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OTOLOGY

Positive findings on MRI in patients with asymmetrical SNHL

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Abstract This is a retrospective study of 100 consecutive patients who attended our ENT outpatient clinic in 6 month-period from April to September 2006. All of them presented with Asymmetrical SNHL. They were all investigated with MRI scan of the IAM and CPA. We did not employ any guidelines or protocols as to when to request MRI in patients with Asymmetrical SNHL. The mean age for the studied group was 52.97. Gender distribution in the studied group was 53% for males and 47% for females. The pickup rate was 1% for CPA lesion which was vestibular schwannoma. However, incidentally, there were 15% of cases with vascular loop at the CPA.

Keywords SNHL · MRI · Acoustic neuroma · Vascular loop · Vestibular schwannoma

Introduction

The presentation of a patient with Asymmetrical SNHL always arouses suspicion of retrocochlear pathology which can be serious. In this era of increasing trend of litigation, the clinicians tend to be defensive in their medical practice. Therefore, with the slightest asymmetry of hearing on Audiometry, the question of whether to request MRI or not almost always creeps to the clinician's mind. Eventually, the tendency to request MRI scan prevails even though the clinical scenario may not fit well with the type of the investigation requested. Our study clearly depicts this picture.

Unless we employ specific guidelines or protocols as to when to ask for MRI in asymmetrical SNHL, this defensive medical practice would continue. This would mean loss of money and resources.

Review of literature

The following examples demonstrate the variation in guidelines in terms of asking for MRI scan in patients with Asymmetrical SNHL.

Welling and co-workers arbitrarily suggested investigating patients with any 15 dB (or greater) difference in thresholds at any single frequency from 500 Hz to 4 kHz. [1].

The Otolaryngology and Radiology departments in Oxford have suggested a protocol of investigating patients with a minimum of 15 dB difference between the averages of all frequencies between 250 and 8 kHz [2]. In addition, they included all the patients with unilateral tinnitus alone but recommended an upper age limit of 70 years. They have justified this scheme on the basis that it has shown a pick up rate of 5% of CPA lesions.

Mangham [3] has suggested a different approach to this problem. He collected the audiograms from his own series of vestibular schwannomas and also collected data on patients attending a non-selective audiology clinic ("the non-tumour patients"). For a variety of protocols he found out how many of the tumour patients it identified (true positive rate) and how many of the non-tumour patients it would also have included (false positive rate). He represented his results in a receiver-operator characteristic curve

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that plots for each criterion the true against the false positive rate for a range of interaural threshold differences. For single frequencies, he found that the worst to be 250 dB Hz and the best to be 2 kHz but when he combined the best four frequencies (1, 2, 4 and 8 kHz), he did better yet and he found the best asymmetry to be of the order of 15 and 20 dB. The specificity varied significantly between the two thresholds and so he favoured investigating those patients with a 15 dB with the auditory brainstem response test and those with a 20 dB difference by using MRI, reflecting the limited availability of this resource. He drew no distinction between unilateral and bilateral Asymmetrical hearing loss. However, it seems rational that a small unilateral deficit should be more significant than an asymmetry in a patient with established bilateral hearing loss.

Obholzer et al. [4] employed the criterion of 15 dB in those whose better hearing ear had a mean of ≤30 dB hearing loss (considered a unilateral hearing loss) and a 20 dB threshold if the better ear hearing was >30 dB (asymmetrical hearing loss). Their result yielded 97% sensitivity and 49% specificity.

In terms of the incidental findings of vascular loop at the CPA on MRI, our findings have shown a significant higher percentage than most of the other series. Schuknecht and Reissner [5] in the USA have screened patients with SNHL and he found that the incidence of vascular loop is 12.5%. The same findings were reported by Parnes et al. [6]. Mirza et al. [7] reported an incidence of 5% of vascular loops at the CPA.

Materials and methods

We have examined 100 consecutive case notes of those patients with Asymmetrical SNHL. Audiograms and symptoms, on which the decision to scan was made, were reviewed. We have collected the information as per the following data collection sheet:

- Age of the patient:
- Gender: male/female
- Onset of hearing loss: sudden/gradual
- Duration of hearing loss
- Ear affected: right/left
- Degree of asymmetry of hearing loss on audiogram:
- Associated symptoms:
- Tinnitus:
- Facial palsy
- Paraesthesia in trigeminal distribution
- Vertigo
- Headache
- Visual problems/diplopia
- Others
- Associated co-morbidity
- Findings on MRI of Internal auditory meatus.

