1 Introduction

1.1 Interpreting an Audiogram

To interpret an audiogram, readers of this book must have a basic understanding of the graph, symbols, and tests. The following provides a basic overview of the graph and symbols and how to interpret their meaning. For purposes of consistency this book works with the interpretation criteria used in the authors' own clinic. Other clinics may use different standards—there are several available. Regardless of which criteria are chosen, it is important for everyone in a given clinic to use the same criteria for ease and consistency of interpretation.

1.1.1 Pure-Tone Air and Bone Conduction Thresholds

Pure-tone air and bone conduction thresholds are plotted on the audiogram graph. Pure-tone air and bone conduction thresholds are used to determine the degree and type of hearing loss.

Graph

The air and bone conduction symbols are plotted on the audiogram graph (▶ Fig. 1.1). The x-axis represents pitch or frequency. The x-axis goes from low to high frequencies from left to right. The y-axis represents the magnitude or degree of hearing loss. The y-axis goes from soft to loud sounds from top to bottom.

Symbols

There are specific symbols for the right and left ear (▶ Fig. 1.2). The air conduction symbol for the right ear consists of a circle (unmasked) or a triangle (masked), while the left ear symbol can be an X (unmasked) or a square (masked). For bone conduction, the right ear is represented by < (unmasked) or "[" (masked), whereas the left ear symbol is > (unmasked) or "]" (masked). When a response cannot be obtained at the limits of the audiometer (no response), the foregoing symbols have an arrow added to the bottom of the symbol. For unmasked air conduction, for example, the symbol for no response in the right ear is , whereas the symbol for the left ear is . The symbols are shown in red for the right ear and blue for the left ear. Sometimes an indication of whether masking could or could not be performed or whether a symbol was vibrotactile (felt) should be noted. A "c" or asterisk near the symbol can be used to indicate an air or bone conduction threshold that could not be masked. A "v" can be used to indicate a threshold that was vibrotactile. It is important that whatever indicator (letter, asterisk, etc.) you use that it is defined somewhere on the audiogram (ex. v = vibrotactile). Note, other symbols are used, such as an "S" for sound field testing. This book is going to focus on the most common symbols used for testing adults.

Configuration of Hearing Loss

Symmetric and Asymmetric Hearing Loss

Although this book provides a description of each ear, it is also possible to describe the two ears together or define whether the hearing loss is symmetric (equal hearing between ears) or asymmetric (different hearing between ears). Symmetric hearing loss is typically defined as hearing in which pure-tone air conduction thresholds in the right and left ear are separated by ≤ 10 dB HL across all frequencies. Although there is no consensus on defining asymmetric hearing loss, one interpretation of asymmetric hearing loss that may warrant a referral to an otologist is two pure-tone air conduction thresholds with a difference of ≥ 15 dB HL or one threshold with a difference of ≥ 20 dB HL.

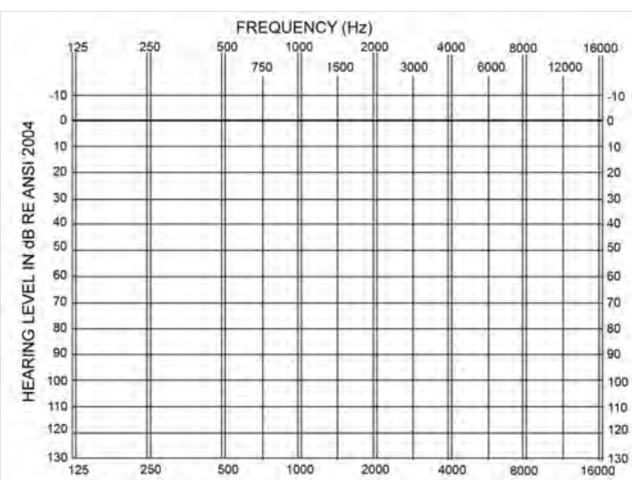


Fig. 1.1 Audiogram graph, with the x-axis, from left to right, representing low to high frequencies and the y-axis, from top to bottom, representing soft to loud sounds.

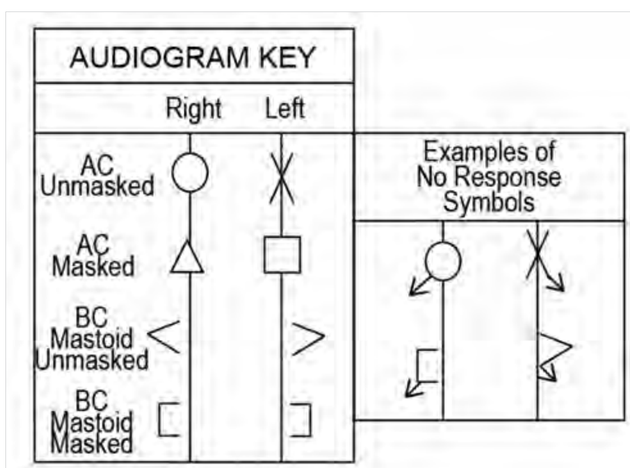


Fig. 1.2 A basic legend of symbols used to graph results on an audiogram.

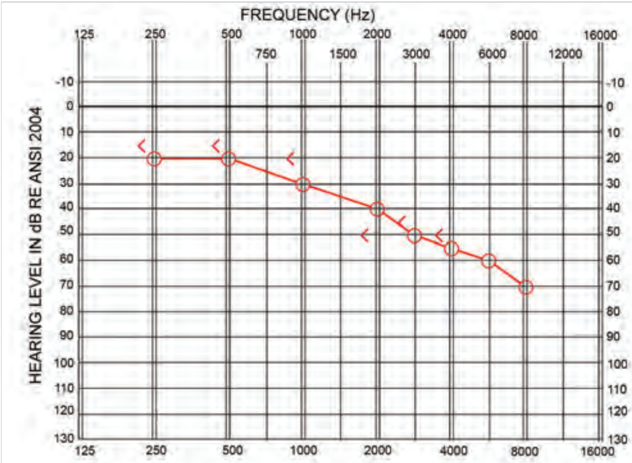


Fig. 1.3 Audiogram depicting a right ear with slight to moderately severe sensorineural hearing loss.

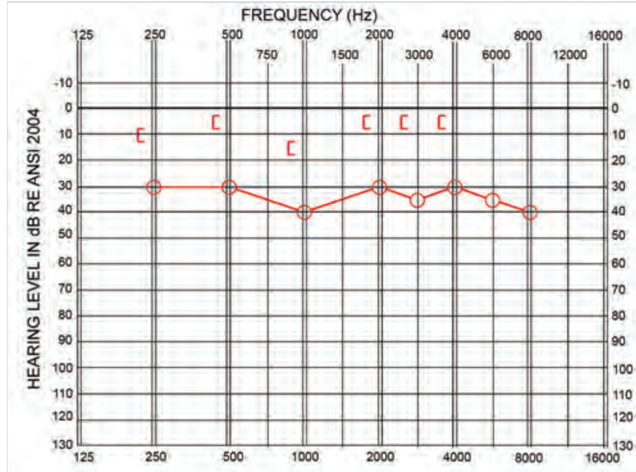


Fig. 1.4 Audiogram depicting a right ear with mild conductive hearing loss.

