Clinical and Audiometric Variability in Patients with ASNHL: A Retrospective Study for Vestibular Schwannoma Prediction

Risha Sheni BS[1], Tyler Bergeron BS[1], Thomas Scharfenberger BS[1], Kareem Al-Mulki MD[2], Howard Moskowitz MD[2]

[1]Albert Einstein College of Medicine

[2]Department of Otorhinolaryngology – Head & Neck Surgery, Montefiore Medical Center

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BACKGROUND

Although vestibular schwannomas (VS) are rare clinical entities, they are diagnosed in 1% to 5% of patients with suspected asymmetric sensorineural hearing loss (ASNHL).[1-3] Gadolinium-enhanced MRI remains the gold standard for detection with near perfect sensitivity and specificity, but these studies are expensive, sometimes poorly tolerated, and time-consuming. Furthermore, the low diagnostic yield from these studies has the potential to waste valuable resources.

Various screening protocols have been suggested to discern which patients with ASNHL should undergo further imaging[4-8], but no single approach has gained universal acceptance. Most protocols use the degree of hearing loss as the main indication for obtaining imaging. Few studies have examined other clinical predictors of positive MRI in ASNHL patients.

OBJECTIVES

This study aims to investigate clinical history and audiometric findings as predictors of positive MRI in patients with ASNHL being evaluated for potential vestibular schwannoma.

METHODS

This retrospective cohort study was conducted on patients who underwent audiometric testing and MRI of the internal auditory canals from November 2015 to October 2022 at Montefiore Medical Center. The sample included 196 patients, 166 of whom had unremarkable MRIs while 30 were found to have a vestibular schwannoma. Patients were categorized into either right positive, left positive, or negative MRI groups. Demographic data and clinical history including Type II diabetes status, prior chemotherapy exposure, triglyceride level, and hemoglobin A1C level were collected. Medication usage, including aspirin, SSRI, and PDE-5 inhibitors were also collected. Audiometric data was collected from the most recent audiogram following the initial hearing loss complaint. Symptomatic data included onset, duration, laterality, vertigo, tinnitus, and otalgia.

Statistical analyses were done with SPSS using Chi-Square and Student's t-test (alpha = 0.05).

RESULTS

Table 1: Clinical symptoms and audiogram findings sorted by left ear MRI findings.

Patient Reported Symptoms	MRI Negative	MRI Left Positive	p-value
N (%)	120	11	
Laterality of Chief Complaint			0.070
Bilateral	67 (56%)	3 (27%)	
Unilateral Left	53 (44%)	8 (73%)	
Hearing loss	84 (70%)	10 (91%)	0.143
Vertigo	38 (32%)	3 (27%)	0.766
Tinnitus	68 (57%)	5 (45%)	0.477
Ear pain	14 (12%)	0 (0%)	0.234
Left Audiogram			
Pure tone average	39.25	53.18	0.112
ST	30.31	37.50	0.370
SD%	87.16	88.00	0.915

Table 2: Clinical symptoms and audiogram findings sorted by right ear MRI findings.

Patient Reported Symptoms	MRI Negative	MRI Right Positive	p-value
N (%)	113	19	
Laterality of Chief Complaint			0.002**
Bilateral	67 (59%)	4 (21%)	
Unilateral Right	46 (41%)	15 (79%)	
Hearing loss	81 (72%)	18 (95%)	0.032**
Vertigo	36 (32%)	5 (26%)	0.656
Tinnitus	69 (61%)	13 (68%)	0.544
Ear pain	16 (14%)	1 (5%)	0.288
Right Audiogram			
Pure tone average	35.77	48.88	0.022**
ST	27.48	42.61	0.011**
SD%	87.51	68.50	0.007**

Table 3: Patient audiogram findings sorted by MRI findings.

Patient Characteristics	MRI Negative	MRI Positive	p-value
N (%)	166	30	
Weighted Audiogram			
Pure tone average	32.59	50.42	<0.001**
ST	24.91	40.07	<0.001**
SD%	87.69	78.27	0.059
Difference (Δ) in Audiogram			
Pure tone average	19.11	27.33	0.090
ST	15.19	25.07	0.028**
SD%	11.83	28.93	0.002**

RESULTS

Demographic, clinical variables, and medications

- No significant demographic differences were found between the MRI-positive and negative groups
- Patients with a positive MRI more frequently reported hearing loss that began over 6 months prior to their visit (81% vs. 60%, p<.05)
- In those with unilateral left and bilateral ear complaints, no significant difference between MRI groups was found in the prevalence of unilateral left-sided hearing loss, or in reported hearing loss, vertigo, tinnitus, or otalgia.
- In those with unilateral right and bilateral ear complaints, the positive MRI group had a higher prevalence of right hearing loss complaints (95% vs 72%, p<.05) and more frequently had hearing loss limited to the right ear (79% vs. 41%, p<.01). There was no significant difference in vertigo, tinnitus, or otalgia. Audiometric data for the MRI positive group also revealed a significant increase in ST (27.48 vs. 42.61, p<.05) and decrease in SD% (87.51 vs. 68.50, p<.05).

Audiometric findings

- Weighted audiogram groups represent a standardization of data to account for uneven numbers of left/right cases
- Significant differences between MRI negative and positive groups found in mean pure tone average (32.59 vs. 50.42, p<.001) and ST (24.91 vs. 40.07, p<.001)
- Statistically significant differences in absolute values of differences between right and left ears (delta) of groups, with MRI-positive group having a larger delta difference in ST (15.19 vs. 25.07, p<.05) and SD% (11.83 vs. 28.93, p<.01)

CONCLUSIONS

This study evaluated differences among patients with ASNHL being evaluated by MRI. Individuals with VS had a greater difference in mean pure tone average and ST between the affected and non-affected ear. These differences may help in the creation of more rigorous criteria and guidelines that can direct practitioners to know if imaging of ASNHL is warranted. Further investigation is necessary to make protocols that are uniform and evidence-based.

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