THE VALIDITY OF THE ACOUSTIC REFLEX DECAY TEST IN THE DIAGNOSIS OF ACOUSTIC NEUROMA

CELENE MCNEILL

Hearing Research and Diagnostic Clinic
350 Victoria St, Darlington NSW 2010

ABSTRACT

Acoustic Reflex Decay is the main test used in the screening of retro-cochlear lesions at those clinics where Auditory Evoked Response facilities are not available. This study looked at the reflex decay findings of 46 patients with surgically confirmed acoustic neuromas to assess the validity of this procedure, comparing the size of the tumour to the presence of reflex decay at 2kHz. No correlation was found between tumour size and decay. The smallest tumour presented reflex decay while the largest had normal acoustic reflex results. Based on this study acoustic reflex decay is not a good predictor of retro-cochlear pathology.

INTRODUCTION

Although Auditory Brainstem Response (A.B.R.) is the test of choice to detect retro-cochlear pathologies, there are still some clinics where this facility is not available. These clinics usually rely on other tests such as Acoustic Reflex Decay (ARD) to screen for retro-cochlear lesions. The objective of this study was to look at ARD findings in patients with confirmed acoustic neuroma to assess the reliability of this procedure as a means of screening for retro-cochlear lesions.

ARD was first reported by Anderson et al (1979), as found in patients with VIIIth nerve lesions. It was then suggested that ARD was useful in differentiating cochlear from retro-cochlear hearing losses. According to Turner et al (1984), 63% of the patients with retro-cochlear pathology presented ARD and 84% showed some abnormality in the acoustic reflex (elevated or absent threshold and/or decay).

Before the widespread use of A.B.R. in the audiological testing routine, the pathological adaptation to sounds was considered one of the most valuable findings for the diagnosis of retro-cochlear pathology. Adaptation is defined as a decrease of response to a persistent sensory stimulus, a property of all sensory systems. In the auditory system, adaptation is found to be abnormal in cases of lesions of the acoustic nerve. The pathological assessment of adaptation was first reported by Schubert in 1944 (cited in Katz, 1984), as the Tone Decay test. This test is a subjective measurement that can be performed using several different procedures devised by different authors (Hood, 1956; Carhart, 1957; Rosenberg, 1958 and Green, 1960).

The objective measurement of the adaptation phenomenon became possible with the development of Impedance Audiometry, more specifically with the Metz bridge, devised by Metz in 1946. This electroacoustic device was the first used to measure the Acoustic Reflex (AR). In 1970, Anderson et al observed abnormal adaptation of the AR in patients with tumours of the acoustic nerve who also presented positive results in subjective Tone Decay tests (cited in Katz, 1984). Characteristically, the AR is sustained for at least 10 seconds at 600Hz and 1 kHz at 10 dB above the AR threshold in normal ears, using contra-lateral stimulation. The ARD became a routine measurement as a screening procedure for detecting acoustic neuromas, among other retro-cochlear diseases.

All the patients tested in our clinic have ARD routinely checked during impedance audiometry. It has been observed, however, that some of those patients with confirmed retro-cochlear lesions did not present any abnormality in the AR, indicating false negative results. Fowler et al (1984) reported a false negative rate for ARD in VIIIth nerve lesions ranging from 2 to 23% in different studies.

This study looks at the percentage of patients with confirmed acoustic neuroma who presented positive ARD findings, as indicative of abnormal adaptation to sound, and compares these findings to the size of the tumour.
METHOD

The audiological test results of 46 patients who had an acoustic neuroma removed by surgery were analysed in order to correlate the presence of ARD in the pre-operative tests with the size of the tumour as documented by the surgeon. All the 46 patients had audiological assessment at the Hearing Research and Diagnostic Clinic prior to the tumour removal.

The assessment included pure tone audiometry (air conduction and bone conduction), speech audiometry (P.I. function using Boothroyd's words lists) and impedance audiometry (tympanometry, AR thresholds via contra-lateral stimulation at 500Hz, 1kHz, 2kHz and 4kHz, via ipsi-lateral stimulation at 1kHz and 2kHz, and ARD via contra-lateral stimulation at 500Hz and 1kHz) and A.B.R. using clicks from 90 to 106 dBHL as applicable.

The AR measurements were performed using Amplaid 702 and Amplaid 720 impedance bridges. The maximum output used to measure the ARD was 115 dBHL. ARD was considered present when the AR was reduced by at least 50% of its recorded amplitude during 10 seconds stimulation at 10 dB above the AR threshold at 500Hz and 1kHz via contralateral stimulation.

