AUDITORY BRAINSTEM RESPONSE : A DIAGNOSTIC TOOL: THREE CASE REPORTS

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N. Madanoğlu, Ph.D. / U. Arıbal, Ph. D.*** / F. Akdaş, Ph.D.***

* *Professor, Department of Audiology and Speech Pathology, Faculty of Medicine, Marmara University, Istanbul, Turkey.*
** *Associate Professor, Department of Audiology and Speech Pathology, Faculty of Medicine, Marmara University, Istanbul, Turkey.*
*** *Specialist, Department of Audiology and Speech Pathology, Faculty of Medicine, Marmara University, Istanbul, Turkey.*

ABSTRACT

The sensitivity of Auditory Brainstem Response (ABR) audiometry is high for detecting the 8th cranial nerve (N VIII) tumors. With the routine use of ABR the sensitivity and specificity of the test will be higher. We present three cases which illustrate the value of ABR as a diagnostic tool. The results of ABR were positive in all three cases and were verified by Magnetic Resonans Imaging (MRI) and surgery. The role of ABR testing in diagnosis is undeniable with its being noninvasive and an easy to use technique.

Key Words: Retrocochlear pathology, Neural pathology, Cerebellopontine angle tumors, Auditory brainstem response,

INTRODUCTION

One of the major issues of clinical audiology is to differentiate cochlear versus retrocochlear pathologies (1,2). Especially when the reason of the retrocochlear pathology is a life threatening tumor, it is hazardous not to detect the pathology as early as possible.

As suggested by most clinical settings, we use ABR routinely in patients with sensori-neural hearing impairments to differentiate sensory versus neural pathologies. ABR as being a noninvasive and easy to apply technique, is used most commonly for diagnosis. Also as it is stated by some authors, that functional abnormalities in the electrical responses appear in the brain before the structural defect appears which then can be imaged in MRI (3).

In recent years sensitivity and specificity of ABR findings in neurodiagnosis has been examined and high correlation was found in identification of retrocochlear pathologies (4). ABR is a powerful tool in identifying tumors in posterior fossa and 8th nerve involvements (5-8).

We want to present three cases to indicate the high sensitivity of ABR in neurodiagnosis.

CASE 1:

The first case is a 25 year old man (subject E B). The patient was a soccerball player who fell down and lost consciousness very briefly during a match. His medical history was unremarkable besides this very brief loss of consciousness.

Clinical Findings: Conventional audiometric techniques were used. Pure tone averages of 2dB and 0dB for the right and left ears (Fig. 1) were detected.

Acoustic immitance assessment revealed normal tympanograms (type A) in both ears. Ipsilateral reflexes were present from 500 - 4000 Hz at 95dB HL bilaterally. Contralateral reflexes were within the normal range between 500 - 4000 Hz.

Speech discrimination was 88% in the left ear and 90% in the right ear.

Diagnostic ABR was applied at 70dB nHL in both ears.

Normal absolute peak latency values and interpeak latencies were obtained in the right ear.

In the left ear, although the waveform morphology was normal, absolute latency values of wave I, III, V and interpeak latency values of wave I-III, III-V, I-V were longer than our clinic norms. Prolonged wave V values were detected in the latency-intensity function down to 40dB nHL. Prolonged absolute wave latencies and interpeak values supported retrocochlear pathology (Fig. 2).

In his MRI, there was the evidence of an epidermoid tumor in the left cerebellopontine angle (Fig. 3). On the 14th of December 1994, he had underwent a left retromastoid craniotomy. Pathological examination of the specimen showed epidermoid cyst.

