciprofloxacin 0.3%/ dexamethasone 0.1%) alone and Ciprodex augmented with 0.5%, 1.25% and 2.0% N-acetylcysteine (NAC).
Background: Chronic suppurative otitis media (CSOM) is often treated with Ciprodex, though 10-15% of patients do not respond. The addition of NAC to Ciprodex otic solution was shown to be superior to Ciprodex alone for CSOM; recently, NAC has also been shown to inhibit bacterial biofilms.
Methods: Using a disc diffusion method, each solution was tested on plates containing Staphylococcus aureus ATCC 29513 and Pseudomonas aeruginosa ATCC 27853 on Days 0, 7 and 14, incubated for 24 hours, and assessed for stability and efficacy. Drops were incubated on Days 0, 7, and 14 to assess sterility. A collection of 15 strains of P. aeruginosa isolated from patients with CSOM were tested using the BioFilm-PA antimicrobial susceptibility device (Innovotech, Edmonton, AB) to assess the efficacy of Ciprodex with and without NAC.
Results: Ciprodex with all concentrations of NAC remained stable, and there was no difference in effectiveness on S. aureus and P. aeruginosa plates at 14 days. All solutions remained sterile at 14 days. When NAC in a concentration of 0.5% or greater was added to Ciprodex, P. aeruginosa biofilm growth was inhibited.
Conclusions: Sterility, stability, and efficacy in treating common bacteria causing CSOM, including biofilms, with Ciprodex-NAC solutions, has been demonstrated. This is essential preliminary data in support of clinical use in a randomized controlled trial for CSOM.

IRB or IACUC Approval: (N/A)
List outside funding: Funding for this research was provided through the Ainsley Endowment Fund, Division of Otolaryngology---Head & Neck Surgery, University of British Columbia, Canada.

Define Professional Practice Gap & Educational Need: Chronic suppurative otitis media(CSOM) is commonly treated with topical ciprofloxacin-dexamethasone; however, 10-15% of patients to not respond. As well, bacterial biofilms, which are especially difficult to treat, are increasingly being recognized in the etiology of CSOM. A professional practice gap exists in management of refractory CSOM and CSOM involving biofilms.
Learning Objectives: -To discuss the in vitro evidence of sterility and stability of solutions of ciprofloxacin/dexamethasone and N-acetylcysteine (NAC).-To demonstrate the effectiveness of ciprofloxacin/dexamethasone-NAC on Staphylococcus aureus and Pseudomonas aeruginosa strains, as well as Pseudomonas aeruginosa biofilms.
Desired Result: Attendees will learn of the in vitro evidence to support clinical use of ciprofloxacin/dexamethasone-NAC in a randomized controlled trial for COSM.

Medical Knowledge

Canal Wall Reconstruction in the Surgical Management of Cholesteatoma

Stanley Pelosi, MD, George B. Wanna, MD, Eric E. Smouha, MD

Objective: We have previously presented preliminary results for a novel method of canal wall reconstruction (CWR) in the surgical management of cholesteatoma. Our current aim is to validate these findings in a larger patient population with longer follow-up, and to show that our CWR method will minimize postoperative recurrence and otorrhea.
Design: Retrospective case series
Setting: Tertiary otologic practice
Patients: Patients undergoing mastoidectomy for cholesteatoma removal
Intervention: 31 patients with cholesteatoma underwent CWR mastoidectomy. CWR was performed by en bloc removal of the bony canal wall, eradication of disease, and then replantation in the sinodural angle for mastoid obliteration.
Outcome measures: Recurrence, otorrhea, hearing outcomes, mastoid bowl size for CWR patients, as compared to patients undergoing intact canal wall (ICW) or canal wall down (CWD) mastoidectomy.
Results: 4 patients (13%) had recidivistic disease. 2 patients had residual cholesteatoma pearls removed in the office, and 2 patients had residual cholesteatoma found on revision tympanoplasty. Intermittent postoperative otorrhea occurred in 32% of CWR patients, and in 55% of CWD patients. The average postoperative PTA in CWR patients was 34 dB, with no change between mean pre- and post-operative hearing levels. A small or medium sized cavity was obtained in nearly all patients.
Conclusions: CWR is advantageous in cases where a CWD procedure would result in a large infection-prone cavity and an ICW procedure might compromise exposure. By maintaining an exteriorized attic, the CWR technique also results in a lower recurrence rate than ICW mastoidectomy, and prevents the need for a second-stage operation.

IRB or IACUC Approval: HSD09-00451
Preliminary data regarding this topic with a smaller patient subset was presented at the AAO-HNS national meeting, Washington DC, September 2007. No portions of this data have previously been published.

Define Professional Practice Gap & Educational Need: There is no ideal surgical method for cholesteatoma management, as both canal wall up and canal wall down techniques have their limitations.
Learning Objective: Canal wall down mastoidectomy is advantageous in the surgical management of cholesteatoma in that the potential for recurrence is minimized by exteriorization of the mastoid cavity. However, creation of an open cavity, which often leads to mucositis and otorrhea, and necessitates periodic cleaning. Several canal wall reconstruction has been proposed, but to this point no technique has emerged as superior to the others.
Desired Result: Our intended result is the awareness of a surgical alternative that improves outcomes over canal wall up and canal wall down mastoidectomy in selected cases of cholesteatoma.
Patient Care
Medical Knowledge
Practice-Based Learning

Transmastoid Repair of the Sinus Wall for Pulsatile Tinnitus Due to Sigmoid Sinus Diverticulum and Dehiscence

David J. Eisenman, MD, Hernan Goldsztein, MD

Objective: 1) Describe a surgical technique for treatment of pulsatile tinnitus due to sigmoid sinus diverticulum/dehiscence. 2) Present the results and complications of the surgical treatment.

Study design: Retrospective case series of 12 patients with pulsatile tinnitus undergoing surgical repair of sigmoid sinus diverticulum/ dehiscence.

Setting: Tertiary referral center.