Frequency (Hz)	<15 dB	>15 dB
500		
1,000		
2,000		
4,000		

We did not employ any guidelines or protocols as to when to request MRI in patients with Asymmetrical SNHL. We have employed the following exclusion criteria to be able to answer the question on one single variable which is asymmetrical hearing loss with regards to MRI findings. The exclusion criteria have included patients who presented with:

- Tinnitus only
- Vertigo only
- Paraesthesia in Trigeminal distribution only
- Facial palsy only.

Results

The age distribution in the studied group is shown in Fig. 1.

Figure 2 shows the sex distribution in the study group.

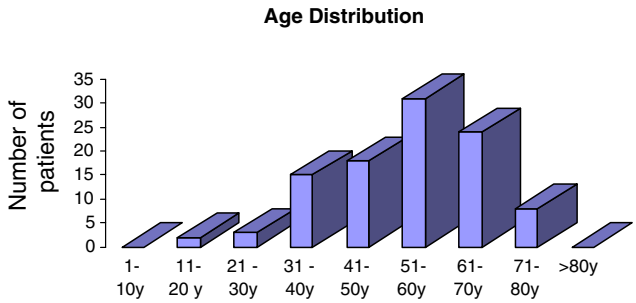

Fig. 1 The age distribution in the studied group

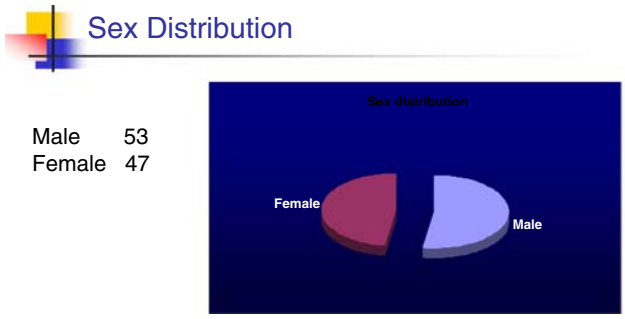

Fig. 2 Sex distribution in the study group

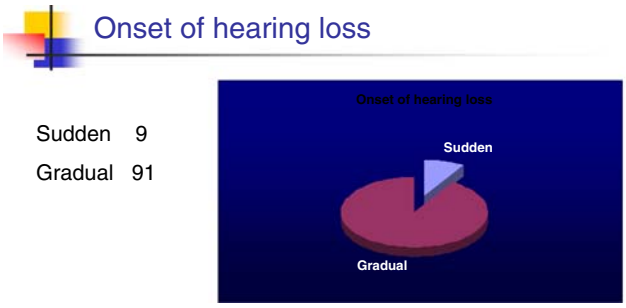

Fig. 3 Onset of hearing loss in the study group

Figure 3 shows the onset of hearing loss in the study group.

Figure 4 shows the duration of hearing loss from the onset in the study group.

The shortest duration of hearing loss in the study group was one month, the longest was 41 years and the mean duration was 3.5 years.

Figure 5 shows the side of hearing loss in the study group.

Figure 6 shows the symptoms associated with hearing loss in the study group.

Figure 7 shows the degree of Asymmetry of hearing loss in the studied group.

This means that 55% of the patients had >15 dB hearing loss and 45% had <15 dB HL. Figure 8 shown in the following bar chart.

Figure 9 shows the associated co-morbid conditions with SNHL.

Figure 10 shows the findings on MRI in the study group.

The one patient in our series with vestibular schwannoma has the following clinical scenario:

- 61-year-old male.
- Gradual Right SNHL for 3 years with vertigo and paraesthesia in the trigeminal distribution.
- Audiogram: asymmetry of >15 dB in the frequencies 500–4 kHz.

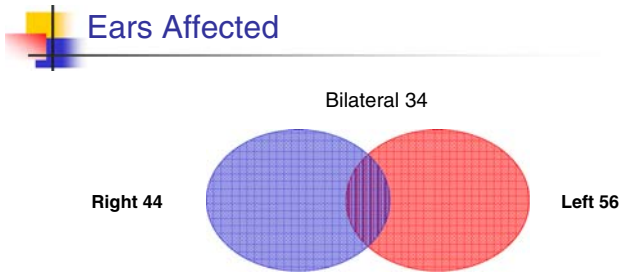

Fig. 5 Side of hearing loss in the study group

- MRI (Fig. 11) has shown 18 × 16 mm lesion in the right internal acoustic meatus displacing the cerebellum and pons.

