

AUDIOLOGICAL EVALUATION  
TEST DATE: April 15, 2013

HISTORY

**Name:** Steven Smith

**Age:** corrected age 6 weeks (corrected for 8 weeks prematurity)

**Reason for visit:** Follow-up evaluation after not passing newborn hearing screenings.

**Hearing history:** Steven did not pass an newborn hearing screening and rescreening at Evergreen Hospital NICU; he did not pass the brainstem auditory evoked response screening in both ears for both screenings.

**Middle ear history:** Steven has a negative history of ear infections.

**Family history of childhood hearing loss:** Negative.

**Medical History:** Steven was born at 32 weeks gestation at 1530 grams and his neonatal history is significant for chronic lung disease.

**Developmental progress:** Steven's parents report that he has inconsistent responses to sound at home.

**Medical home:** Steven lives with his parents in Maple Valley and is followed by Dr. David Jones at Valley Medical Center Pediatrics.

TEST RESULTS

The BAER and OAE tests were conducted after Steven fell into natural sleep.

**Brainstem Auditory Evoked Response**

**Procedure:** the intensity of the stimulus was manipulated to determine the lowest intensity which elicited a detectable response, or threshold of the BAER response. Upon completion of the test, the resulting BAERs were analyzed both in terms of the presence of a response and the latency of waves within each response. BAER threshold values have been corrected to dBeHL values to reflect the relationship between BAER and behavioral thresholds. Both dBnHL and dBeHL values are listed for each intensity level tested.

**Normal range:** Normal auditory function is defined as BAER thresholds of 0-20 dBeHL.

**Results:**

Level	Wave V (msec)	Level	Wave V (msec)
<b>Left Ear</b>		<b>Right Ear</b>	
<b>500 Hz</b>		<b>500 Hz</b>	
40 dBeHL (55 dBnHL)	10.87	65 dBeHL (80 dBnHL)	10.76
30 dBeHL (45 dBnHL)	No response	55 dBeHL (70 dBnHL)	No response
<b>2000 Hz</b>		<b>2000 Hz</b>	
45 dBeHL (50 dBnHL)	7.74	65 dBeHL (70 dBnHL)	7.74
35 dBeHL (40 dBnHL)	No response	55 dBeHL (60 dBnHL)	No response
<b>4000 Hz</b>		<b>4000 Hz</b>	
40 dBeHL (40 dBnHL)	7.33	70 dBeHL (70 dBnHL)	7.43
30 dBeHL (30 dBnHL)	No response	60 dBeHL (60 dBnHL)	No response
<b>Bone Conduction-Left-Click</b>		<b>Bone Conduction-Right-Click</b>	
40 dBeHL (40 dBnHL)	6.80	Could not test-awoke	
30 dBeHL (30 dBnHL)	No response		

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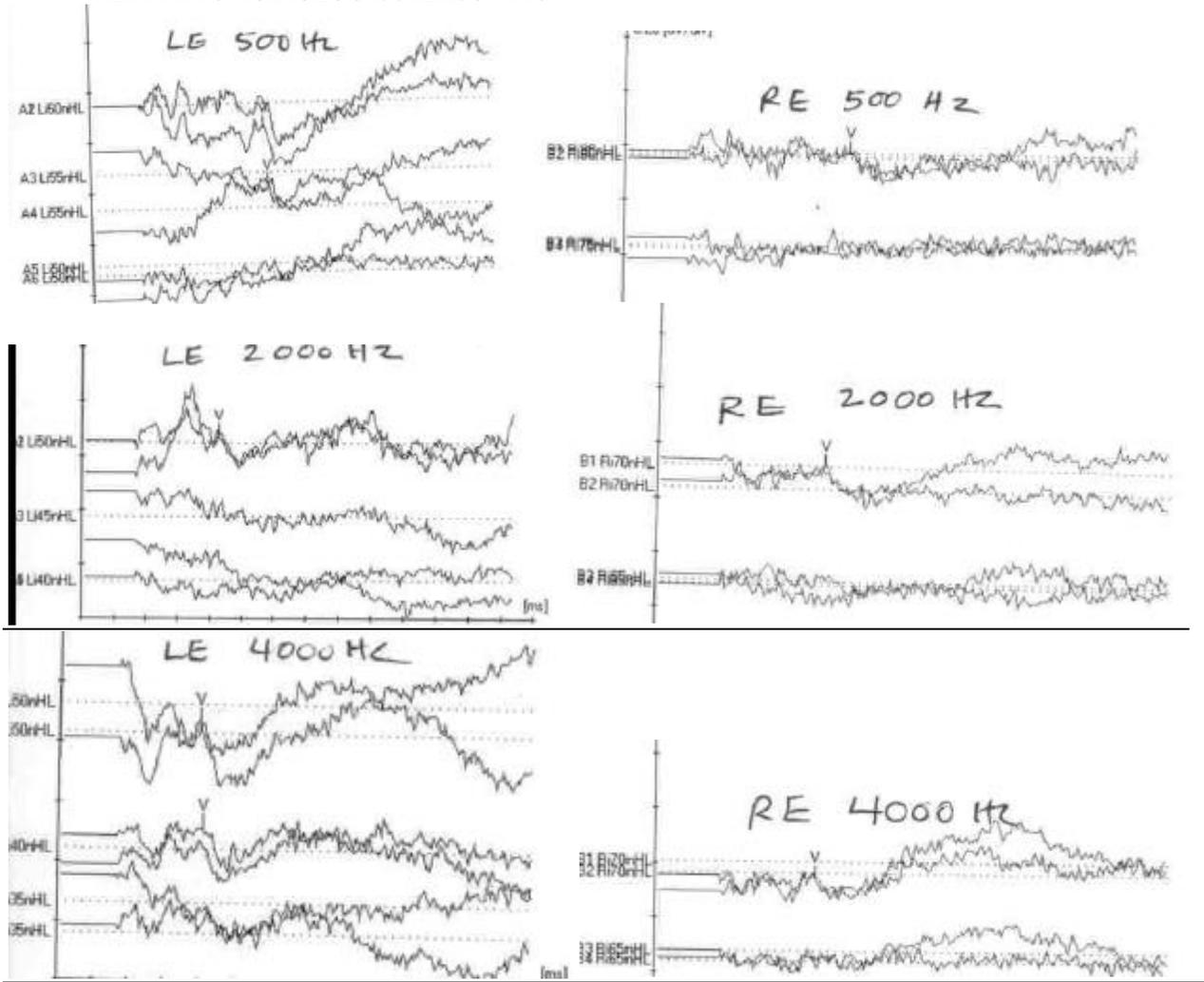
NAME: SMITH, STEVEN

