Diagnostic Value of Acoustic Reflexes

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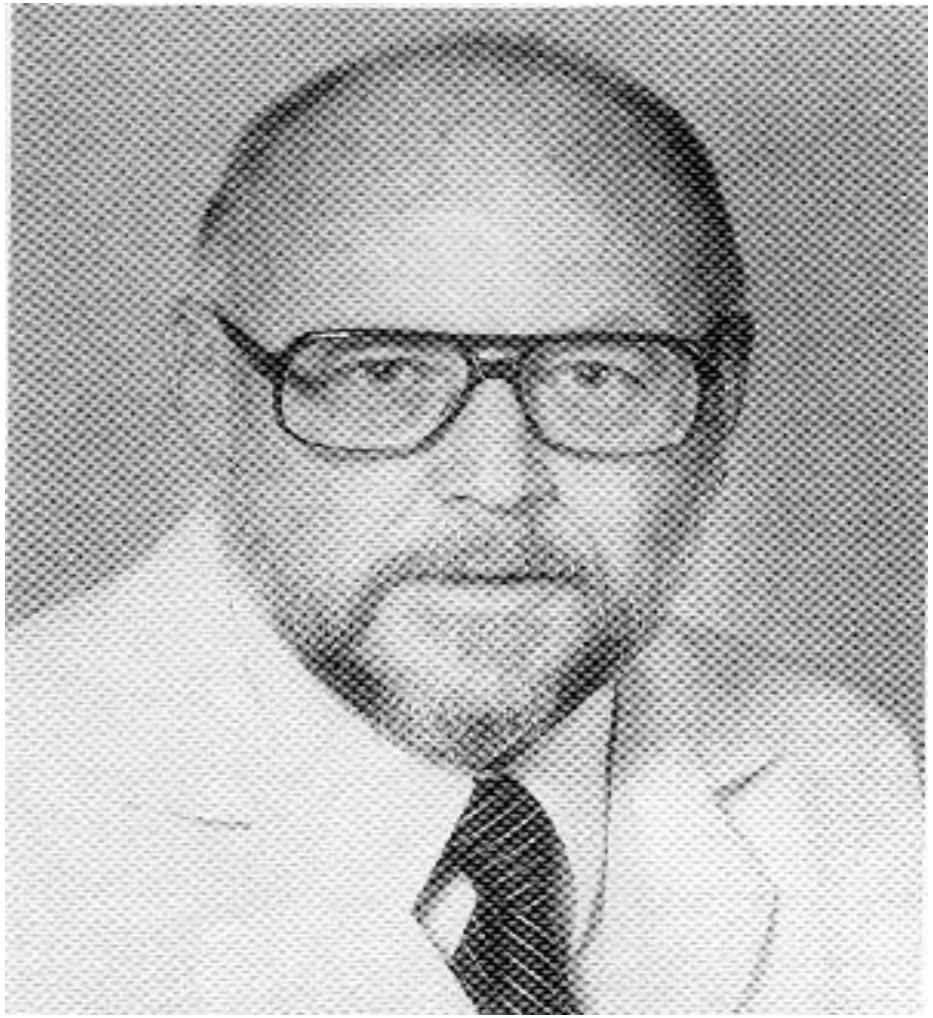
Diagnostic Value of Acoustic Reflexes

- The Long Clinical Tradition with Admittance Measurement
- Acoustic Reflex Measurement is Evidence-Based Practice
- Review of Anatomy and Physiology
- Variety of Acoustic Reflex Measurements
- Clinical Applications of Acoustic Reflexes
- Summary of Advantages of Acoustic Reflexes in Clinical Audiology

James Jerger

Classic Impedance Studies in Early 1970s at Methodist Hospital And Baylor College of Medicine in Houston Texas, USA



Clinical Experience With Impedance Audiometry

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THE development of impedance audiometry during the past decade has added new scope and dimension to clinical audiology. Based on the pioneering efforts of Metz,[1] subsequent workers have refined instrumentation, technique, and interpretation to produce an invaluable tool for differential diagnosis.

The development of contemporary instrumentation for impedance audiometry has, in the main, followed two essentially parallel paths. In the United States, Zwislocki and his colleagues[2-6] developed an electromechanical bridge. In Europe, Thomsen, Terkildsen, Møller, and others,[7-10] pioneered the application of the electroacoustic approach, culminating in the present commercially available electroacoustic bridge.

The present paper reports our clinical experience with the latter instrument based on its routine administration to well over 400 successive patients over a one-year period. Our aim was to assess the efficacy of the electroacoustic approach as a routine clinical procedure and to evaluate its diagnostic value in a typical audiologic case load.

In general we found that the testing procedure was easily mastered, even by audiologically unsophisticated personnel, that valid and meaningful results could be obtained for almost every patient, and that, with certain reservations, the data of impedance audiometry constitute extremely valuable diagnostic information.

Subsequent sections present statistical information when patients are grouped according to age and type of hearing loss, and individual case reports illustrating the diagnostic value of impedance audiometry.

Accepted for publication June 19, 1970.

From the Department of Otolaryngology, Baylor College of Medicine, and the Audio-Vestibular Laboratory, the Methodist Hospital, Houston.

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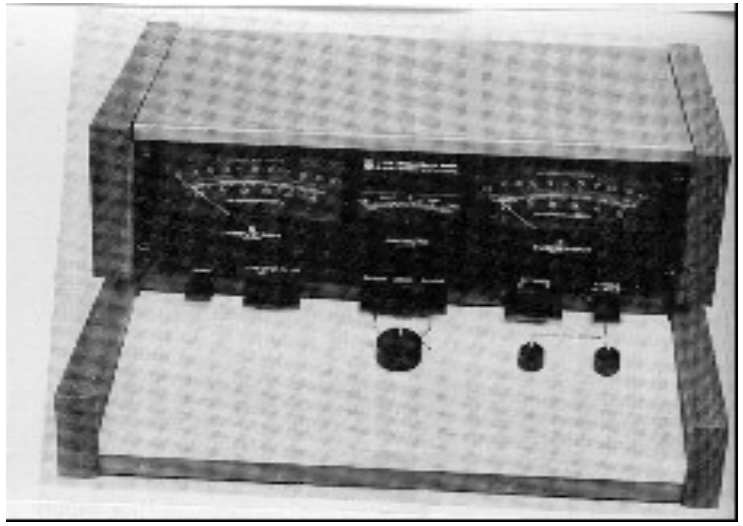
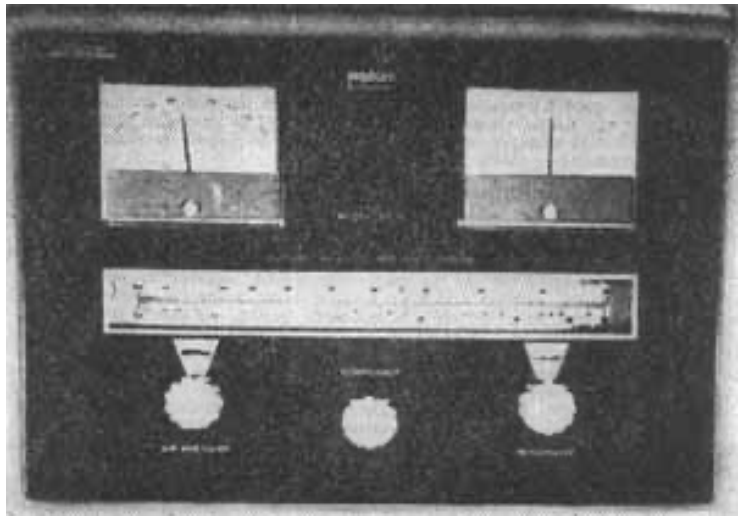
A probe tip containing three tubes is sealed in the external meatus, forming a closed cavity bounded by the inner surface of the probe tip, the walls of the external meatus, and the tympanic membrane. One tube is used to deliver, into this closed cavity, a probe tone generated by a 220-hertz oscillator driving a miniature receiver. The second tube is connected to a miniature probe microphone which monitors the sound pressure level of the 220-Hz probe tone in the closed cavity and delivers the transduced voltage through an amplifier to a bridge circuit and balance meter. The balance meter is nulled by an SPL of exactly 95 dB in the closed cavity. A potentiometer on the output of the 220-Hz oscillator permits variation of the SPL over a range corresponding to a compliance variation (equivalent volume) of 0.2 to 5.0 cc. The third tube is connected to an airpump which permits variation in air pressure in the closed cavity over a range of ±400 mm (water). Air pressure is read on an electromanometer.

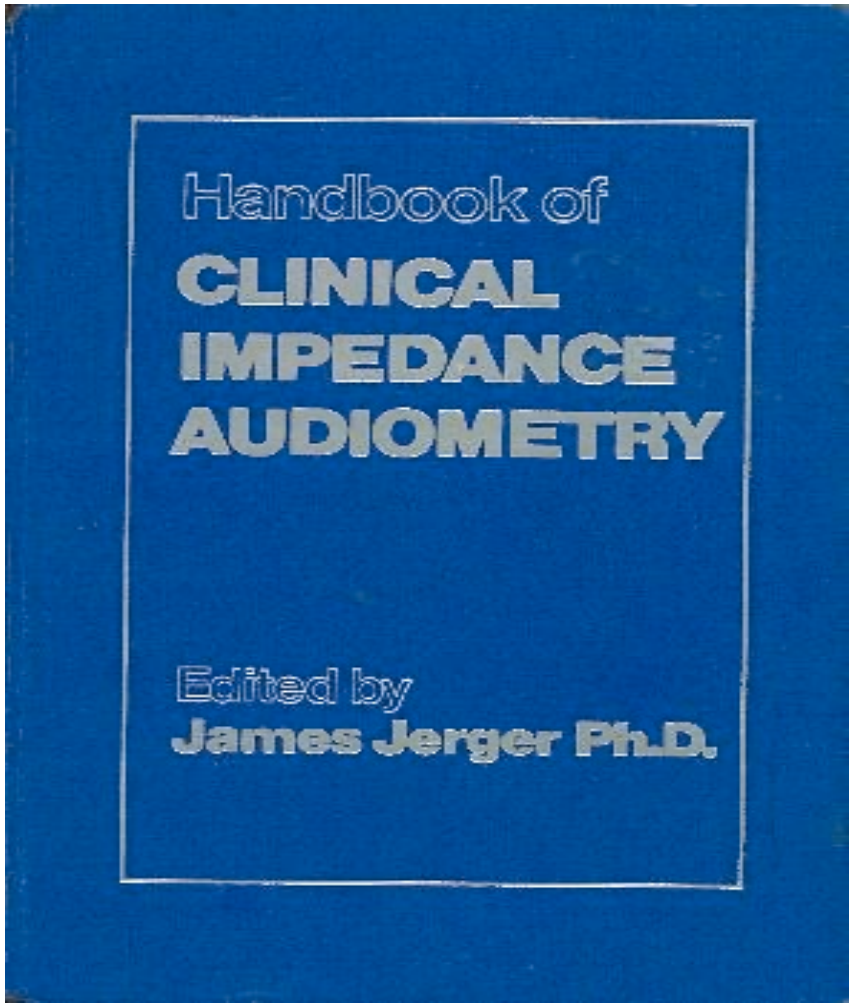
James Jerger
Classic Impedance Studies in Early 1970s at Methodist Hospital And Baylor College of Medicine in Houston Texas, USA



GSI 1720



Madsen
ZO 70

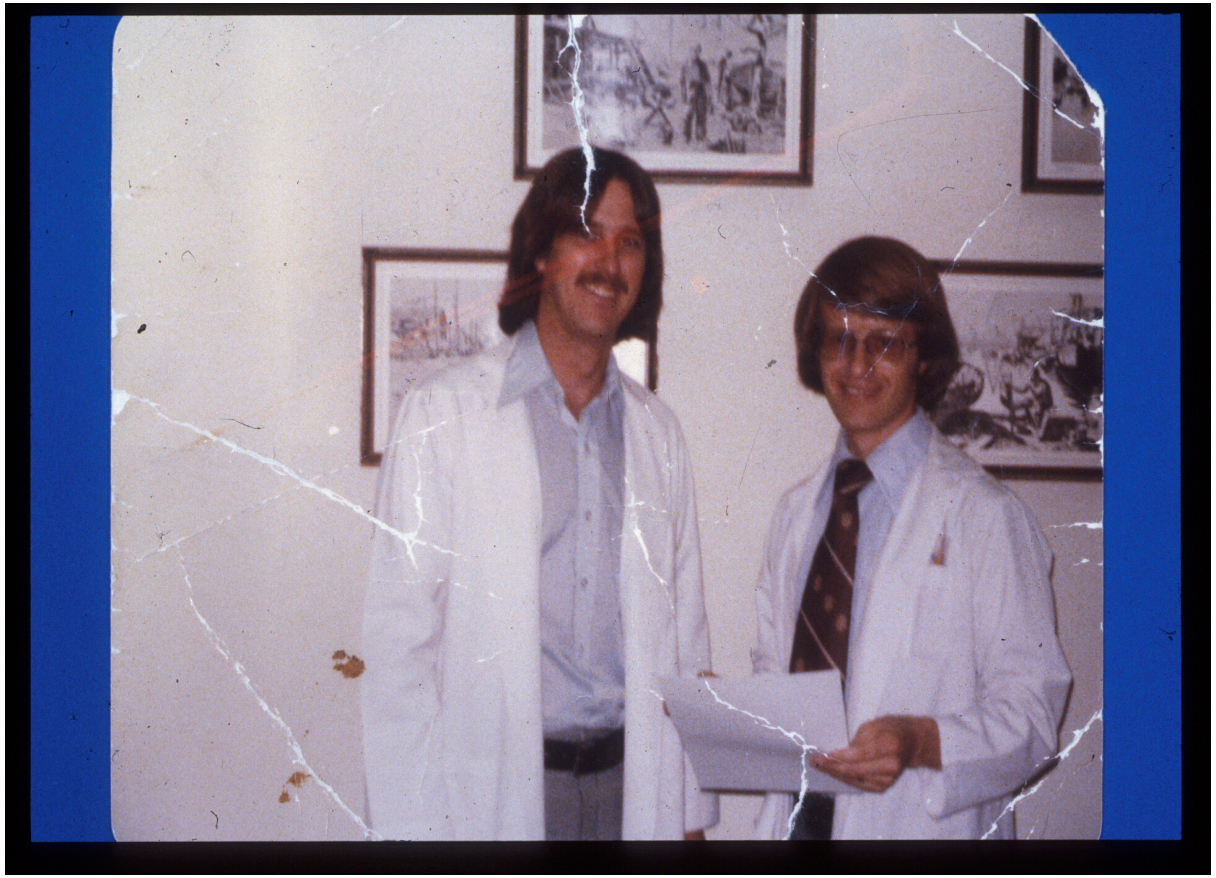


1975

James Jerger Generates Research Evidence In Support of Admittance Measurements

- Jerger JW (1970). Clinical experience with impedance audiometry. *Arch Otolaryngol, 92*, 311-324
- Jerger, J., Jerger, S., Mauldin, L. Studies in impedance audiometry. I. Normal and sensori-neural ears. *Arch Otolaryngol* 96:513-523, 1972.
- Jerger, S., Jerger, J., Mauldin, L., Segal, P. Studies in impedance audiometry. II. Children below six years. *Arch Otolaryngol* 99:1-9, 1974.
- Jerger, J., Anthony, L., Jerger, S., Mauldin, L. Studies in impedance audiometry. III. Middle ear disorders. *Arch Otolaryngol* 99:165-171, 1974.