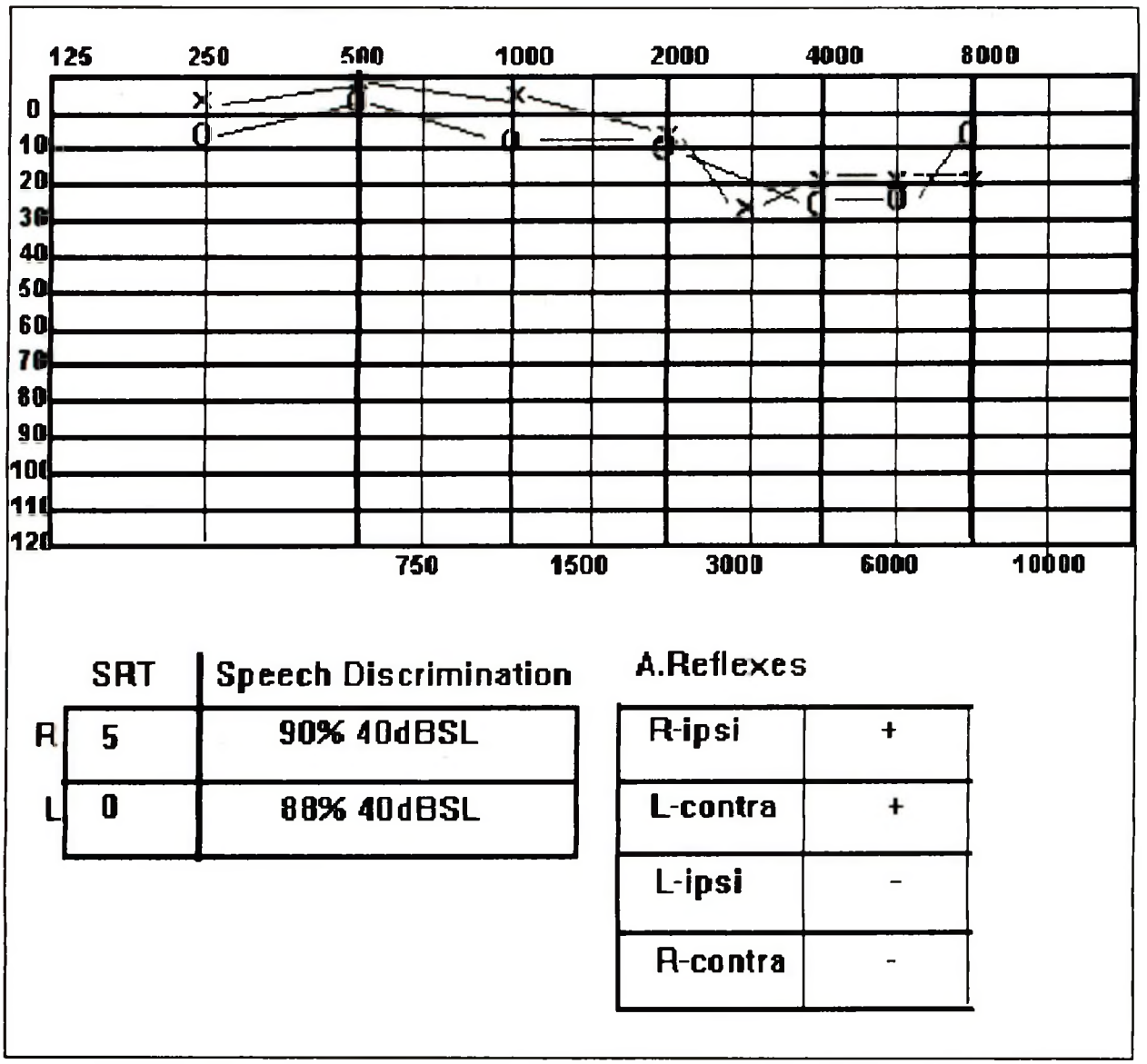


Fig. 1: *Pure - tone, speech and acoustic immitance test results of Case 1.*

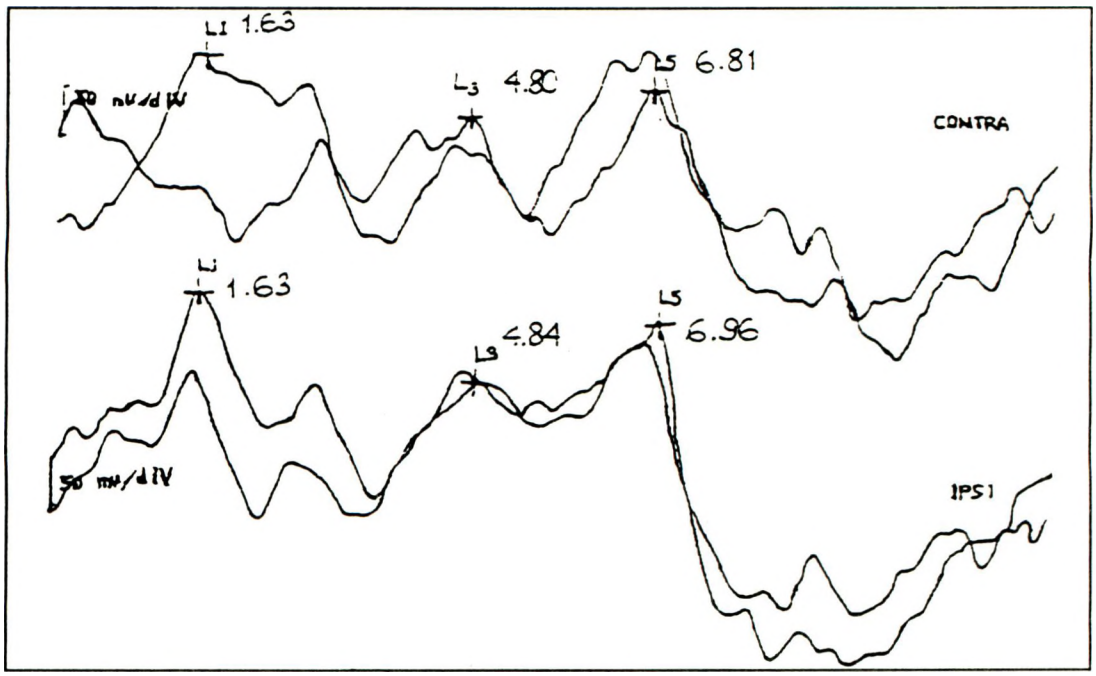


Fig. 2: *ABR for left ear of Case 1.*

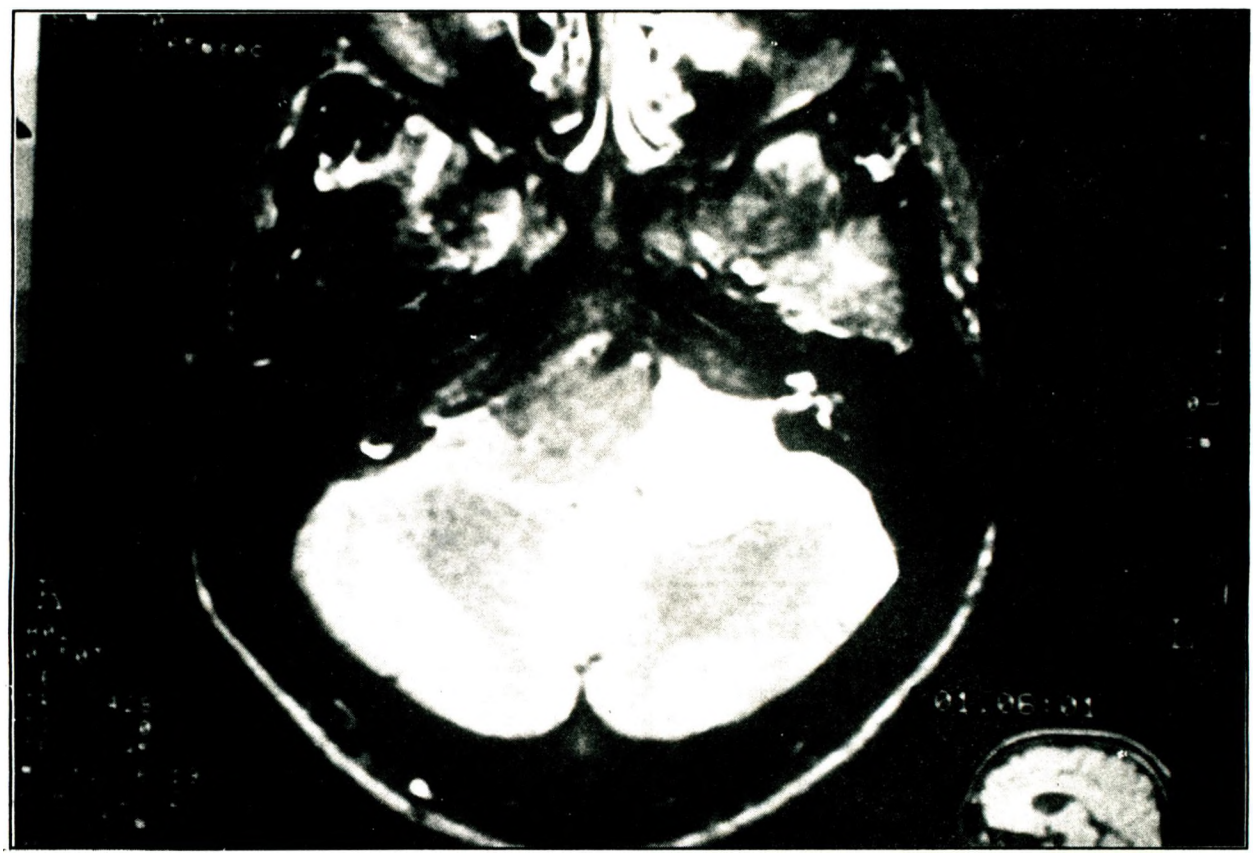


Fig. 3: *MRI of Case 1.*

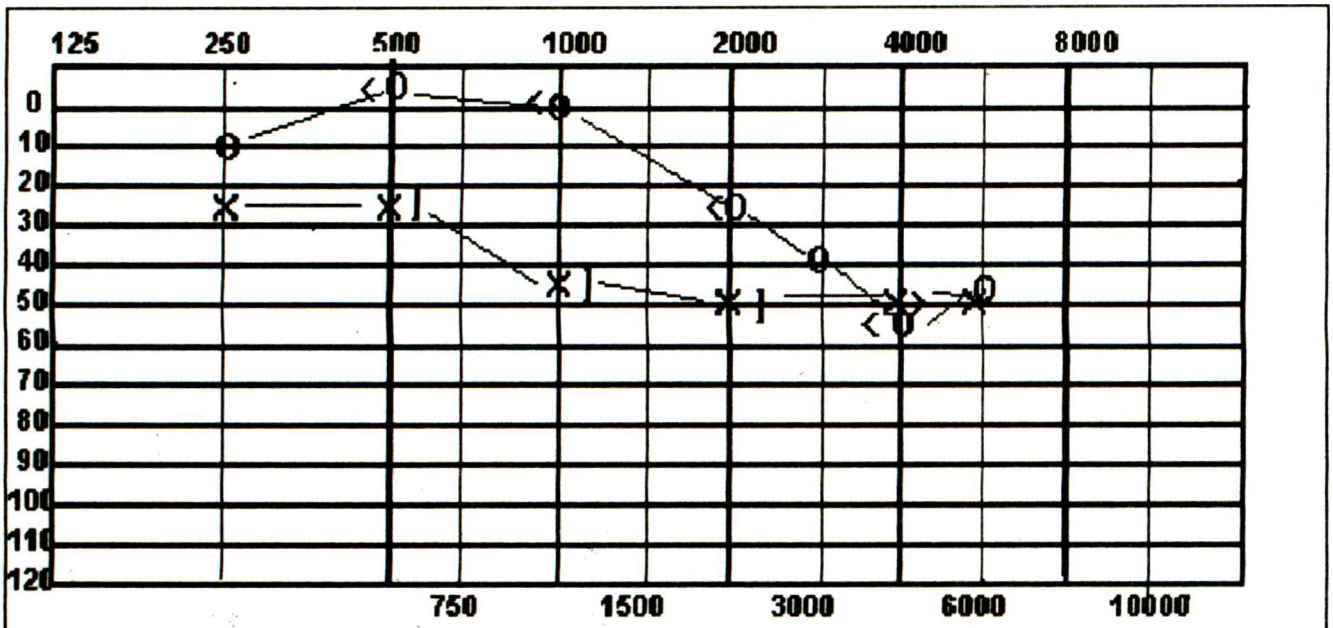
CASE 2:
A 61year old man (Subject AY) with a complaint of tinnitus in the left ear for 2.5 months was referred from the ENT department of our hospital, with normal otoscopic findings. He did not have any other complaints or medical disorder.

Clinical Findings: Initial audiological assessments including pure tone, speech audiometry and immitance tests were applied on the 20th of March, 1992. Behavioral tests showed a slight to mild