Patients: Twelve patients with pulsatile tinnitus and radiographic evidence of ipsilateral sigmoid sinus diverticulum or dehiscence.

Intervention(s): Transmastoid reconstruction of the sigmoid sinus.

Main outcome measure(s): Resolution of tinnitus after surgical intervention.

Results: Twelve patients with pulsatile tinnitus and computed tomographic evidence of sigmoid sinus diverticulum or dehiscence were treated with transmastoid repair of the sinus wall. All but one patient reported complete resolution of the tinnitus post-operatively. One patient experienced acute visual loss and was found to have intracranial hypertension 48 hours after surgery, though there was no evidence of sinus thrombosis or radiographic evidence of acute elevation of intracranial pressure. She was treated with ventriculoperitoneal shunting and bilateral optic nerve sheath decompression, and has since recovered her vision. This is also the only patient who has also had a partial recurrence of the symptoms on the same side.

Conclusions: Sigmoid sinus diverticula have recently been reported as a surgically treatable cause of pulsatile tinnitus. The pathophysiology, precise diagnostic radiographic criteria and the significance of sinus dehiscence without diverticulum have yet to be well-defined. A standardized technique for transmastoid repair, with a high-rate of cure, is herein described.

IRB or IACUC Approval: University of Maryland, Baltimore Institutional Review Board (IRB) has fully approved: HP-00044282

Define Professional Practice Gap & Educational Need: 1. Limited understanding and awareness of the incidence, pathophysiology of and treatment of pulsatile tinnitus due to sigmoid sinus diverticulum and dehiscence.
Learning Objective: 1) Describe a surgical technique for treatment of pulsatile tinnitus due to sigmoid sinus diverticulum/dehiscence. 2) Present the results and complications of the surgical treatment.
Desired Result: Attendees will better understand how to identify sigmoid sinus pathology responsible for pulsatile tinnitus, and understand the priniciples and techniques of surgical treatment.

Patient Care
Medical Knowledge
Practice-Based Learning

Continuous Facial Nerve Stimulating Burr for Otological and Neurotological Surgeries

Olivier Sterkers, MD, PhD, Reka Ablonczy, MD
Alexis Bozorg-Grayeli, MD, PhD, Daniele Bernardeschi, MD, PhD

Objective: to evaluate a continuous facial nerve stimulating burr (StimBurGard (SBG)) during otological/neurotological procedures in terms of safety and reproducibility when drilling in contact to the fallopian canal (FC) of the mastoid segment of the facial nerve (FN).

Study design: Prospective clinical trial

Setting: Tertiary referral center

Patients: 30 patients operated through translabyrinthine approach for vestibular schwannoma removal was divided in 3 groups. Group 1 (5 patients): the stimulation current was fitted at 3 and 2 mA visualizing the location of the burr when the first response was obtained in the mastoid cavity. Group 2 (11 patients): the stimulation was limited at 1 mA and the thickness of FC was evaluated on post-operative CT scan. Group 3 (14 patients), the thickness of FC was evaluated at threshold in order to avoid large opening of FC.

Results: Group 1: stimulation at 3 mA occurred in aditus ad antrum and at 2 mA near the FC. Group 2: mean thickness of 1.17 +/- 1.02 mm with 2 cases of uncovered FN. Group 3: the mean stimulation threshold was 0.6 +/- 0.37 mA and the mean thickness was 0.44 +/- 0.57 mm with 2 cases of uncovered FN (p=0.027). In all patients, FN at brainstem was stimulated at 0.03 mA before VS dissection.

Conclusion: Continuous facial nerve stimulating burr by means of SBG system is a safe and effective device for FN stimulation and identification. The intensity of stimulation in order not to open the facial canal is around 1 mA.

IRB or IACUC Approval:

Define Professional Practice Gap & Educational Need: Lack of knoledge of correct identification of facial nerve during otological and neurotological surgery especially for resident.

Learning Objective: to use a Continuous facial nerve stimulating burr during mastoid surgery.

Desired Result: improve safety for facial nerve during otological surgery and to be at ease for beginners.

Patient Care
Medical Knowledge

2:20

Size Matters: New Insights in an "Old" Pathology

Bob Lerut, MD, Alain Pfammatter, MD
Johnny Moons, MScN, Thomas Linder, MD, PhD

Objective: The correlation between eardrum perforations and hearing loss was studied.
Study design: Using a prospective database 220 patients, who underwent primary surgery for chronic otitis media simplex with a perforated eardrum, were evaluated.
Setting: Tertiary referral center
Patients: 151 patients with 155 eardrum perforations, which were checked for correct diagnosis, normal middle-ear status and integrity of the ossicular chain, were included.
Interventions: All patients underwent primary myringoplasty.
Main outcome measurements: Conductive hearing loss due to eardrum perforations.
Results: Hearing loss shows a linear relationship to increasing eardrum perforation size. Umbo-involvement shows a worsening of the hearing by 3-5 dB (p=0,019). The least impact of a perforation is seen at the resonance frequency of 2kHz. Above and below 2kHz, an "inverted V-shape" of the air-bone-gap is a consistent finding. If the air-bone-gap exceeds the "inverted V-shape" pattern, additional pathology behind the eardrum perforation must be assumed and addressed.
Conclusions: We propose using standardized photographs or drawings to document pre-operative perforation sizes. A linear relationship between the size of a perforation and the conductive hearing loss does exist. Umbo-involvement at the perforation margin may worsen the hearing by 3-5 dB, whereas the position of the perforation itself does not play a role. The least impact of a perforation is seen at the resonance frequency of 2kHz. An "inverted V-shape" pattern, above and below 2kHz, of the air-bone-gap is a consistent finding. If the air-bone-gap exceeds this pattern additional pathology behind the eardrum perforation must be assumed and addressed.

Define Professional Practice Gap & Educational Need:
1. Lack of good measuring standards for eardrum perforations
2. Lack of tools to evaluate the size of a tympanic membrane perforation
3. Lack of an algorithm to predict the hearing loss
4. Lack of an algorithm predicting any other pathology such as ossicular chain pathology.