Degree of Hearing Loss

Degree of hearing loss is used to classify the magnitude or amount of hearing loss. Clark developed the following guidelines for determining the degree of hearing loss based on an air conduction PTA of 500, 1,000, and 2,000 Hz[1]:

Normal = –10 to 15 dB HL
Slight = 16 to 25 dB HL
Mild = 26 to 40 dB HL
Moderate = 41 to 55 dB HL
Moderately severe = 56 to 70 dB HL
Severe = 71 to 90 dB HL
Profound = ≥ 91 dB HL

For example, in ▶ Fig. 1.3, the hearing loss would be classified as a slight sloping to moderately severe hearing loss.

Types of Hearing Loss

Sensorineural Hearing Loss

This is the most common type of hearing loss that is seen clinically (▶ Fig. 1.3). A sensorineural hearing loss indicates hearing loss that involves the inner ear and/or the eighth (auditory) nerve. It can be caused by many factors, such as normal aging of the hearing system (presbycusis), genetics, or noise exposure. On the audiogram, this type of hearing loss is characterized by having an air–bone gap that is ≤ 10 dB HL (the bone conduction and air conduction thresholds are within 10 dB HL). ▶ Fig. 1.3 illustrates an example of sensorineural hearing loss. An example of an interpretation of this audiogram would be slight sensorineural hearing loss from 250 to 500 Hz, sloping from a mild to moderately severe hearing loss from 1,000 to 8,000 Hz. Note that there may sometimes be reverse air–bone gaps (the bone conduction threshold has greater hearing loss than the air conduction threshold, such as at 2,000 Hz). If the air–bone gap is reversed, even if it is > 15 dB, it is still considered a sensorineural hearing loss.

Conductive Hearing Loss

This type of hearing loss involves the outer and/or middle ear (▶ Fig. 1.4). It can be caused by many factors, such as a cerumen

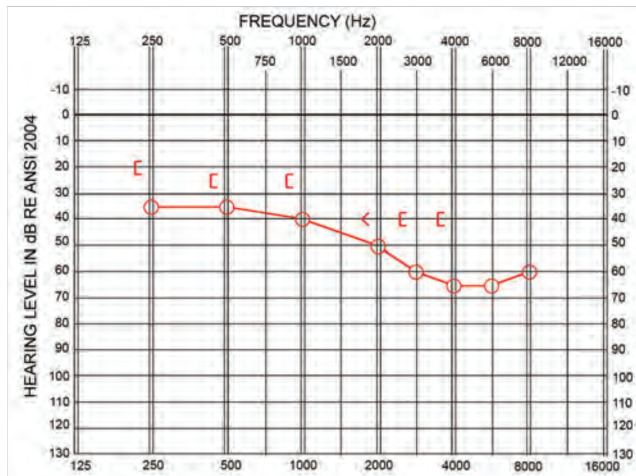


Fig. 1.5 Audiogram depicting a right ear with mild to moderately severe mixed hearing loss.

impaction, fluid in the middle ear, or disarticulation of the bones of the middle ear. On the audiogram, this type of hearing loss is characterized by having an air–bone gap that is > 10 dB HL and bone conduction thresholds that are within the normal range of hearing. ▶ Fig. 1.4 illustrates an example of conductive hearing loss. An example of an interpretation of this audiogram would be a mild conductive hearing loss from 250 to 8,000 Hz.

Mixed Hearing Loss

This type of hearing loss involves the outer and/or middle ear and the inner ear and/or eighth nerve (▶ Fig. 1.5). It can be caused by a combination of factors already mentioned. On the audiogram, this type of hearing loss can be characterized by having both the aforementioned characteristics and/or having an air–bone gap > 10 dB HL, but the bone conduction thresholds are not within the normal range of hearing. ▶ Fig. 1.5 illustrates

audiogram would be mild sloping to moderately severe mixed hearing loss.

1.1.2 Speech Awareness Thresholds and Speech Recognition Thresholds

A speech awareness threshold (SAT) is used to find the level at which the patient can detect spondee words 50% of the time. It is important to note the patient does not have to understand what was said, but rather needs only to detect the sound. An SAT can be used if the patient does not speak the language of the examiner or if the patient is unable to repeat the words due to the inability to talk or poor word recognition. A speech recognition threshold (SRT) is established by finding the level at which the patient can repeat or identify a spondee word 50% of the time. The SAT/SRT should be within ± 10 dB of the pure-tone average (PTA; average of 500, 1,000, and 2,000 Hz). A difference larger than this may indicate nonorganic (unreliable) hearing loss. It is also possible that a discrepancy will occur due to steeply sloping hearing loss or poor word recognition. SAT and SRT are interpreted the same way the degree of pure-tone air and bone conduction thresholds are interpreted. For example, an SRT of 15 dB HL would indicate a normal ability to receive speech, but an SRT of 50 dB HL would indicate a moderate loss in the ability to receive speech. An SAT of 50 dB HL would indicate a moderate loss in the ability to *detect* speech.

1.1.3 Word Recognition Scores

A word recognition score (WRS) provides information on the ability of the patient to understand or recognize speech. It reports how clear speech is to a patient when it is presented at a suprathreshold level (level that is audible and comfortable) and can be used to counsel the patient on realistic expectations for communication and possibly help predict benefit from hearing aids. The scale to interpret WRS is as follows:

Normal = 90 to 100%
Slight difficulty = 76 to 88%
Moderate difficulty = 60 to 74%
Poor recognition = 50 to 58%
Very poor recognition = < 50%

For example, a WRS of 64% would indicate a moderate difficulty in the ability to recognize speech.

1.1.4 Immittance Testing

Tympanometry

Tympanometry measures the integrity of the tympanic membrane and the middle ear. This book uses the following interpretation:

Ear canal volume normal range = 0.6 to 2 mL (a difference between ears of > 1 mL may indicate a perforation or patent pressure equalization (PE) tube)
Middle ear pressure normal range = ± 100 daPa
Static admittance normal range = 0.3 to 1.5 mL

A large ear canal volume, such as 4 mL in one ear, compared to 1.5 mL in the opposite ear may indicate a perforation in the tympanic membrane. The interpretation is stated as "large ear canal volume." Middle ear pressure of – 150 daPa indicates negative pressure behind the tympanic membrane and is interpreted as

0.1 mL is interpreted as hypocompliant, meaning the tympanic membrane is moving less than normal (fluid, etc.), and static admittance of 1.8 mL is interpreted as hypercompliant, meaning the tympanic membrane is moving more than normal (disarticulation of ossicles, etc.). Middle ear pressure and static admittance of no pressure or no peak (NP) is interpreted as flat (fluid, etc.).

