PROGRAM
of the

One Hundred Thirty-Second Annual Meeting

AMERICAN OTOLOGICAL SOCIETY, INC.

April 24-25, 1999

Marriott's Desert Springs Resort
Palm Desert, California

OFFICERS
JULY 1, 1998 - JUNE 30, 1999

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The American Otological Society is accredited by the Accreditation Council for Continuing Medical Education to sponsor continuing medical education for physicians.
This Continuing Medical Education offering meets the criteria for eight (8) credit hours in Category One (1) of the Physician's Recognition Award of the American Medical Association.

Saturday, April 24, 1999

REGISTRATION - 7 a.m.

BUSINESS MEETING - 7 a.m.
ROOM: SALON G
(Restricted to Members)

Minutes of the Annual Meeting 1998

Introduction of New Members

Election of Nominating Committee

Report of the Secretary-Treasurer

Report of the Editor-Librarian

SCIENTIFIC PROGRAM - 7:30 a.m.
ROOM: SALON G
(Open to Non-Members)

Remarks by the President
Gregory J. Matz, M.D.

Introduction of the Guest of Honor
Barbara A. Bohne, Ph.D.

Presidential Citation
Robert L. Kohut, M.D.

MIDDLE EAR AND INNER EAR

1. 7:40 a.m. Pulsatile Tinnitus in Patients with Morbid Obesity: The Effectiveness of Weight Reduction Surgery
Elias Michaelides, M.D.*
Aristides Sismanis, M.D.
Harvey J. Sugerman, M.D.
Warren L. Felton, III, M.D.

2. 7:50 a.m. An Analysis of Labyrinthine Fistula in Chronic Otitis Media with Cholesteatoma
Chong-Sun Kim, M.D.*
Sun O. Chang, M.D.
Seung Ha Oh, M.D.
Byeong Ho Song, M.D.
Hong-Ju Park, M.D.
Jeong-Hun Hah, M.D.
Weon-Jin Seong, M.D.

3. 8:00 a.m. Analysis of Eustachian Tube Function by Video Endoscopy
Dennis S. Poe, M.D.*
Ilmari Pyykko, M.D., Ph.D.
Hannu Valtonen, M.D., Ph.D.
Juha Silvola, M.D., Ph.D.

4. 8:10 a.m. Management of the Atelectatic Ear
John L. Dornhoffer, M.D.*

8:20 a.m. **DISCUSSION**

***speaker**

5. 8:30 a.m. Ossicular Chain Reconstruction Using a New Tissue Adhesive
Jennifer L. Maw, M.D.*
Jack M. Kartush, M.D.

6 8:40 a.m. The Other Ear - Findings and Results in 3600 Bilateral Stapedectomies
Robert L. Daniels, M.D.*
Larry W. Krieger, M.D.
William H. Lippy, M.D.

7. 8:50 a.m. Outcomes and Quality of Life in Conductive Hearing Loss
Michael G. Stewart, M.D., M.P.H.*
Newton J. Coker, M.D.
Herman A. Jenkins, M.D.
Spiros Manolidis, M.D.

8. 9:00 a.m. Distortion-Product Otoacoustic Emissions in Children with Middle Ear Effusion
Neil M. Sperling, M.D.
Manoj Kantu, M.D.*
Jeffrey N. Cousin, M.D.
Mahesh Bhaya, M.D.
Peter Homel, Ph.D.
Jane R. Madel, Ph.D.
Joseph McPhee, Ph.D.

9:10 a.m. **DISCUSSION**

***speaker**

9. 9:20 a.m. Malignant Tumors of the Temporal Bone: A Review of 57 Cases
Stephanie A. Moody, M.D.*
Barry E. Hirsch, M.D.
Eugene N. Myers, M.D.

10. 9:30 a.m. The NIDCD's Clinical Trials Cooperative Groups: A Brief Overview
A. Julianna Gulya, M.D.*
Ralph F. Naunton, M.D.

9:40 a.m. **DISCUSSION**

9:50 a.m. **INTERMISSION**

MENIERE'S DISEASE

11. 10:10 a.m. External Aperture of the Vestibular Aqueduct in Meniere's Disease
Xianxi Ge, M.D.*
John J. Shea, Jr., M.D.

12. 10:20 a.m. The Presence of Autoantibodies in the Sera of Meniere's Disease
Tai J. Yoo, M.D., Ph.D.*
Osman Sener, M.D.
S.S. Kwon, M.D.
Xianxi Ge, M.D.
John J. Shea, Jr., M.D.

***speaker**

13. 10:30 a.m. Evaluating the State of Meniere's Disease Using Transtympanic Electrocochleography
Matthew Ng, M.D.*
Hiroshi Shimizu, M.D.
John K. Niparko, M.D.

14. 10:40 a.m. Intratympanic Gentamicin Therapy of Uncontrolled Vertigo Associated with Meniere's Disease
Terrence E. Zipfel, M.D.*
Carl L. Reams, M.D.

10:50 a.m. **DISCUSSION**

VESTIBULAR DISORDERS AND HISTOPATHOLOGY

15. 11:00 a.m. Air and Water Caloric Testing: Variability of Test-Retest Responses
Arvind Kumar, M.D.
Roy Amir, M.D.*

16. 11:10 a.m. Outcome Analysis of Individualized Vestibular Rehabilitation Protocols
F. Owen Black, M.D.*
Colette R. Angel
Susan C. Pesznecker, R.N.

***speaker**

NOTES

17. 11:20 a.m. Long-Term Efficacy of a Vestibular Rehabilitation Program
Marian Girardi, M.A.*
Horst R. Konrad, M.D.

18. 11:30 a.m. A Comparison of Treatment Options for Non-Specific Dizziness
Brian W. Blakley, M.D., Ph.D.*

19. 11:40 a.m. Effects of Nitric Oxide on Morphology of Isolated Cochlear Outer Hair Cells: Possible Involvement in Sensorineural Hearing Loss
Timothy T. K. Jung, M.D., Ph.D.*
Raymund J. Llaurado, M.D.
Paul D. Kim, M.D.
Boo-Hyun Nam, M.D., Ph.D.
Earnest O. John, Ph.D.

20. 11:50 a.m. Pathology of Bell's Palsy
Jack L. Pulec, M.D.*
Michael J. Patterson, Ph.D.

12 Noon **DISCUSSION**

12:10 p.m. **GROUP PHOTOGRAPH MEMBERS OF THE AMERICAN OTOLOGICAL SOCIETY, INC.**
(Location to be announced.)

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***speaker**

NOTES

SUNDAY, April 25, 1999

REGISTRATION - 12:00 Noon

BUSINESS MEETING - 12:30 p.m.
ROOM: SALON G
(Restricted to Members)

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 Head and Neck Surgery

Report of the Audit Committee

Report of the Nominating Committee

Report of Communications

Unfinished Business

New Business

SCIENTIFIC PROGRAM - 1:00 p.m.
ROOM: SALON G
(Open to Non-Members)

NOTES

COCHLEAR IMPLANTS

21. 1:00 p.m. Preoperative Cochlear Implant Imaging: Is MRI Enough?
Simon Ellul, M.B.B.S., F.R.A.C.S.*
Clough Shelton, M.D.
H. Christian Davidson, M.D.
H. Ric Harnsberger, M.D.

22. 1:10 p.m. The Stability and Clinical Utility of Neural Response Telemetry (NRT) in the C124M Cochlear Implant
Susan B. Waltzman, Ph.D.*
Noel L. Cohen, M.D.
William H. Shapiro, M.A.
Steven J. Staller, Ph.D.
Joshua P. Light, M.D.

23. 1:20 p.m. The Influence of Age at Implantation on Performance with a Cochlear Implant in Children
Paul R. Kileny, M.D.*
Teresa A. Zwolan, Ph.D.
Carissa Ashbaugh, M.A.

24. 1:30 p.m. Cochlear Implant Electrode Migration in Adults and Children
J. Thomas Roland, Jr., M.D.*
Andrew Fishman, M.D.
George Alexiades, M.D.
Susan B. Waltzman, Ph.D.
Noel L. Cohen, M.D.
Ronald A. Hoffman, M.D.