Acoustic Immittance Measurement: My First Clinical Activity at Baylor College of Medicine (Houston Texas)



With Larry Mauldin (circa 1975)

ACOUSTIC REFLEX AMPLITUDE IN
AUDITORY DYSFUNCTION

A Dissertation Submitted to the Faculty of
The Graduate School
Baylor College of Medicine

In Partial Fulfillment of the
Requirements for the Degree
of

Doctor of Philosophy

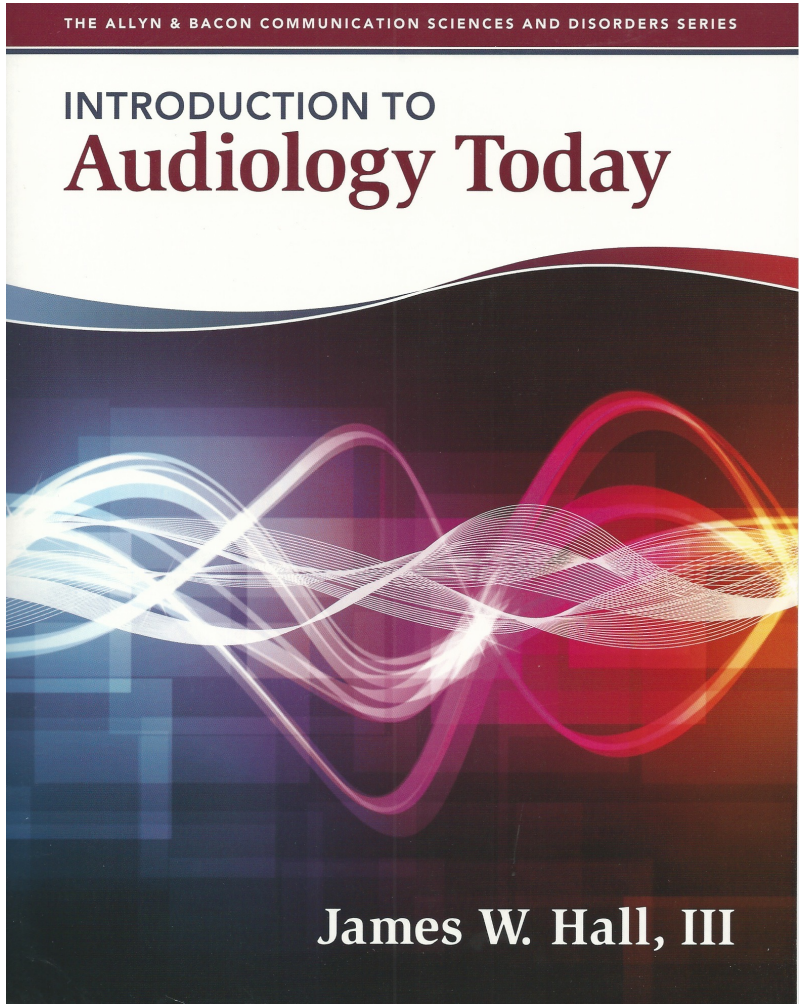
by

JAMES W. HALL III

Houston, Texas
August 3, 1979

Published Articles Based on PhD Dissertation (Plus 30+ Additional Publications on Acoustic Reflex)

- Hall JW III. Acoustic reflex amplitude: I. Effect of age and sex. *Audiology (Basel) 21:* 294-309, 1982
- Hall JW III. Acoustic reflex amplitude: II. Effect of age-related auditory dysfunction. *Audiology (Basel) 21:* 386-399, 1982
- Hall JW III. Quantification of the relationship between crossed and uncrossed acoustic reflex amplitude. *Ear and Hearing 3:* 296-300, 1982



Diagnostic Value of Acoustic Reflexes : *Historical Perspective (1)*

- Luscher (1929). First observed acoustic reflex
- Jepsen (1951). Confirmed stapedius muscle acoustic reflex
- Klockhoff (1961). Early clinical study of acoustic reflexes
- James Jerger (1970). Applied electro-acoustic impedance device clinically in U.S.A.
- Anderson, Barr & Wedenberg (1970). Early detection of 8th nerve tumors with acoustic reflex
- Neimeyer & Sesterhenn (1974). Estimating hearing threshold with acoustic refex
- Jerger et al (1974) Sensitivity Prediction by Acoustic Reflex (SPAR)
- Keith (1975) Acoustic reflex in neonates
- Jerger & Hayes (1976) Crosscheck principle in pediatric audiology

Diagnostic Value of Acoustic Reflexes

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Evidence-Based Practice and Best Practices in Audiology

Sackett's definition of evidence-based medicine adapted to audiology:

… the conscientious, explicit, and judicious use of current best evidence in making decisions about the care of individual patients with hearing loss and related disorders. The practice of evidence based audiology means integrating individual clinical expertise with the best available external clinical evidence from systematic research."

David L. Sackett, MD

"Father of Evidence-Based Practice"

Acoustic Reflex Measurements:
Substantial Research and Clinical Evidence

2/14/2020 acoustic stapedial reflex - PubMed - NCBI

PubMed | acoustic stapedial reflex

Format: Summary **Sort by**: Most Recent **Per page**: 20

Best matches for acoustic stapedial reflex:

[The application of **acoustic stapedial reflex** in hearing screening of infants].
Yang FL et al. Lin Chung Er Bi Yan Hou Tou Jing Wai Ke Za Zhi. (2016)

Measurement of the Electrically Evoked **Stapedial Reflex** Response with Wideband **Acoustic** Reflectance Measurement.
Wolfe J et al. J Am Acad Audiol. (2018)

Pressurized Wideband **Acoustic Stapedial Reflex** Thresholds: Normal Development and Relationships to Auditory Function in Infants.
Hunter LL et al. J Assoc Res Otolaryngol. (2017)

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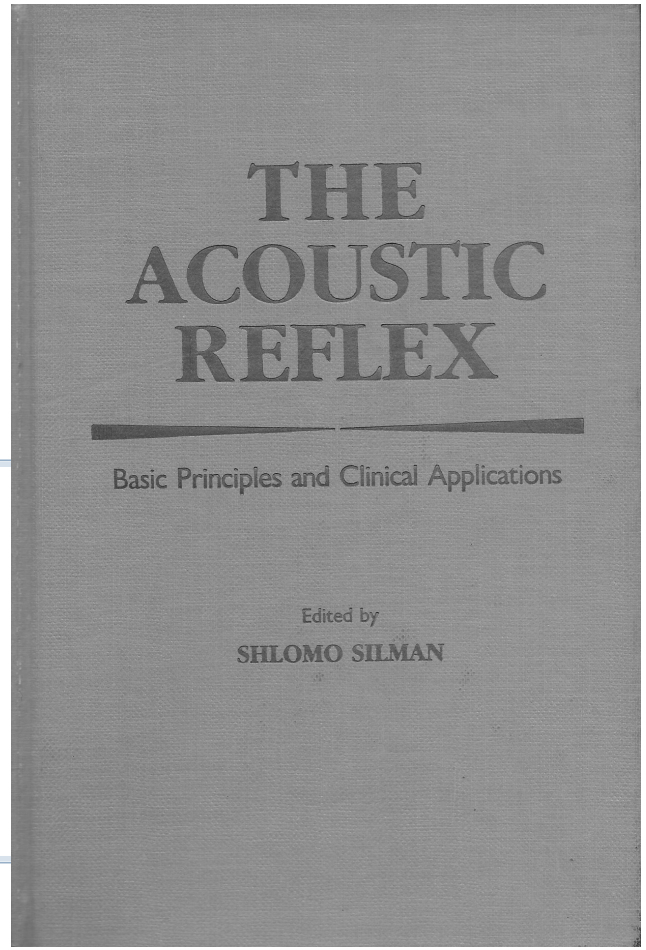
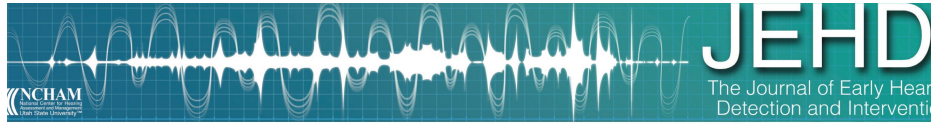


1984

Acoustic Reflex Measurement in Children is Standard of Care



2019; 4(2): 1–44

Year 2019 Position Statement: Principles and Guidelines for Early Hearing Detection and Intervention Programs

The Joint Committee on Infant Hearing

Table of Contents

Abbreviations

AAA – American Academy of Audiology
AABR – Automated Auditory Brainstem Response
AAP – American Academy of Pediatrics
ABA – American Board of Audiology
ABR – Auditory Brainstem Response
AHRQ – Agency for Healthcare Research and Quality
ANSI – American National Standards Institute
ASHA – American Speech-Language-Hearing Association
ASL – American Sign Language
ASSR – Automated Steady-State Response
BOA – Behavioral Observation Audiometry
CART – Communication Access Real-time Translation
CAEP – Cortical Auditory Evoked Potentials
CMV – Cytomegalovirus
cCMV – Congenital Cytomegalovirus
CDC – Centers for Disease Control and Prevention
CE – Click Evoked
CI – Cochlear Implant
dB – Decibel
DEC – Division of Early Childhood
DPOAE – Distortion Product Otoacoustic Emissions
DSL – Desired Sensation Level
ECMO – Extracorpeal Membrane Oxygenation
EHDI – Early Hearing Detection and Intervention
EHDI PALS – Early Hearing Detection & Intervention: Pediatric Audiology Links to Services
HIPAA – Health Insurance Portability and Accountability Act
HL – Hearing Level
HRCT – High Resolution Computed Tomography
HRSA – Health Resources and Services Administration
IDEA – Individual with Disabilities Education Act
IEP – Individualized Education Program
IFSP – Individual Family Service Plan
IOM – Institute of Medicine
ISO – International Organization for Standardization
JCAHO – Joint Commission on Accreditation of Health Care Organizations
JCIH – Joint Committee on Infant Hearing
LTF/LTD – Loss-to-Follow-Up/Loss-to-Documentation
MRI – Magnetic Resonance Imaging
NCHAM – National Center for Hearing Assessment and Management
NICHQ – National Institue for Children's Health Quality
NIDCD – National Institute of Deafness and Communication Disorders
NICU – Neonatal Intensive Care Unit
NIH – National Institutes of Health
NLM – U.S. National Library of Medicine

The key aspects of audiologic assessment for infants and young children are:

- Auditory brainstem response is the gold standard test for threshold estimation for infants and children who cannot complete behavioral audiologic assessment. ABR provides ear- and frequency-specific threshold estimates that are necessary for the diagnosis of the type, degree, and configuration of hearing loss and provision of amplification (Gorga et al., 2006).
- Measures of middle ear function should be completed as part of the diagnostic audiologic process for infants and young children. Either tympanometry or wideband reflectance can be used to characterize middle ear function (Hunter et al., 2013).
- Acoustic reflexes are an important test of middle ear function and the integrity of auditory brainstem path ways (de Lyra-Silva et al., 2015).

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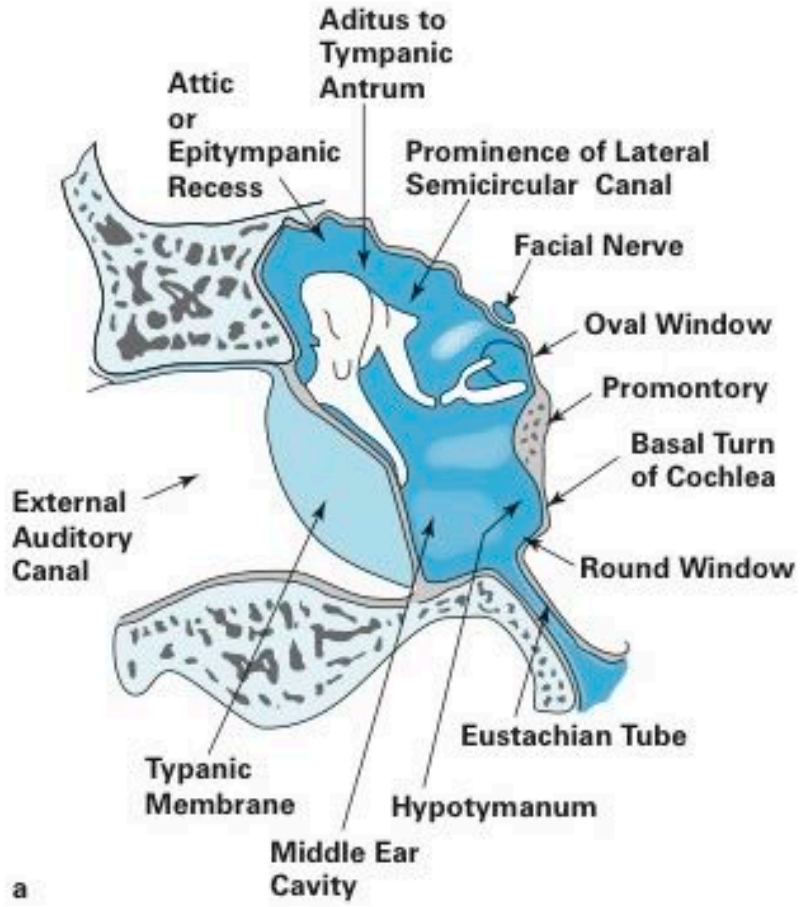
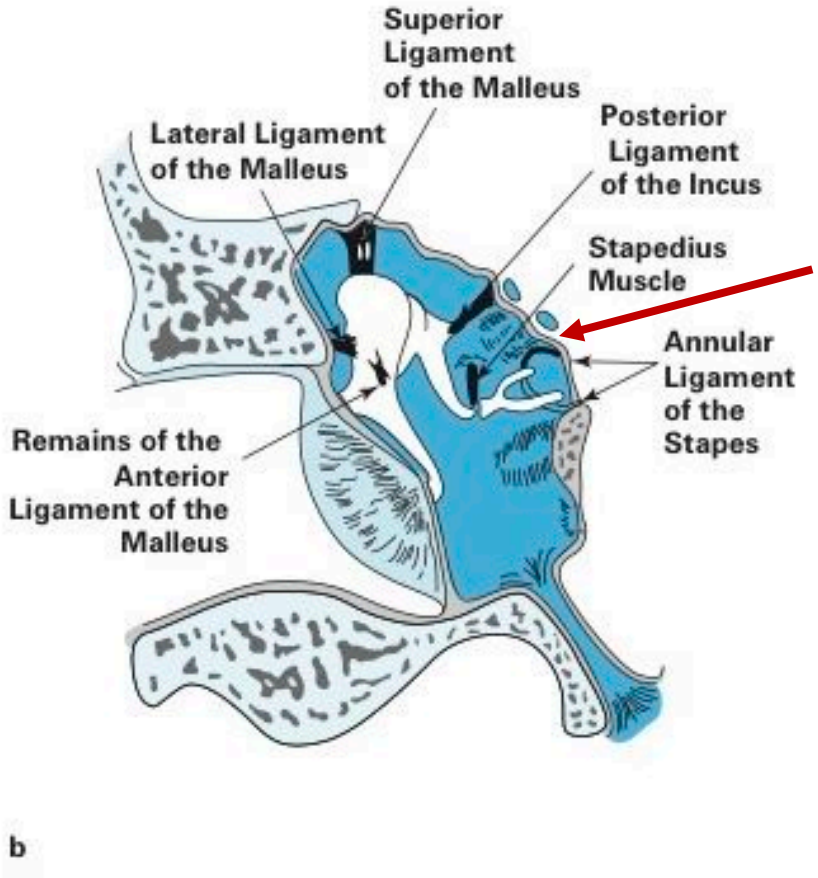
Middle Ear Muscles