Learning Objective: Present new method of measuring eardrum perforations, predict the hearing loss and predict pathology other than a tympanic membrane perforation.

Desired Result: Implementation of new software and algorithm to measure the size of a tympanic membrane perforation, predict the hearing loss and counsel the patient when other pathology is suspected.

Patient Care
Medical Knowledge

Comparison of Hollow Core CO2 Laser Fiber to KTP Laser Fiber in Stapes Surgery

Loren J. Bartels, MD, Christopher J. Danner, MD

Objective: Evaluate the effect of CO2 laser compared to KTP laser for primary stapes surgery. Comparative parameters: successful completion of small-hole stapedotomy, hearing gain, and dizziness.

Study design: Retrospective case review of 273 primary stapes procedures performed between May 2004 and March 2010. Standard audiometry, surgical technique and side effect data were collected by researchers blinded to experimental group.

Setting: Tertiary referral center.

Patients: Patients undergoing primary laser stapes surgery.

Intervention: Stapes surgery using either KTP or CO2 laser fiber.

Main outcome measures: We assessed whether laser type affected: 1) successful completion of small hole stapedotomy, 2) Hearing outcomes and dizziness following small-hole stapedotomy.

Results: With the CO2 laser, footplate work was completed more consistently as a small-hole stapedotomy (95.1% CO2 versus 81.3% KTP; $p<0.01$). Of those who underwent small-hole stapedotomy (49 CO2 versus 48 KTP treated patients), hearing outcomes between the two techniques were not statistically different. Immediate postoperative dizziness rates were significantly lower with CO2 versus KTP (2.4% and 15.8%, respectively; $p<0.05$). At two weeks follow-up, dizziness was mild and no difference was observed between groups. Overall dizziness rates for both KTP and CO2 laser were among the lowest reported in the literature.

Conclusions: CO2 and KTP lasers differ in their interaction with tissue and, based on this retrospective review, it is evident that the CO2 laser more consistently enables formation of a small-hole stapedotomy and significantly reduces postoperative dizziness. While hearing outcomes are not statistically different, choice of laser has a significant effect on surgeon and patient.

IRB or IACUC Approval:
WIRB approval (exemption) being requested
List outside funding: none, however, OmniGuide did provide personnel at their expense to do the data collection from our charts. No funds were granted to us to produce these data and no funds have been paid to either author or any entity with which we are associated.

Define Professional Practice Gap & Educational Need:
What are the clinically relevant differences between CO2 and KTP lasers in stapes surgery?
Learning Objective: Learn that while hearing outcomes are not significantly different among commonly used CO2 and KTP lasers, other aspects of stapes surgery may be advantaged by CO2 over KTP lasers such as dizziness.
Desired Result: Attendees would be more likely to view CO2 lasers as preferred over visible light lasers for patient safety in stapes surgery.
Patient Care
Practice-Based Learning

Fascia, Vein, or Fat for Oval Window Grafting in Primary Partial Stapedectomy

R. Mark Wiet, MD, Joyce Kim, BS
Richard J. Wiet, MD, Robert A. Battista, MD

Objective: To compare hearing results following primary, partial stapedectomy using three different oval window grafting materials while using the same stapes prosthesis.

Study design: Retrospective case review from a single institution.

Setting: Tertiary referral private practice.

Patients: Patients who underwent partial stapedectomy for otosclerosis with placement of fascia, vein, or fat as a perilymph seal, and reconstruction with a bucket handle prosthesis.

Intervention: Partial stapedectomy.

Main outcome measure: Hearing results were documented according to American Academy of Otolaryngology - Head and Neck Surgery guidelines. Preoperative and postoperative, air and bone conduction thresholds were recorded to form a four-frequency pure tone average (PTA). Preoperative and postoperative air bone gaps were calculated. Amsterdam Hearing Evaluation Plots were also recorded.

Results: 735 patients were identified that underwent stapedectomy between 1980 and 2010. 348 patients met inclusion criteria. Mean time for postoperative audiometric testing was 11.5 weeks. There were 127 (36%) fascial graft patients, 125 (36%) vein graft patients, and 96 (28%) fat graft patients. Closure of the air-bone gap to within 10 dB was achieved in 61% of fascial graft patients, 59% of vein graft patients and 80% of fat graft patients. The average postoperative PTA was 30 dB for fascial graft, 34 dB for vein graft and 36 dB for fat graft patients.

Conclusions: There is no statistically significant difference in hearing results when using fascia, vein or fat tissue seal for partial stapedectomy with a bucket handle prosthesis.

IRB or IACUC Approval: AMH 2010-17 (1220101777)

Define Professional Practice Gap & Educational Need:
Address a lack of knowledge regarding the ideal graft material to prevent perilymph fistula in partial stapedectomy.

Learning Objective:
Provide an understanding of hearing results from various graft materials used in partial stapedectomy while controlling for the type of prosthesis.

Desired Result:
A better understanding of the hearing results achieved from various graft materials used in partial stapedectomy.

Patient Care
Medical Knowledge

2:42

Total Ossicular Chain Reconstruction: Transmastoid Facial Recess Approach Versus Transcanal Approach

Brandon Isaacson, MD, Ryan Neilan, MD

Objective: To compare the hearing outcomes of two different surgical approaches for total ossicular chain reconstruction.

Study design: Retrospective case control study.

Setting: Academic tertiary medical center.

Patients: Forty-one patients with mixed or conductive hearing loss. Intervention(s): All subjects underwent either a transcanal (TC) or transmastoid facial recess (TMFR) total ossicular chain reconstruction from January 2007 to January 2010.

Main outcome measure(s): The postoperative four frequency (500 Hz, 1000 Hz, 2000 Hz, 3000 Hz) air bone gap (ABG) was calculated from air and bone conduction thresholds for each study patient. Patients were categorized with respect to ABG (0 - 10 dB, 11 - 20 dB, 21 - 30 dB, 31 - 40 dB, greater than 40 dB). A two tailed t-test was used to compare the two surgical approaches with respect to postoperative air bone gap.