Analysis of the results was conducted by considering the surgeon's post-operative notes regarding the size and side of the tumour, the air conduction pure tone thresholds at 1 kHz in the affected ear, the presence of contralateral reflex decay at 1 kHz, the absolute latency of waves I, III and V, and the interaural wave V latency difference in the A.B.R.

RESULTS

Analysis of the results was based on the AR measurements at 1 kHz via contra-lateral stimulation, as this was considered the more representative of the tested frequencies (Fowler et al., 1984).

The results are reported as: "no reflex" when no AR was obtained up to 115 dBHL stimulation; "no decay" when there was AR but no decay was present; "decay" when ARD was present and "could not test" when the AR threshold was above 105 dBHL hence the decay could not be tested. The AR was reported as present regardless of its sensation level.

Results obtained from the 46 patients showed no AR in 43%, followed by 26% who presented ARD, 17% who presented no ARD and 11% could not be tested for ARD.

The tumours were divided in 3 groups according to their size in diameter: up to 1 cm;

![Graph showing reflex decay results](image)

Figure 1: Comparison of tumour size and reflex decay results.
1.5 to 3cm and more than 3cm. The numbers in these groups were, respectively, 19, 21, and 6. A comparison of the AR results with tumour size is shown in fig 1. No consistent correlation could be established between the two, showing that AR results are not a good predictor of tumour size.

The hearing loss at 1 kHz was classified as: “no loss” for thresholds up to 20 dBHL, “mild” from 25 to 40 dBHL, “moderate” from 45 to 65 dBHL, “severe” from 70 to 85 dBHL and “profound” from 90 dBHL and up. The relationship between the hearing loss at 1 kHz and the AR results is shown in fig 2.

DISCUSSION

It was hypothesised that “no decay” could be related to a small sized tumour, which would not affect the auditory function. It was thought that decay might not be detected when the tumour was still too small to interfere in the AR mechanism. Analysis of fig 1, however, does not confirm this hypothesis, as “no decay” was found in all three tumour size groups. Ironically, the smallest tumour found in the study (0.5 cm) presented ARD while the largest (4.5 cm) showed no decay; indicating no consistent relationship between tumour size and abnormal adaptation to sound.

The correlation between hearing loss and AR results, as shown in fig 2, also failed to demonstrate any relationship between ARD and degree of loss. “Decay” and “no decay” were found in all degrees of loss except in the “profound” group where the AR was absent.

Based on this group of patients we can conclude that ARD can be found in acoustic neuromas with any degree of hearing loss, except for those greater than 90 dBHL. The presence of ARD, therefore, can be considered as an indication of retro-cochlear lesion. The extension of the lesion however, cannot be predicted; any tumour size can produce abnormal adaptation to sound.

From the 46 cases studied, however, the ARD could be tested in only 19 patients. The remaining 27 cases either did not present AR or had AR thresholds at elevated levels which did not allow decay measurement. That the AR was absent in the majority of our patients is in agreement with other studies reported in the literature (Fowler, 1984). Absent AR in normal hearing or in sensorineural hearing losses seems to be the strongest sign of retro-cochlear lesion detected by AR measurements. Our data also agrees closely with Turner’s (1984) which showed 84% of the retro-cochlear patients to have some abnormality in the AR (either absent, elevated or decay). Our false negative rate (17%
with no ARD) agrees with the highest rate reported by Fowler (23%). The percentage of ARD found in our population, however, is far lower than that reported by Turner. His study showed 63% of the patients having ARD while in our study only 17% presented decay.

In our study there was 59% of patients, with acoustic neuroma, for whom there was no objective way of measuring adaptation to sound.

Furthermore, false positive results of the ARD have not been investigated in our clinic. Fowler reported the false positive rate to range from 1 to 31% in the literature. Without these figures, the reliability of this test in predicting retro-cochlear lesions cannot be fully determined.

The A.B.R. of these 46 patients, on the other hand, did not leave any doubts regarding the site of the lesion. All the results were clearly abnormal, showing either absence of waveforms or interaural wave V latency differences greater than 0.2 ms. Although it is a fast screening procedure, the objective measurement of ARD during impedance audiometry is not a very reliable predictor of retro-cochlear lesions. When positive, it should be considered as an indication of retro-cochlear pathology. The clinician, however, should be aware of the possibility of misleading results. In our study, 5 out of 46 patients with confirmed acoustic neuroma revealed AR present at normal sensation levels and no ARD. Normal AR results, therefore, do not exclude the possibility of retro-cochlear pathology.

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REFERENCES


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