(From Hall JW III (2014). *Introduction to Audiology Today*. Boston: Pearson)





Diagnostic Value of Acoustic Reflexes
Middle Ear Muscles: Stapedius Muscle

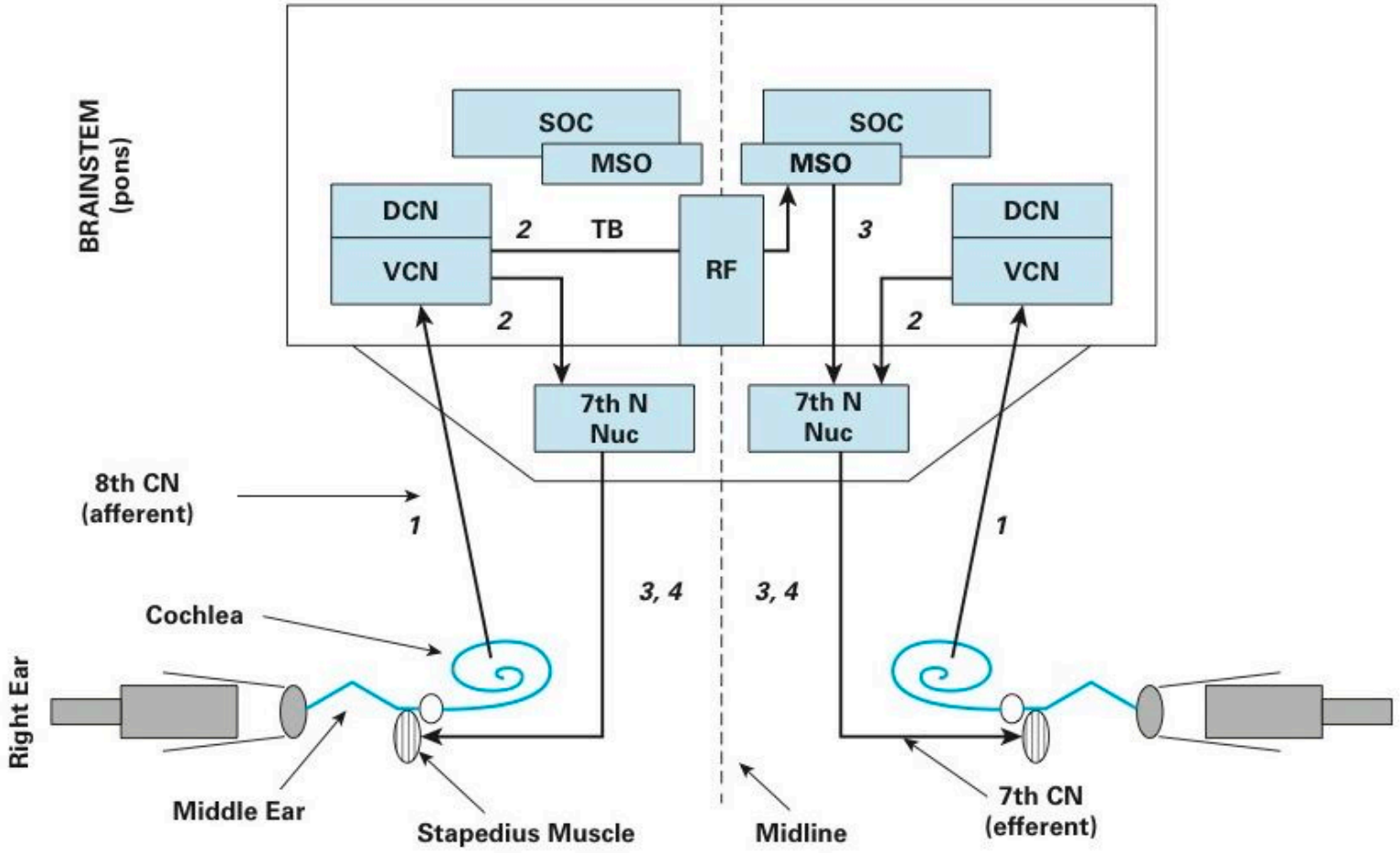
- Small striated muscle (smallest in the body)
- Located in a canal posterior to tympanic cavity
- Attached at one end to the canal and the other to the neck of the stapes
- Innervated by a branch of the 7th (facial) cranial nerve
- Acoustic reflex is a consensual senomotor reflex (unilateral stimulus bilateral motor response to sound stimulation)
- Stimulated in various ways including
  - Acoustic reflex by sounds of about 85 dB HL
  - Gentle tactile stimulation of outer ear
  - Electrical stimulation of ear canal wall
  - Voluntary contraction (can you wiggle your ears?)

Diagnostic Value of Acoustic Reflexes
Middle Ear Muscles: Tensor Tympani Muscle

- Striated muscle
- Located in a small canal above the auditory canal
- Attached at one end to the walls of the canal and the other to the manubrium of the malleus
- Innervated by mandibular branch of the 5th (trigeminal) cranial nerve
- Contracts as part of general startle response
- Response is usually transient and not repeatable
- May play a role in intermittent tinnitus, e.g., Wescott et al (2013). Tonic tensor tympani syndrome in tinnitius and hyperacusis patients: A multi-clinic prevalence study Noise & Health, 15, 117-128 [Melbourne Australia]

Acoustic Stapedial Reflex Pathways According to Erick Borg

(From Hall JW III (2014). *Introduction to Audiology Today*. Boston: Pearson)



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Diagnostic Value of Acoustic Reflexes
Clinical Instrumentation

- **Estimated ear canal volume**
- **Static admittance (compliance)**
- **Tympanometry**
  - **220 vs. 1000 Hz probe tones for adults vs. neonates**
  - **Multiple admittance components**
  - **Middle ear resonance**
  - **Gradient calculation**
  - **Toynbee and Valsalva procedures**
  - **Fistula test**
- **Acoustic reflexes**
  - **Ipsi - and contralateral conditions**
  - **Tonal and noise stimulation**
  - **Reflex decay**
  - **Reflex amplitude *and latency***

Diagnostic Value of Acoustic Reflexes
A Variety of Measures

- Acoustic threshold (ART) or minimum response level
- Acoustic reflex amplitude
- Acoustic reflex decay
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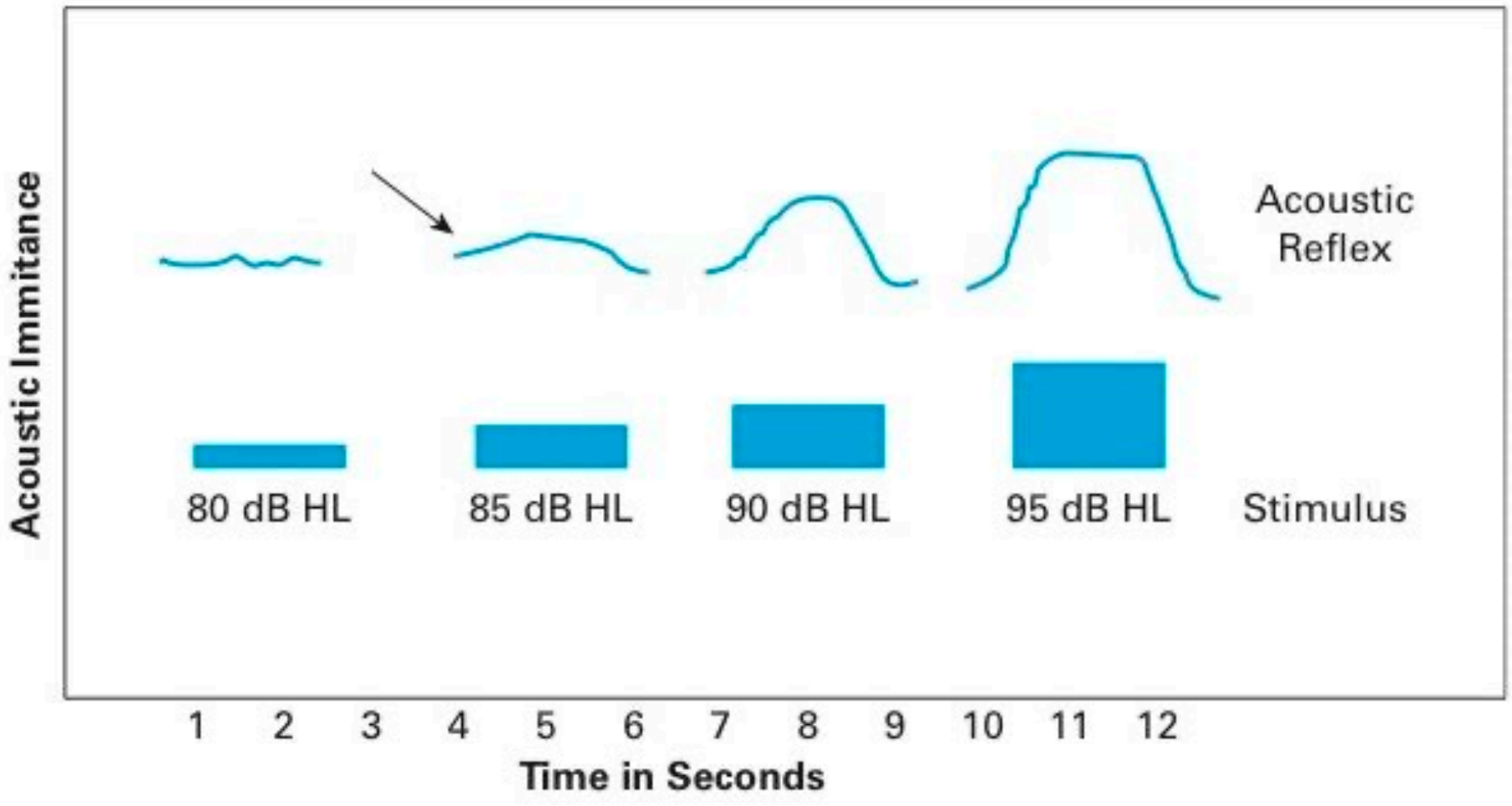
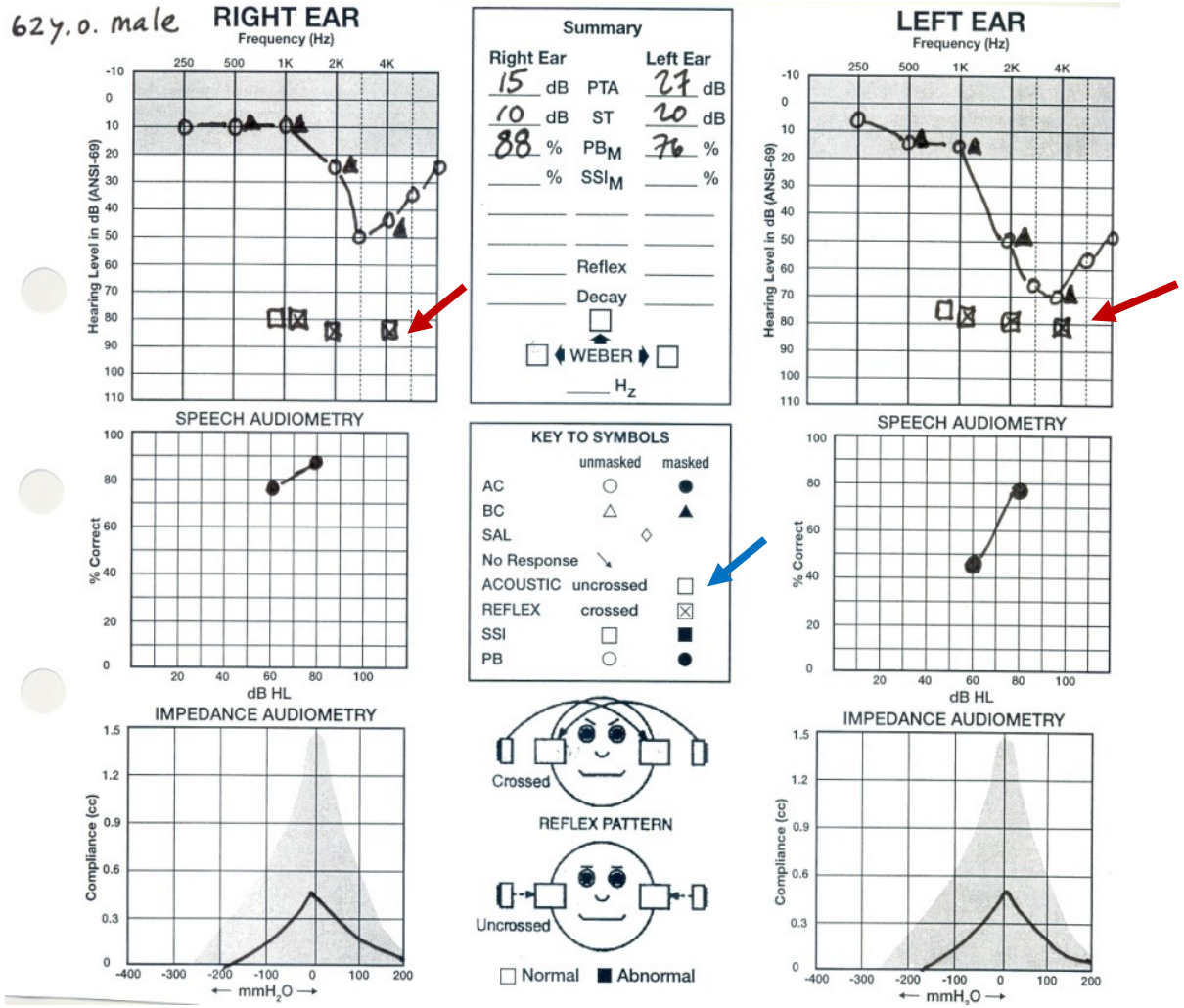
Diagnostic Value of Acoustic Reflexes
Acoustic Reflex Threshold
(From Hall JW III. *Introduction to Audiology Today*. Boston: Pearson, 2014)



Plotting Acoustic Reflex Threshold Results on an Separate Ear Audiogram Form



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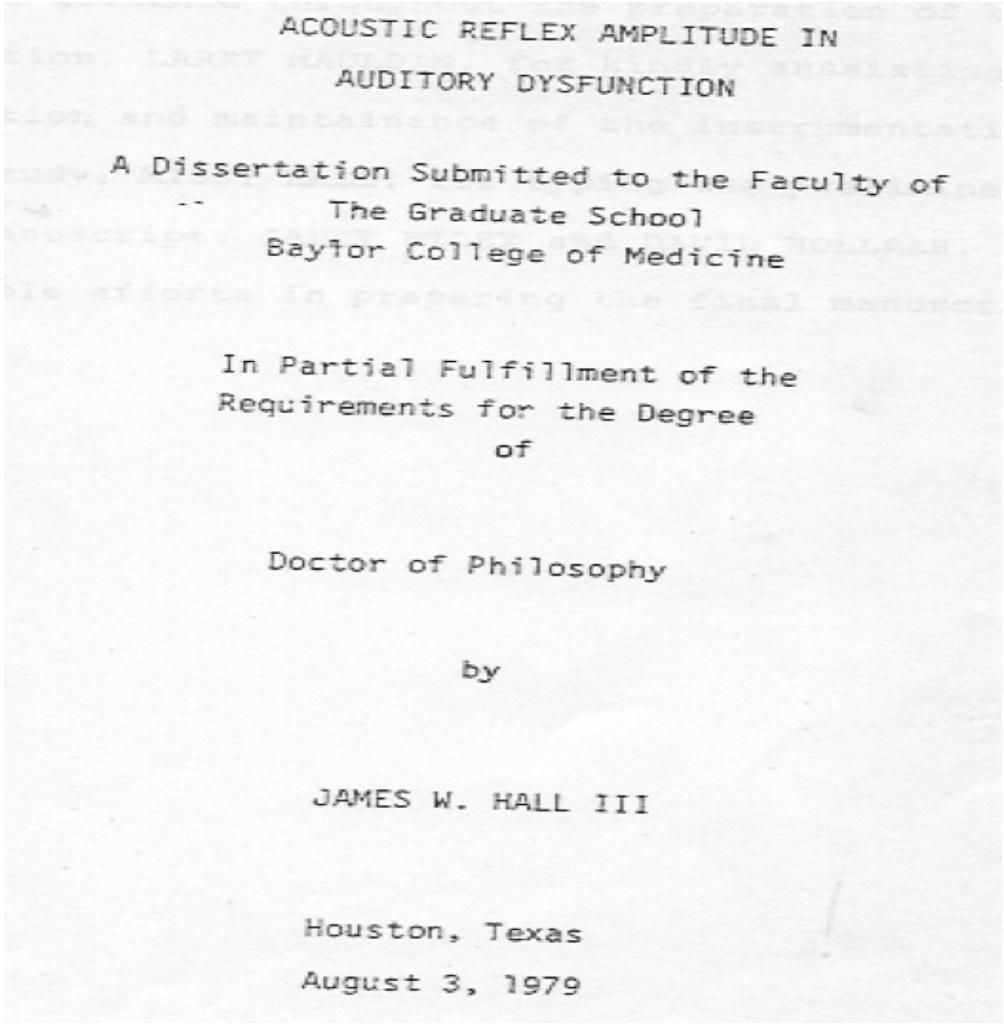