Results: Fourteen subjects underwent a TMFR ossicular chain reconstruction and twenty-seven subjects underwent a trancanal or TC approach. 57.1% of the TMFR group and 44.4% of the TC group had a postoperative air bone gap of 20 dB or less. 71.4% of the TMFR group and 66.7% of the TC groups had a postoperative ABG of 30 dB or less. A t-test showed no significant difference ($p = 0.19$) between the TC and the TMFR approaches with respect to postoperative ABG.

Conclusions: The TMFR approach demonstrated a higher proportion of patients with a postoperative ABG or 20 dB or less compared to the TC approach; however, there was no significant difference between the two groups when analyzed as a whole.

IRB: 022010-052

Define Professional Practice Gap & Educational Need The success rates of ossicular chain reconstruction are a constant source of disappointment to the patient and surgeon. This is especially true for total ossicular chain reconstruction.

Learning Objective: To demonstrate a novel technique for total ossicular chain reconstruction.

Desired Result: Attendees will learn a novel technique for total ossicular chain reconstruction that may result in better hearing outcomes.

Patient Care
Medical Knowledge
Practice-Based Learning

3:15

Minimally Invasive Functional Approach for Cholesteatoma Surgery

Bassem M. Hanna, MD, Dennis S. Poe, MD

Objective: Report efficacy of a functional, minimally invasive approach for cholesteatoma surgery.

Study design: retrospective review of surgical cases between 1996-2004.

Setting: Tertiary referral center. All operations were done by the senior author.

Patients: All had primary cholesteatomas extending beyond the mesotympanum, planned for canal wall up (CWU) mastoidectomy.

Intervention: Surgical exposure progressed from transcanal to postauricular tympanoplasty to CWU mastoidectomy as needed to lyse the intermittent fibrous attachments binding matrix to surrounding mucosa under microscopic or endoscopic guidance. Planned 2nd stage operations were attempted transcanal with endoscopic assistance.

Main outcome measure(s): Presence/absence of recurrent/residual cholesteatoma.

Results: 184 ears of 169 patients were operated; ages 1 to 79 years (mean 31), 102 M, 82 F. Average follow up was 3 years and 2 months, range 1-11 years. Post-operatively, 95 (51.6%) ears were planned to follow, 89 (48.4%) were planned for a second look procedure. 2 cases were planned for a 3rd look. Overall recurrence rate was 19/184 (10.3%); residual rate 2/184 (1.1%). Failure rates were: Transcanal 11.1% (4/36 recurrences); Postauricular 2.8% (1/32 recurrence); CWU 13.8% (16/116 - 2 residuals, 14 recurrences). Final average PTA was: Transcanal 19.9 dB, Postauricular 23.8 dB, CWU 29.8 dB. The failure rates when employing endoscopes, 10.9% (13/119 -12 recurrences, 1 residual), versus no endoscopes, 12.3% (8/65 -7 recurrences and 1 residual), was not statistically significant.

Conclusions: A functional minimally invasive approach to cholesteatoma surgery provided equivalent success rates as published canal wall down mastoidectomy. Endoscopic techniques were helpful in providing adequate views while minimizing exposure

IRB or IACUC Approval: IRB approval Children Hospital Boston No

Define Professional Practice Gap & Educational Need:
lack of contemporary knowledge
Learning Objective: to educate otologic surgeons in improved techniques for management of cholesteatoma
Desired Result: it is hoped that attendees can adopt these improved techniques to enhance their practices

Patient Care
Practice-Based Learning

Dehiscent Superior Semicircular Canal Patients: Phenotypes, Surgical Findings and Outcomes

P. Ashley Wackym, MD, F. Owen Black, MD
David A. Siker, MD

Objective: To identify the neurotologic, audiology and vestibular function test characteristics of patients with radiographically confirmed superior semicircular canal dehiscence.

Study design: Retrospective case review.

Setting: Tertiary referral center.

Patients: Thirty-four adults and two children with radiologically confirmed superior semicircular canals (DSSCs) presented over a 10-year interval with widely varying symptoms, including autophony, hyperacusis, aural fullness, hearing loss, sound-induced vestibular dysfunction, otolithic dysfunction, pulsatile tinnitus, nausea, cognitive dysfunction and altered spatial orientation.

Interventions: Patients underwent audiometric testing, electrocochleography (ECoG), vestibular evoked myogenic potentials (VEMP), vestibular autorotation testing (VAT), videonystagmography (VNG), computerized rotary chair testing, and computerized dynamic posturography (CDP). Ten adult patients and one six-year old child underwent a middle cranial fossa approach with re-surfacing or plugging procedures, combined with repair of their encephaloceles, if present. One patient's dehiscence was initially plugged through a mastoid approach. Vestibular rehabilitation therapy was completed if necessary.

Main outcome measures: Character and size of the DSSC, patient symptomatology, and results of diagnostic studies.

Results: The mean age was 50.11, with a range of 6 to 66 years. There were 26 females and 10 males. Both children were males. Auditory and vestibular function tests were highly variable. Surgical outcomes were independent of presenting symptoms, size of the dehiscence or auditory and vestibular functions tests.

Conclusions: The spectrum of clinical, radiographic and intraoperative findings suggests that both congenital and acquired etiologies are likely. Decisions regarding surgical management in patients with confirmed DSSC should be based on the magnitude of the symptoms and the degree of inner ear impairment.