1.1.5 Acoustic Reflex Thresholds

Acoustic reflex thresholds measure the acoustic reflex arc, which consists of the tympanic membrane, middle ear, inner ear, eighth nerve, auditory brain stem, seventh (facial) nerve, and stapedius muscle. The reflex occurs bilaterally; therefore, it is measured with ipsilateral and contralateral stimulation. Results from this test are used in conjunction with others to help determine conditions, such as a tumor on the eighth nerve. A reflex is considered present if a compliance change ≥ 0.02 mL is measured. Acoustic reflex thresholds are interpreted as follows:

Normal/present = ≤ 100 dB HL
Elevated = 105 to 110 dB HL
Absent = no response at 110 dB HL

Acoustic Reflex Decay

Acoustic reflex decay measures the ability of the acoustic reflex threshold to remain present for 10 seconds and not decay by 50% during this 10-second period. It has traditionally been used to aid in determining the presence of a tumor on the eighth nerve. When the reflex remains present and does not decay by 50% during the 10 seconds, the result is interpreted as negative (for retrocochlear pathology). If the reflex decays, for example, at 5 seconds, the result is interpreted as positive or abnormal, and the point at which it decays, 5 seconds in this example, is also stated.

1.2 Testing Considerations

1.2.1 Clinician–Patient Interaction

It is important to establish a rapport with the patient to make the patient feel comfortable for the hearing test. For some patients, having a hearing test can cause extreme anxiety. Obtaining a thorough case history, listening to the patient's concerns, and providing clear instructions as well as reassurance during testing will help make testing go smoothly.

1.2.2 Preparation for Testing

General maintenance of the equipment is important for obtaining accurate results. It is important to do daily listening checks of the equipment to ensure all transducers are functioning properly. Immittance probe tips should be examined and cleared of any debris. Annual calibration is required and quarterly calibration checks are recommended. The cords should be untangled to ensure ease of placement of the transducers on the patient. It is also important to disinfect the earphones, specula, and immittance probe tips to prevent the spread of infec-

clear ear canals. Also, if the patient reports a better ear, testing should start in the better ear.

1.2.3 Audiological Test Instructions and Masking

For tests involving pure-tone air and bone conduction, SAT/SRT, and WRS, it is recommended that patients face away from the examiner so they cannot anticipate when pure-tones or words are being presented and to prevent lip reading.

Pure-Tone Air Conduction

Supra-aural headphones or insert earphones are used for pure-tone air conduction testing. Patients are typically provided with a response button or asked to raise their hand when they hear a beep, even if it is very soft. Sometimes a patient will press the button too much and may have to be reinstructed to press the button only when the beep is heard.

Masking may be required if the patient has an asymmetric hearing loss. The purpose of masking is to prevent the better, nontest ear from hearing the test stimulus; otherwise, the thresholds reported on the hearing test may not reflect the true hearing loss in the ear being tested. A traditional rule is that masking is required if there is a difference of 40 dB HL between the air conduction threshold of the test ear and the bone conduction threshold of the nontest ear for headphones and 60 dB HL for insert earphones. When masking, the patient will be asked to ignore the new sound presented and continue to respond to the tone. The masking signal will be added to the opposite or nontest ear, and the tone will continue to be presented in the ear being tested. To mask, a typical rule is to add 10 dB HL to the threshold of the nontest ear and use a 15 dB plateau to obtain threshold. There are many methods for masking, and this topic is beyond the scope of this book, and the reader is referred to other sources.[2,3]

Pure-Tone Bone Conduction

A bone oscillator is used for pure-tone bone conduction testing. It is important to place the bone oscillator on the mastoid, and it should not touch the pinna. Bone conduction can help determine the type of hearing loss. As for pure-tone air conduction threshold testing, patients are typically provided with a button or asked to raise their hand when they hear a beep, even if it is very soft.

Masking will be required if there is an air–bone gap of ≥ 15 dB HL between the air conduction and bone conduction threshold of the test ear. If masking is needed, a headphone or insert earphone is placed on the nontest ear, and the bone oscillator remains on the mastoid of the test ear. Masking noise is then presented, and the method and response will be the same as for air conduction testing. The only difference between masking for bone and air conduction is additional masking may be needed to account for the occulsion effect at 250, 500, and 1,000 Hz.

SAT/SRT

SAT and SRT are typically completed using supra-aural headphones or insert earphones using a CD or monitored live voice (ensuring the examiner

the two syllables). The patient is instructed to press the button upon hearing two-syllable spondee words (SAT) or is asked to repeat the words (SRT). If the patient is unsure of a word, the patient is encouraged to guess.

Masking may be required if there is a difference of 40 dB between the unmasked SAT/SRT and the best bone conduction threshold of the nontest ear for headphones and 60 dB for insert earphones. Masking method and presentation are the same as for pure-tone testing.

WRS

WRS testing determines the speech recognition ability of a patient at a suprathreshold level using a CD recording because it is standardized and avoids the variability of a monitored live voice. There are different ways to determine the suprathreshold level of testing. One is to add + 30 to + 40 dB sensation level (SL) to the SRT. This may not be the best method for patients with a sloping hearing loss because an SRT of 10 dB with a + 40 dB SL for hearing loss that is moderately severe to severe at 2,000 Hz may not provide adequate high-frequency information. Another method, used in the authors' clinic, is the most intelligible level (MIL). This involves slowly increasing the volume of monitored live speech until a comfortable and intelligible level is determined. The patient is then instructed to repeat the last word of the sentence (which may vary depending on the test material used).

Masking may be required if there is a difference of 40 dB between the presentation level and the best bone conduction threshold of the nontest ear for headphones and 60 dB for insert earphones. One method for masking is to take the presentation level and subtract 20 dB to determine the masking presentation level for the nontest ear. This typically works for symmetric hearing. If there is an asymmetry, particularly for mixed or conductive hearing loss, the SRT should be examined as well as the pure-tone thresholds of the nontest ear to ensure effective masking is being used.

Tympanometry

A probe is placed in the patient's ear and positive and negative pressures are introduced. The patient is counseled that there will be a sensation of pressure and to be as quiet and still as possible. If a seal cannot be maintained, sometimes using a small amount of a water-based gel, such as that used for insertion of earmolds, on the tip of the probe may help maintain a seal for testing.

Acoustic Reflex Thresholds

The probe is placed in the test ear and the stimulus is presented ipsilaterally. Then a probe with a loudspeaker is placed in the contralateral ear and the stimulus is presented contralaterally. The patient is instructed to be as quiet and still as possible.