***speaker**

25. 1:40 p.m. The Effect of Frequency Allocation on Phoneme Recognition With the Nucleus 22 Cochlear Implant
Lendra M. Friesen, M.S.
Robert V. Shannon, Ph.D.
William H. Slattery III, M.D.*

26. 1:50 p.m. Comparison of a Simultaneous and a Non-Simultaneous Speech Processing Strategy in Newly Implanted Patients
Terry A. Zwolan, Ph.D.*
Paul R. Kileny, Ph.D.
Sharon Smith, M.S.
Susan Waltzman, Ph.D.
Pat Chute, Ed.D.
Elizabeth Domico, M.A.
Jill Firszt, M.S.
Annelle Hodges, Ph.D.
Dawna Mills, M.S.
Maggie Whearty, M.S.

2:00 p.m. DISCUSSION

2:10 p.m. SCIENTIFIC PRESENTATION BY GUEST OF HONOR

2:30 p.m. INTERMISSION (AOS requests that all attendees show support to exhibitors during this intermission)

***speaker**

NOTES

ACOUSTIC TUMORS

27. 3:00 p.m. Lesions of the Internal Auditory Canal and Cerebellopontine Angle in an Only Hearing Ear: Is Surgery Ever Advisable?
Colin L. W. Driscoll, M.D.*
Robert K. Jackler, M.D.
Lawrence H. Pitts, M.D., Ph.D.

28. 3:10 p.m. Acoustic Neuroma Surgery: Use of Cochlear Nerve Action Potential Monitoring for Hearing Preservation
Lance E. Jackson, M.D.*
Joseph B. Roberson, Jr., M.D.

29. 3:20 p.m. Audiometric Findings in Acoustic Neuroma Patients
Stephen G. Harner, M.D.*
David A. Fabry, Ph.D.
Charles W. Beatty, M.D.

30. 3:30 p.m. Spontaneous Involution of Acoustic Tumors
Charles M. Luetje, M.D.*

3:40 p.m. DISCUSSION

HEARING LOSS

31. 3:50 p.m. Cochlear Ischemia Induced by Circulating Iron Particles Under Magnetic Control: An Animal Model for Sudden Hearing Loss
John M. Schweinfurth, M.D.*
Anthony C. Cacace, Ph.D.

***speaker**

NOTES

32. 4:00 p.m. Hearing Problems in Mexican American Elderly
Zoreh Davanipour, DVM, Ph.D.*
Nicole M. Lu, M.S.
Michael Lichtenstein, M.D.
Kyriakos S. Markides, Ph.D.

33. 4:10 p.m. Profound Hearing Loss Associated With Hydrocodone Abuse
Rick A. Friedman, M.D., Ph.D.*
Dawna Mills, M.S.
John W. House, M.D.
William M. Luxford, M.D.
Stuart Gherini, M.D.

34. 4:20 p.m. Child and Family Factors Associated with Deaf Children's Success in Auditory-Verbal Therapy
Susan R. Easterbrooks, M.M.Sc., Ed.D.*
Colleen M. O'Rourke, Ph.D.
N. Wendell Todd, M.D.

35. 4:30 p.m. Extratympanic Electrocochleography: Diagnostic and Predictive Value
Dennis G. Pappas, Jr., M.D.*
Dennis G. Pappas, Sr., M.D.

36. 4:40 p.m. High Stimulus Rate Auditory Evoked Potentials (ECoG & ABR)
Mohamed A. Hamid, M.D., Ph.D.*
Hesham M. Sami, M.D.

***speaker**

NOTES

4:50 p.m. **DISCUSSION**

Introduction of New President
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1886-89	J.S. Prout, MD
1890	O.D. Pomeroy, MD
1891-94	Gorham Bacon, MD
1895-99	Arthur Mathewson, MD
1900-02	H.G. Miller, MD
1903-05	B. Alex Randall, MD
1906-07	Emil Gruening, MD
1908	C.J. Kipp, MD
1909-10	Frederick L. Jack, MD
1911-12	Edward B. Dench, MD
1913-14	J.F.McKernon, MD
1915-16	C.W. Richardson, MD
1917	C.R. Holmes, MD
1918	Norval H. Pierce, MD
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ABSTRACTS

of the

ONE HUNDRED THIRTY-SECOND ANNUAL MEETING

AMERICAN OTOLOGICAL SOCIETY, INC.

April 24-25, 1999

Marriott's Desert Springs Resort
Palm Desert, California

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The mission of the American Otological Society, Inc., shall be

a. To advance and promote medical and surgical otology including the rehabilitation of the hearing impaired.

b. To encourage and promote research in otology and related disciplines.

c. To conduct an annual meeting of the members for the presentation and discussion of scientific papers and the transaction of business affairs of the Society.

d. To publish the papers and discussions presented during the scientific program and the proceedings of the business meetings.

PULSATILE TINNITUS IN PATIENTS WITH MORBID OBESITY:
The effectiveness of Weight Reduction Surgery

Elias Michaelides, M.D., Aristides Sismanis, M.D.
Harvey J. Sugerman, M.D., Warren L. Felton, III, M.D.

Background: Morbid obesity (45 kg above ideal body) is increasing in the US population. Many morbidly obese patients suffer from disabling pulsatile tinnitus (PT) secondary to intracranial hypertension (pseudotumor cerebri)
Objective: To determine the effectiveness of weight reduction surgery for relief of PT in patients with morbid obesity.
Study design: This is a retrospective study of morbidly obese patients with associated PT.
Setting: Academic tertiary referral center
Patients: Seventeen female patients underwent weight reduction surgery
Results: All patients had PT and headaches Other co-morbidities were pseudotumor cerebri, hypertension, diabetes mellitus, and sleep apnea. Median age was 34 (Range 24-45 years). Average pre-operative body mass was 46 kg/m^2 (Range 33-70 kg/m^2). Average weight loss was 44 kg (Range 22.7- 98.6 kg). Fourteen patients had pre-operative CSF measurements with an average pressure of 342 mm of H_20 (Range 120-600). Post-operative values were obtained on 5 patients with average pressure 179 mm of H_20 (Range 140-220) Fourteen patients experienced complete resolution of their PT. Three patients continued to have PT despite significant weight reduction.
Conclusions: Weight reduction surgery was found very effective in relieving PT in morbidly obese patients and should be considered when conservative management has failed. In addition, correction or improvement of the associated co-morbidities was noticed in the majority of patients.

AN ANALYSIS OF LABYRINTHINE FISTULA IN CHRONIC OTITIS MEDIA WITH CHOLESTEATOMA

Chong-Sun Kim, M.D., Sun O Channg, M.D., Seung Ha Oh, M.D.,
Byeong Ho Song, M.D., Hong-Ju Park, M.D.,
Jeong-Hun Hah, M.D., Weon-Jin Seong, M.D.

Objectives: This study aimed to evaluate the efficacy of preoperative tests for predicting fistulas and postoperative hearing results according to surgical management.

Study Design: A retrospective study of the clinical records of 1,593 patients who underwent operations for chronic otitis media with cholesteatoma from Jan 1979 through Jul 1998.

Setting: University hospital, a tertiary referral center

Patients: Patients who were proved to have labyrinthine fistulas during the operation of cholesteatoma.

Main Outcome Measures: The results of the pre- and postoperative bone conduction pure tone average and pure tone threshold at 4 kHz were examined. The temporal bone CT scan and intraoperative findings were evaluated.

Results: Labyrinthine fistulas were found in 8.4% or 131 patients in this study. Fistulas were most commonly found in the lateral semicircular canal (92.4%). Positive fistula tests and positive temporal bone CT findings in labyrinthine fistula cases were recorded in 35.1% and 73.9% of cases, respectively. Canal down mastoidectomy procedures were applied in 125 ears (95.4%). The cholesteatoma matrix was removed in 121 ears (92.4%). The average bone conduction threshold showed no significant difference between pre- and postoperative evaluations. The change in bone conduction was not significantly different between matrix removed and matrix maintained groups.

Conclusions: The high resolution temporal bone CT scan is highly recommended for detection of labyrinthine fistulas. The postoperative hearing results are not affected by the size of the fistula and the type of mastoidectomy procedures.