sensori-neural hearing loss bilaterally greater for the left in the midfrequencies. Speech discrimination scores were 96% in the right and 84% in the left ear. (Fig. 4)

Immitance measurement showed normal type A tympanograms and normal static compliance measurements bilaterally. Crossed acoustic reflexes with sound to the right ear were absent. With sound to the left ear reflexes were within normal limits with reduced sensation levels indicating positive Metz recruitment. Uncrossed acoustic reflexes were normal for the right ear but absent for the left ear.

His ABR at 70dB nHL was characterized by a prolonged wave III absolute latency, and a prolonged I-III interpeak interval with normal waveform morphology in the right ear. In the assessment of latency-intensity function, a prolonged wave V was identifiable down to 40dB nHL with partial abnormal waveform configuration.

His response on the left ear at 95dB nHL showed a well defined wave I with no identifiable later waves (II through V) (Fig. 5).



	SRT	Speech Discrimination
R	10	96% / 40dBSL
L	40	84% / 40dBSL

A.Reflexes		Metz Rec.
R-ipsi	+	
L-contra	+	+
L-ipsi	-	
R-contra	on-off	

Fig. 4: *Pure - tone, speech and acoustic immitance test results of Case 2.*

MRI examination revealed the left cerebellopontine angle tumor partially protruding in the internal acoustic canal (Fig. 6).

On the 25th of July 1992, a tumor was removed with the translabyrinthine approach, and pathological examination revealed an 8th nerve schwannoma.