Acoustic Reflex Decay

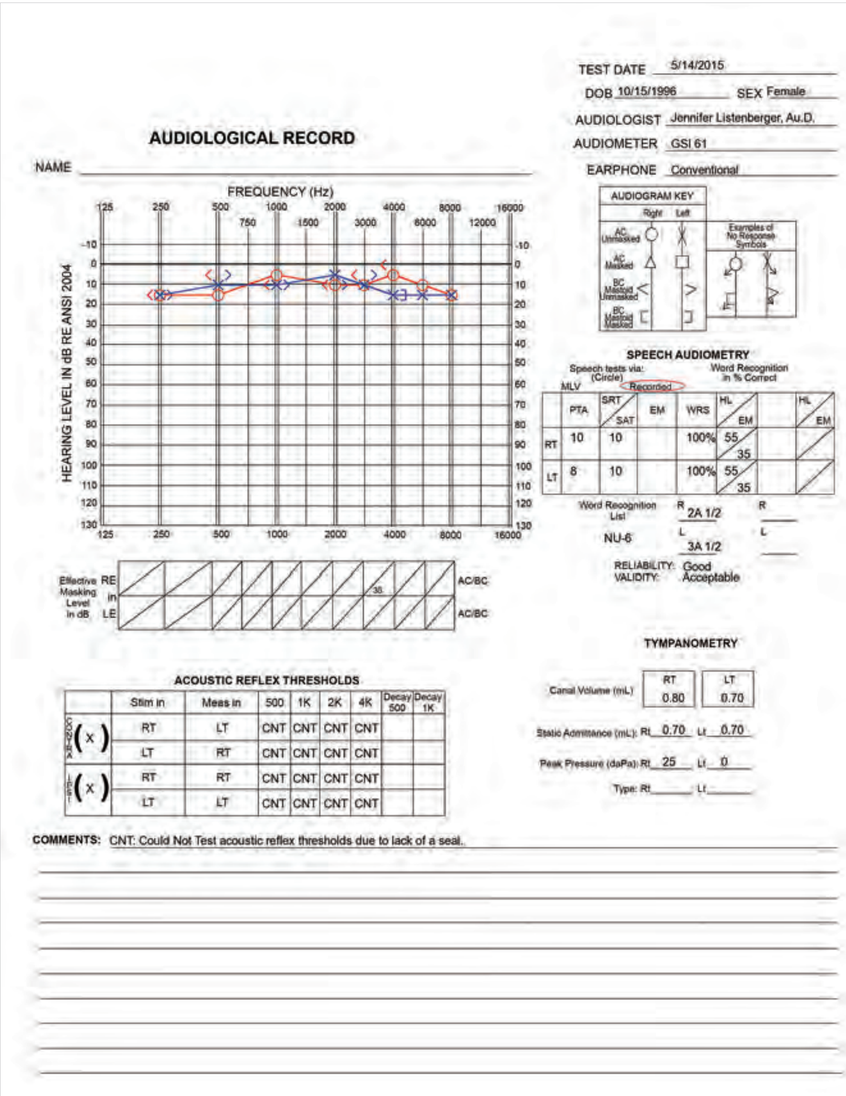
The stimulus probe is placed in the contralateral ear and the measurement probe is placed in the test ear. The stimulus presentation level is determined by adding + 10 dB SL to the con-

to remain as quiet and still as possible.

4.6 Case 6

4.6.1 Case History

An 18-year-old woman was accompanied by her father. Her father reported that the family had concerns regarding her hearing loss due to how loud her voice was when she talked. The patient reported some need for repetition in noisy places, such as her dance studio. She denied any tinnitus, dizziness, or aural pressure.



	PTA	SRT/SAT	EM	WRS	HL/EM
RT	10	10		100%	55/35
LT	8	10		100%	55/35

Word Recognition List: NU-6, R 2A 1/2, L 3A 1/2

RELIABILITY: Good
VALIDITY: Acceptable

	RT	LT
Canal Volume (mL)	0.80	0.70
Static Admittance (mL)	0.70	0.70
Peak Pressure (daPa)	25	0
Type		

	Stim in	Meas in	500	1K	2K	4K	Decay 500	Decay 1K
Contra	RT	LT	CNT	CNT	CNT	CNT		
	LT	RT	CNT	CNT	CNT	CNT		
Ipsi	RT	RT	CNT	CNT	CNT	CNT		
	LT	LT	CNT	CNT	CNT	CNT		

Fig. 4.6 Audiogram of a patient whose family was concerned she had hearing loss and who reported difficulty hearing in her dance studio.

5.3 Case 3

5.3.1 Case History

The patient was a 40-year-old man with Alport's syndrome and reported a diagnosis of some hearing loss during grade school with stable hearing until college. He reported a rapid decline in hearing over the past 2 years with a noticeable increase in the need for repetition in quiet settings at home and work, as well as increased difficulty understanding speech in noisy situations. He denied any tinnitus, dizziness, or aural pressure or fullness at that time. There was no significant history of ear pathology, ear surgery, or noise exposure. The patient's mother has Alport's syndrome and a significant hearing loss. He reported having a kidney transplant approximately 20 years ago that failed within 5 years of completion of the procedure. He was currently on kidney dialysis. There were no hearing tests available for comparison. The patient had not used hearing aids, but did use HAT for the television and theater.