ANALYSIS OF EUSTACHIAN TUBE FUNCTION BY VIDEO ENDOSCOPY

Dennis S. Poe, MD, Ilmari Pyykko, MD, PhD,
Hannu Valtonen, MD, PhD, Juha Silvola, MD, PhD

Objective: Human eustachian tubes (ET) were inspected in vivo endoscopically and video recordings made for careful slow motion analysis of normal physiological function.
Setting: Ambulatory office in a tertiary referral center.
Subjects: 22 adults, 17 with no history for ET dysfunction (2 of which had tympanic membrane(TM) perforations), 5 with known ET dysfunction.
Interventions: Transnasal endoscopic examination of the nasopharyngeal opening of the eustachian tube during rest, swallowing, and yawning. 2 patients with a perforated TM were examined microscopically and endoscopically after india ink was placed onto the anterior promontory.
Main outcome measures: Video analysis of ET opening movements and mucociliary flow.
Results: Normal ETs had four consistant sequential movements:
1. Palatal elevation causing passive rotation of the cartilage.
2. Active rotation of the cartilage and posterior displacement initiating distal tubal opening.
3. Dilation of the lumen due primarily to tensor tympani muscle movement beginning distally and inferiorly, then opening proximally and superiorly.
4. Depression of the inferior wall.
Dysfunctional ETs had intraluminal swelling, strictures, or minimal muscle movement.
India ink studies demonstrated flow directed to the inferior ET mucosa.
Conclusions: Slow motion endoscopic video analysis may be a useful new technique for the study of eustachian tube physiology. Consistant muscle movement patterns were demonstrated in normals but absent in abnormals. Mucociliary flow may aid in the dependant drainage pattern of the ET. More studies of normal and abnormal patterns are needed to establish useful clinical correlates.

MANAGEMENT OF THE ATELECTATIC EAR

John L. Dornhoffer, M.D., F.A.C.S.

Objective: The time for surgical intervention in the case of the atelectatic ear is controversial as the natural course toward cholesteatoma development cannot be predicted, and hearing remains normal until later in the disease course. Consequently, surgery is often delayed until there is a clear indication, such as hearing loss or frank cholesteatoma development, but such delay often necessitates more extensive surgery. As earlier intervention appears to be in the best interest of the patient, but is often avoided due to near normal hearing levels at this stage, we attempted to compare pre- and postoperative hearing results and graft take after cartilage tympanoplasty in the atelectatic ear prior to cholesteatoma development.
Study design: This retrospective study used a computerized otologic data base to identify patients meeting the inclusion criteria.
Setting: Study was performed at a tertiary referral center.
Patients: A total of 75 patients aged 2-80 years underwent cartilage tympanoplasty with or without ossicular reconstruction for surgical treatment of the Stage III atelectatic ear (ear drum retracted to promontory without cholesteatoma).
Interventions: Surgical intervention involved elevation of the ear drum, followed by cartilage reconstruction of the tympanic membrane, with ossicular reconstruction as indicated.
Main outcome measure(s): Postoperative pure tone average air-bone gap for 4 frequencies *(500,* 1000, 2000, 3000 Hz) compared to pre-operative levels; graft take.
Results: There was no detrimental effect on hearing, with excellent graft take in all patients. Details of hearing results and staging criteria will be presented.
Conclusions: Surgical intervention for the atelectatic ear can be successfully performed at an early stage, prior to cholesteatoma development, thus preventing the need for later, more extensive surgery.

5.

OSSICULAR CHAIN RECONSTRUCTION USING A NEW TISSUE ADHESIVE

Jennifer L. Maw, M.D., Jack M. Kartush, M.D.

Hypothesis: A new medical grade cyanoacrylate tissue adhesive will improve the results of ossicular chain reconstruction in a rat model.

Background: An ideal tissue adhesive has long been awaited by otologists. Studies examining the older cyanoacrylates have demonstrated variable efficacy and toxicity. Octylcyanoacrylate is a new tissue adhesive that has many properties ideal for otologic surgery.

Methods: Twelve female C-D rats were anesthetized and pre-operative ABR was performed. A left atticotomy was performed and the incus was removed. In the adhesive group, the incus was dipped in octylcyanoacrylate and interposed between the tympanic membrane and the stapes; no adhesive was used in the control group. At 8 weeks, postoperative ABR was performed, the integrity of the ossicular chain inspected and histopathological analysis of the temporal bones was performed. Statistical comparison of ABR results were done using the Mann-Whitney test.

Results: Seven rats were randomized to the adhesive group and five to the control group. There were no histopathological differences in the temporal bones of the animals. The ossicular chain was not intact in 2 of the controls, while the rest were intact at 8 weeks. The post-operative air conduction ABR (mean dB SPL) (67.5 control vs 34.3 adhesive,
$p < 0.02$) and air-bone gap (52.5 control vs 18.9 adhesive, $p< 0.02$) was significantly better in the adhesive group.

Conclusions: This new medical grade tissue adhesive improves the hearing results of ossicular chain reconstruction based on ABR with no apparent histotoxicity in this animal model.

THE OTHER EAR - FINDINGS AND RESULTS IN 3,600 BILATERAL STAPEDECTOMIES

Robert L. Daniels, M.D., Larry W. Krieger, M.D.,
William H. Lippy, M.D.

Objectives: To determine the incidence of unilateral and bilateral middle ear abnormalities in patients with otosclerosis which could potentially impact successful stapedectomy and the rates of success in these cases, including the chance of overclosure in the second ear.

Study Design: Retrospective case review of operative and audiological records.

Setting: Private otology practice.

Patients: 1,800 patients who had 3,600 primary stapedectomies for bilateral otosclerosis.

Intervention: Analysis of perioperative and follow-up audiograms with associated operative findings including: obliterative otosclerosis and solid footplates, dehiscent or overhanging facial nerve, narrow oval window niche, promontory overhang, and ossicular fixation or malformation.

Outcome measures: Audiologic success as defined by: overclosure or closure of pre-operative, four-frequency averaged air-bone gap to less than 10dB at six months or greater follow-up.

Results: The rate of finding any abnormality was 25%. Abnormalities present bilaterally were found in 136 patients (8%), with otosclerosis requiring an OW drillout as the most common finding (40%). Bilaterally dehiscent or overhanging facial nerves was 25%. Success in patients with abnormalities was 73% overall with bilateral overclosure in 41%.

Conclusions: Abnormal middle ear findings during stapedectomy occur in a significant percentage of patients. Reasonable rates of success and overclosure can still be expected in these ears but this is somewhat finding specific. The predictive value of these findings and the associated rates of success with potential impact on surgical counseling and planning for the "other ear" will be discussed.

7.

OUTCOMES AND QUALITY OF LIFE IN CONDUCTIVE HEARING LOSS

Michael G. Stewart, M.D., M.P.H., Newton J. Coker, M.D.
Herman A. Jenkins, M.D., Spiros Manolidis, M.D.

Objective: To measure quality of life (QOL) and hearing-specific functional status before and after treatment of conductive hearing loss (CHL).
Study Design: Prospective longitudinal outcomes-based study.
Setting: Tertiary academic medical center.
Patients: Adult patients with conductive hearing loss (at least 20 dB conductive component). Mean age = 48.6 years, n = 77.
Interventions: CHL treated with surgery in 80%; amplification in 20%.
Main outcome measures: QOL was measured using the MOS SF-36 instrument, and hearing-specific functional status was measured using the Hearing Satisfaction Scale (HSS) - both are well-validated health status instruments. Audiometric outcome was measured using guidelines from the Hearing and Equilibrium Subcommittee of the AAO-14NS.
Results: There was a significant (p=0.00 1) mean improvement in PTA in the treated ear (18.1 dB +/- 13.1 dB). Mean QOL scores in CHL patients at study entry were comparable to the general population. There was no significant improvement in mean global QOL scores after treatment, although the hearing-specific instrument demonstrated significant improvements (emotional subscale, p=0.001; social/situational subscale, p=0.02). The hearing-specific instrument was much more sensitive to treatment effect than the global instrument, as measured by effect size (HSS = 1.29, SF-36 = 0.07) and standardized response mean (HSS = 0.92, SF-36 = 0.10). Regression analysis indicated the only predictors of hearing status change after treatment were pre-treatment hearing status ($p<0.05$) and the mental health QOL subscale ($p<0.05$).
Conclusions: Treatment of CHL results in significant improvement in hearing-specific functional status, although these changes are difficult to detect using a global QOL instrument.

8.

DISTORTION-PRODUCT OTOACOUSTIC EMISSIONS IN CHILDREN WITH MIDDLE EAR EFFUSION

Neil M. Sperling, M.D., Manoj Kantu, M.D., Jeffrey N. Cousin, M.D.
Mahesh Bhaya, M.D., Peter Homel, Ph.D., Jane R. Madell, Ph.D.
Joseph McPhee, Ph.D.

Distortion-product otoacoustic emissions (DPOAE) has become a valuable measure of frequency-specific cochlear function. Because middle ear effusion (MEE) affects low-frequency hearing and most emission systems primarily measure low-frequency responses, the clinical utility of DPOAE in this setting remains speculative. We report the use of a commercially available DPOAE system with enhanced frequency capability in the presence of MEE.