ACOUSTIC REFLEX AMPLITUDE IN
AUDITORY DYSFUNCTION

A Dissertation Submitted to the Faculty of
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Houston, Texas
August 3, 1979

Diagnostic Value of Acoustic Reflexes: *Amplitude in Young Normal Subjects*

(Dissertation: James W. Hall III, 1979)

Advancing Age

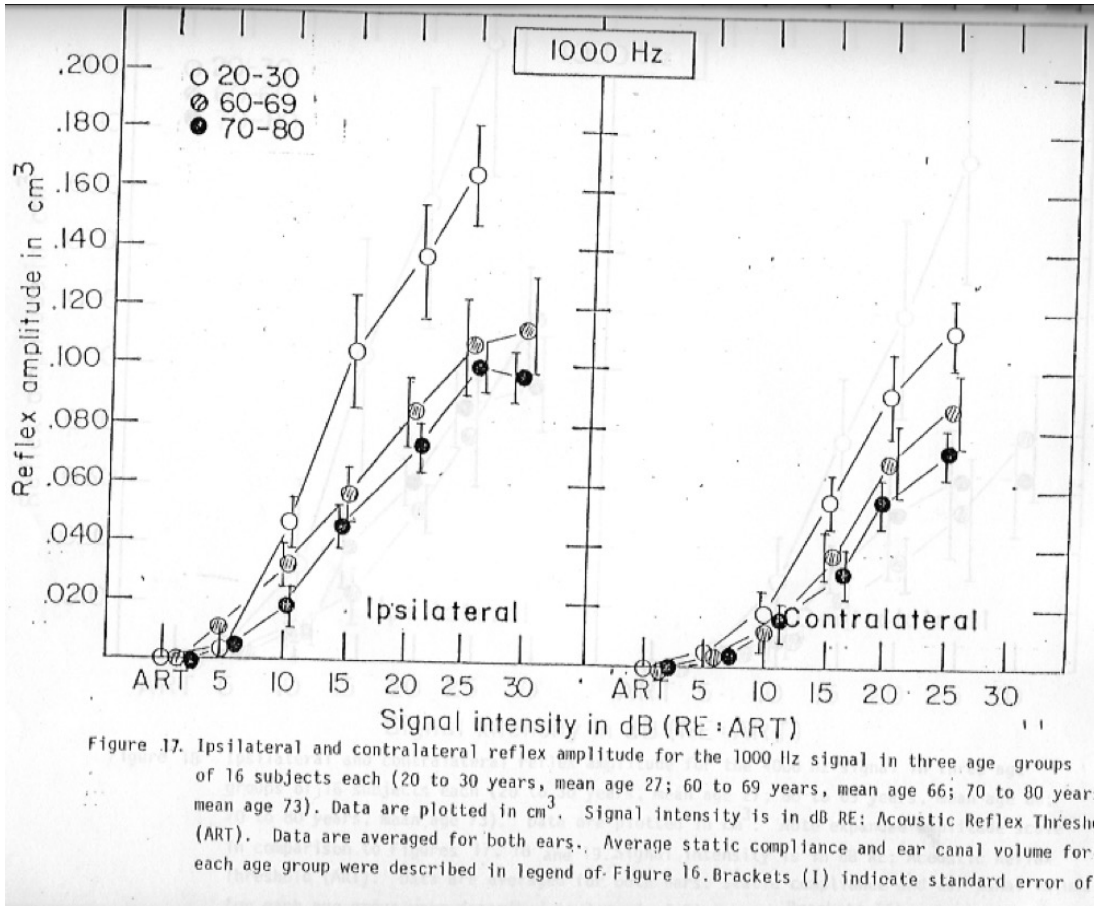

Figure 17. Ipsilateral and contralateral reflex amplitude for the 1000 Hz signal in three age groups of 16 subjects each (20 to 30 years, mean age 27; 60 to 69 years, mean age 66; 70 to 80 year mean age 73). Data are plotted in cm^3. Signal intensity is in dB RE: Acoustic Reflex Thresh (ART). Data are averaged for both ears. Average static compliance and ear canal volume for each age group were described in legend of Figure 16. Brackets (I) indicate standard error of

Central Auditory Process Disorder

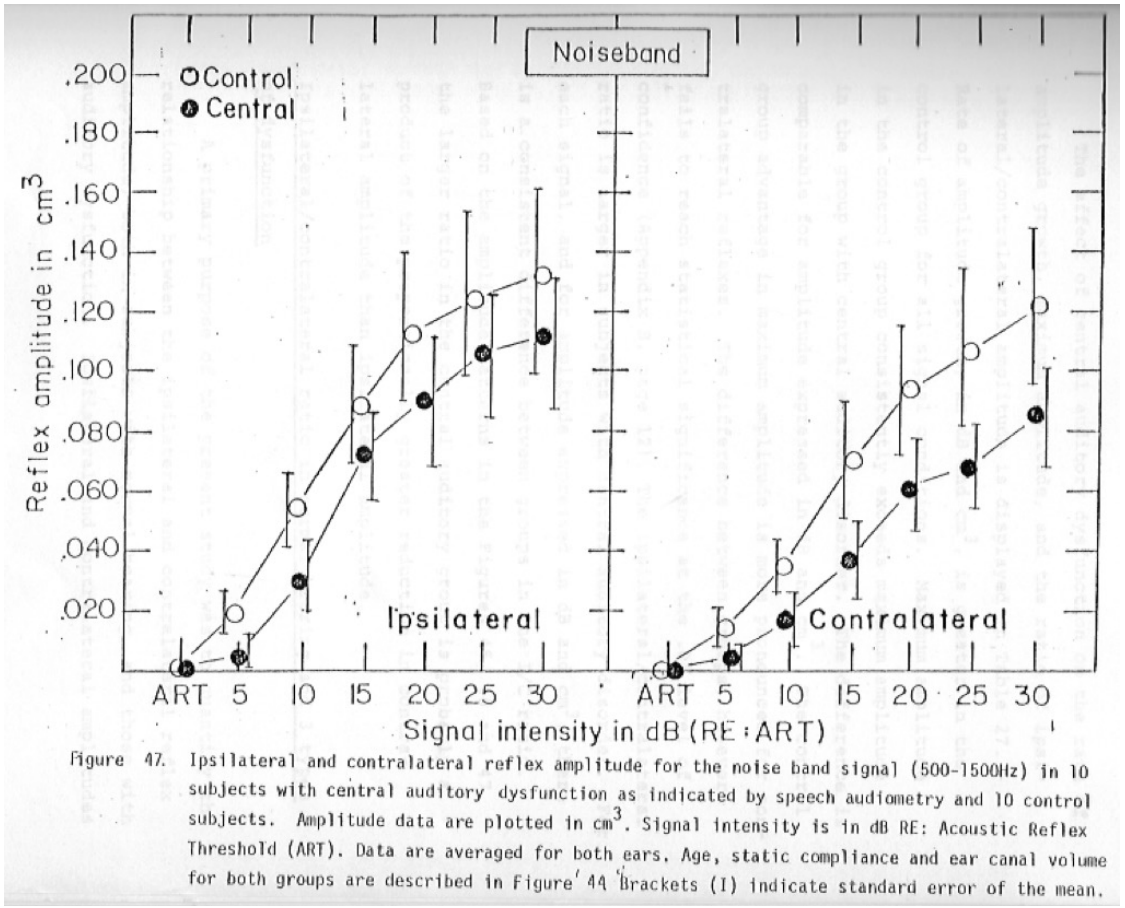

Figure 47. Ipsilateral and contralateral reflex amplitude for the noise band signal (500-1500Hz) in 10 subjects with central auditory dysfunction as indicated by speech audiometry and 10 control subjects. Amplitude data are plotted in cm^3. Signal intensity is in dB RE: Acoustic Reflex Threshold (ART). Data are averaged for both ears. Age, static compliance and ear canal volume for both groups are described in Figure 44. Brackets (I) indicate standard error of the mean.

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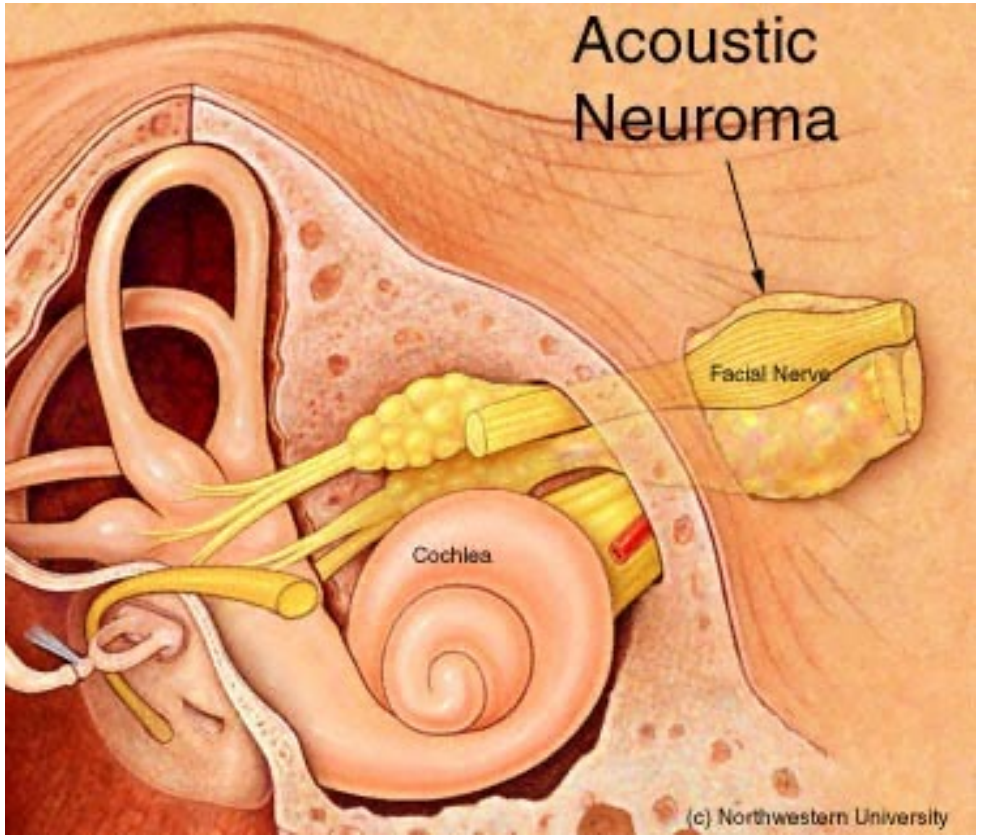
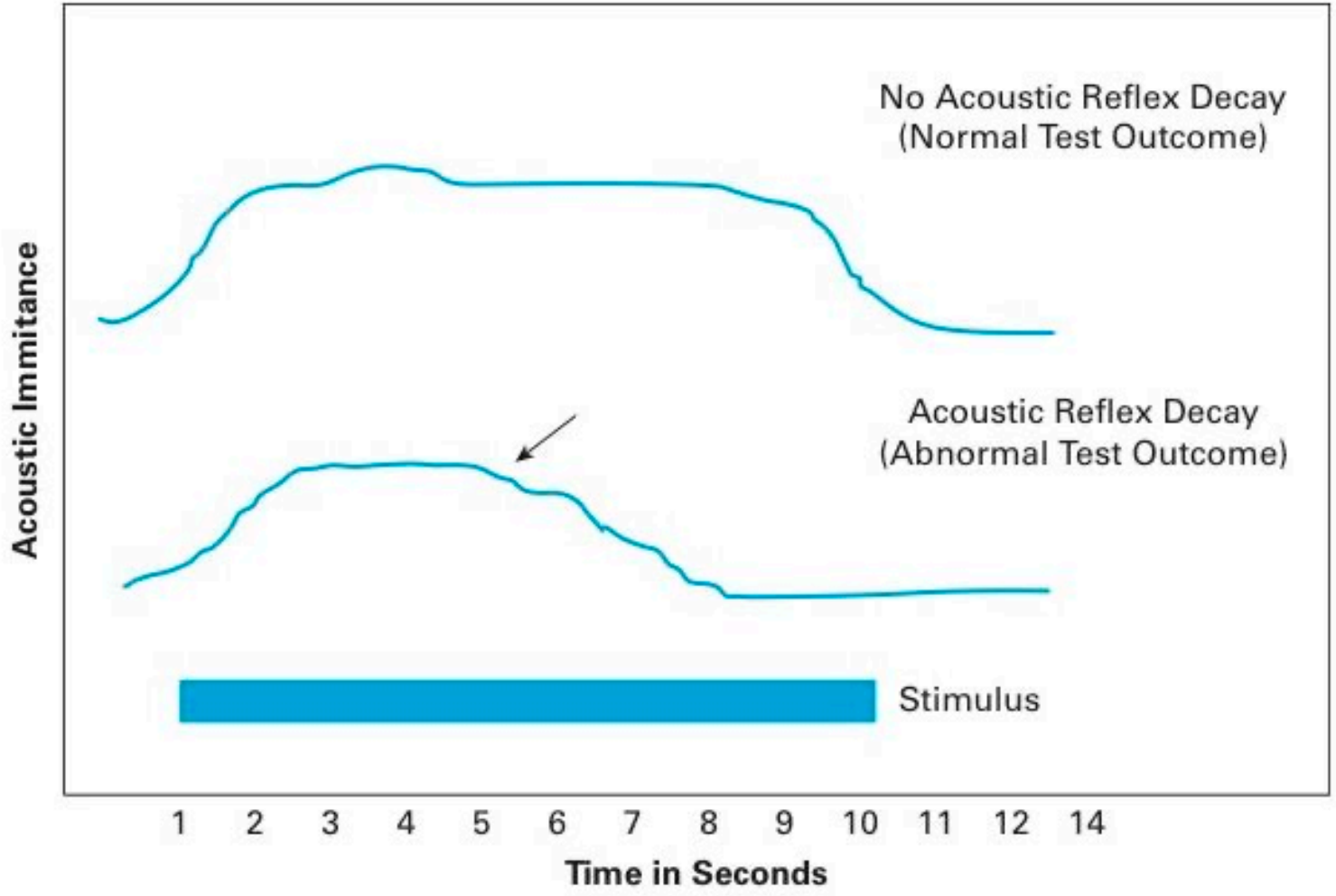
A Variety of Measures