IRB or IACUC Approval: Yes
LRI-608

Define Professional Practice Gap & Educational Need Lack of awareness of superior semicircular canal dehiscence occurring in children, and the wide range of variability in the phenotypes of children and adults with the disorder.
Learning Objective: To understand that this disorder can exist in children and the clinical manifestations are variable.
Desired Result: Accurate diagnosis of the disorder can be made in patients who previously went undiagnosed.
Patient Care
Medical Knowledge
Practice-Based Learning

3:31

Development of the Jugular Bulb and Its Abnormalities: A Radiologic Study

David R. Friedmann, MD, Jan Eubig, MD
Megan McGill, Bidyut K. Pramanik, MD
Anil K. Lalwani, MD

Objective: Jugular bulb(JB) abnormalities such as jugular bulb diverticuli(JBD) and high-riding jugular bulb(HRJB) of the temporal bone can erode into the inner ear and present with hearing loss, vestibular disturbance, and pulsatile tinnitus. This comprehensive radiologic study investigates the development of the venous system from transverse sinus to internal jugular vein (IJV) and the incidence of JB abnormalities.

Setting: Academic medical center

Patients, Intervention, Main outcome measure: Measurements of transverse & sigmoid sinus, the jugular bulb, and carotid artery were made from CT of neck with IV contrast in infants(n=5), children (n=15), adults(n=40) and the elderly(n=10). In addition, 100 HRCT of the temporal bone were evaluated for incidence and laterality of JB abnormalities.

Results: JB was not detected in patients less than 2 years-old, enlarged until 21, and remained stable thereafter. From transverse sinus to IJV, the greatest variation in size was just proximal and distal to JB. Right-sided venous dominance was most common (2.60 vs. 1.72 cm2). Interestingly, while HRJB was usually present on the dominant side, JBD was equally distributed on the right and left. Of the 100 temporal bone CT reviewed, HRJB was detected in 14 patients, 3 of who had bilateral HRJB. JBD were detected in 4 patients.

Conclusions: The JB is a dynamic structure that forms after 2 years of age and stabilizes in adulthood. HRJB are more common than JBD. The etiology of HRJB and JBD is likely different: concordance of HRJB to the dominant venous side suggests that its formation is flow related in contrast to JBD whose formation is likely flow-independent.

IRB or IACUC Approval: exempt

Define Professional Practice Gap & Educational Need:

Learning Objective: The development of the jugular bulb throughout human life and the clinical consequences of its abnormalities

Desired Result: An understanding of jugular bulb development, the incidence of its abnormalities as detected radiologically

Medical Knowledge
Practice-Based Learning

3:39

Stereotactic Radiosurgery for Glomus Jugulare Tumors

Candice C. Colby, MD, Ian Crocker, MD
Douglas E. Mattox, MD

Objective: Demonstrate that single fraction or fractionated linear accelerator-based stereotactic radiosurgery is an effective method of treatment of glomus jugulare tumors that prevents continued tumor growth and avoids cranial nerve morbidities.
Study design: Retrospective case review.
Setting: Tertiary care referral center.
Patients: Adults with known glomus jugulare tumors treated with stereotactic radiosurgery from January 2000- December 2008.
Intervention(s): Single fraction or fractionated linear accelerator-based stereotactic radiosurgery, delivered via dynamic conformal arcs with beam shaping achieved by a multi-leaf collimator mounted to the head of the linear accelerator. Fractionated therapy was used for patients with significant brainstem or cerebellar compression by the tumor.
Main outcome measure(s): Number of patients treated, tumor control as documented by imaging, any change in neurologic findings demonstrated by improvement or worsening of cranial nerve neuropathies, other complications.
Results: 22 glomus jugulare tumors in 21 patients have been treated with either single fraction stereotactic radiosurgery (16 tumors) or fractionated stereotactic radiosurgery (6 tumors). Follow up ranged 24-96 months. Median tumor volume was 6.5 cm3. No complications of the radiosurgery occurred. One patient with bilateral tumors has shown progression of pre-existing sensorineural hearing loss, otherwise no new cranial nerve neuropathies developed. No tumors have shown increase in size based on serial imaging.
Conclusions: Single fraction or fractionated stereotactic radiosurgery is an effective method of treatment of glomus jugulare tumors that prevents continued tumor growth and avoids facial and lower cranial nerve morbidities commonly associated with surgical removal of these difficult lesions.

IRB or IACUC Approval: IRB approved

Define Professional Practice Gap & Educational Need: The lack of contemporary knowledge that Glomus jugulare tumors may be best treated with linear accelerator-based stereotactic radiosurgery, with long-term follow up showing a decreased morbidity when compared to surgical intervention.

Learning Objective: Demonstrate that single fraction or fractionated linear accelerator-based stereotactic radiosurgery is an effective method of treatment of glomus jugulare tumors that prevents continued tumor growth and avoids cranial nerve morbidities.

Desired Result: Consider more frequent use of linear accelerator-based stereotactic radiosurgery as a practical and improved alternative for treatment of glomus jugulare tumors over surgical intervention.

Patient Care
Medical Knowledge
Practice-Based Learning

System-Based Practice

PROGRESS REPORT – AOS Clinician Scientist Award

PI: Benjamin T. Crane, MD

Visual and Vestibular Perceptions of Motion

This report covers the period of funding from this clinician-Scientist award from July through November of 2010. The award was terminated early because I was awarded an NIDCD K23. Although the duration of funding from this award was short, it was a productive period. During the first month of the award set up of the laboratory was completed, the nucleus of which is a 6-degree of freedom motion platform for use in human motion perception experiments.

Initial experiments focused on finding the thresholds of human vestibular perception in yaw (rotation about a horizontal axis), surge (forward-backward motion), heave (up-down), and sway(left-right) by delivering motion in darkness and gathering 2-alterative forced choice responses as to the perceived direction. Although some of these thresholds have previously been described in humans, prior studies have focused on a population almost exclusively under the age of 40. The current data set also included healthy older individuals to provide normative data in the age range where vestibular disorders most frequently occur. It was found that vestibular thresholds increased with age. In anticipation of testing patients with unilateral vestibular weakness the experimental protocol was designed so that thresholds could independently be measured in both directions. More surprising, was that these thresholds were frequently asymmetric in normal individuals.