A prospective, controlled study of 71 ears in 37 children is reported. Measurable DPOAE in ears with MEE was compared with that in control ears without MEE. An accepted Otitis Media index was utilized to select patient groups, and no patient had a history of ear surgery, perforation, or sensorineural hearing loss. Both groups underwent pure-tone audiometry and DPOAE analysis at .5, 1, 2, 4, 6, 8, and 10 kHz. The presence of DPOAE responses followed accepted criteria of occurring at least 10 dB above the noise floor.

Twenty-seven of 53 ears with MEE (52%) demonstrated high-frequency range (4 to 10 kHz) DPOAES, compared to 18/18 (100%) control. Only 10/53 (19%) ears with MEE demonstrated low-frequency DPOAEs as compared to 15/18 (83%) of controls.

These results demonstrate the presence of measurable high-frequency DPOAE responses in a significant number of children with MEE. The expanded application of this technology in a common clinical condition is likely to lead to significant advances in diagnostic and management methods.

9.

MALIGNANT TUMORS OF THE TEMPORAL BONE: A REVIEW OF 57 CASES

Stephanie A. Moody, M.D., Barry E. Hirsch, M.D.
Eugene N. Myers, M.D.

Objective: This study is aimed to evaluate the staging system proposed by our institution and determine survival status according to stage and treatment.
Study Design: This study was a retrospective case review.
Setting: The study was conducted at a tertiary care medical center and specialty hospital.
Patients: Studied were 42 patients with primary and 15 patients with secondary malignancy of the temporal bone.
Intervention: All patients received surgery of the temporal bone. Radiation therapy was given depending on tumor stage and hostopathologic findings.
Main Outcome Measures: The two year survival of patients undergoing surgical resection and radiation therapy, when indicated.
Results: The two year survival for primary malignant tumors of the temporal bone were T_1 lesions = 100%; T_2 = 80%; T_3 = 50%; T_4 = 29%. Survival for T3 tumors was 75% with postoperative radiation therapy compared to 0% for surgery alone.
Conclusions: The 2-year survival data directly correlated with the staging system. Radiation therapy increases survial in T_3 lesions.

10.

THE NIDCD'S CLINICAL TRIALS COOPERATIVE GROUPS: A BRIEF OVERVIEW

A. Julianna Gulya, M.D., Ralph F. Naunton, M.D.

The National Institute on Deafness and Other Communication Disorders (NIDCD) embarked upon the establishment of (two) clinical trials cooperative groups in October, 1996 in response to a perceived research need. It intended that the clinical trials cooperative groups (CTCGS) design and implement clinical trial protocols capable of addressing the efficacy of therapeutic interventions for diseases and disorders of human communication. Most commonly, owing to the substantial numbers of patients required, the trials are expected to involve multiple study sites, with each study site adhering to a uniform study protocol, standardized treatment regimens, and prescribed data collection procedures.

A complex administrative structure is required to coordinate the activities of the CTCGs and to assure compliance with a myriad of government regulations. Similarly, participating study sites must meet stringent requirements including leadership by an individual experienced in clinical trials. Currently, there is a relative dearth of experienced clinical trialists dedicated to research in human communication.

This presentation will detail the complexities involved in the conduct of multicenter clinical trials and the NIDCD's efforts to promote clinical trials activities and to develop clinical trials training opportunities.

11.

EXTERNAL APERTURE OF THE VESTIBULAR AQUEDUCT IN MENIERE'S DISEASE

Xianxi Ge, M.D., John J. Shea, Jr., M.D.

Objective: To relate the length of the external aperture of the vestibular aqueduct to the summating action potential ratio in Meniere's patients.
Study design: Retrospective case study.
Setting: Neurotology referral center.
Patients: Fifty-four patients with Meniere's disease and nine patients with non-Meniere's disease.
Intervention: The external aperture of the vestibular aqueduct was measured from a three-dimensional surface reconstruction CAT scan. Trans-tympanic electrocochleography was performed on Meniere's disease patients.
Main outcome measure: The length of the external aperture of the vestibular aqueduct in the Meniere's disease ears was related to the SP/AP ratio in the Meniere's disease ears.
Results: The average length of the external aperture in the Meniere's disease ears was 3.79 mm. The length in the non-Meniere's disease was 5.35 mm ($p<0.05$). An enlarged SP/AP was found in 95 % of ears in the group with nonvisible external apertures, 91 % of ears in < 5mm group, 58% of ears in 5-7mm group, and 29% of ears in >7mm group (chi-square=24.814, p = 0. 000).
Conclusions: The length of external aperture of vestibular aqueduct in Meniere's disease patients is significantly shorter than in non-Meniere's disease. Endolymphatic hydrops, evidenced by an enlarged SP/AP ratio, was related to the length of external aperture of the vestibular aqueduct. The shorter the external aperture, the more often the SP/AP ratio was enlarged. Three-dimensional CAT scan is a valuable test in the differential diagnosis of Meniere's disease.

12.

THE PRESENCE OF AUTOANTIBODIES IN THE SERA OF MENIERE'S DISEASE

Tai J. Yoo, M.D., Ph.D., Osman Sener, M.D., S. S. Kwon, M.D.
Xianxi Ge, M.D. John J. Shea, Jr., M.D.

Objective: To examine the presence of antibody in the sera of Meniere's disease patient against eight inner ear antigens by Enzyme Linked Immunosorbent Assay (ELISA).

Study design: Prospective double blind study.

Setting: Tertiary referral center.

Patients: One hundred thirteen patients with Meniere's disease and twenty eight normal persons

Intervention: Review patients' medical history of Meniere's disease. Examine the antibodies against chicken type II collagen, bovine type II collagen, their cyanogen bromide cleaved peptide II, type IX and XI collagen, C-raf-1, and β-tubulin by ELISA.

Main outcome measure: Meniere's disease and result of ELISA.

Results: The sensitivity of each antigen was between 37% and 60% individually, 91% when all eight inner ear antigens were combined, while the specificity of each antigens was between 89% and 100%, 79% when all eight inner ear antigens were combined. These result showed that 91% of Meniere's disease sera have antibody activities to one or more of these inner ear antigens.

Conclusions: The results suggest that ELISA test to these eight inner ear antigens was useful as a diagnostic tool for Meniere's disease and further study is required to elucidate the role of these antigens in the pathogenesis of Meniere's disease which eventually might result in better therapy.

EVALUATING THE STATE OF MIENIERE'S DISEASE USING TRANSTYMPANIC ELECTROCOCHLEOGRAPHY*

Matthew Ng, M.D., Hiroshi Shimizu, M.D., John K. Niparko, M.D.

Objective: A "gold standard" for the diagnosis of hydrops is an important, but elusive tool. We examined the results of transtympanic electrocochleography (t-ECOG) from patients suspected of having Meniere's disease. We assessed the association between abnormal t-ECOG measurements and disease severity.
Study Design: Retrospective.
Setting: Tertiary referral center.
Patients: Patients fulfilling diagnostic criteria of Meniere's disease by 1995 AAO-HNS guidelines.
Intervention(s): t-ECOG, using click and 1,2, and 4 KHz tone burst stimuli.
Main Outcome Measure: Association between tone-evoked SP amplitude and click-evoked SP/AP ratio and disease severity.
Results: In a cohort of 94 patients, 185 ears were tested with t-ECOG. Fifty were classified as "definite" Meniere's disease, 1 as "probable", 45 as "possible", and 89 as "normal". Chi square analysis ($p<.0001$) and analysis of variance ($F<.0001$) suggested a strong correlation between disease severity and SP amplitude, as well as disease severity and SP/AP ratio. The strength of these comparisons was substantially lessened by the inability to detect the SP response along the leading edge of the AP waveform in 47 (25.5%) of the 185 ears tested. SP amplitude at a stimulus frequency of 2 KHZ exhibited the strongest association with disease severity.
Conclusions: 1) t-ECOG provides a sensitive near-field recording method for endocochlear potentials. 2) SP/AP ratios harbor electrical artifacts that can confound detection and precise measurement of true SP amplitude. 3) Conversely, there is high reliability in the SP recorded with t-ECOG and high power of statistical association with disease severity.

*Supported by the American Otological Society Research Fund.

14.

INTRATYMPANIC GENTAMICIN THERAPY OF UNCONTROLLED VERTIGO ASSOCIATED WITH MENIERE'S DISEASE

Terrence E. Zipfel, M.D., Carl L. Reams, M.D.