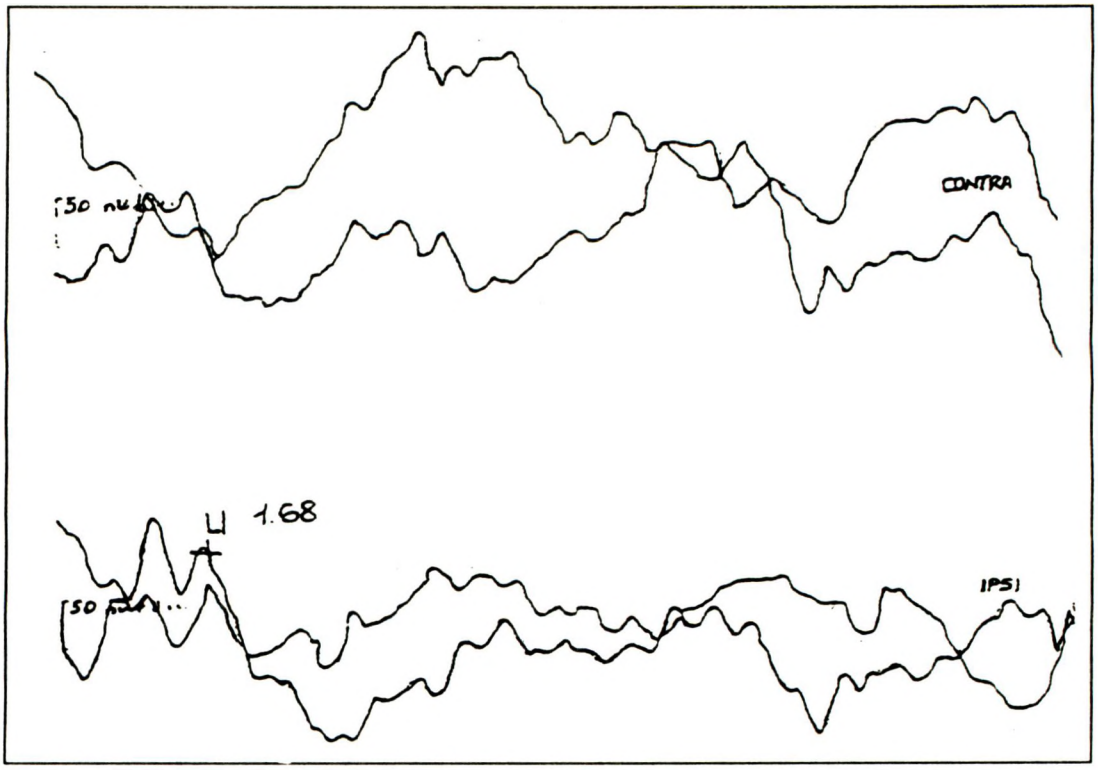


Fig. 5: *ABR for left ear of Case 2.*

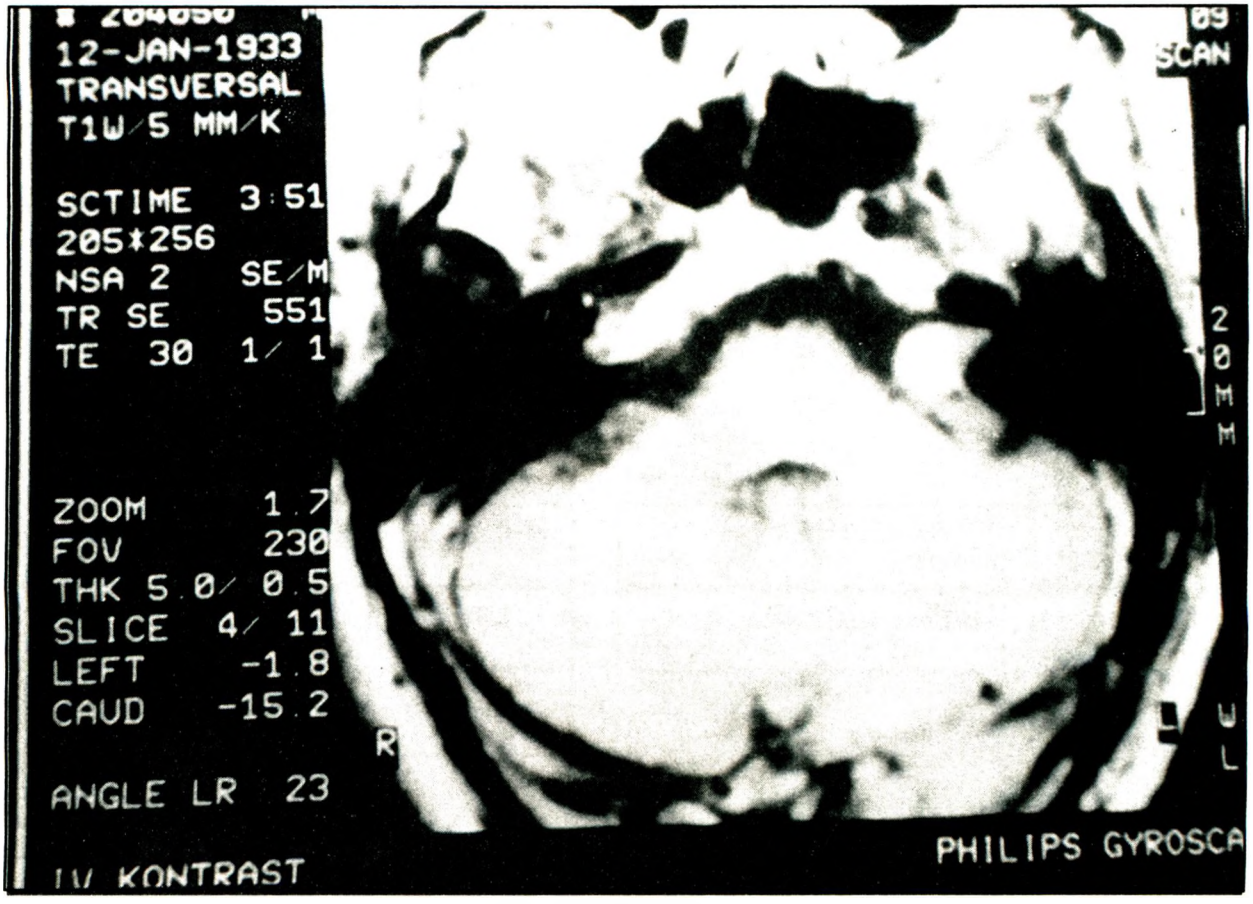


Fig. 6: *MRI of Case 2.*

CASE 3:

The third case (Subject EI) was a fifteen year old young girl referred from ENT in June 1991 with a four to five year history of right-sided progressive hearing loss and pain in the post auricular area which disappeared later on. She denied any vertiginous symptoms, balance problems, facial twiching and numbness. In the last 2 to 3 years, she had right-sided high frequency tonal tinnitus intermittently. Recently, she realized that she had hearing difficulty in understanding while talking on the telephone with her right side. But the family ignored this complaint, thinking that since she was in her teens, she was trying to get attention and they attributed the complaints to the school problems.

Clinical Findings: Except for her righ-sided hearing loss, her physical examination was within normal limits, including cranial nerves.

Audiometric evaluation showed predominantly low frequency hearing loss in the right ear with entirely normal hearing in the high frequencies. Her PTA in the right ear was 57 dB and WDS was 58% (Fig. 7).

Although she had normal hearing in the high frequencies, we were not able to elicit either ipsilateral or contralateral acoustic reflexes for the right ear.

Her hearing in the left ear was normal. Left ear ipsilateral and contralateral reflexes were within normal limits.

