

Original Research Article

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Role of MRI in audio-vestibular dysfunction; is it cost-effective?

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ABSTRACT

Background: Till date, debate still exists among researchers regarding the use of magnetic resonance imaging (MRI) in all the cases presenting as asymmetrical sensorineural hearing loss (SNHL). The objective of the study was to investigate cost-effectiveness of MRI for evaluating patients with audiovestibular symptoms.

Methods: A retrospective study was carried out included all adult patients (>12 years) presenting over a 12 month period between November 2014 and October 2015 at Otolaryngology department clinic, Armed Forces Hospital. Khamis Mushait, Saudi Arabia with asymmetrical sensorineural hearing loss (sudden or progressive) and have underwent MRI of cerebellopontine angle and internal auditory meati for evaluation of audiovestibular symptoms.

Results: The study included 52 patients with audiovestibular symptoms. Their mean age (\pm SD) was 46 (\pm 13.9) years and almost two-thirds of them (65.4%) were males. Majority of them were presented with deafness (84.6%). Vertigo and tinnitus were presented in 38.5% and 53.8% of them, respectively. Over the studied 52 patients, MRI of cerebellopontine angle yielded no detectable lesion in any case.

Conclusions: MRI was not cost-effective, so it is important that clinical and audiometric indications for MRI referral criteria should be reviewed and analyzed to ensure cost-effectiveness of MRI in detecting audiovestibular dysfunctions, particularly in situations with financial restraints and long waiting time.

Keywords: Audiovestibular, MRI, Cerebellopontine angle, Cost-effective

INTRODUCTION

The role of MRI in identifying the Audio-vestibular pathologies is well known, especially in cases where a retro-cochlear lesion such as acoustic neuroma is being suspected.¹ This lesion may go undiagnosed and may present itself as only asymmetrical hearing loss.¹ However, not all cases of asymmetrical sensorineural hearing loss (SNHL) have retro-cochlear pathology and till date debate still exists among researchers regarding the use of MRI in all the cases presenting as asymmetrical SNHL.¹⁻⁴ MRI as an expensive imaging technique should have an effective utilization strategies to minimize the rising imaging-related health care costs.^{4,5} The MRI referral rates by general practitioners

are increasing to audiology departments, which may have a significant impact on service provision.⁶ Therefore, it is important to reassess the diagnostic yield of MRI in the evaluating patients with audiovestibular symptoms compared to previous studies, and to determine whether presenting clinical features could be used to predict a positive imaging study and hence guide future referral protocols.^{2,7,8} This retrospective study is therefore being carried out to investigate cost-effectiveness of MRI for evaluating patients with audiovestibular symptoms. This study being unique of its kind in the kingdom will help to formulate a proper protocol for such patients presenting with audio-vestibular disease and identifying them correctly for being a candidate for MRI scanning thus indirectly reducing the work load and cost to the hospital.

METHODS

A retrospective study was carried out included all patients presenting over a 12 month period between November 2014 and October 2015 at Otolaryngology department clinic, Armed Forces Hospital, Khamis Mushait, Saudi Arabia. The study included all adult (>12 years) patients who presented with asymmetrical sensorineural hearing loss (sudden or progressive) confirmed via 3 different pure-tone audiogram at separate occasions, with or without tinnitus (non-pulsatile) or vertigo and have underwent MRI of cerebellopontine angle and internal auditory meati for evaluation of audiovestibular symptoms. Patients who had congenital hearing loss, history of head/temporal bone trauma, active ear infection or disease, with history of prior ear surgery, otosclerosis or any other obvious or identifiable cause of asymmetrical hearing loss were excluded from the study. The primary investigator collected radiology data from radiology online In-hospital system. Then data were recorded on a checklist and entered in SPSS version 22 for statistical analysis.

RESULTS

The study included 52 patients with audiovestibular symptoms. Their demographic and clinical characteristics are summarized in Table 1. Their mean age (\pm SD) was 46 (\pm 13.9) years and almost two-thirds of them (65.4%) were males. Majority of them were presented with deafness (84.6%). Vertigo and tinnitus were presented in 38.5% and 53.8% of them, respectively. Over the studied 52 patients, MRI of cerebellopontine angle yielded no detectable lesion in any case (Table 1).

Table 1: Characteristics of studied group.

Characteristics	Values
Gender n (%)	Male 34 (65.4)
	Female 18 (34.6)
Age Mean\pmSD	46 \pm 13.9
Deafness n (%)	44 (84.6)
Asymmetrical n (%)	41 (93.2)
Duration of deafness	4.6 \pm 4.06
Average dB (Mean\pmSD)	62.19 \pm 24.36
Vertigo n (%)	20 (38.5)
Tinnitus n (%)	28 (53.8)
Disequilibrium n (%)	0 (0.0)
Nystagmus n (%)	0 (0.0)
Direction n (%)	0 (0.0)
Cranial nerve involvement n (%)	0 (0.0)

DISCUSSION

Because of the clear demonstration of the retrocochlear auditory pathways obtained by MRI, it is considered as a cost-effective means of investigating audiovestibular symptoms or parameters.⁹ According to Vandervelde and Connor, MRI is "specifically focused on excluding

treatable compressive abnormality of the cerebello-pontine angle as a rare cause of audiovestibular dysfunction".² Referral of patients with audiovestibular symptoms for MRI is a relatively frequent practice at our institution. Its cost-effectiveness was a point of discussion; therefore we conducted this study to investigate the cost-effectiveness of MRI for evaluating patients with audiovestibular symptoms at our setting. In another similar study, up to twenty percent of patients presenting to an otolaryngology department were found to be potential candidates for audiovestibular symptoms screening.⁶ In another study, several of the clinicians referred over 70% of new patients with audiovestibular symptoms for MRI.² Also, British Association of Otorhinolaryngologists reported that imaging evaluation comprised 10% of the MRI workload in hospitals with sizeable otolaryngology departments.⁶ It has been documented that the diagnostic outcome of MRI screening for audiovestibular symptoms does not compare with that of other situations as for example MRI screening of children with epilepsy, where 12.7% of cases have relevant positive imaging findings.^{10,11} In the current study, over the studied 52 patients, MRI of cerebellopontine angle yielded no detectable lesion in any case. Worldwide, there is a constant challenge regarding the cost-effectiveness of MRI in investigating rare disorders amongst a large number of symptomatic patients as in our cases. Additionally, there are several reports investigated the diagnostic accuracy and diagnostic yield of MRI for the assessment of audiovestibular dysfunction.² Several studies have been considered MRI as an appropriate, low-cost and rapid screening test for audiovestibular dysfunction.¹²⁻¹⁷ although its ability to confidently detect small lesions has been questioned.^{18,19}

Imaging protocols should depend on the balance of overall diagnostic benefit against cost and waiting times. In the present study, MRI yielded no diagnostic benefits therefore, this finding should be considered when relating results of previous studies. Previous radiological studies have observed audiovestibular dysfunction at a frequency ranged between 1.4-15% in patients with sensorineural hearing loss.¹²⁻¹⁸

CONCLUSION

Among patients present with audiovestibular symptoms, none of them demonstrated a clinically significant MRI abnormality. Therefore, this practice may lead to the MRI workload. We conclude that in the present study, MRI was not cost-effective, so it is important that clinical and audiometric indications for MRI referral criteria should be reviewed and analyzed to ensure cost-effectiveness of MRI in detecting audiovestibular dysfunctions, particularly in situations with financial restraints and long waiting time.

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