- Acoustic threshold (ART) or minimum response level
- Acoustic reflex amplitude
- Acoustic reflex decay
  - Anderson H, Barr B & Wedenberg E (1970). Early diagosis of VIIIth nerve tumours by acoustic reflex tests. *Acta Oto-laryngologica, 69*, 232-237
  - Olsen WO, Noffsinger D & Kurdziel S (1975). Acoustic reflex and reflex decay: Occurrence in patients with cochlear and eighth nerve lesions. *Archives of Otolarynoglogy-HNS, 101,* 622-625
- Acoustic reflex latency



Acoustic Reflex Decay: Normal versus Abnormal Patterns

(From Hall JW III. *Introduction to Audiology Today*. Boston: Pearson, 2014)



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Norris TW, Stelmachowitz P, Bowling G & Taylor D (1974). Latency measures of the acoustic reflex. *Audiology, 13,* 464-469

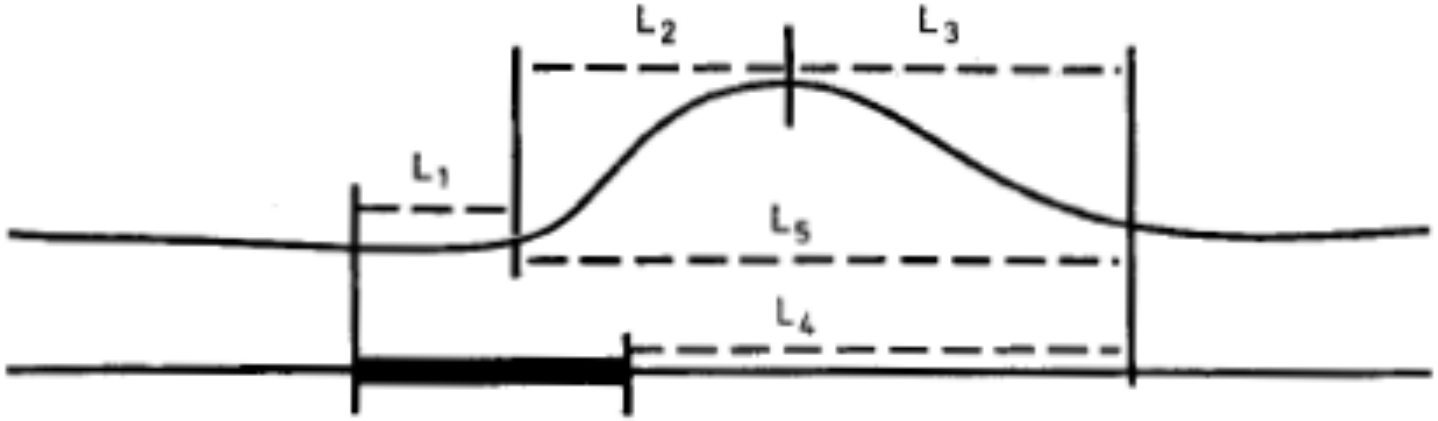


Fig. 1. Measurement technique.

	L_1	L_2	L_3	L_4	L_5
Normal group	129.1	245.2	282.2	395.2	527.4
Sensorineural group	136.5	294.3	595.2	753.9	889.6

Data from "Old" Literature on Acoustic Reflex Latency is Invalid Due to Instrument Limitations

(Up to 400 ms of time constant delays)

GSI 1723
(1977 Vintage)

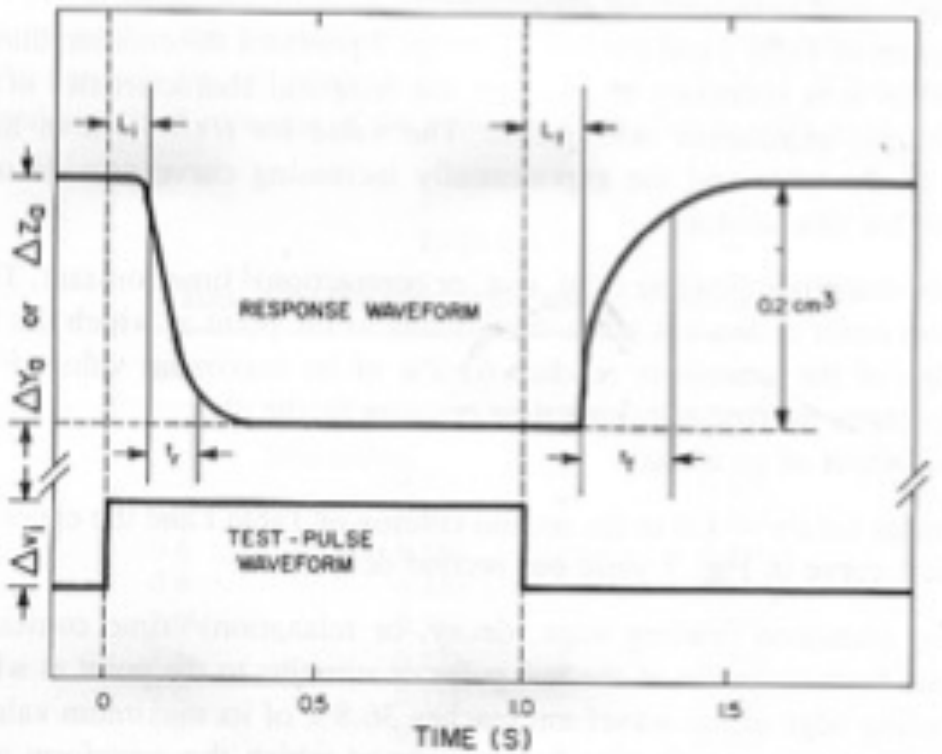
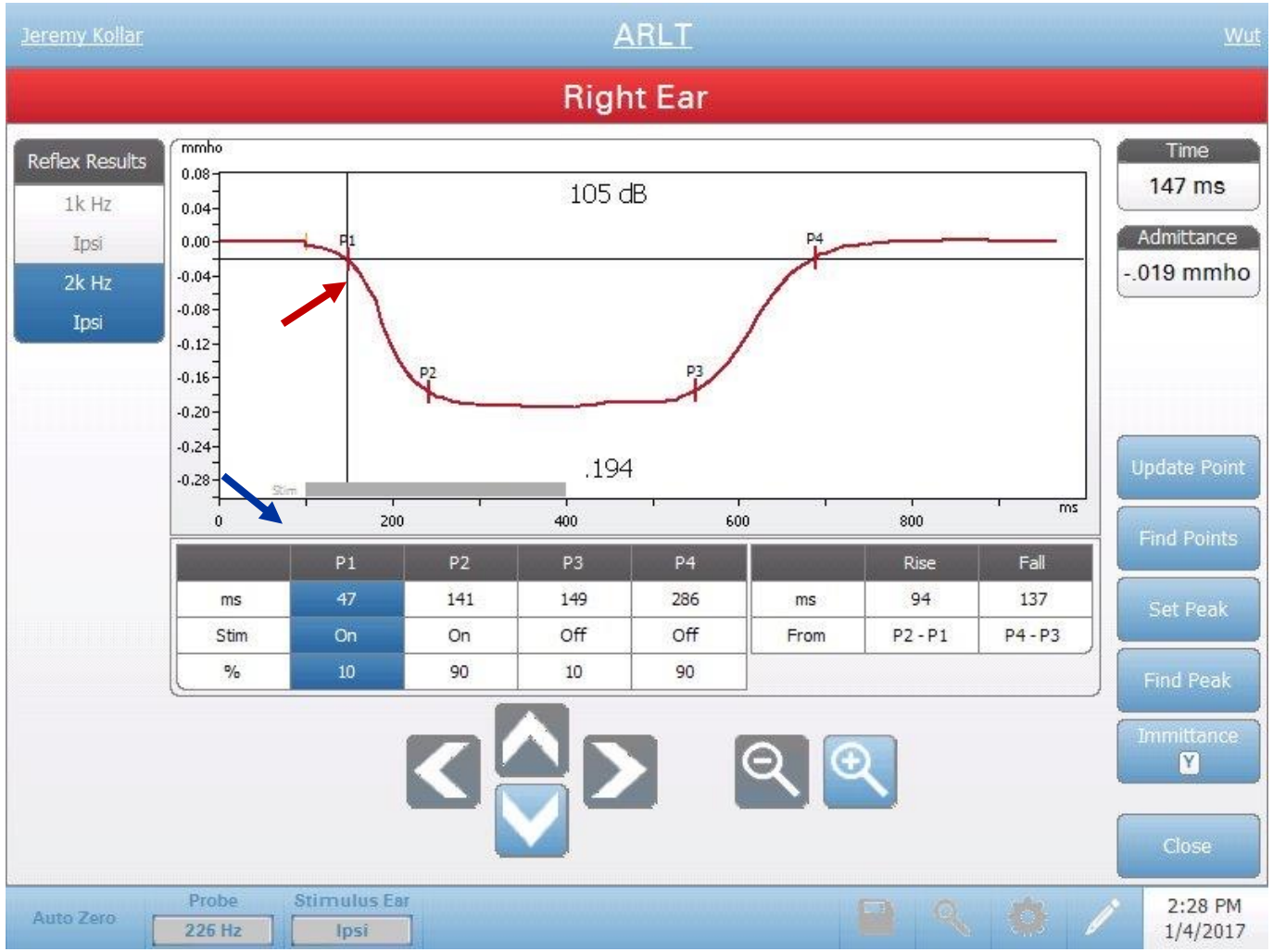


Fig. 8 Analog electrical-output waveform (upper curve) from a commercial acoustic-immittance instrument (Grason Stadler 1723) when procedure suggested by Popelka and Dubno (1978) was used to measure its temporal characteristics. Initial latency L_i, risetime t_r, terminal latency L_t, and falltime t_f are identified. (After ANSI, 1982; Popelka, 1979.)

Acoustic Reflex Measurement: Diagnostically Powerful yet Clinically Underutilized

Accurate Latency Measurement is Now Feasible



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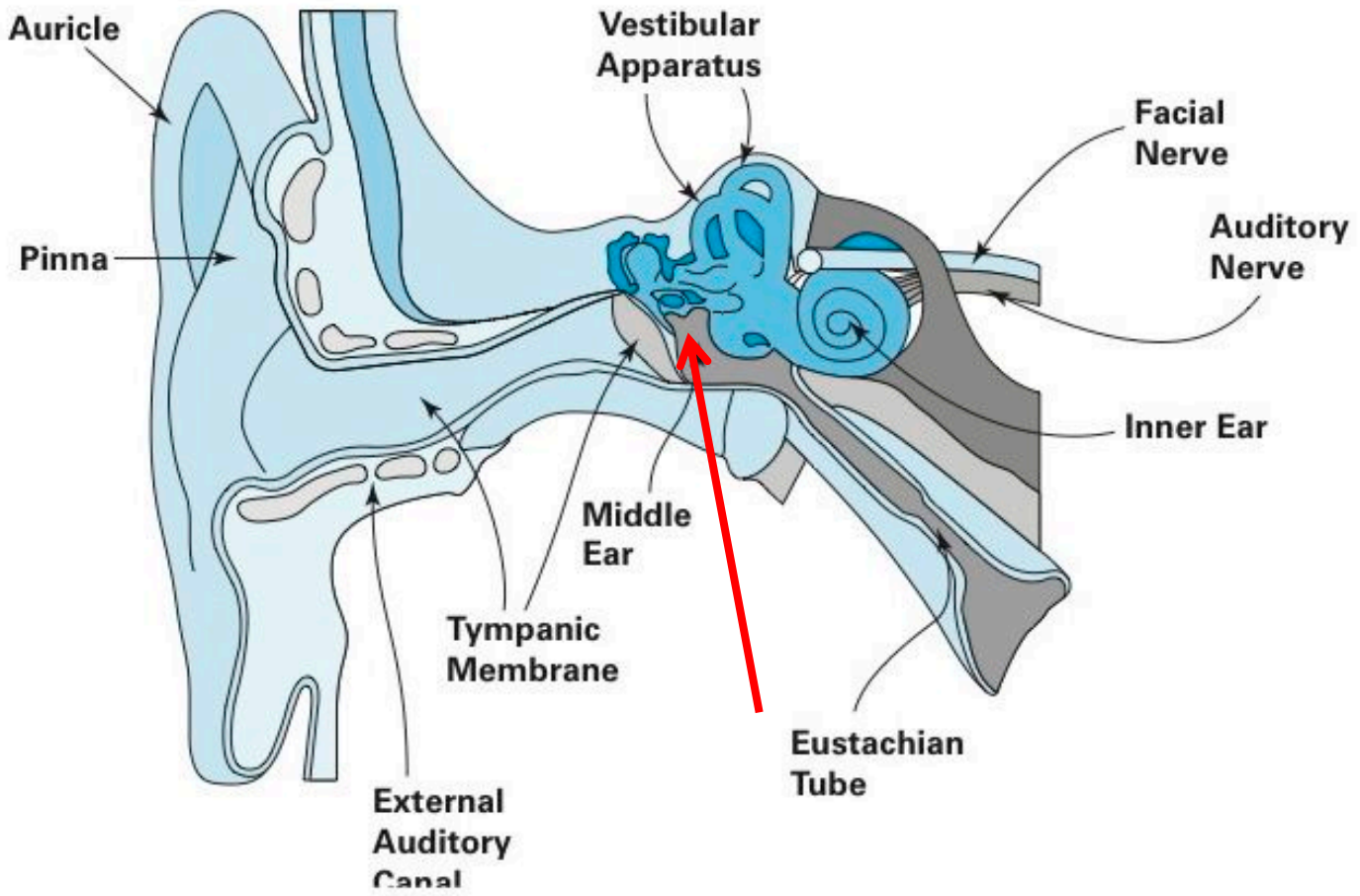
- The Long Clinical Tradition with Admittance Measurement
- Acoustic Reflex Measurement is Evidence-Based Practice
- Review of Anatomy and Physiology
- Variety of Acoustic Reflex Measurements
- Clinical Applications of Acoustic Reflexes
- Summary of Advantages of Acoustic Reflexes in Clinical Audiology

Diagnostic Value of Acoustic Reflexes
Numerous Valuable Clinical Applications

- **Detection of even subtle middle ear dysfunction**
- **Normal hearing sensitivity versus sensory hearing loss**
- **Detection of 8th nerve dysfunction**
- **Detection of 7th nerve dysfunction**
- **Detection of brainstem auditory dysfunction**
- **Diagnosis of auditory neuropathy spectrum disorder**
- **Identification of false or exaggerated hearing loss**

Acoustic Reflex Measurement in the Detection of Even Subtle Middle Ear Disorders

(From Hall JW III. *Introduction to Audiology Today*. Boston: Pearson, 2014)