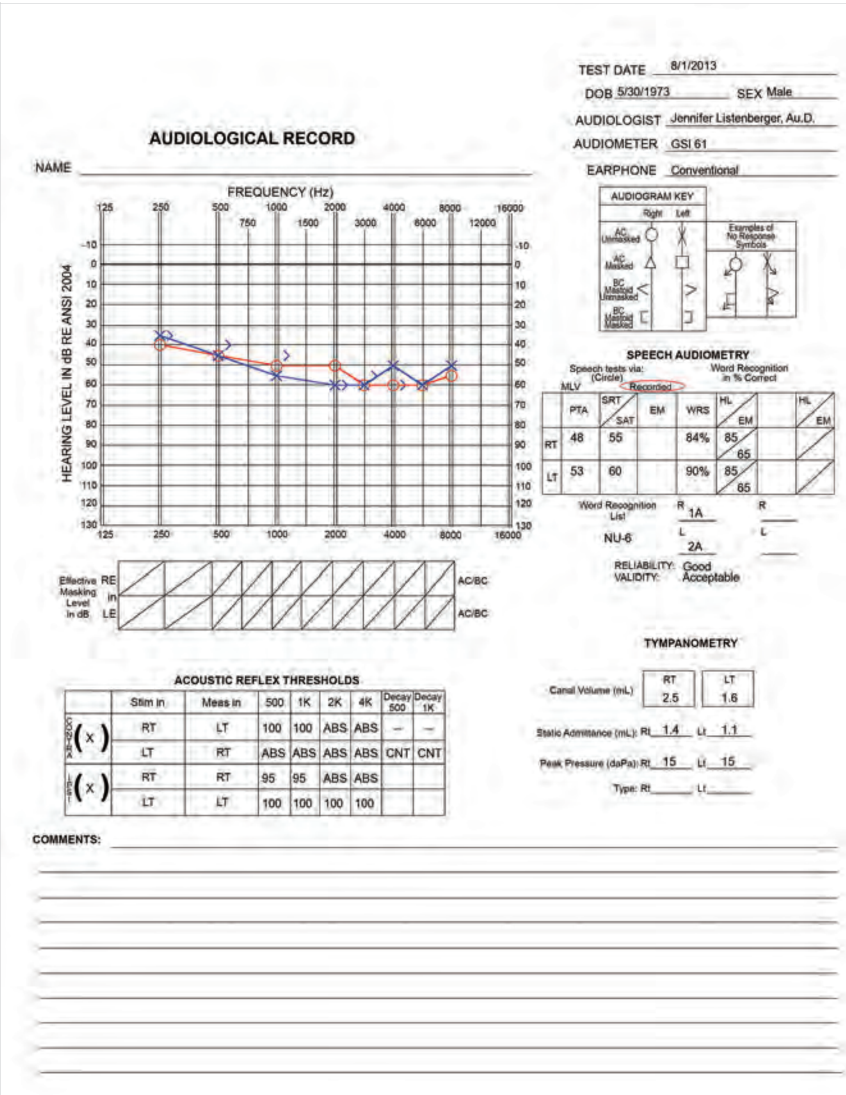


Fig. 5.3 Audiogram of a patient diagnosed with Alport's syndrome.

5.3.2 Interpretation

Right Ear—Mild sensorineural hearing loss at 250 Hz, sloping to moderate at 500 to 2,000 Hz, sloping to moderately severe at 3,000 to 6,000 Hz, and rising to moderate at 8,000 Hz. The SRT revealed a moderate loss in the ability to receive speech and was in agreement with the PTA. The WRS revealed slight difficulty in the ability to recognize speech. Immittance testing revealed a normal tympanogram and normal acoustic reflex thresholds from 500 to 1,000 Hz and absent from 2,000 to 4,000 Hz to ipsilateral stimulation and absent thresholds from 500 to 4,000 Hz to contralateral stimulation. Acoustic reflex decay could not be measured.

Left Ear—Mild sensorineural hearing loss at 250 Hz, sloping to moderate to moderately severe at 500 to 3,000 Hz, and rising and sloping to moderate and moderately severe at 4,000 to 6,000 Hz, and rising to moderate at 8,000 Hz. The SRT revealed a moderately severe loss in the ability to receive speech and was in agreement with the PTA. The WRS revealed a normal ability to recognize speech. Immittance testing revealed a normal tympanogram, normal acoustic reflex thresholds from 500 to 4,000 Hz to ipsilateral stimulation, and normal acoustic reflex thresholds from 500 to 1,000 Hz and absent from 2,000 to 4,000 Hz to contralateral stimulation, and negative contralateral reflex decay at 500 and 1,000 Hz.

5.3.3 Intervention

An ENT specialist medically cleared the patient for amplification. Audiological recommendations included annual hearing testing to monitor progression of hearing loss, evaluation for amplification and HAT options, and hearing protection in noise.

5.25 Case 25

5.25.1 Case History

The patient was a 73-year-old male who stated he began to notice hearing loss in his left ear many years ago. Reportedly, this was examined, and he was told that there was nothing concerning at that time. He reported that his hearing continued to decline in the left ear. He noted a hissing tinnitus in the left ear. He perceived relatively good hearing in the right ear. He stated that intermittent dizziness had started in the last few months.

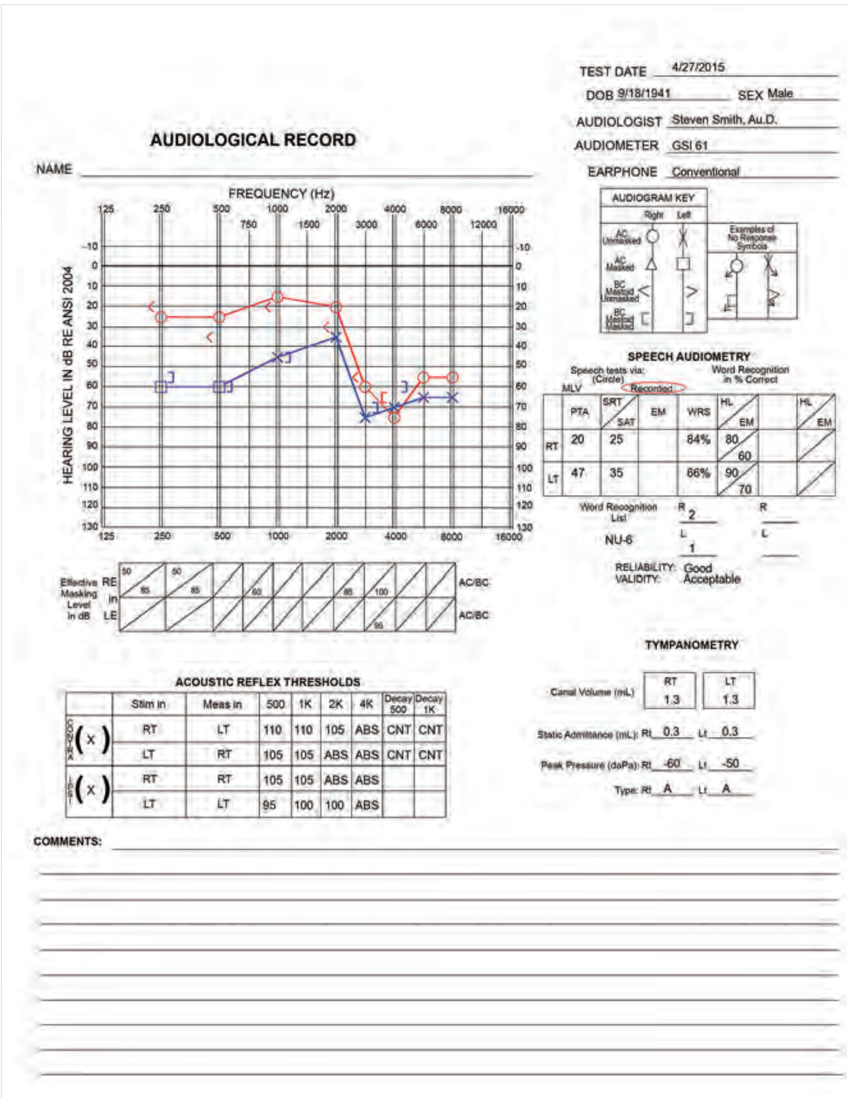


Fig. 5.25 Audiogram of a patient with progressive left-sided hearing loss with intermittent dizziness starting a few months ago.