DOB: 01-04-2013

UW Medicine

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Center on Human Development and Disability (CHDD)  
University of Washington Medical Center  
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**Immittance and Otoscopy**

**Procedure:** The status of the child’s outer and middle ear system was evaluated using tympanometry with a 1000 Hz probe tone.

**Normal range:** For tympanometry measures in infants, normal tympanograms are indicated by a positive compliance, but there are no normative values.

**Results:** On otoscopic inspection, the ear canals were noted to be clear bilaterally. Tympanograms are shown below:

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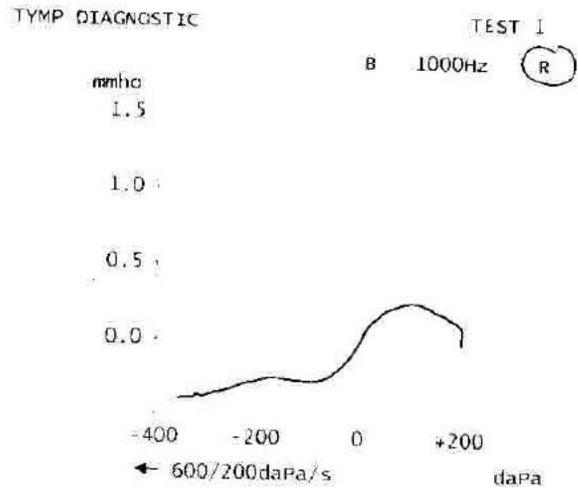
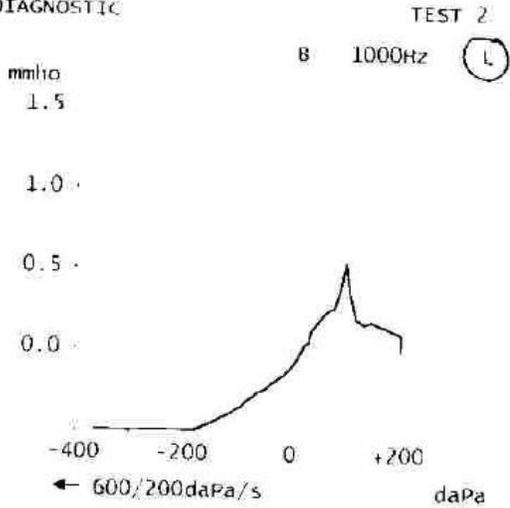
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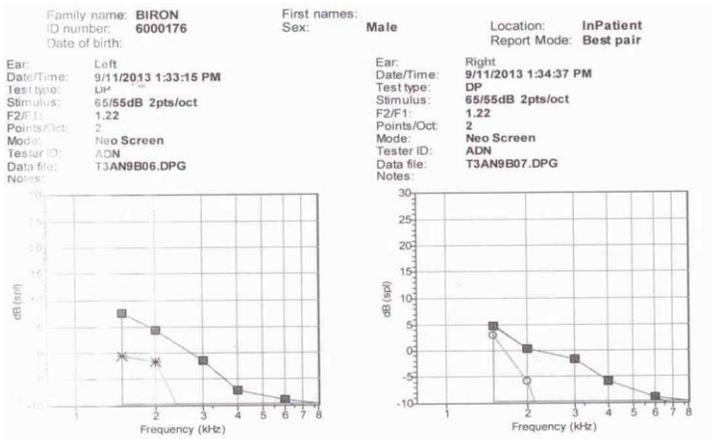


**Evoked Otoacoustic Emissions**

**Procedure:** The status of the child's peripheral hearing status was evaluated using both distortion product evoked otoacoustic emissions (DPOAE). OAEs are acoustic signals generated by the cochlea in response to external auditory stimulation. OAEs are thought to be generated by the outer hair cells within the cochlea and are independent of neural activity. Individuals with normal cochlear function have robust OAEs in response to stimulation from 1000-5000 Hz, whereas individuals with hearing loss greater than 30 dB HL show no OAE in the frequency region of the hearing loss.