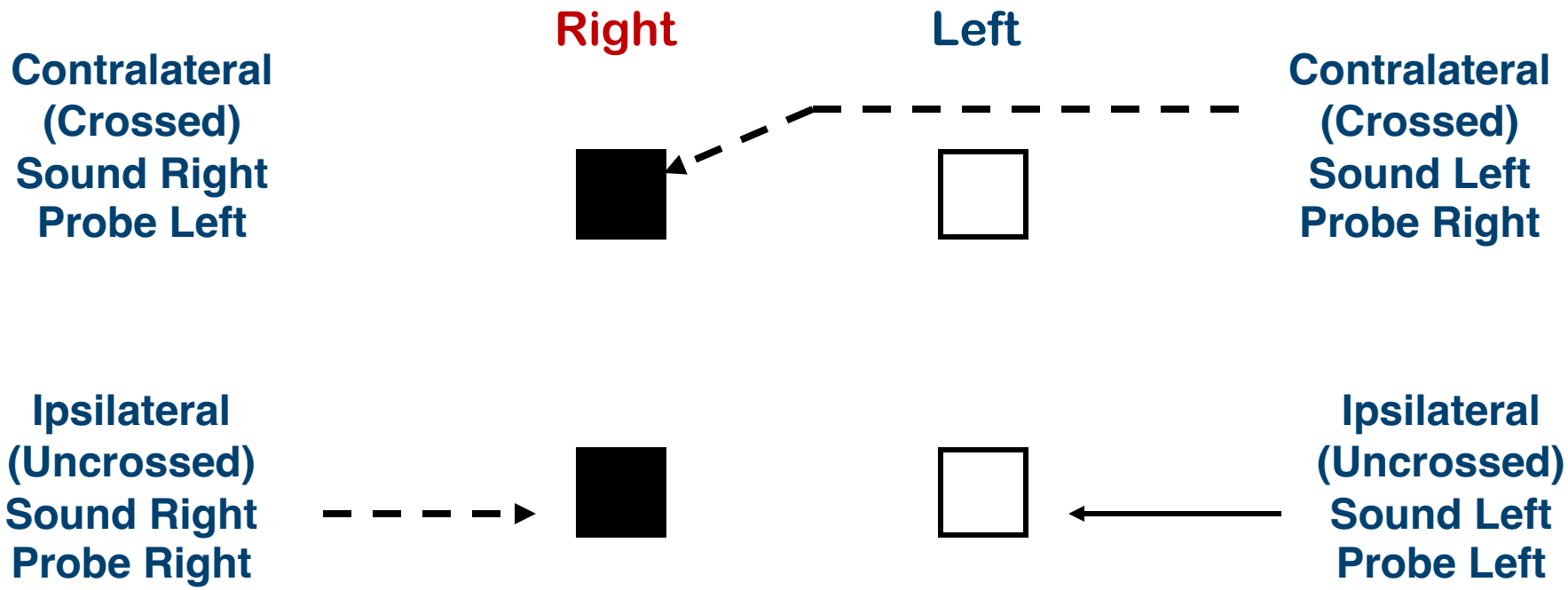


Acoustic reflex present at normal levels (e.g., 80 – 90 dB) = Normal middle ear function (no air-bone gap)

Plotting the Results of Acoustic Reflex Measurements
Mild Middle Ear Disorder

■ Abnormal Acoustic Reflex

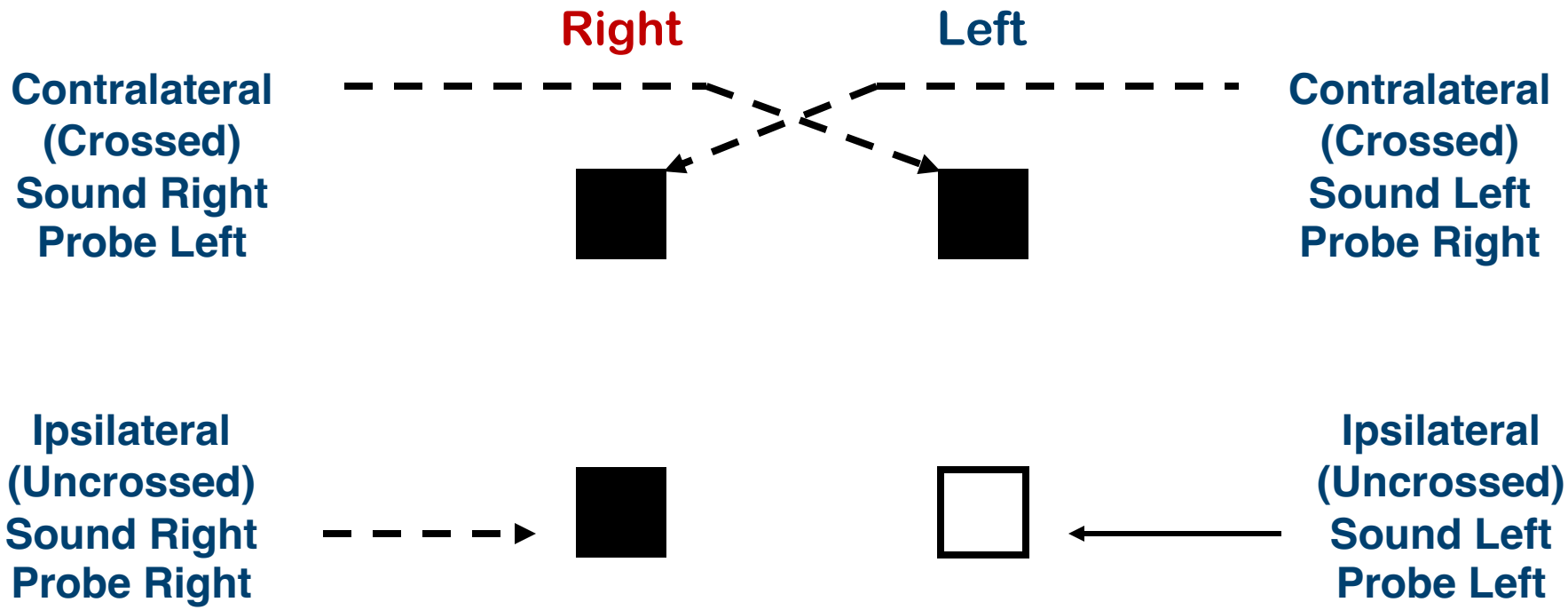
VERTICAL PATTERN
Abnormal tympanogram? Abnormal OAEs?
Air bone gap in audiogram?
Mild middle ear disorder pattern



Plotting the Results of Acoustic Reflex Measurements
Moderate Middle Ear Disorder

■ **Abnormal Acoustic Reflex**

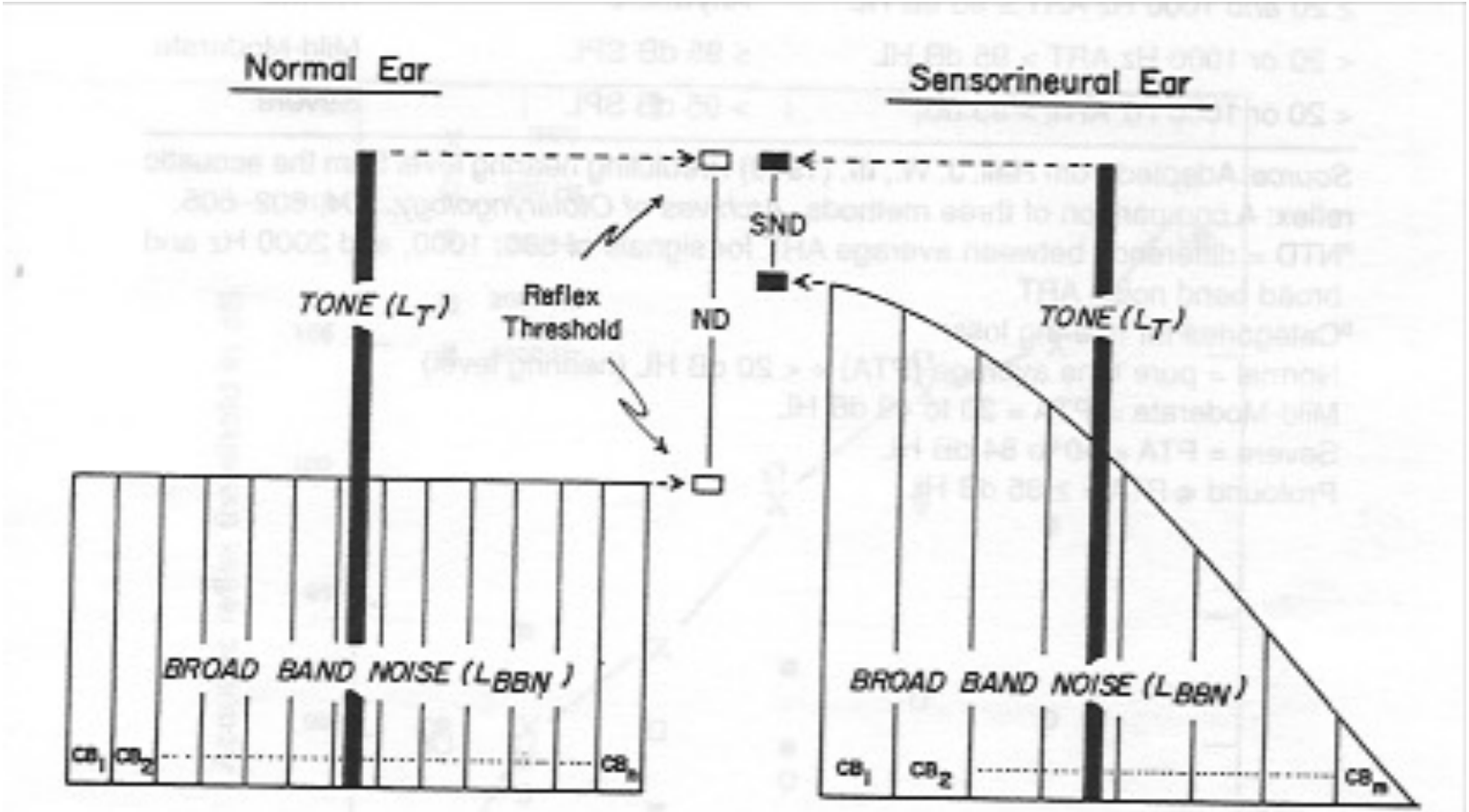
INVERTED "L" PATTERN
Moderate or severe conductive hearing loss on right ear



Diagnostic Value of Acoustic Reflexes
Numerous Valuable Clinical Applications

- Detection of even subtle middle ear dysfunction
- Normal hearing sensitivity versus sensory hearing loss
  - Identification of sensory hearing loss in infants and young children
  - Diagnosis of false and exaggerated hearing loss
- Detection of 8th nerve dysfunction
- Detection of 7th nerve dysfunction
- Detection of brainstem auditory dysfunction
- Diagnosis of auditory neuropathy spectrum disorder
- Identification of false or exaggerated hearing loss

Jerger J, Burney P, Mauldin L & Crump B (1974). Predicting hearing loss from the acoustic reflex. *JSHD, 39,* 11-22



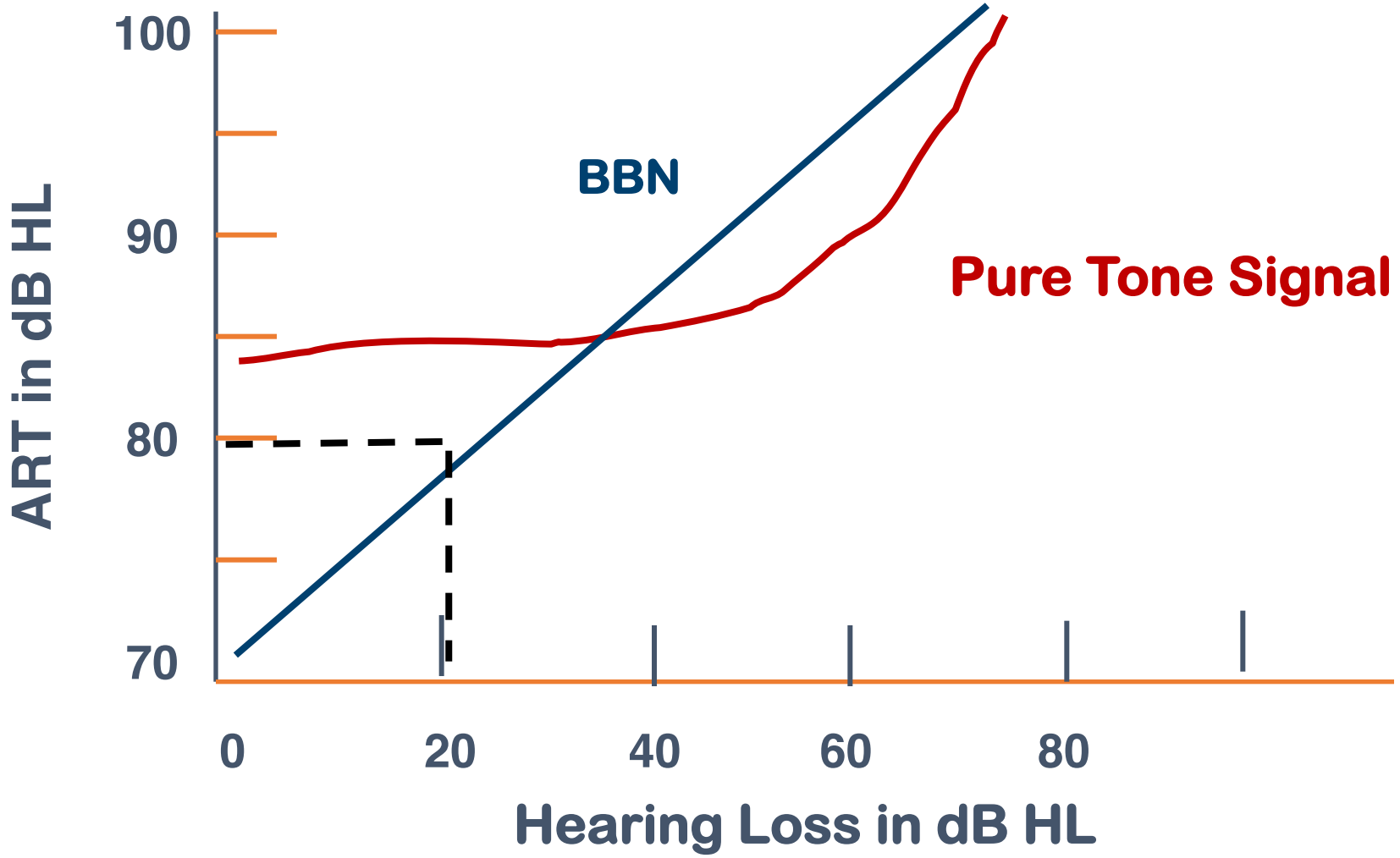
From the original paper on Sensitivity Prediction by Acoustic Reflex (SPAR) by Jerger et al., 1974.