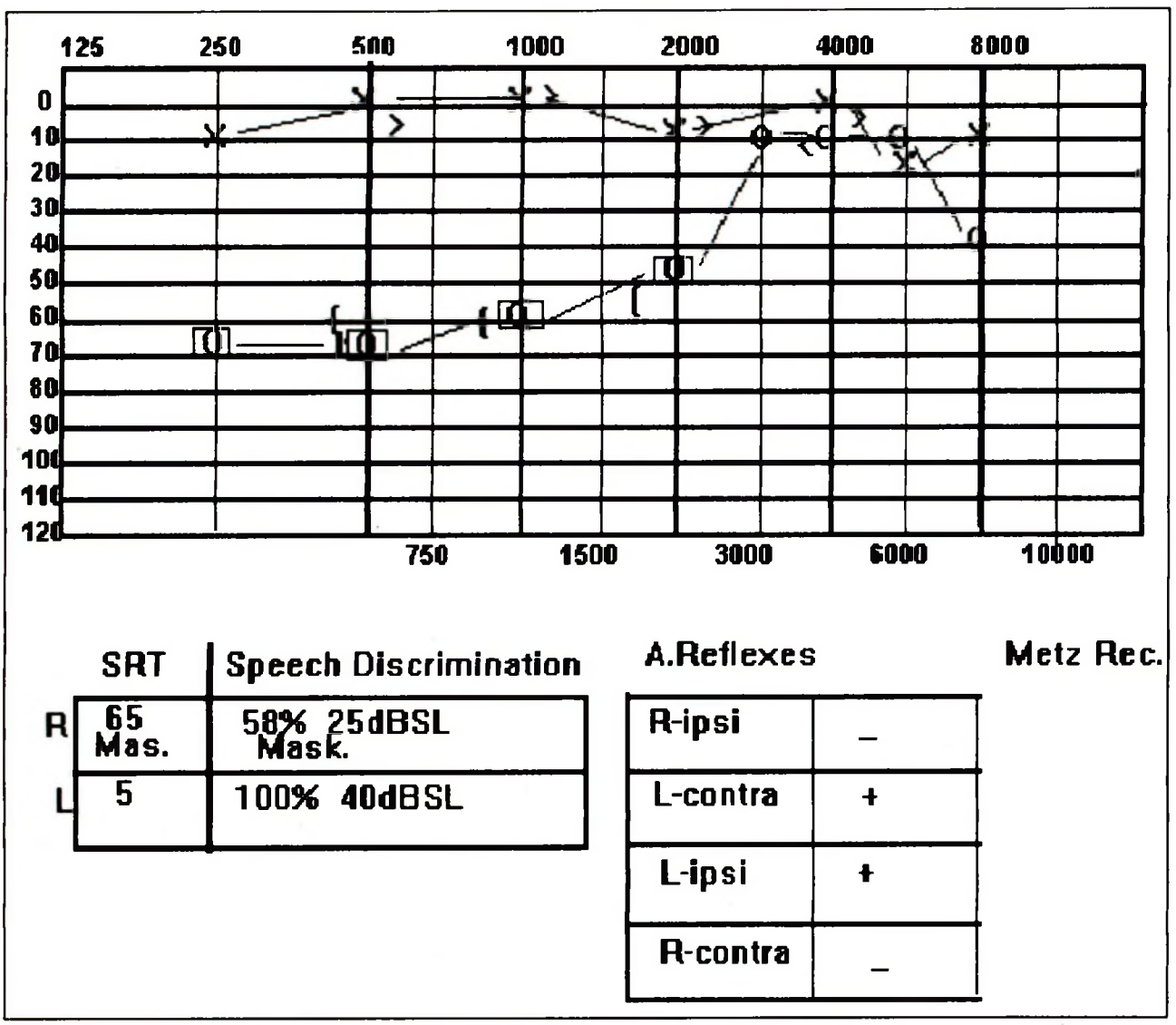


Fig. 7: *Pure - tone, speech and acoustic immitance test results of Case 3.*

Her ABR responses demonstrated prolonged IPL for the right ear and absolute latency of the wave V was also prolonged (Fig. 8).

Mastoid tomograms demonstrated 42x30 mm mass lesion on the right cerebellopontine angle (Fig. 9). Her MRI was also consistent with this finding.