Following from this, our pick up rate of vestibular schwannoma in this study was 1% which lags behind the published figures in other series. Also, incidentally, there were 15% of patients to have vascular loop at the CPA; 18% with high signals in the mastoid air cell system and 8% with high signals in the paranasal sinuses. Amongst those 15 patients with vascular loop, 10 patients had it bilateral, 3 patients had it contralateral to the side of hearing loss and 2 patients had it ipsilateral to the side of hearing loss.

Discussion

MRI imaging in patients with marginal asymmetrical SNHL is debatable. MRI is still relatively expensive as a screening tool and is associated with patient morbidity. It is therefore not suitable for universal screening. However, it provides targeted screening on a population defined by the presence of unilateral or asymmetrical SNHL. Clinical acumen is clearly of importance and may override any guidelines [8].

Using a protocol to select these patients provides guidance in the recognition of retrocochlear pathology, standardisation of care within departments and, if evidence

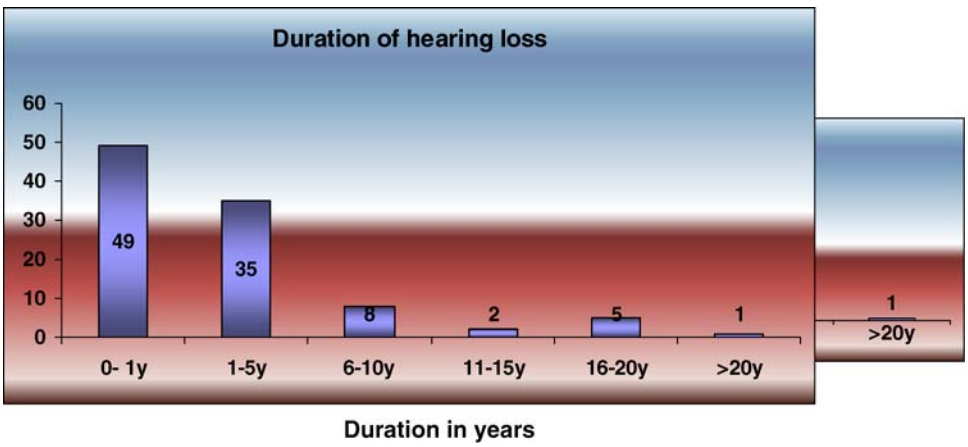

Fig. 4 Duration of hearing loss from the onset in the study group

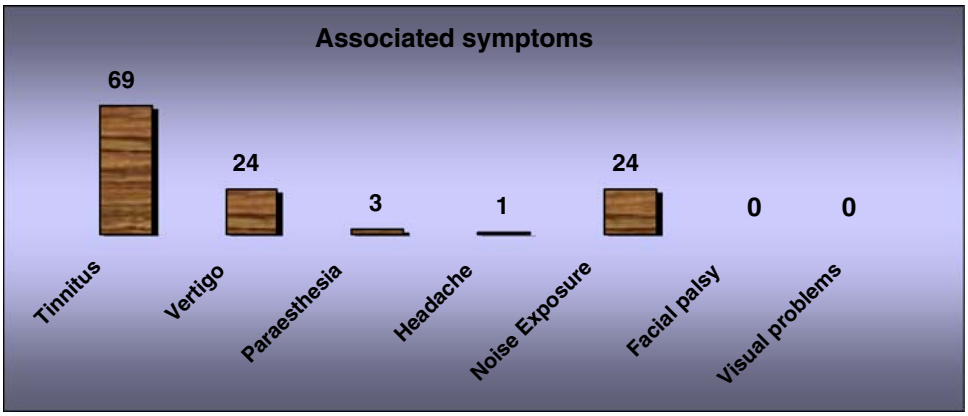

Fig. 6 Symptoms associated with hearing loss in the study group