5.25.2 Interpretation

Right ear—Slight sensorineural hearing loss at 250 to 2,000 Hz, with a rise to normal at 1,000 Hz, sloping to moderately severe to severe at 3,000 to 4,000 Hz, rising to moderate at 6,000 to 8,000 Hz. The SRT demonstrated a slight loss and was in agreement with the PTA. The WRS was obtained and showed a slight difficulty. Immittance testing revealed a normal tympanogram. Acoustic reflex thresholds for ipsilateral and contralateral stimulation were present, but elevated at 500 and 1,000 Hz and absent at 2,000 and 4,000 Hz. The contralateral acoustic reflex decay could not be measured.

Left ear—Moderately severe rising to mild sensorineural hearing loss at 250 to 2,000 Hz, sloping to severe at 3,000 Hz, rising to moderately severe at 4,000 to 8,000 Hz. The SRT demonstrated a mild loss and was relatively in agreement with the PTA. The WRS was obtained and showed moderate difficulty. Immittance testing revealed a normal tympanogram. Acoustic reflex thresholds for ipsilateral stimulation were normal at 500 through 2,000 Hz and absent at 4,000 Hz. Acoustic reflex thresholds for contralateral stimulation were present, but elevated at 500 through 2,000 Hz and absent at 4,000 Hz. The contralateral acoustic reflex decay could not be measured.

5.25.3 Intervention

The patient was referred to an ENT specialist for follow-up due to the asymmetry of his hearing and WRS. He was referred for an MRI to rule out a retrocochlear pathology, and it was recommended that he follow up for a hearing aid evaluation, pending medical clearance.

5.26 Case 26

5.26.1 Case History

The patient reported a long-standing history of bilateral profound sensorineural hearing loss. The hearing loss in the right ear occurred suddenly and was gradual in the left ear. Over the last year she had noticed a decrease in hearing with her left BTE hearing aid compared to her last hearing test. She could no longer hear anything with the left hearing aid. She had extreme difficulty hearing during the appointment, and all communication was completed by writing to her. She noted intermittent clicking and other noises in her left ear when she watched TV at night. She had occasional otalgia in the left ear. She had previously been evaluated for a cochlear implant, but did not qualify at the time because her heart was not able to handle anesthesia. She did not report other otologic symptoms or history.

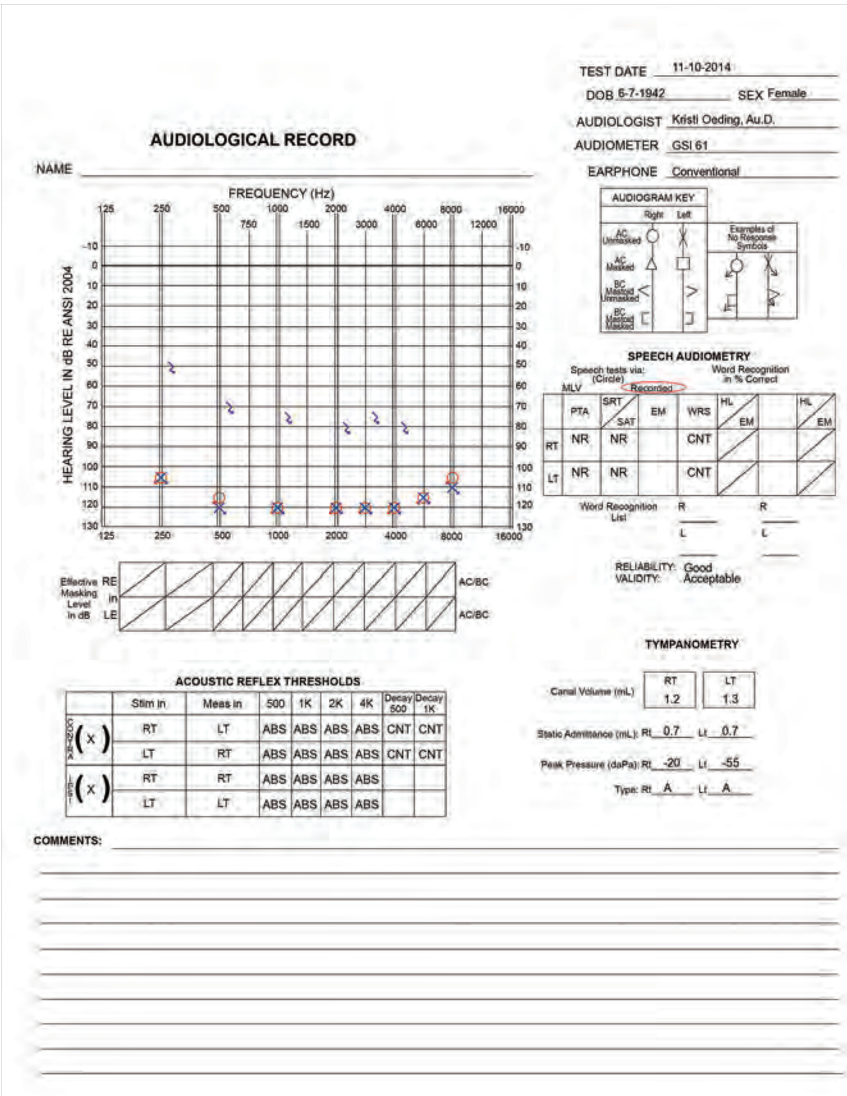


Fig. 5.26 Audiogram showing a hearing loss that was gradual in the left ear and sudden in the right ear.

5.26.2 Interpretation

Right ear—Pure-tone thresholds revealed a profound sensorineural hearing loss with no measurable response within the limits of the audiometer at 250 to 8,000 Hz. The SAT revealed an inability to detect speech at the limits of the audiometer and was in agreement with the PTA. The WRS could not be tested because an SAT could not be obtained. Immittance testing revealed a normal tympanogram. Ipsilateral and contralateral acoustic reflex thresholds were absent from 500 to 4,000 Hz. Acoustic reflex decay could not be measured at 500 and 1,000 Hz due to absent contralateral acoustic reflex thresholds.

Left ear—Pure-tone thresholds revealed a profound sensorineural hearing loss with no measurable response within the limits of the audiometer at 250 to 8,000 Hz. The SAT revealed an inability to detect speech at the limits of the audiometer and was in agreement with the PTA. The WRS could not be tested because an SAT could not be obtained. Immittance testing revealed a normal tympanogram. The ipsilateral and contralateral acoustic reflex thresholds were absent from 500 to 4,000 Hz. Acoustic reflex decay could not be measured at 500 and 1,000 Hz due to absent contralateral acoustic reflex thresholds.

5.26.3 Intervention

The pure-tone air conduction thresholds had decreased to no response in the left ear from 250 to 4,000 Hz compared to her last hearing test. The otologist could not see a reason why she could not undergo surgery because her most recent cardiology report was good. She was scheduled for a CI evaluation and a CT scan, and the otologist planned to talk with her cardiologist about surgery.