Estimation of Hearing Thresholds with Acoustic Reflexes: A Sampling of Publications

- Hall JW III and Bleakney ME. Hearing loss prediction by the acoustic reflex: Comparison of seven methods. Ear and Hearing 2: 156-164, 1981
- Hall JW III. Hearing loss prediction in a young population: Comparison of seven methods. International Journal of Pediatric Otorhinolaryngology 3: 225-243, 1981
- Hall JW III and Koval C. Accuracy of hearing prediction by the acoustic reflex. The Laryngoscope 92: 140-149, 1982
- Hall JW III, Berry GA and Olson K. Identification of serious hearing loss with acoustic reflex data: Clinical experience with some new guidelines. Scandinavian Audiology 11: 251-255, 1982

Simplified SPAR (Sensitivity Prediction by the Acoustic Reflex)

Hall JW III, Berry GA and Olson K. Identification of serious hearing loss with acoustic reflex data: Clinical experience with some new guidelines. Scandinavian Audiology 11: 251-255, 1982



Acoustic Reflexes in Neonates

Kei J. Acoustic stapedial reflexes in healthy neonates: normative data and test-retest reliability. *JAAA, 23,* 2012

- 66 full term infants
- Acoustic reflexes recorded with 1000 Hz probe tone
- Tone and BBN stimuli
- All neonates had acoustic reflexes

Joseph Kei

University of Queensland
Brisbane Australia

Acoustic Reflexes in Neonates

(Kei J. Acoustic stapedial reflexes in healthy neonates: normative data* and test-retest reliability. *JAAA, 23,* 2012)

Stimulus	Median ART (dB HL)	90% Range
500 Hz	80	70 - 95
2000 Hz	70	60 - 85
4000 Hz	65	50 - 80
BBN	55	50 – 75

**** N = 68 ears***

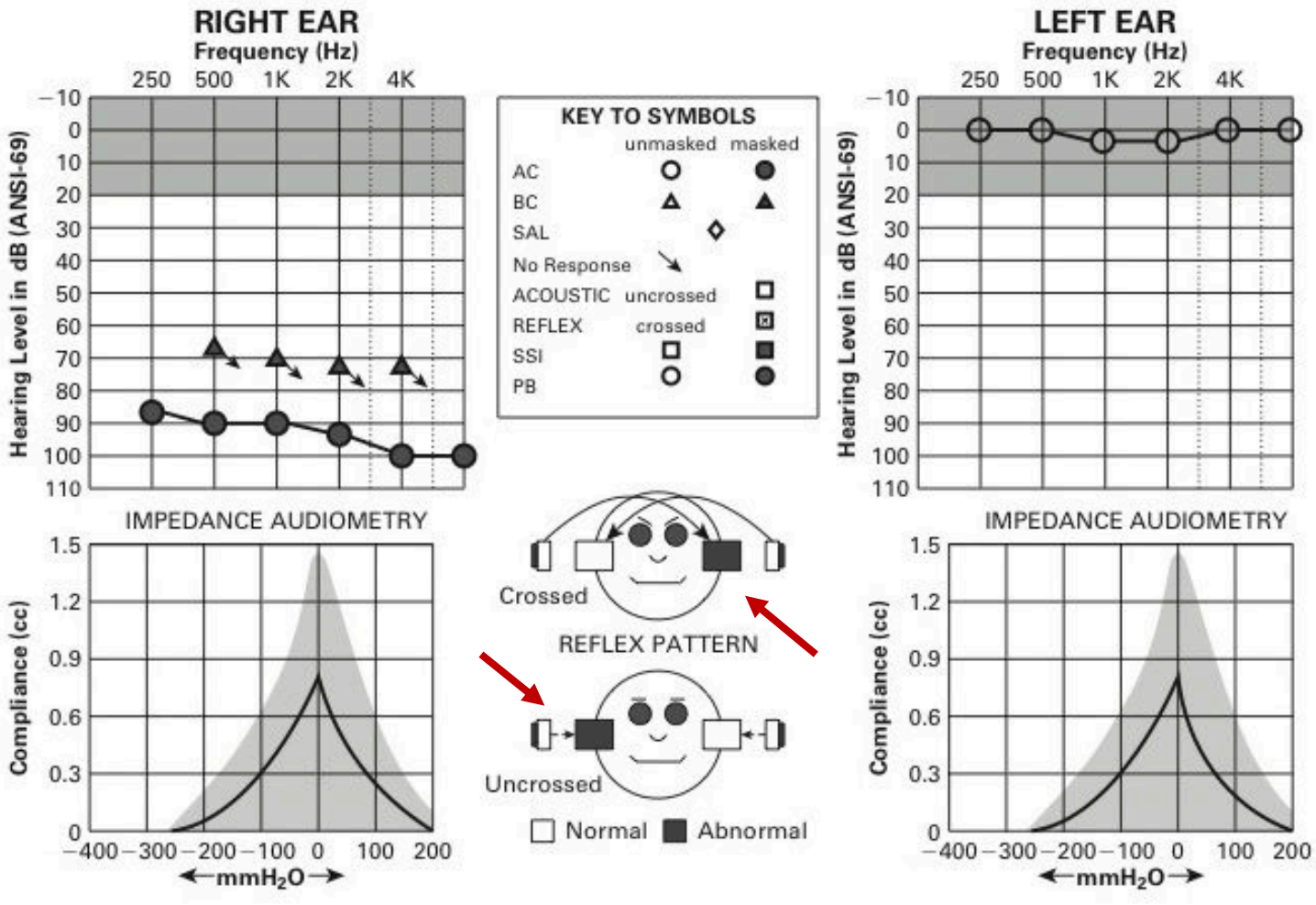
Diagnostic Value of Acoustic Reflexes
Numerous Valuable Clinical Applications

- Detection of even subtle middle ear dysfunction
- Normal hearing sensitivity versus sensory hearing loss
- Detection of 8th nerve dysfunction
- Detection of 7th nerve dysfunction
- Detection of brainstem auditory dysfunction
- Diagnosis of auditory neuropathy spectrum disorder
- Identification of false or exaggerated hearing loss

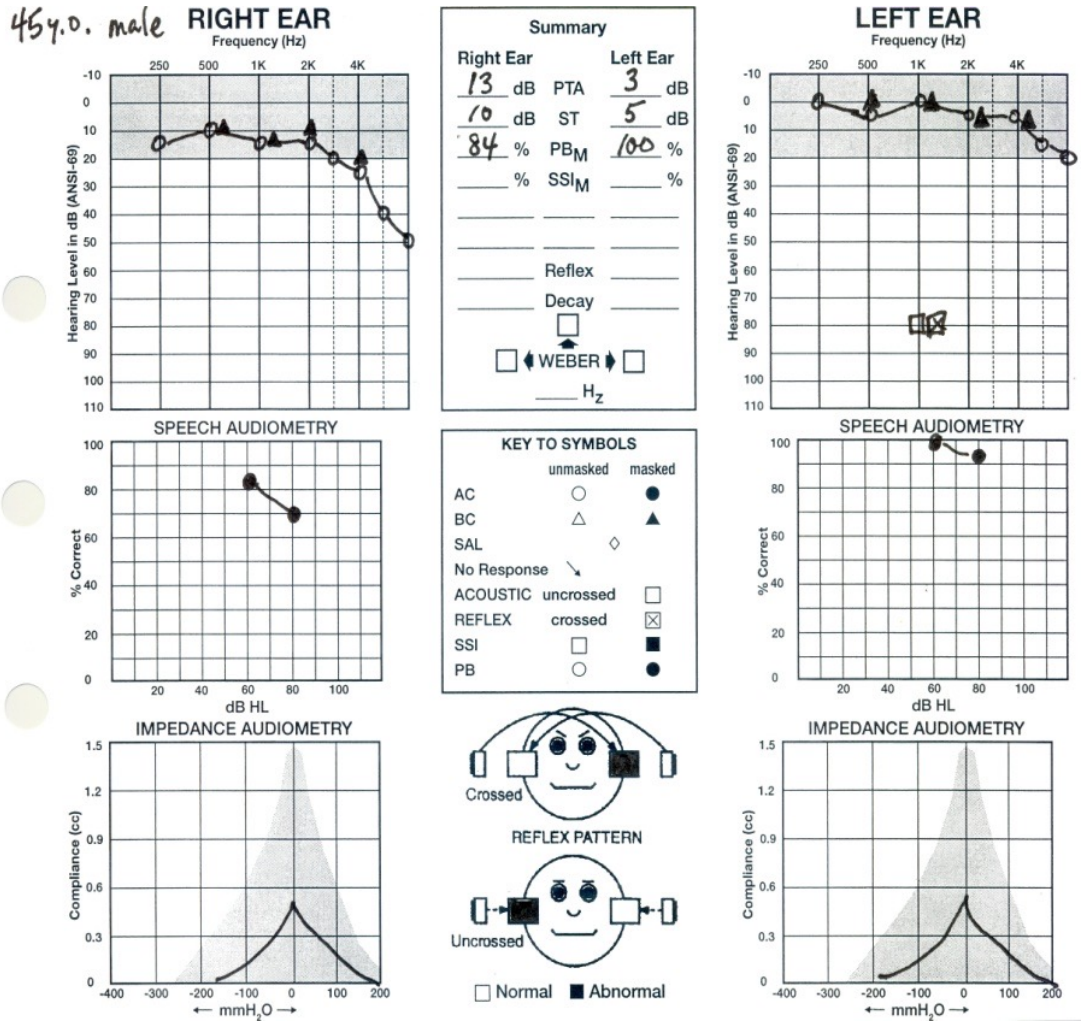
Plotting the Results of Acoustic Reflex Measurements

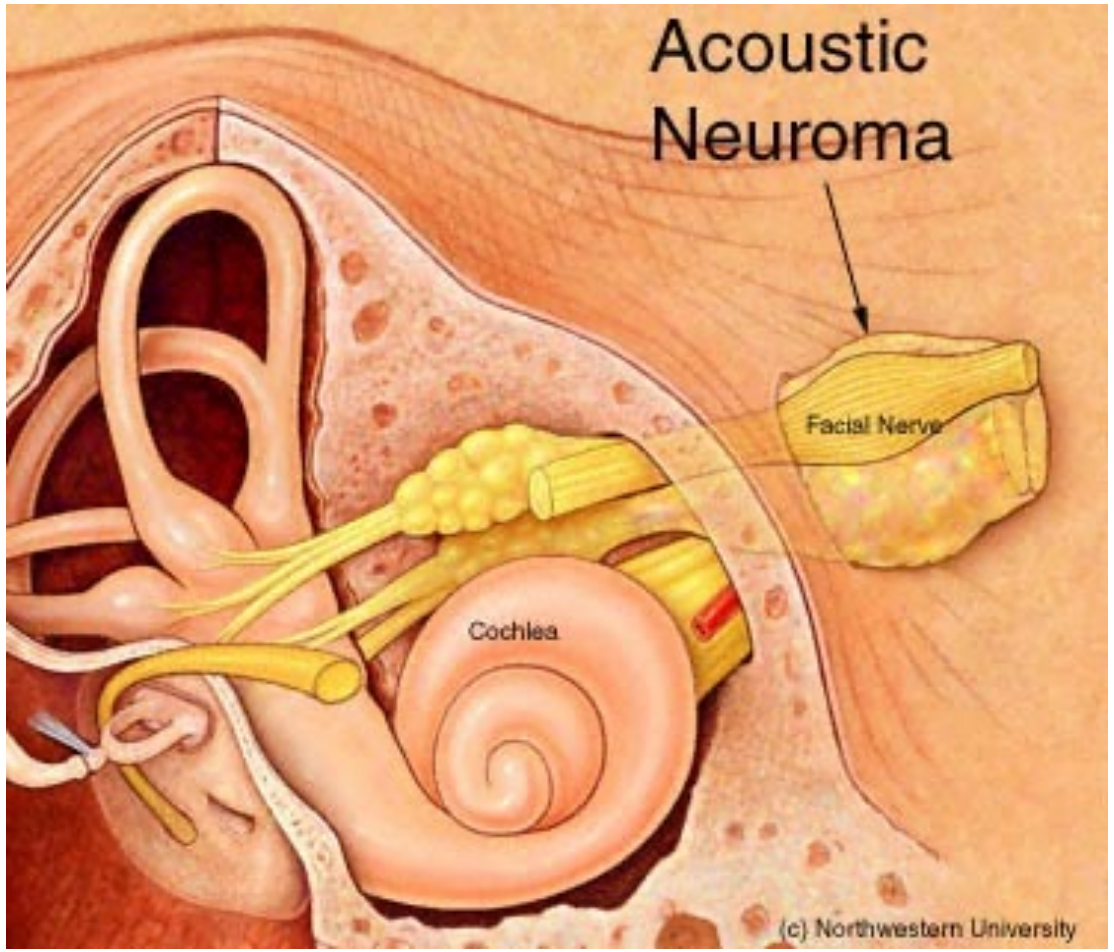
Severe-to-Profound Sensory Hearing Loss

(From Hall JW III. Introduction to Audiology Today. Boston: Pearson, 2014)



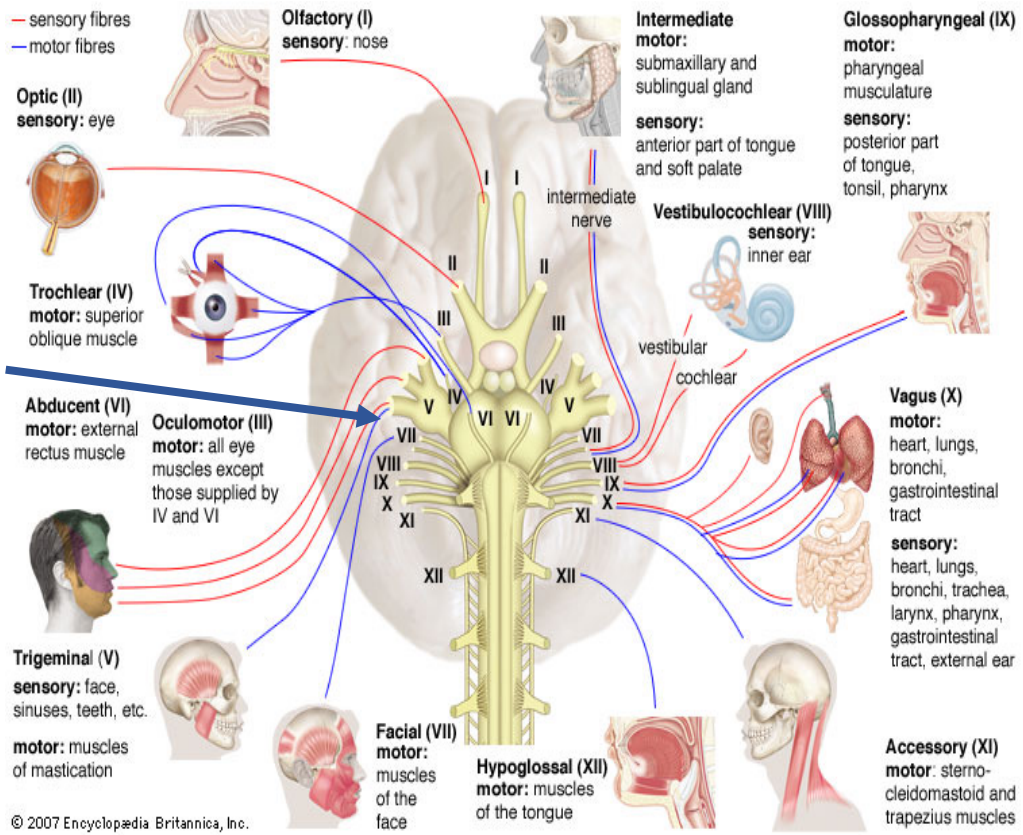
Audiogram and Acoustic Reflex Pattern:
8th Cranial Nerve Disorder