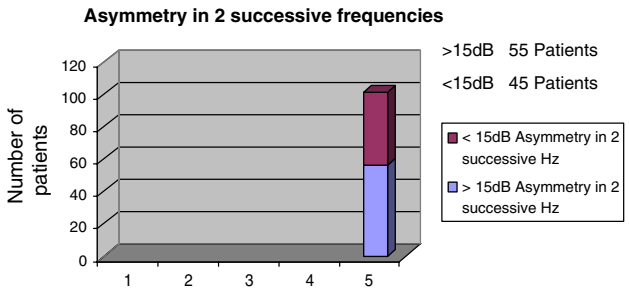

Fig. 7 The degree of Asymmetry of hearing loss in the studied group

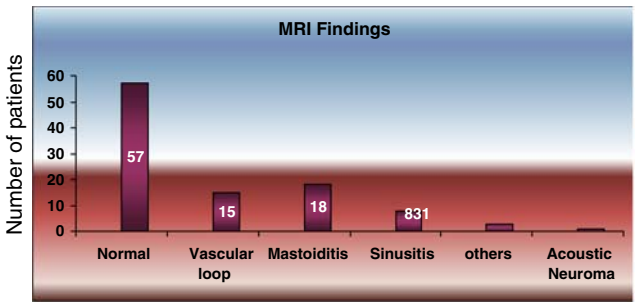

Fig. 10 The findings on MRI in the study group

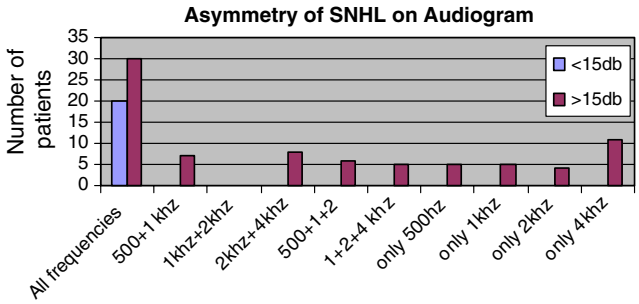

Fig. 8 The Asymmetry on audiogram is shown

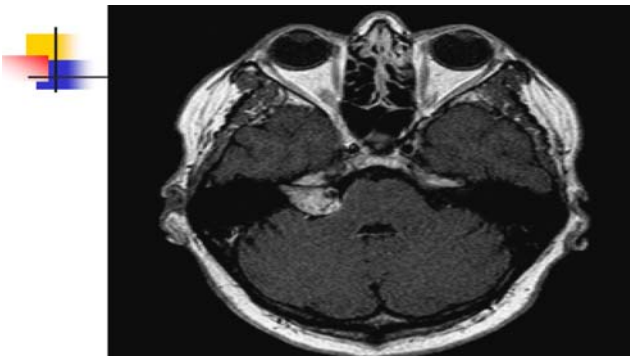

Fig. 11 MRI has shown 18 × 16 mm lesion in the right internal acoustic meatus displacing the cerebellum and pons

based, may aid a medico-legal defence for not screening a patient.

Although, this is a retrospective study and consists of relatively small sample size, it is still a clear indicator as to the importance of employing a guideline or a protocol as to when to request a scan. This is evident by the fact that the pickup rate of vestibular schwannoma in this study is much less than most of the big series which show, on average, a pick up rate of 5%.

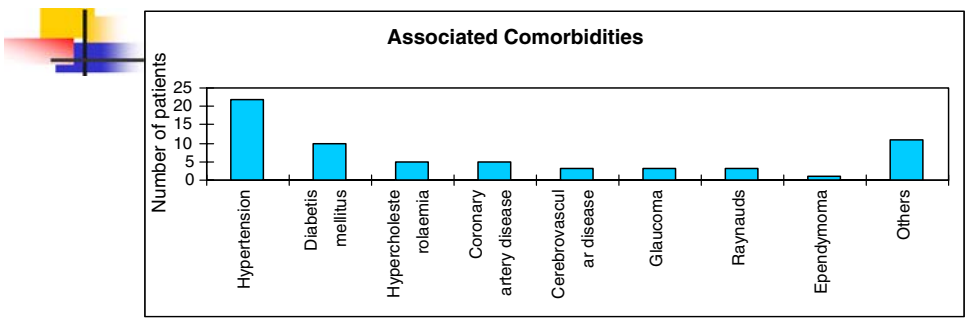

Fig. 9 The associated co-morbid conditions with SNHL

Conclusion

Our pick up rate of vestibular schwannoma is 1% which lags far behind the published series. This may be related to the fact that we do not employ specific guidelines or an established protocol. Applying guidelines for selection of patients for MRI IAMs is worth considering.

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