Objective: To evaluate the efficacy and ototoxicity of intratympanic gentamicin therapy in the treatment of intractable vertigo secondary to unilateral Meniere's disease.

Study Design: A retrospective case review

Setting: A tertiary referral center

Patients: The study consisted of 28 patients with intractable vertigo secondary to unilateral Meniere's disease who were refractory to medical therapy. Eligibility for review required a minimum follow-up period of 2 years after intratympanic gentamicin therapy.

Intervention: Intratympanic gentamicin solution was administered to the affected ear on a weekly basis by serial titration.

Main Outcome Measure: Vertigo control and hearing preservation outcomes following intratympanic gentamicin therapy were determined using the American Academy of Otolaryngology-Head and Neck Surgery 1985 guidelines for the reporting of treatment results in Meniere's disease.

Results: Complete vertigo control without relapse was achieved in 66% of patients. An additional 12% of patients experienced initial control of vertigo with subsequent relapse within I year of treatment. The overall failure rate was 19%. The overall rate of hearing preservation was 8 1 %. Five patients experienced a 20% or greater decline in speech discrimination following treatment. Three patients experienced pure tone average threshold shifts of 20 decibels or more.

Conclusions: Intratympanic gentamicin therapy is an effective treatment for intractable vertigo secondary to unilateral Meniere's disease. Nineteen percent of patients in our series, however, ultimately failed and required surgical intervention. The overall safety of intratympanic gentamicin was excellent with a hearing preservation rate of 8 1 %.

AIR AND WATER CALORIC TESTING: VARIABILITY OF TEST-RETEST RESPONSES

Arvind Kumar, M.D., FRCS (Edin), Roy Amir, M.D.

Objective: To statistically compare the test-retest responses of normal subjects to air and water caloric stimulations.

Study design: Cross-sectional study of twenty normal subjects at a tertiary care hospital.

Patients: Healthy volunteers between the ages of twenty and forty, with no history of otologic disease.

Intervention: Each ear was irrigated twice with air and twice with water, both at 20 degrees C, for twenty seconds. The flow rate of the air was 5Liters/minute.

Main Outcome Measure: Induced nystagmus was measured in terms of maximum slow phase velocity (SPV^{max}) and culmination frequency (CF). Test-retest variability was calculated and statistically analyzed.

Results:

- average CF (water): 38.5 (SD 9.7)
- average CF (air): 15.3 (SD 6.5)
  This difference is statistically significant ($p<0.01$).

- average SPV^{max} (water): 13.18 (SD 7.3)
- average SPV^{max} (air): 1.9 (SD 1.6)
  This difference is statistically significant ($p<0.01$).

- average test-retest variability for water (CF) : 9.7% (SD 7.8)
- average test-retest variability for air (CF): 24.8% (SD 28.3).
  This difference is statistically significant ($p<0.01$).

- average test-retest variability for water (SPV^{max}): 32.3 % (SD 24.9 5)
- average test-retest variability for air (SPV^{max}): 51.5% (SD 28.8).
  This difference is statistically significant ($p<0.01$).

- The differences between average test-retest variabilities measured in terms of CF versus
  SPV^{max}, for both air and water, are significant ($p<0.01$).

Conclusions:

- Air and water are not equivalent stimuli when the temperature and duration of application are the same.
- Variability of responses to water stimulation are significantly less than for air.
- The variability of CF is significantly less than that of SPV^{max}, for both air and water stimuli.

16.

OUTCOME ANALYSIS OF INDIVIDUALIZED VESTIBULAR REHABILITATION PROTOCOLS

F. Owen Black, M.D., Colette R. Angel, Susan C. Pesznecker, R.N.

OBJECTIVE: Determine outcome of vestibular rehabilitation protocols in subjects with vestibular disorders compared to normal and abnormal controls.
STUDY DESIGN: Prospective study, with longitudinal, matched control design. Subjects were solicited consecutively according to these criteria: Subjects who fell on computerized dynamic posturography (CDP) sensory organization tests (SOTs) 5 & 6 and 1) were participating in a normal subject study, 2) Vestibular patients who fell on SOTs 5 & 6 but did not undergo rehabilitation and 3) Vestibular patients who underwent rehabilitation.
SETTING: Tertiary neurotology clinic
PATIENTS: (1) Male and females over age 18 with chronic inner ear disorders and chief complaints of unsteadiness, imbalance and/or motion intolerance; (2) matched controls.
INTERVENTIONS: Pre- and post-rehabilitation assessment included CDP, vestibular disability index, and activity of daily living questionnaires.
Individualized rehabilitation plans were designed and implemented to address the subject's specific complaints and functional deficits. Supervised sessions were held at weekly intervals and self-administered programs devised for daily home use.
MAIN OUTCOME MEASURES: CDP composite and SOT scores, number of falls on CDP, and self assessment instruments, including dizziness handicap scores.
RESULTS: Comparing pre- and post-treatment CDP, 90% of patients showed statistically significant improvements in SOTs, overall composite score, and reduction in falls. All patients reported symptomatic improvement.
CONCLUSIONS: Outcome analysis of vestibular protocol physical therapy confirmed objective and subjective improvement in a group of patients with chronic vestibular disorders. Similar results have been reported by other investigators, but no prospective studies with normal and abnormal controls could be identified in the literature.

17.

LONG-TERM EFFICACY OF A VESTIBULAR REHABILITATION THERAPY PROGRAM

Marian Girardi, M.A., Horst R. Konrad, M.D.

Objective: To determine whether a customized vestibular rehabilitation therapy (VRT) program provides long-term (two years or more) improvement in dizziness and balance symptoms.

Study design: A retrospective study of 200 randomly selected individuals from a 1500 patient-base population, treated for dizziness and balance disorders with individually tailored VRT exercises was performed. Subjects' anonymity was maintained.

Setting: Tertiary referral center.

Patients: Urban/rural midwesterners referred for dizziness and balance dysfunction symptoms with primary diagnoses other than BPPV.

Intervention: A VRT program customized for each individual patient. Exercises were specifically designed to address distinct vestibular deficits as determined by an initial assessment of the patient.

Outcome Measures: The Dizziness Handicap Inventory (DHI) was administered prior to starting VRT and two or more years following the completion of the VRT program. An investigator-designed questionnaire was also administered post therapy.

Results: One hundred twenty-three individuals participated in the study and 62.5% showed a decrease in DHI Total score, 68.8% a lower Functional score, 53.1% a decreased Emotional score and 78.1% a reduced Physical score. ANOVA showed significant ($p<0.01$) reductions in all four DHI measures following therapy. Additionally, 75.8% of the individuals reported having symptoms less frequently and 80.0% stated symptoms were less severe two or more years after completing a VRT program than prior to therapy. Over 90% of the respondents would recommend a similar VRT program to family/friends with comparable symptoms.

Conclusion: Customized VRT provides long-term improvement in balance symptoms as measured by the DHI. A significant majority of patients treated with VRT continue to demonstrate long-term improved balance following cessation of exercises.

18.

A COMPARISON OF TREATMENT OPTIONS FOR NON-SPECIFIC DIZZINESS

Brian W. Blakley, M.D., Ph.D.

OBJECTIVE: To compare two methods of treating patients with non-specific dizziness and suggest factors that might favor one treatment over the other.
STUDY DESIGN: Retrospective review of 230 patients who presented with non-specific dizziness.
PATIENTS: Patients presented with complaints of dizziness but did not meet recognized criteria for a specific otologic or organic medical cause of their dizziness. All patients reported that their symptoms had been bothersome for at least 3 months. Normal ENG and imaging studies (CT or MRI) were required.
INTERVENTIONS: 93 patients were treated with vestibular rehabilitation and 137 were treated with antidepressant therapy.
MAIN OUTCOME MEASURE: If the patient and physician felt that the symptoms of dizziness had either gone away or improved enough so that no further treatment was needed treatment was considered successful.
RESULTS: Of 93 patients treated with vestibular rehabilitation 61 (66%) reported improvement at their one month follow-up. Of 137 patients treated with antidepressants (80%) reported improvement. The follow-up time for antidepressants was 8 +/- 2.3 weeks. Follow-up was different than for vestibular rehabilitation because the antidepressant method requires adjustment of the dose of medication every two weeks.
CONCLUSIONS: While differences between the two groups in this study do not permit direct, valid comparison it appears that use of antidepressants has a significant role in treatment of non-specific
dizziness.
canals.