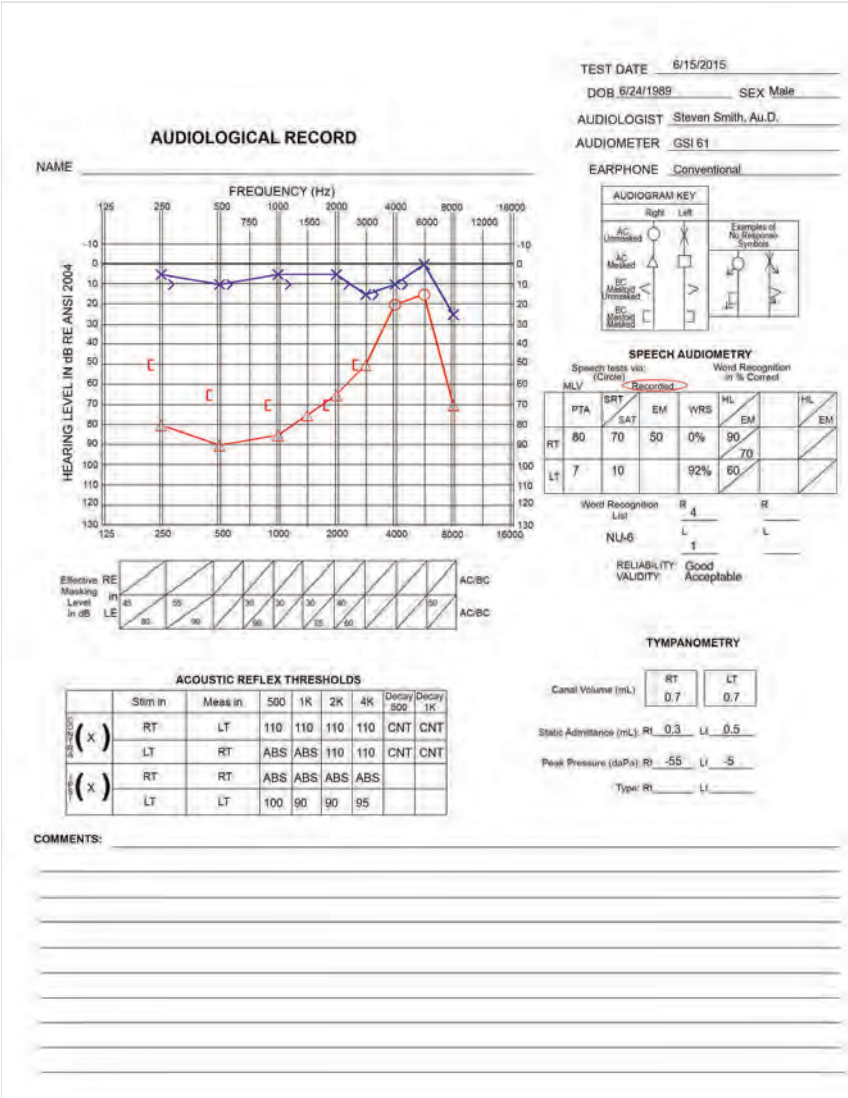
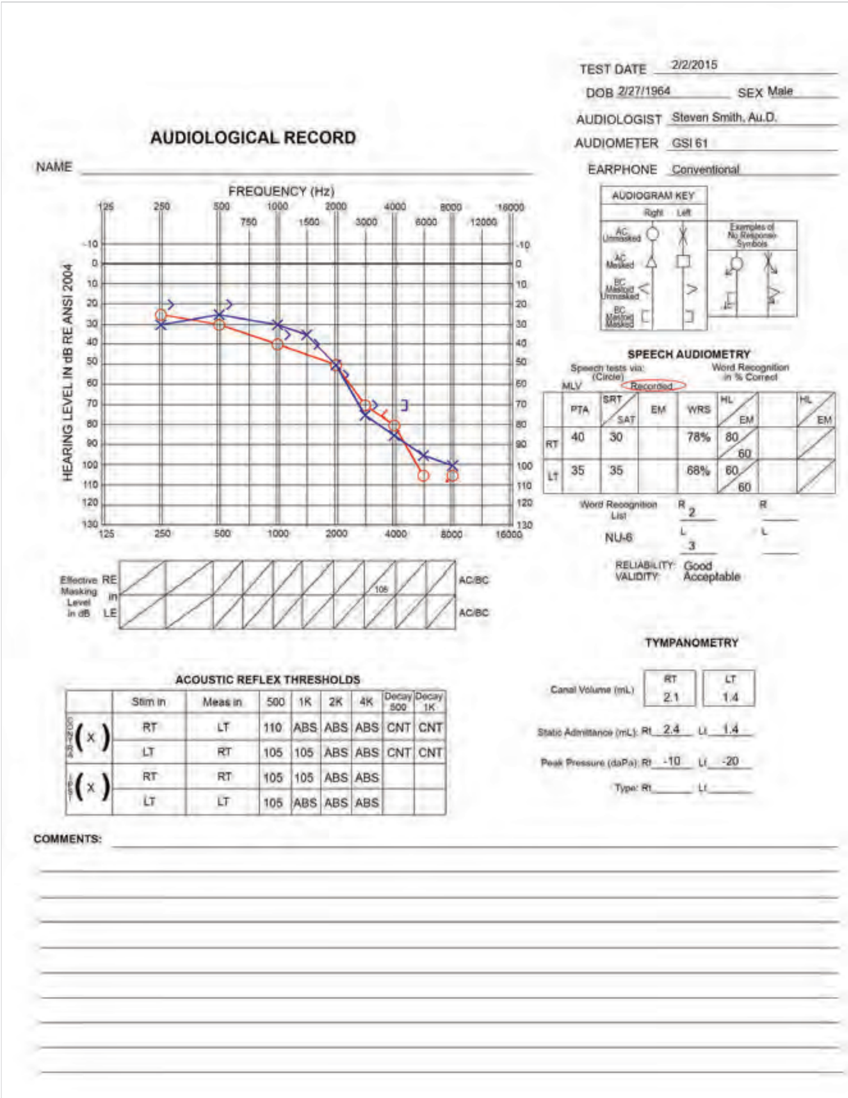


Fig. 9.7 Practice audiogram case 7.



TEST DATE 2/2/2015
DOB 2/27/1964 SEX Male
AUDIOLOGIST Steven Smith, Au.D.
AUDIOMETER GSI 61
EARPHONE Conventional

AUDIOLOGICAL RECORD

NAME

SPEECH AUDIOMETRY

Speech tests via: (Circle) MLV Recorded

Word Recognition in % Correct

	PTA	SRT / SAT	EM	WRS	HL / EM		HL / EM
RT	40	30		78%	80 / 60		
LT	35	35		68%	60 / 60		

Word Recognition List NU-6: R 2, L 3

RELIABILITY: Good
VALIDITY: Acceptable

TYMPANOMETRY

Canal Volume (mL): RT 2.1, LT 1.4
Static Admittance (mL): Rt 2.4 Lt 1.4
Peak Pressure (daPa): Rt -10 Lt -20
Type: Rt ____ Lt ____

ACOUSTIC REFLEX THRESHOLDS

	Stim in	Meas in	500	1K	2K	4K	Decay 500	Decay 1K
CONTRA (x)	RT	LT	110	ABS	ABS	ABS	CNT	CNT
	LT	RT	105	105	ABS	ABS	CNT	CNT
IPSI (x)	RT	RT	105	105	ABS	ABS		
	LT	LT	105	ABS	ABS	ABS		

COMMENTS:

Fig. 9.8 Practice audiogram case 8.