To investigate potential asymmetry in vestibular perception of higher velocity supra-threshold motion a 2-interval experiment was designed. Subjects were moved in one direction followed by a second movement in the opposite direction. Although the duration of both movements was constant, the velocity was variable. The subjects chose which motion was larger, and the relative sizes of the movements were adjusted so that the point of subjective equality was reached, i.e. both movements seemed of equal size to the subject. The hypothesis was that those with asymmetric perceptual thresholds would also have directionally asymmetric perception with higher velocity movements. As it turned out this is not the case and perception was directionally symmetric for movements with peak velocities in the range of 10 to 40 cm or deg/s. However, the order in which the movements were presented frequently influenced their perceived magnitude. In most individuals the second motion was perceived disproportionately larger. However there were also individuals with near symmetric perception and a few who perceived the first motion to be larger. When the two intervals of motion were in the same direction they were universally perceived equally in healthy subjects without the order effect seen with opposite direction stimuli. The perception of visual motion in two interval experiments was similar to actual motion. Future experiments will focus on the underlying basis of these phenomena and the effects of vestibular pathology. Another aim of the proposal was to develop new vestibular rehabilitation techniques. Pilot data was collected in 6 patients with migraine associated vertigo to see if a visual motion task improved symptoms. Unfortunately, the initial strategy did not prove to be beneficial, but a modified technique that uses a different strategy is currently being developed.

Continuation of this research is funded by NIDCD K23 DC011298-01.

AOS Research Grant – Progress Report
PI: Barbara S. Herrmann, Ph.D.

Vestibular Evoked Myogenic Potentials in Meniere's Disease: Diagnostic Application of Inhibition Depth.

The Vestibular Evoked Muscle Potential (VEMP) has shown promise in the functional assessment of the saccule and in the diagnosis of Meniere's syndrome and semicircular canal dehiscence. We are studying the cervical or cVEMP which is generated by a brief change in the tone of a contracted sternocleidomastoid muscle induced by an intense transient sound. Although already in clinical use, ability of the cVEMP to track saccular function is limited by the variability of its waveform characteristics (amplitude, latency, and threshold) and by its indirect nature of tracking saccular function via an inhibitory vestibular reflex. The purpose of this grant is to test a newly developed method of measuring the size of the saccular response by estimating the amount of inhibition of muscle contraction that is generated by the saccule's response. We have termed this estimate of inhibition depth Muscle Modulation Amplitude or MMA.

The first aim of our study was to evaluate the sensitivity of this new metric by comparing the traditional peak to peak amplitude measure (VEMPpp) and the MMA calculated from the same set of data. Data has been collected on 20 normal subjects comparing multiple responses from a low intensity stimulus (70 dB HL) and a high intensity stimulus (90 dB HL). The raw data used to generate a VEMP was stored digitally so that it can be used for both the traditional VEMPpp measurement and the calculation of MMA. The analysis of this data is ongoing and will compare the performance of each metric in distinguishing the VEMP response at two levels of saccular function, i.e. the two intensity levels.

In addition to the collection of data for the first aim of this study, we have also collected data and compared VEMPpp and MMA for two different rates of stimulation used in the VEMP literature. This small study was done to verify that the methods used in assessing the variability of the VEMPpp and the improvement possible with measurement of MMA was not confounded by stimulus rate. The results of this study indicated for stimulation rates of 5 per sec or 13 per sec, there was no systematic difference in either VEMPpp or MMA.

We are currently preparing to collect data for the second aim of this study which is to make VEMP measurements on two populations of individuals with clinically identified pathology: Meniere's Disease and Semicircular Superior Canal Dehiscence. Modification of our previous version of VEMP testing software for ongoing calculation of MMA and more efficient streaming of the raw test data for digital storage is almost complete. Comparison of VEMPpp amplitude and MMA for these two populations will determine if MMA as a more direct estimate of the saccular response can better distinguish these populations from normal and possible track changes in saccular response during the course of the disease.

AOS Research Grant—Progress Report
PI: Richard Smith, M.D.

Meniere's Disease - A Molecular Genetic Study

Mapping the First Menière's Disease Locus (MenD1)

We identified a large Chilean family segregating MD. Using the Affymetrix 50K SNP array (Affymetrix, Santa Clara, CA) we genotyped 18 individuals and completed linkage analysis using dChip. Two LOD score peaks >1 were identified on chromosome 1q (LOD 2.36) and chromosome 17p (LOD 1.66) and studied with additional short tandem repeat polymorphic markers (STRPs). The region on chromosome 17p did not segregate with all affected persons and was eliminated, while the region on chromosome 1 did segregate with the disease and represents the first MD locus to be identified. It has been designated MenD1.

Gene Analysis and Variant Detection

The MenD1 candidate interval maps to chromosome 1q31.3-q41, covers 25 Mb and encodes 205 predicted genes, including 30 hypothetical proteins. Based on the large number of genes and our poor understanding of the pathophysiology of MD, we reasoned that a gene-by-gene selection and screening process would be impractical and instead chose to screen all coding sequence in the interval at one time using targeted genomic capture and pyrosequencing.

We identified 1959 coding regions which we targeted for capture using the NimbleGen Sequence Capture Array (Roche NimbleGen, Madison, WI). Working with NimbleGen, we designed an array of non-unique probes to which we added 15-30 base pairs (bp) of 'padding' to improve sequence quality of exons; we also merged adjacent small targets into a single contiguous larger target to meet our requirement that targets cover at least 500 bp to improve capture. We estimated that the final array had 8.2% of 'missing' coding sequence.

Capture was performed using four DNA samples, and sequencing was completed using 454 GS FLX Titanium chemistry running one sample per gasket. At the time we designed this experiment, this approach to mutation discovery over large genomic intervals using a nuclear triad (parent-parent-child) with a biological replicate of the affected parent and massive targeted genome capture with pyrosequencing was unique and has since been widely promoted by NimbleGen.