EFFECTS OF NITRIC OXIDE ON MORPHOLOGY OF ISOLATED COCHLEAR OUTER HAIR CELLS: POSSIBLE INVOLVEMENT IN SENSORINEURAL HEARING LOSS

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Increasing evidence implicates free radicals in the pathogenesis of otitis media and possibly in the development of sensorineural hearing loss. We propose that, as an inflammatory mediator (IM) of otitis media, nitric oxide (NO) can cause cochlear insult and damages outer hair cells (OHCs), The purpose of this study is to investigate morphological changes in cochlear QHCs caused by nitric oxide.

Isolated OHCs from adult chinchilla cochlea were exposed to standard buffer solution (SBS) (control group 1) or the NO producing compounds, S-nitroso-N-acetyl, L-penicillamine (SNAP, 1-1.5 mg/ml, experimental group 1) or 3-morpholinosynonimine (SIN-1, 1-1.5mg/ml, experimental group 2). Since NO is readily converted to nitrite (NO_2) and nitrate (NO_3) *in vivo*, a second control group utilizing sodium nitrite ($NaNO_2$) as an NO_2 donor was employed to separate potential effects of NO_2 from NO. All experiments were performed at an osmolality of 305±5 mOsm, room temperature, and with exposure time up to ninety minutes. The cells were observed using an inverted microscope, and the images recorded on the IMAGE Pro-plus program.

OHCs exposed to either SBS or $NaNO_2$ (control groups 1 and 2) showed no significant change in cell shape or length. Cells superfused with SNAP or SIN-1 exhibited ballooning and significant shortening in mean cell length ($P<0.01$). In contrast to SNAP the changes caused by SIN-1 were irreversible. This study demonstrates that exposure to NO causes morphologic changes in isolated OHCs suggesting possible involvement of NO radical in the development of sensorineural hearing loss as a sequelae of chronic otitis media.

PATHOLOGY OF BELL'S PALSY

Jack L. Pulec, M.D., Michael J. Patterson, Ph.D.

Objective: Since few patients die while they suffer Bell's Palsy, little information is available about the pathology of the nerve. This study is to learn about the pathology.

Study design: Surgical techniques were developed to perform biopsies of different parts of the facial nerve without the production of additional morbidity for the patient.

Setting: A tertiary referral private practice of neuro-otology and teaching hospital in a large metropolitan area. Patients: Patients with Bell's Palsy requiring surgical decompression.

Intervention: All patients had complete diagnostic evaluation including topognostic, electrodiagnostic, audiometric, vestibulometric and imaging tests before the edematous portion of the facial nerve was surgically decompressed. Fragments of the facial nerve were removed during surgery for the treatment of Bell's Palsy in over 100 patients. The nerves were studied using electronmicroscopy.

Main outcome measures: A variety of pathologic changes were identified. The histopathological findings were correlated with the pre-operative history and physical findings, topognostic and electrical tests and eventual amount of recovery.

Results: Previously undescribed morphologic changes, varying degrees of degeneration and possible viruses were observed.

Conclusions: The results demonstrate that the completeness of facial recovery can be predicted by the degree of pathology present at decompression.

21.

PREOPERATIVE COCHLEAR IMPLANT IMAGING: IS MRI ENOUGH?

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Objective: This study was designed to investigate the accuracy of MRI as a preoperative imaging technique for cochlear implant candidates.
Study Design: Retrospective, blinded.
Setting: Tertiary medical center.
Patients: 25 Cochlear implant candidates with various etiologies of hearing loss.
Intervention: Cochlear implant candidates received preoperative high resolution temporal bone CT scanning, and high resolution fast spin echo T2 (FSE) MRI.
The images were read independently of each other and blindly by two neuroradiologists. The imaging results were also correlated with intraoperative findings.
Main Outcome Measures: Lack of agreement between the findings for either imaging technique. Also, lack of agreement between imaging findings and intraoperative findings.
Results: FSE-MRI is equal to CT imaging in the detection of abnormalities of cochlear patency. FSE-MRI is better than CT imaging for the detection of cochlear dysplasia and large vestibular aqueducts, and to determine the presence of the cochlear nerve.
Conclusion: We find that FSE-MRI is accurate in predicting inner ear anomalies, and obstruction of the cochlear lumen. It also adds additional information not gathered from CT imaging, such as the presence and size of the cochlear nerve.

22.

THE STABILITY AND CLINICAL UTILITY OF NEURAL RESPONSE TELEMETRY (NRT) IN THE C124M COCHLEAR IMPLANT

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Objective: The Nucleus C124M cochlear implant features a bidirectional neural response telemetry (NRT) system which allows for the measurement of electrical action potentials (EAP) from within the cochlea. The data obtained provides essential information relating to the response of the auditory nerve to stimulation, integrity of the prosthesis and possible prognostic and device programming indicators. The clinical utility of this technique may be inferred by its stability and relationship to psychophysical measures over time.

Study Design: The study group consists of 20 adults and children in whom the decision to be implanted had already been made.

Patients and Setting: Fifteen deaf children and five deaf adults were implanted with the Nucleus C124M device and followed at the medical center.

Interventions and Main Outcome Measures: NRT responses were recorded intraoperatively, at initial stimulation and at 2 weeks and 1,3,6 and 12 months post initial stimulation. At each session, NRT thresholds, amplitude growth functions and neural recovery functions were recorded from four electrodes (20, 15, 10, 5). Psychophysical measures were obtained at each postoperative interval.

Results: Correlation coefficients were calculated among measures and one-way analyses of variance were performed independently. Preliminary results show a relationship between NRT and psychophysical measures, the nature of which is variable.

Conclusions: NRT provides valuable information regarding implant status and underlying physiological strata. The stability and relationship of psychophysical and physiologic measures over time will provide information regarding their clinical utility in the programming of young children and more flexible cochlear implant platforms and could provide insight into the effects of chronic electrical stimulation.

THE INFLUENCE OF AGE AT IMPLANTATION ON PERFORMANCE WITH A COCHLEAR IMPLANT IN CHILDREN

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Objective:
The main goal of this investigation was to determine if age at implantation influences performance with a cochlear implant.
Study design:
This was a retrospective study.
Setting
The study was carried out at a tertiary referral, academic medical center
Patients:
Patients participating in this study were cochlear implant recipients ages 2.5 to 17.8 years implanted at ages ranging from 24 months to 14.5 years. Length of implant use ranged from 6 months to 6.5 years.
Interventions:
Patients underwent cochlear implantation and standard habilitation with a cochlear implant as well as diagnostic audiological and speech perception testing.
Main outcome measures:
The main outcome measures were speech recognition scores obtained at various post-operative intervals, ranging from 6 months to 6.5 years post-implantation.
Results:
Regression analyses were used to evaluate speech recognition scores as a function of age at implantation and as a function of length of implant use. Factorial ANOVA was used to compare speech recognition scores of patients grouped by age at implantation and by length of implant use. Children implanted between the ages of 2-4 years performed significantly better than children implanted after the age of 4 years when tested 3 years post-implantation. This trend was maintained when scores obtained by children implanted between 18 and 48 months were compared to scores obtained by children implanted between 49 and 71 months of age.
Conclusions:
Our data indicate that children implanted at a younger age have an advantage over those implanted at older ages when controlling for experience with a cochlear implant.

COCHLEAR IMPLANT ELECTRODE MIGRATION IN ADULTS AND CHILDREN

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Objective:
A possible post operative complication of cochlear implant surgery is electrode array extrusion or migration. Factors that may contribute to electrode movement after placement include skull growth in the young patient, intracochlear fibrosis or ossification, trauma, and uncoiling forces created by the elastic properties of the electrode array. The purpose of this study is to determine the frequency and nature of electrode migration in the children and adult implantees.
Study Design:
A prospective serial radiographic analysis of electrode position was performed.
Patients and Setting:
Seventy five implanted children and adults with multichannel cochlear implants were followed at a major cochlear implant center.
Inter,ventions and Outcome Measures:
Plain film radiographic analysis, with computer enhancement of images when necessary, of electrode intracochlear position was performed. Changes in position over time, from one to eight years post implantation, were recorded. Clinical performance changes were also evaluated.
Results:
No electrode extrusion or migration was found in children. Electrode migration was identified in three adults. Only one adult had significant clinical performance changes, requiring reoperation and repositioning.
Conclusion:
This study of a representative sample of our cochlear implant population confirms the stability of the electrode array over time.

25.