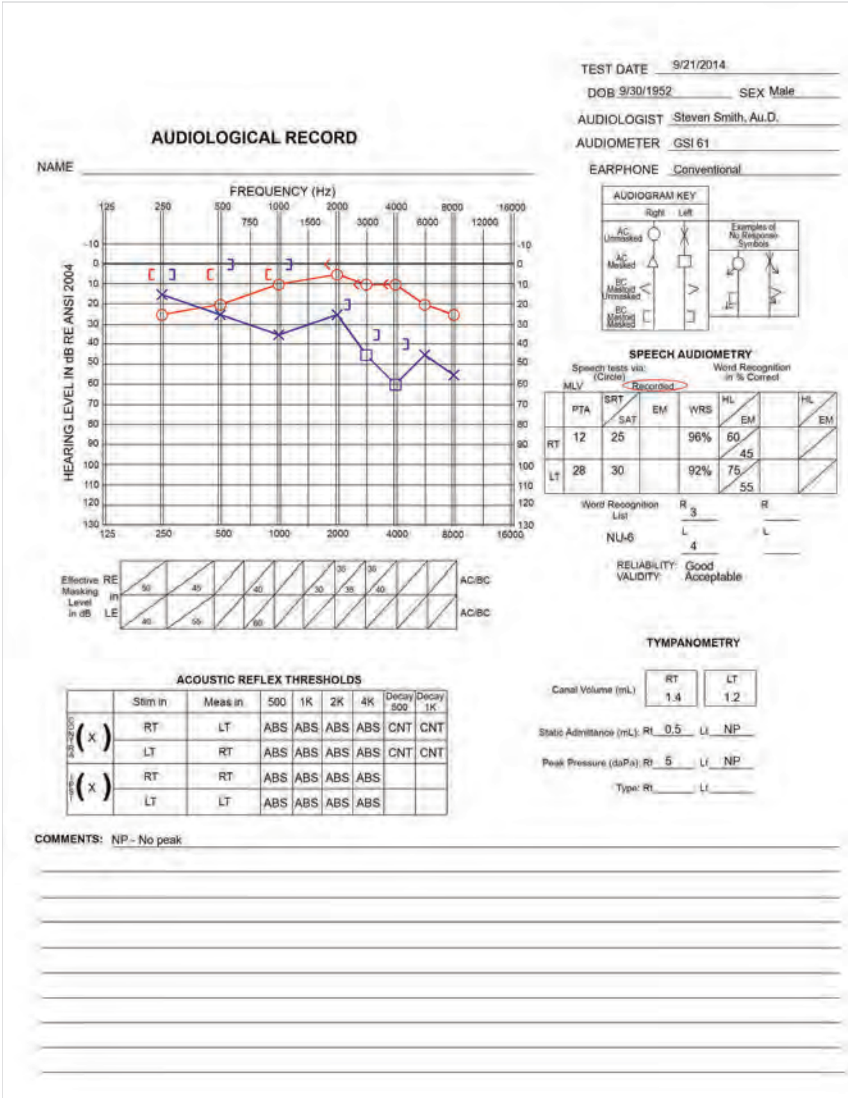


Fig. 9.9 Practice audiogram case 9.

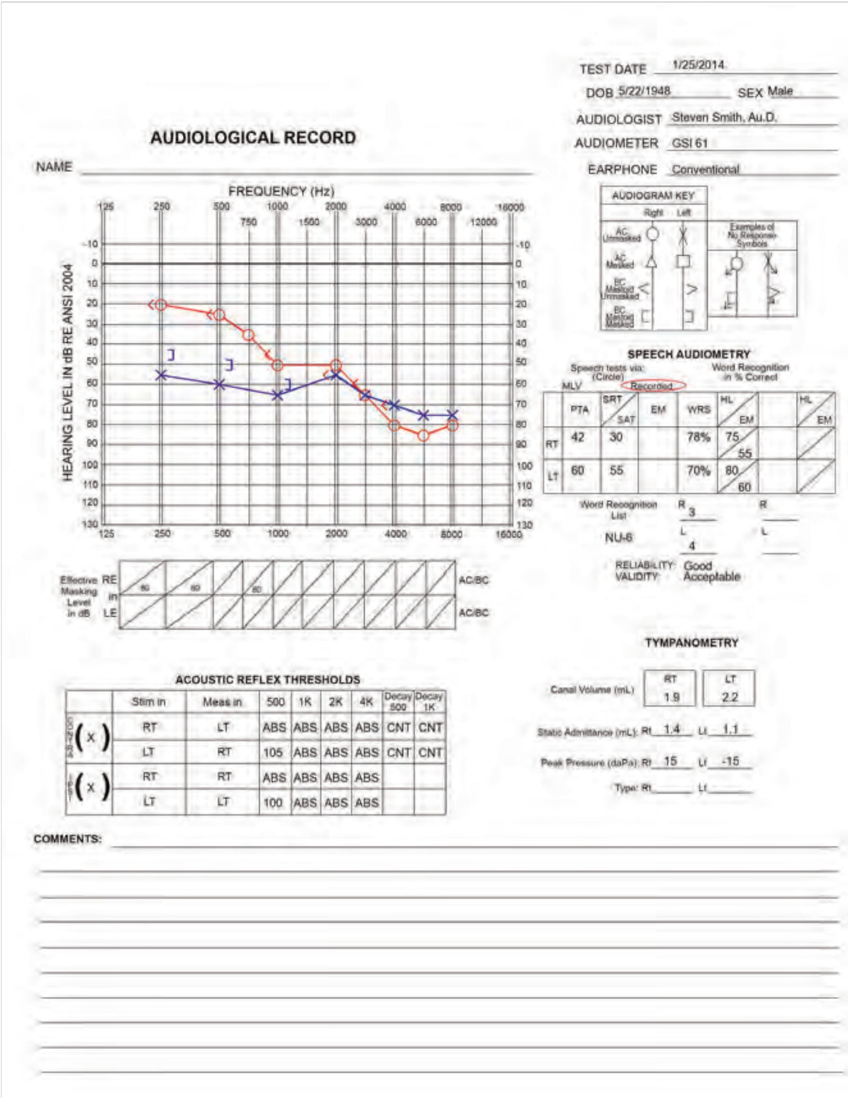


Fig. 9.10 Practice audiogram case 10.