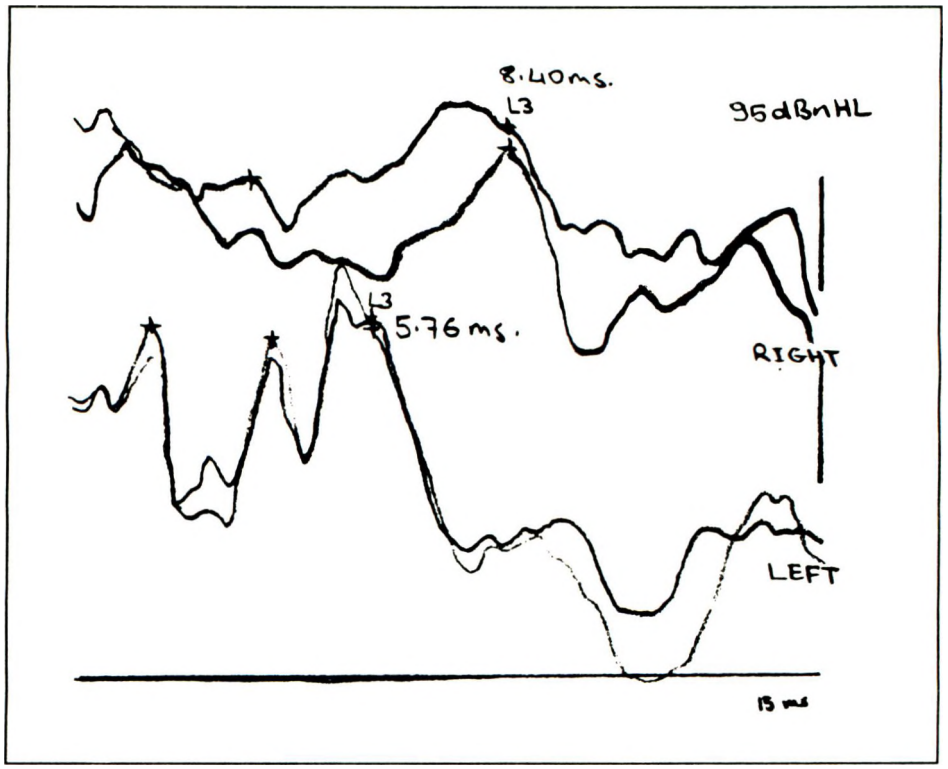


Fig. 8: *ABR for right and left ear of Case 3.*

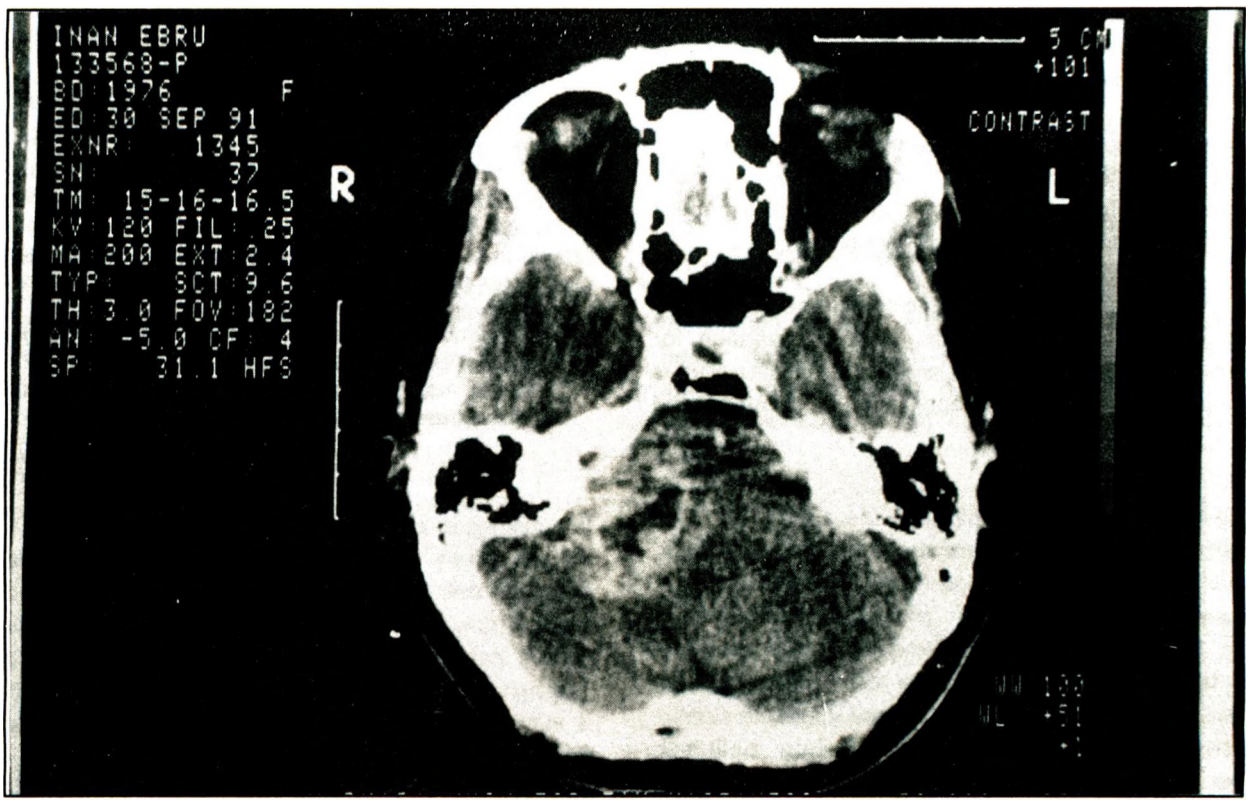


Fig. 9: *MRI of Case 3.*

The patient was referred to neurosurgery and a right retromastoid craniotomy was done. The tumor which involved $7,8^{th}$ and lower cranial nerves and also attached to the pons was removed totally. Pathologic examination of the specimen revealed a schwannoma.

DISCUSSION

The ultimate goal of diagnostic procedures for eighth nerve tumors is early detection. ABR has proven to be a reliable, reproducible and accurate tool in neurotologic diagnosis (9). As a noninvasive technique easy to apply; it is an ideal tool to serve the purpose. ABR recordings add additional information to that provided by the other electro-physiological tests already developed as adjuncts to conventional audiometry (10).

Schuknecht (11) suggests that up to 75% of auditory nerve fibbers can be damaged with a negligible effect on puretone hearing. So the sensitivity of ABR is important in detecting even subclinical retrocochlear abnormalities as seen in our case 1. Also Susan Jerger and James Jerger (12) present an acoustic schwannoma case with normal hearing. Normal hearing should not dissuade the otologist and audiologist from a comprehensive evaluation because especially smaller tumors are much more elusive in their clinical presentation.

Another useful information gained from ABR results is assisting the surgeon in selecting the surgical approach for removal and in advising the patient regarding his postoperative prognosis.

Unilateral tinnitus, asymmetric sensori-neural hearing loss and dizziness are all classic indication for retrocochlear involvement and further investigation is inevitable which is ABR application as in our second and third case. Musiek (3) presents acoustic neurinoma cases only with unilateral mild sensori-neural hearing loss and tinnitus symptoms. Any signs and symptoms suggesting the presence of a tumor should be the reason for an ABR test.

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