THE EFFECT OF FREQUENCY ALLOCATION ON PHONEME RECOGNITION WITH THE NUCLEUS 22 COCHLEAR IMPLANT

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Hypothesis: Phoneme recognition performance in patients implanted with the Nucleus 22 cochlear implant is affected by the frequency-to-electrode assignment.
Background: Multiple electrodes in modern cochlear implants are intended to deliver frequency-specific information to different tonotopic locations along the cochlea. However, the relation between the electrode locations, distribution of frequency information, and performance has not been thoroughly explored.
Methods: Ten listeners were each tested on vowel and consonant identification tasks immediately after receiving each of fifteen speech processors. Experimental processors were created with 4, 7, and 20 activated electrodes. Five different frequency allocations were tested with all electrode conditions.
Results: For 7- and 20-electrode maps, best vowel recognition performance was obtained with frequency tables 7 and 9, with subjects showing best performance with the table with which they were most familiar. With 4-electrode maps, no change in vowel recognition performance was observed as a function of the frequency allocation. Consonant scores showed only a small effect of frequency allocation across all processors. Results were similar across listeners with different insertion depths.
Conclusion: The allocation of frequency ranges to electrodes in the Nucleus-22 cochlear implant can affect vowel recognition, when more than 4 electrodes are used, but is less important for consonant recognition. The allocation of frequency to electrode is an important factor in multichannel implants with more than 4 electrodes. The similarity of results across implant listeners with different electrode insertion depths implies that the optimal frequency allocation is one that best matches the allocation to which they've become accustomed, rather than one that matches the tonotopic location of the electrodes.

COMPARISON OF A SIMULTANEOUS AND A NON-SIMULTANEOUS SPEECH PROCESSING STRATEGY IN NEWLY IMPLANTED PATIENTS

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Objective: The CLARION Multi-Strategy Cochlear Implant implements various speech processing strategies in order to optimize performance for individual users. The purpose of this study was to evaluate and compare the speech perception scores obtained by newly implanted adult patients when using two different speech processing strategies: Simultaneous Analog Stimulation (SAS), a simultaneous strategy that reconstructs the analog waveform, and Continuous Interleaved Sampler (CIS), a high-rate, non-simultaneous, pulsatile strategy.

Study Design: This was a multi-center study that employed a within-subjects balanced crossover design. Experience with the two strategies was replicated in each patient (ABAB design). Order of strategy use was balanced across all patients.

Setting: The study was carried out at several cochlear implant centers affiliated with tertiary medical centers.

Patients: Patients consisted of postlingually deafened adults who received a Clarion cochlear implant.

Interventions: Total patient involvement lasted 15 weeks. Speech perception testing and sound quality assessments were performed following use with each strategy.

Main outcome measures: Primary outcome measures include speech perception data and patient responses to questionnaires regarding speech and sound quality.

Results: Preliminary analysis of group data show similar mean speech perception scores after using each strategy for 5 weeks. Examination of individual patient results indicated that some patients achieve significantly higher scores with one strategy than with the other

strategy. Data will be presented regarding patient variables that affect speech perception performance with each strategy.

LESIONS OF THE INTERNAL AUDITORY CANAL AND CEREBELLOPONTINE ANGLE IN AN ONLY HEARING EAR: IS SURGERY EVER ADVISABLE?

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Objective: To define the indications for surgery in lesions of the internal auditory canal (IAC) and cerebellopontine angle (CPA) in an only hearing ear.
Study Design: Retrospective case series.
Setting: Tertiary referral center.
Patients: Four patients with lesions of the IAC and CPA who were deaf on the side opposite of the lesion. Two patients had vestibular schwannoma (VS) and one each meningioma and progressive osseous stenosis of the IAC. The opposite ear was deaf due to 4 different causes: VS (Neurofibromatosis Type 2), sudden SNHL, otosclerosis, idiopathic IAC stenosis.
Intervention(s): Middle fossa removal of VS in 2; retrosigmoid resection of meningioma in 1, and middle fossa IAC osseous decompression in 1.
Main outcome measure: Hearing as measured on pure tone and speech audiometry.
Results: Preoperative hearing was class A in all four patients. Postoperative hearing is class A in three patients and class D in the patient with Neurofibromatosis Type 2.
Conclusions: While the vast majority of neurotologic lesions in an only hearing ear are best managed non-operatively, in highly selected cases surgical intervention is warranted. Surgical intervention should be considered when one or more of the following circumstances is present: 1) Predicted natural history of the disease is relatively rapid loss of the remaining hearing, 2) Substantial brainstem compression has evolved (e.g. large acoustic neuroma) and, 3) Operative intervention may result in improvement of hearing or carries relatively low risk of hearing loss (e.g. CPA meningioma).

ACOUSTIC NEUROMA SURGERY: USE OF COCHLEAR NERVE ACTION POTENTIAL MONITORING FOR HEARING PRESERVATION

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Objectives: Compare the hearing preservation results obtained with use of two intraoperative eighth nerve monitoring methods, cochlear nerve action potential (CNAP) and auditory brainstem response (ABR), during complete acoustic neuroma (AN) resection.
Study Design: Retrospective.
Setting: Tertiary referral center.
Patients: Twenty-two consecutive patients who underwent hearing preservation AN surgery.
Interventions: Intraoperative monitoring by CNAP and/or ABR during AN resection.
Main Outcome Measure: Postoperative hearing. Hearing preservation was considered achieved for pure tone average $\leq$ 50 dB and speech discrimination $\geq$ 50%.
Results: Twenty-one patients met inclusion criteria for the study. Monitoring was successfully performed in 14 of 15 patients (93%) who underwent attempted CNAP monitoring and seven of 17 (41%) who underwent attempted ABR monitoring. When tumor size was $\leq$ 20 mm in greatest dimension, hearing preservation was achieved in eight of 11 patients (73%) monitored with CNAP, versus two of six patients (33%) not monitored with CNAP ($p = 0.12$). ABR monitoring did not improve hearing preservation rates compared to those not monitored with ABR (50% versus 64%). At the completion of surgery, the presence or absence of CNAP predicted the presence or absence of hearing preservation in 12 of 14 cases (86%), whereas ABR successfully predicted hearing results in seven of seven cases (100%).
Conclusions: When comparing CNAP and ABR monitoring techniques during AN surgery, CNAP was more frequently obtainable. CNAP monitoring was associated with a higher chance of hearing preservation. ABR monitoring did not have a positive influence on hearing preservation results. Both ABR and CNAP were useful for predicting postoperative hearing.

29.

AUDIOMETRIC FINDINGS IN ACOUSTIC NEUROMA PATIENTS

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Objective: Hearing loss remains the most common symptom associated with an acoustic neuroma. This reviews the audiometric findings from over 750 patients who had a surgical procedure between January 1, 1979, and December 31, 1998.
Study design: This is a retrospective study. The preoperative data from the various test frequencies are arranged by range, median, and mean. This is then cross-analyzed against patient age, gender, tumor size, and time of diagnosis by decade. Next the Hearing Classification proposed by the AAO-HNS is used to study these patients. Postoperative audiometric data will be arranged and analyzed in the same way as the preoperative data.
Setting: Tertiary referral center.
Patients: Surgically confirmed acoustic neuroma patients who had no prior surgical or radiosurgical therapy.
Intervention: Surgical removal of an acoustic neuroma.
Main outcome result: Provides possibly the largest and most complete audiometric data from a group of pure acoustic neuroma patients including application of the most widely accepted hearing classification system.
Results: There are preoperative audiometric data from 98 percent of the patients, 84 percent had measurable hearing. Postoperative audiometric data was available from 81 percent of patients. Measurable hearing was present in 20 percent.
Conclusions: Confirms that hearing alteration is almost universal in acoustic neuroma patients. Demonstrates that hearing preservation is possible in a significant number.essential.

SPONTANEOUS INVOLUTION OF ACOUSTIC TUMORS

Charles M. Luetje, M.D.

Objective: To determine spontaneous involution of acoustic tumors in unoperated patients.
Study design: Retrospective study of outcome.
Setting: Private tertiary otology/neurotology referral center.
Patients: Ninety-nine patients with acoustic tumors for whom interval imaging was elected as opposed to surgery, 1983 to present.
Intervention: Interval imaging with computerized axial tomography or magnetic resonance imaging.
Main outcome measure: Occurrence of spontaneous involution of acoustic tumors.
Results: Six patients demonstrated imaging evidence of spontaneous acoustic tumor involution. Age of these patients at diagnosis ranged from 55 to 74 years. Involutional tumor change varied from 3 mm to 15 mm with followup imaging from 5 to 12 ½ years. Twenty-seven percent of the others were lost to followup. Of those who were compliant with imaging followup, though variable, 23 had tumors that remained unchanged and 17 grew (range 1-17 mm; average 5 mm). Five eventually underwent surgery but only 1 for tumor growth. Nine had gamma knife radiotherapy, 6 as primary treatment and 3 because of growth.
Conclusions: Six (8.1%) of 74 patients with acoustic tumors, for whom followup data was available, demonstrated radiographic evidence of spontaneous involution of their acoustic tumors. Followup for these patients ranged from 5 to 12 ½ years.