Diagnostic Value of Acoustic Reflexes *Numerous Valuable Clinical Applications*

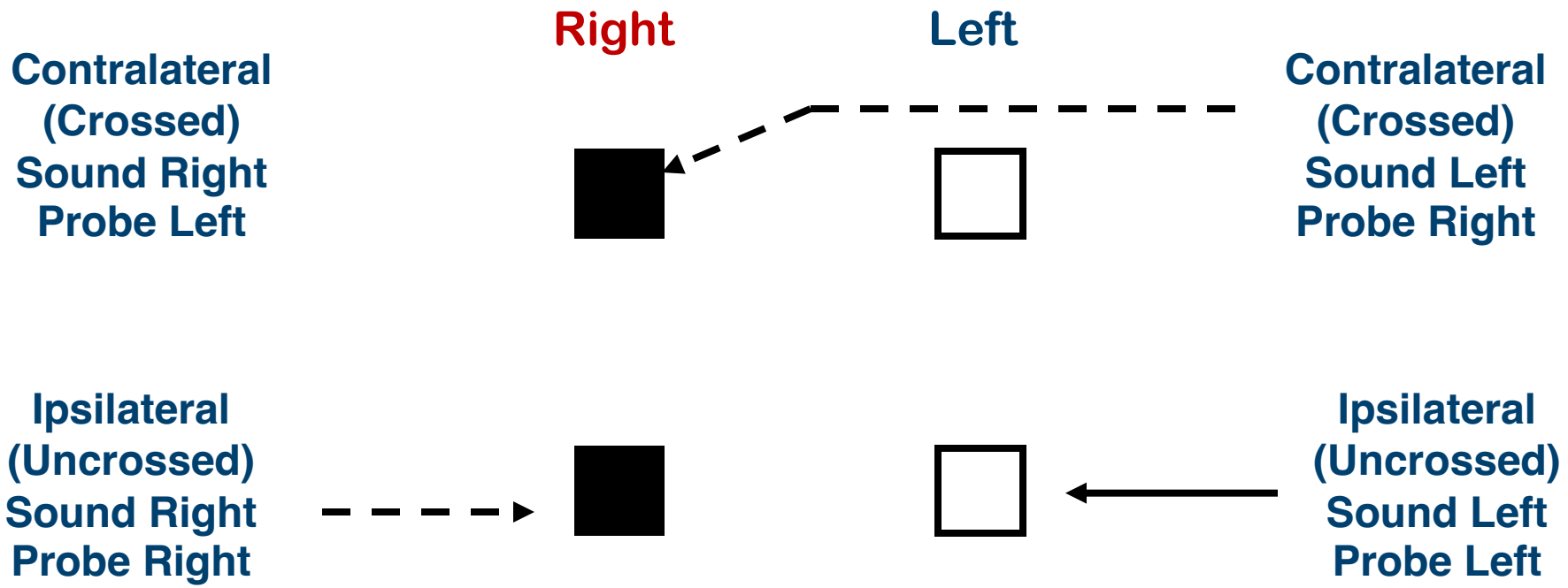
- Detection of even subtle middle ear dysfunction
- Normal hearing sensitivity versus sensory hearing loss
- Detection of 8th nerve dysfunction
- Detection of 7th nerve dysfunction
- Detection of brainstem auditory dysfunction
- Diagnosis of auditory neuropathy spectrum disorder
- Identification of false or exaggerated hearing loss



Plotting the Results of Acoustic Reflex Measurements
7th Cranial (Facial) Nerve Dysfunction

■ Abnormal Acoustic Reflex

VERTICAL PATTERN
Normal tympanogram? Normal OAEs?
Normal audiogram?
7th cranial (facial) nerve dysfunction



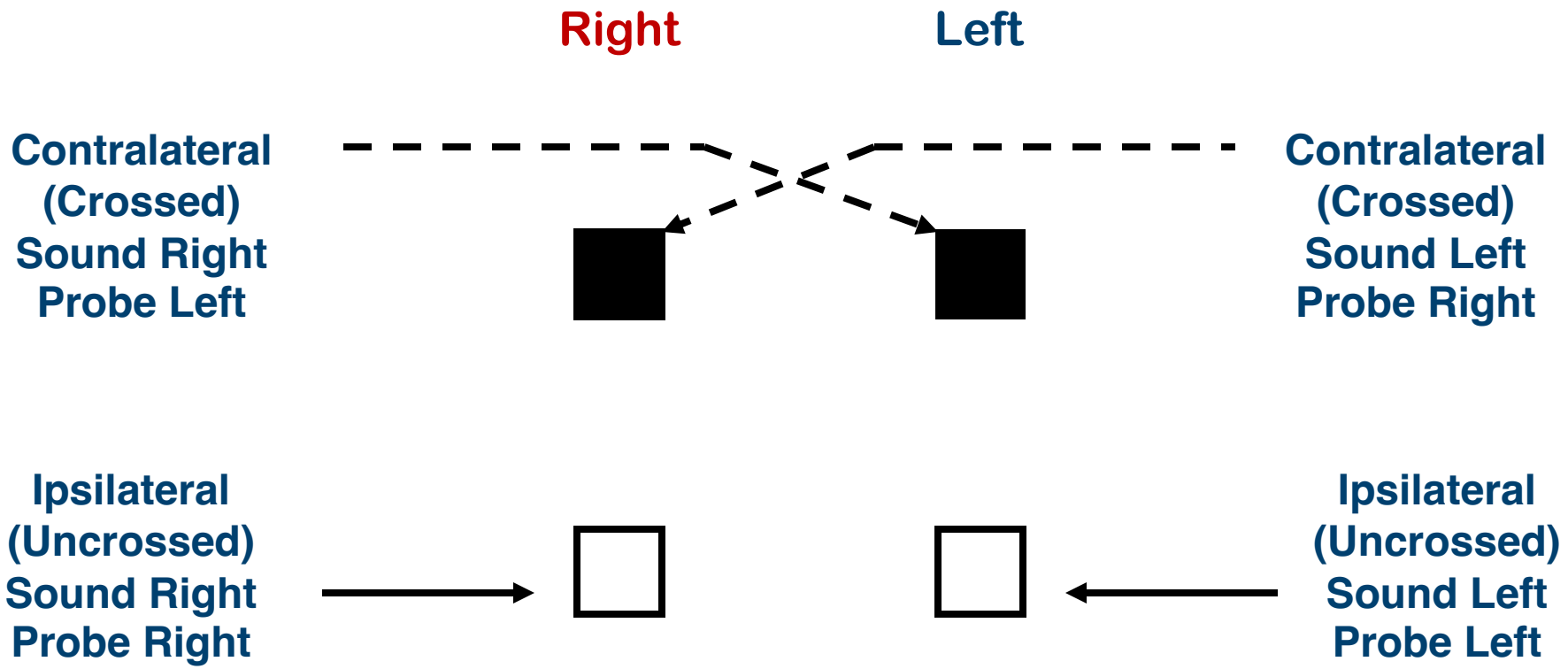
Diagnostic Value of Acoustic Reflexes *Numerous Valuable Clinical Applications*

- Detection of even subtle middle ear dysfunction
- Normal hearing sensitivity versus sensory hearing loss
- Detection of 8th nerve dysfunction
- Detection of 7th nerve dysfunction
- Detection of brainstem auditory dysfunction
- Diagnosis of auditory neuropathy spectrum disorder
- Identification of false or exaggerated hearing loss

Plotting the Results of Acoustic Reflex Measurements
Central (Brainstem) Auditory Dysfunction

■ Abnormal Acoustic Reflex

HORIZONTAL PATTERN
Brainstem auditory dysfunction



Plotting the Results of Acoustic Reflex Measurements

Unique Pattern for Brainstem Auditory Dysfunction

A New Acoustic Reflex Pattern

Susan Jerger, MS; James Jerger, PhD; James Hall, MA

• A new crossed-vs-uncrossed acoustic reflex pattern has been observed in four patients with retrocochlear disorder. The new reflex pattern is characterized by a unique "uni-box" configuration. Reflexes are abnormal with sound to the affected ear on crossed stimulation only. In one additional patient, a variation of the uni-box pattern was found on suprathreshold reflex amplitude measures. We observed a large ear difference between reflex amplitude functions in the crossed condition, but not in the uncrossed condition. This observation suggests that reflex amplitude measures may be a valuable addition to threshold measures in some patients.

(*Arch Otolaryngol* 105:24-28, 1979)

diagnostically nonspecific inverted L-shaped pattern.

This article concerns the one exceptional reflex pattern. This unusual finding occurred in a 53-year-old woman with a large acoustic schwannoma on the right side. At surgery, the tumor was noted to displace and distort adjacent brain stem structures. Figure 1 shows this patient's audiogram and acoustic reflex results. The audiogram shows a mild sensorineural loss in the right (eighth nerve) ear and normal sensitivity in the left ear. Pure-tone average (PTA) scores for 500, 1,000, and 2,000 Hz are 32 dB for the right ear and 1 dB for the left

sound to the affected ear on crossed stimulation only.

We first suspected that the reflex abnormality in this patient was due to middle ear disorder. However, bone conduction thresholds on both ears were superimposed on air conduction thresholds. Further, tympanometry showed normal, bilaterally symmetrical, tympanograms on both ears.

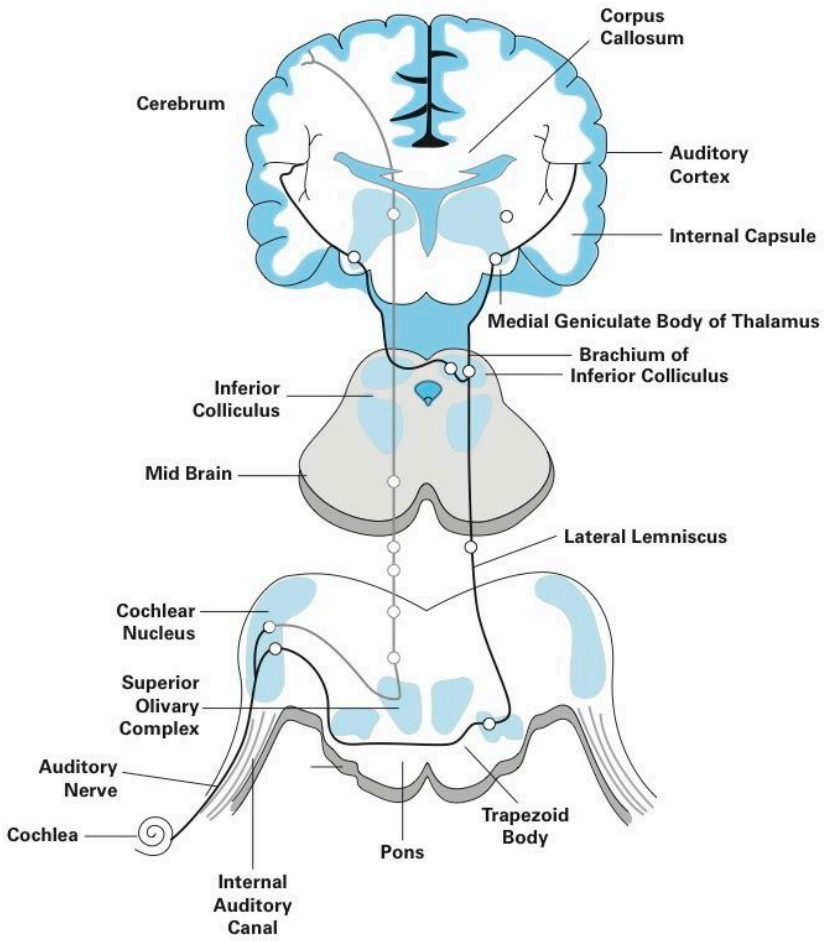
In short, we appeared to be observing a unique new reflex pattern. However, we were reluctant to regard this pattern as a distinct retrocochlear sign. Several possible explanations for this unexpected finding could not be adequately ruled out retrospectively, i.e., undetected middle ear disorder,

Diagnostic Value of Acoustic Reflexes
Numerous Valuable Clinical Applications

- Detection of even subtle middle ear dysfunction
- Normal hearing sensitivity versus sensory hearing loss
- Detection of 8th nerve dysfunction
- Detection of 7th nerve dysfunction
- Detection of brainstem auditory dysfunction
- Diagnosis of auditory neuropathy spectrum disorder

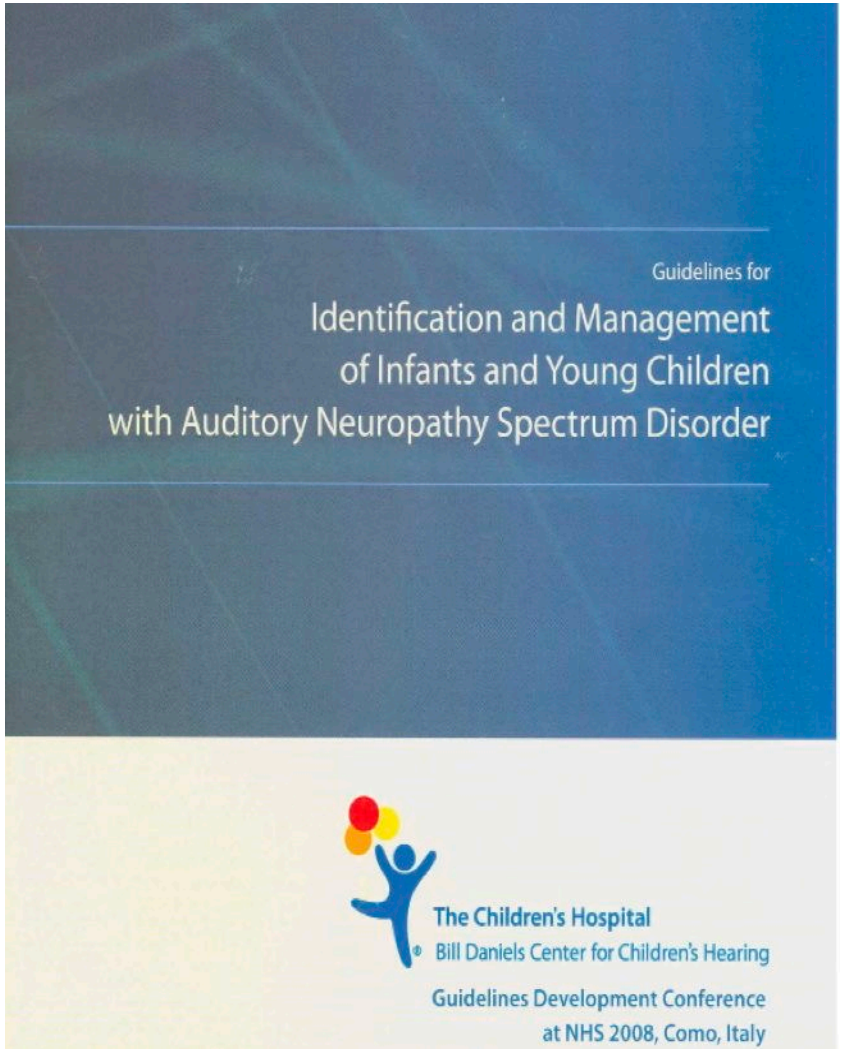
Acoustic Reflexes in the Diagnosis of Auditory Neuropathy Spectrum Disorder (ANSD): Normal *OAEs and Absent Acoustic Reflexes*

- Bielecki, Horbulewicz & Wolan. Prevalence and risk factors for auditory neuropathy spectrum disorder in a screening newborn population at risk for hearing loss. *Int J Pedi ORL, 76*, 2012.
- 5% of children with hearing loss diagnosed with ANSD
- Acoustic reflexes played role in the diagnosis



Diagnosis of Auditory Neuropathy Spectrum Disorder: Minimal Test Battery
(2010 Guidelines)

- **Tests of cochlear hair cell function**
  - Otoacoustic emissions (OAEs)
  - Cochlear microphonic in ECochG or ABR recording (Note: CM may be present with absent OAEs in middle ear dysfunction)
- **ABR for click stimulation with separate averages for:**
  - Rarefaction stimulus polarity
  - Condensation stimulus polarity
- **Acoustic reflex measurement**
  - Ipsilateral for each ear
  - Contralateral for each ear



Diagnostic Value of Acoustic Reflexes
Summary of Clinical Advantages
(Last Slide)

- Objective and not influenced by listener variables, e.g.,
  - Developmental age
  - Cognition and attention
  - Language
  - Motivation
- Quick test time
- Technically simple procedure
- Sensitivity and specificity to disorders involving auditory system from middle ear to the brainstem
- Multiple clinical applications