Candidate Genes

The total number of sequence variants we identified ranged from 1909-2423 per sample, with the number of coding sequence variants ranging from 102-130 per sample. Of the latter, 51-70 coding sequence variants were non-synonymous (i.e. leading to an amino acid change) of which 21-28 were novel mutations. These results were very consistent across samples, with 1.1% to 1.2% of all sequence variants identified per sample representing unique non-synonymous coding sequence variants. The number of novel synonymous variants (i.e. not leading to an amino acid change) ranged from 7-12 and accounted for 0.4% to 0.5% of all sequence variants. Variants confirmed by Sanger sequencing that are potentially disease causing were present in four genes.

CDCV and CDRV Testing

As a test of the CDCV hypothesis and the CDRV hypothesis, we next studied 124 sporadic cases of MD and matched controls. In one gene we identified a common variant that is associated with MD in this small sample set ($p<0.02$ after correction for multiple testing).

As a test of the CDRV hypothesis, in the same gene we also identified 10 rare variants in MD patients and none in controls. Incredibly, in two sporadic cases of MD we identified the exact same variant that segregates in the Chilean family.

Outcome

Using three different human genetic approaches – segregation analysis; association analysis; and rare variant identification – we have found variants in one gene, making this gene the first to be causally associated with MD.

Summary

We are close to completing our first year objectives and are preparing these results for publication. A continuation grant asking for a second year of funding will be submitted to build on these findings. In addition, our results have been presented at the Annual Meeting of the American Society of Human Genetics (by Dr Colleen Campbell, who received acknowledgement for her outstanding research) and at the Sixth International Symposium on Meniere's Disease and Inner Ear Disorders (by Richard Smith).

AOS Research Grant—Progress Report
PI: Fitzakerley, J.L. and Trachte, G.J.

Role for Natriuretic Peptides in Meniere's Disease Treatment

Ménière's disease (MD) is an episodic disease characterized by vertigo, hearing loss and tinnitus. The prevailing hypothesis regarding the pathophysiology of MD is that disruption of endolymph homeostasis initiates the disease process, although the underlying molecular mechanism is unknown. The global hypothesis of this research is that natriuretic peptides (NPs) represent a link between changes in plasma volume and the acute physiological changes that occur in the inner ear during an acute MD attack.

Specific aim #1: To determine the role of ANP in mediating the effects of a high salt diet on hearing. These experiments were designed to test the hypothesis that a high salt diet increases circulating ANP levels, and that the increased ANP levels improve hearing. These experiments are fundamentally complete, and 3 abstracts based on the results of these experiments have been submitted (2 to the Annual Biomedical Research Meeting for Minority Students, and 1 to the Association for Research in Otolaryngology Midwinter Meeting). A manuscript is planned for Spring 2011. Both the low and high salt diets produced significant changes in plasma osmolarity and in plasma renin and ANP concentrations. Despite these effects, there were no significant differences in acoustic thresholds measured in response to 1-32 kHz tones in control (CBA/J) mice. In contrast, the effects of the diets on NPR-A knockout animals were complex. The effects were: 1) diet dependent (differing effects of low vs. high salt), 2) frequency dependent (hearing was worsened at high frequencies, and unaffected at low frequencies), and 3) genotype dependent. Interestingly, the NPR-A knockout appeared to protect mice from the hearing loss observed at high frequencies in wild-type animals in response to a low-salt diet.

Specific aim #2: To determine the effect of acute experimental manipulation of ANP levels on hearing. Oral administration of glycerol was used to manipulate ANP levels. These experiments were significantly slower to progress than those of aim 1. The experiments on the CBA/J and 2 of the 3 genotypes of NPR-C mutant mice have been completed. However, we had very few NPR-C homozygote mice born during the first 9 months of the year, and the NPR-C homozygote mutant animals were more sensitive to glycerol. As a result, the remaining experiments on homozygote mice are being completed this month, and a manuscript is planned for the spring. The completed glycerol experiments have provided significant information regarding the impact of changes in plasma ANP concentration on hearing. The rise in thresholds observed following glycerol administration parallels a decline in plasma [ANP]. In addition, there is a subsequent return to normal thresholds that temporally coincides with the rise in plasma ANP concentrations.

In summary, the experiments funded by this grant are fundamentally complete, and the results will be presented at upcoming scientific meetings. Both manipulations of dietary salt concentration and acute administration of glycerol have been shown to significantly alter plasma osmolarity and ANP concentrations. Increases in plasma ANP concentration are generally associated with hearing improvements, and declines with hearing loss.

Glutamate Receptors and Signaling in the Mammalian Vestibular System

The processing of sensory signals in the vestibular periphery of mammals is not well understood. In hair cells, a mechanical stimulus at the hair bundle results in an electrical current across the apex of the hair cell. As a result, a change in the hair cell's receptor potential occurs, followed by a modulation of transmitter release from the base of the hair cell and a change in afferent firing patterns. Of the two hair cell types in the vestibular periphery, type I hair cells are most sensitive to destruction by gentamicin, an agent used in the treatment of severe cases of Ménière's disease. We are studying the effects of gentamicin on sensory signaling between type I hair cells and their associated calyx afferents. Progress towards completing the experiments is summarized below.

Specific Aim 1 (SA1): Effects of gentamicin on ionic currents in isolated type I hair cells and calyx afferents. We are investigating the hypothesis that gentamicin modulates ionic currents in type I hair cells and their associated calyx afferents. The effects of gentamicin in whole cell patch clamp have been investigated on voltage-dependent K^+ currents in type I hair cells. Large outward K^+ currents in type I cells were reduced on average to 89.2 ± 3.5 % (mean ± SD, n = 5) at +22mV when 1 mM gentamicin was applied extracellularly. Currents were further reduced to 83.1 ± 6.8 % (n = 7) of their control value when the concentration of gentamicin was increased to 5 mM and the effect was reversible as shown in Fig. 1. Type I hair cells were isolated from gerbils at postnatal days P12-P39 and showed mature K^+ conductances. Type I hair cells also express a transient Na^+ current during early postnatal development, but preliminary data suggest the Na^+ current is not blocked by gentamicin. Gentamicin blocked K^+ currents in 8 type I hair cells that had lost their hair bundles, indicating that the drug was not entering the cell through hair bundle transduction channels.