COCHLEAR ISCHEMIA INDUCED BY CIRCULATING IRON PARTICLES UNDER MAGNETIC CONTROL: AN ANIMAL MODEL FOR SUDDEN HEARING LOSS

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Hypothesis Some cases of sudden hearing loss are a cochlear ischemic event.

Background

Sudden hearing loss (SHL) is a controversial topic for which no definitive practical guidelines exist. Studies employing agents directed at improving cochlear blood flow have shown no improvement over the rate of spontaneous recovery. At present, there is insufficient evidence to support medical treatment for SHL, except steroid therapy in select patients. Distortion product otoacoustic emissions (DPOAEs) are sensitive to cochlear disorders, are absent in ischemic injury to the cochlea, but can persist in cochlear neuritis. In a previous study, we have shown that patients who present with SHL and have measurable emissions are much more likely to recover hearing than patients who do not. The underlying cause for the loss of emissions is uncertain, but is believed to be secondary to cochlear ischemia.

Methods

In an effort to explain this loss, an animal model of cochlear ischemia was created. Six rabbits underwent unilateral cochlear embolization through the use of circulating iron particles under magnetic control. Cochlear function was monitored through the measurement of DPOAEs.

Results

A rapid decrease in emissions was noted which fluctuated but largely resolved with return to baseline within two hours to one week after embolization leaving no measurable residual defects. Higher doses of iron with a stronger magnetic field led to the elimination of DPOAEs within three hours.

Conclusion

The mechanism of sudden hearing loss may be an ischemic phenomenon and may be acutely reversible.

32.

HEARING PROBLEMS IN MEXICAN AMERICAN ELDERLY

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Objective: To investigate hearing problems in a cohort of elderly Mexican Americans.
Study Design: A longitudinal field study of a cohort of 3, 049 elderly subjects with in-person baseline and a 2 year follow-up. Population-based cross-sectional data were analyzed.
Settings and Subjects: Hispanic EPESE (Established Populations for Epidemiologic Studies of the Elderly) consisting of Mexican Americans aged 65 and over were selected and interviewed to provide basic health data using area probability sampling from the five Southwestern states during 1993-94.
Main Outcome Measures: Information was collected on demographics, basic health data, histories of certain medical conditions, smoking, alcohol consumption, and several medical assessments. Hearing data were collected by a trained interviewer-administered questionnaire regarding self-perceived hearing problems, including hearing aid use, not hearing a normal voice. Hearing problems were defined as a positive response to any of the self-perceived hearing problem questions.
Results: A hearing problem was identified in 32% of this cohort (986/3,049). There was a significant increase in the prevalence of hearing problems with increasing age (26%, age group 65-74 years; 40%, age group 75-84 years; 60%, age group 85+ years). Statistical analysis using a multiple logistic regression model was performed to identify factors associated with hearing problems. Age (odds ratio: OR=1.08, p=0.0001), gender (men, OR=1.29, p=0.01), smoking (OR=1.25, p=0.03), alcohol consumption (OR=1.55, p=0.0001), and hypertension (OR=1.41, p=0.0002) were statistically significantly associated with hearing problems. No interaction was significant.
Conclusions: An overall prevalence rate of 32% for hearing problems in the Mexican American elderly population was found. Age, gender (men), alcohol consumption, smoking, and hypertension were identified as potential risk factors.

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PROFOUND HEARING LOSS ASSOCIATED WITH HYDROCODONE ABUSE

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Objectives: To describe profound hearing loss associated with hydrocodone overuse and the successful rehabilitation of these patients with cochlear implantation.
Study Design: This is a retrospective review.
Setting: A tertiary otologic referral center.
Patients: Six patients presenting with rapidly progressive hearing loss and a concurrent history of hydrocodone overuse.
Interventions: Comprehensive medical histories, physical findings, audiometric tests and, in those cases undergoing cochlear implantation, post-implantion performance data were reviewed.
Main Outcome Measures: Clinical characteristics of hydrocodone related hearing loss and open set word and sentence performance in those patients undergoing cochlear implantation.
Results: Hydrocodone overuse was associated with rapidly progressive sensorineural hearing loss in six patients. In three patients the initial presentation was unilateral. None of the patients experienced vestibular symptoms and none responded to prednisone therapy. The four patients undergoing cochlear implantation have demonstrated early success with their devices.
Conclusions: Hydrocodone is frequently prescribed in combination with acetaminophen for the relief of pain with a side-effects profile similar to other medications in its class. Although not described previously, overuse or abuse can be associated with a rapidly progressive bilateral sensorineural hearing loss. These patients can be successfully rehabilitated with cochlear implantation.

CHILD AND FAMILY FACTORS ASSOCIATED WITH DEAF CHILDREN' S SUCCESS IN AUDITORY-VERBAL THERAPY

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Colleen M. O'Rourke, Ph.D.

Objective: The objective of this study was to delineate those factors which related significantly to continuation and success in a specific therapy option available to children who are deaf or hard of hearing (D/HH).
Study Design: The type of study was a current and retrospective case review combined with face-to-face or telephone interviews.
Setting: The setting was a tertiary referral center, specifically, an Auditory-Verbal center.
Patients: 80 + clients and their families, who attended the center for at least one year beginning with the academic year 86-87 and ending with the academic year 95-96, were included.
Intervention. All subjects received Auditory-Verbal therapy (Goldberg, 1993), a therapeutic, habilitative approach to developing listening and language skills in D/HH children.
Main Outcome Measures: Main outcome measures include: 1) Extensive parent interview to discern family involvement, 2) LEITER-R Parent Rating Form- A non-verbal measure of child traits, 3) Likert-Type Attitude Scale- A descriptive measure of parental opinion of therapy characteristics, and 4) age/language gap upon exiting program.
Results: Preliminary examination of the first third of the data tend to show that specific family traits (e.g., proximity to therapy services), maternal traits (e.g., amount of time working outside the home), and child traits (e.g., presence of additional learning disorders) may influence continuation and success in Auditory-Verbal therapy.

Reference

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35.

EXTRATYMPANIC ELECTROCOCHLEOGRAPHY: DIAGNOSTIC AND PREDICTIVE VALUE

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Objective: This study is performed to define the clinical value of extratympanic electrocochleography in the diagnosis and treatment of Meniere's disease.
Study Design: This study is a retrospective case review.
Setting: This study is conducted in a otology-neurotology referral center.
Patients: A group of 247 patients with symptoms consistent with Meniere's disease were examined.
Intervention: All patients underwent extratympanic electrocochleography at the time of initial evaluation and, in several cases, following medical and surgical treatment.
Main outcome measures: audiometric thresholds, summating and action potential ratios.
Results: A statistical analysis will focus upon electrocochleography results correlated with specific symptomatology and disease duration and stage. Follow-up electrocochleography data will be correlated with medical and surgical treatment results as well as subsequent pure tone audiologic findings. Findings will also be correlated with previous and transtympanic studies.
Conclusions: Although extratympanic electrocochleography provides objective evidence of inner ear pathology, statistical significance is lacking in its diagnostic value.

HIGH STIMULUS RATE AUDITORY EVOKED POTENTIALS (ECOG & ABR)

Mohamed A. Hamid, MD, PhD, Hesham M. Sami, MD

Objective: Combined Auditory Brainstem Response (ABR) and Electrocochleography (ECoG) are of clinical value in evaluation of hearing loss.
Study Design: Prospective study.
Setting: Private office.
Intervention: All patients underwent combined ABR and ECoG at 7.1 to 97.1/sec rates.
Patients: Patients with Meniere's disease.
Main outcome measures: Audiometric thresholds, action potentials, ABR waveform, morphology, and latencies.
Results: Results showed the expected increase in SP magnitude and increased AP latencies at high stimulus rates. ECoG AP waveform was preserved at higher stimulus rate allowing for accurate determination of wave I in the corresponding ABR signal.
Conclusion: These results demonstrate that combined ABR and ECoG recording at high stimulus rates saves time and provides more comprehensive auditory information for neurotological diagnosis.

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