**Normal range:** A normal DPOAE response is indicated by a signal to noise response (SNR) greater than 5 dB and a minimum DP level of -8.

**Results:**



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ASSESSMENT

Steven demonstrates a bilateral sensorineural hearing loss that is moderately severe in the right ear and mild to moderate in the left ear. Specifically, Steven shows BAER thresholds at 500, 2000, and 4000 Hz at levels of 65, 65, and 70 dBHL in the right ear and at levels of 40, 45, and 40 dBHL in the left ear, respectively. Click-evoked BAER bone conduction testing using masking in the contralateral ear shows no air-bone gap in at least the left ear, supporting that the hearing loss is sensorineural in nature; bone conduction testing in the right ear could not be completed due to Steven awakening. He demonstrates absent otoacoustic emissions in both ears, consistent with a significant bilateral hearing loss. He demonstrates normal outer/middle ear function in both ears on tympanometry measures, also supporting that the hearing loss is sensorineural in nature. Today's results are consistent with the results of his initial hearing screening six weeks ago, indicating no change in his hearing status and supporting that the hearing loss is congenital. The etiology of the hearing loss is unknown at this time.

Today's physiological tests provide information about Steven's auditory system, but do not indicate how he makes use of sound. Information about how Steven responds to a range of frequencies in each ear will be obtained in the future with behavioral testing to tonal stimuli.

RECOMMENDATIONS

Steven's parents, Sally and Sam, were counseled regarding the diagnosis of a sensorineural hearing loss and its implications on Steven's speech and language development, and education. It was discussed that infants with hearing impairment benefit from early identification and intervention. If the family's goals are for the child to develop spoken language skills, hearing aids and cochlear implants are technology for providing improved auditory access for development of listening and spoken language. Alternately, if the family's goals are for their child to develop visual communication skills using American Sign Language, amplification is not necessary, but would be supported by an early intervention program supporting ASL development through family education. Finally, the family may choose an early intervention program that supports their goal of their child developing both spoken language and ASL skills. The family was given the Spanish language version of the "Resource Notebook for Families or Children who are Deaf or Hard of Hearing" published by the WA State Department of Health. As a result of these discussions the following recommendations were made:

**Hearing Loss**

1. It is recommended that Steven be referred to an otolaryngologist (ear-nose-throat physician) for an evaluation regarding the medical aspects of his hearing loss and for medical clearance for the fitting of hearing aids. Steven has been referred to Dr. Jay Rubinstein at UWMC Otolaryngology.
2. It is recommended that Steven's hearing status be monitored closely with evaluations every 3 months for the next year. Steven will return to this clinic for both physiological (BAER/OAE) and behavioral audiological testing when developmentally appropriate.
3. The etiology of his hearing loss is unknown at this time and his parents are advised that they could pursue additional testing in the future including a CT scan of the ear, testing for congenital infections, and genetic testing. For these evaluations, he is referred to Seattle Children's Otolaryngology Clinic (206-987-2105).

**Hearing Technology**

4. Steven is a candidate for binaural hearing aids. If improved auditory access is in line with the family goals for their child, it is recommended that Steven return as soon as possible to be fit with binaural behind-the-ear hearing aids and custom earmolds. Custom earmold impressions were made today so that Steven can return to this clinic within the next month for an initial fitting with binaural hearing aids. Steven's current degree of hearing loss does not make him a candidate for cochlear implantation at this time.

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**Intervention**

5. It is recommended that Steven and his parents enroll in an early intervention program for children with hearing impairment and their families. The family was given information about early intervention services available in the Seattle area. They have been advised to find out about all the programs available so that they can choose a program that is a good fit for their family and their goals for their child.
6. The family has been referred to a family resource coordinator in their county to assist the family with obtaining early intervention services.

Lisa Mancl, M.S., CCC-A  
Pediatric Audiologist, Clinical Preceptor  
(206) 598-9344, [lmancl@uw.edu](mailto:lmancl@uw.edu)

Claire Clarence  
Graduate Audiology Student Clinician

cc: parents (Sally and Sam Smith )  
primary care physician (Dr. Jones at Valley Medical Center Pediatrics)  
family resource coordinator (Jodi Reimer @ NW Center Kids)  
otolaryngologist (Dr. Jay Rubinstein at UWMC Otolaryngology)

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