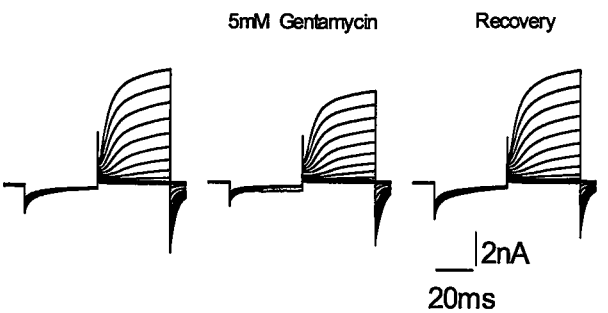

Fig. 1 Gentamicin reversibly reduces K^+ currents in a type I vestibular hair cell. Cell was held at -78 mV in voltage clamp and given a series of voltage steps in 10 mV increments. Peak outward currents were reduced by approximately 20 % in the presence of gentamicin. Currents recovered following washout of the drug.

Neomycin (2.5 mM) also reduced outward current to 69 % of the control value. SA1b investigates the effects of gentamicin on voltage-dependent currents in isolated calyx terminals. We have described voltage-dependent outward K^+ and inward Na^+ conductances in calyx terminals (Dhawan et al. *JARO* 11:463-476, 2010) and recently identified a calcium-activated conductance sensitive to apamin (Meredith et al. ARO abstracts 2011) and a hyperpolarization-activated current (Ih) blocked by Cs^+ in isolated calyx terminals. Further experiments will determine the effects of gentamicin on identified calyx conductances to elucidate presynaptic and postsynaptic changes that occur in the vestibular periphery following gentamicin treatment.

AOS Progress Report
PI: Keiko Hirose, MD

Mononuclear Phagoocytes in the Mammalian Cochlea: Studies on Inhibition and Activation of Leukocytes in the Middle Ear

Since the time of the original application of this grant, I have been funded by the NIDCD to study cochlear epithelial repair and the role of innate immunity in the inner ear (R01 DC011315). The preliminary work that supports this application was in large part funded by the American Otological Society, and I would like to acknowledge the importance of this support in the continuation of this work on inner ear immunity. The following specific aims were proposed in my 2010 application for the AOS Research grant:

To investigate the role of monocyte/macrophage activation in the cochlea, we have proposed **two scenarios.**

Experiment 1: Hypothesis: Macrophages in the injured mouse cochlea participate in phagocytosis of damaged hair cells and thereby terminate destruction of the sensory epithelium.
The activity and movement of endogenously fluorescent macrophages will be imaged in live organ cultures by placing neonatal mouse cochleas in culture and exposing these cells to ototoxic aminoglycoside antibiotics. We will determine if macrophages participate in phagocytosis of hair cell debris. We will also use these cochlear cultures to determine if hair cell debris accumulates and further damage occurs as a result of macrophage depletion.

This work was begun in April 2010 and was presented at the International Symposium of the Meniere's Society and Inner Ear Biology in Kyoto Japan in November 2010. Further work on this in vitro model of cochlear inflammation will be presented in February at the Midwinter meeting of the Association for Research in Otolaryngology. In short, we have demonstrated that macrophages do indeed participate in phagocytosis of hair cell debris. Real time imaging demonstrates migration to hair cells and extensions of processes around normal appearing hair cells in mouse cochlear cultures exposed to ototoxic reagents. This work has shown that macrophages can participate in hair cell clearance. However, when macrophages are depleted with the use of liposomal clodronate, debris clearance can be accomplished in the absence of these professional phagocytes.

Experiment 2: Hypothesis: The protective effect of LPS priming before acoustic injury can be transferred to an untreated mouse by transfusing peripheral blood mononuclear cells from a pretreated mouse to a naïve mouse.
We will determine if the protective effect of LPS against noise-induced threshold shift can be transferred by harvesting monocytes and macrophages from an LPS pretreated mouse and transferring these cells to a non-LPS pretreated mouse. This experiment would demonstrate that activated monocytes and macrophages are sufficient to confer the beneficial effect of stress preconditioning before inner ear injury.

Ongoing work with our preconditioning model has taken an unexpected turn. We have noticed a robust difference in hearing thresholds of mice pretreated with lipopolysaccharide (LPS) compared to those that were not pretreated before intravenous exposure to ototoxic agents (combined kanamycin and furosemide). Because of our parallel experiments in vitro, we have elected to study the effect of LPS-induced macrophage priming in ototoxicity rather than noise exposure for the current time. Those mice that were preconditioned with LPS have a consistently higher elevation in hearing threshold after kanamycin/furosemide than those who are not preconditioned. We have pursued the mechanism of this potentiated response by three methods: we are currently measuring endocochlear potentials (EP) in these mice to determine if macrophage recruitment into the lateral wall by LPS induces changes in EP that are then responsible for the potentiated threshold elevation. We are also investigating whether low dose LPS induces alteration in the blood labyrinth barrier (BLB) by using intravenous sodium fluorescein or intravenous Evans Blue dye exclusion to assess the integrity of the BLB as well as the blood brain barrier in these paradigms. Finally, we will investigate whether CX3CR1 expression, which is an important modulator of inflammation in the central nervous system plays a role in LPS mediated preconditioning. While this current series of experiments represents a departure from the original specific aim, these data are proving to be compelling and could provide an important insight into how inflammation affects hearing directly, whether lateral wall inflammation affects endocochlear potential and whether breaches in the blood labyrinth barrier result in loss of endocochlear potential. This work will serve as the subject of another grant submission in the next year.

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Members Deceased Since Last Spring Meeting

Frank N. Ritter, MD (Senior 1993 (Active 1972))
Ann Arbor, MI
Date of Death: 11/16/2010

NOTES