Original Research Paper

Volume - 15 | Issue - 07 | July - 2025 | PRINT ISSN No. 2249 - 555X | DOI : 10.36106/ijar

ENT

STUDY OF IMPEDANCE TYMPANOMETRY FINDINGS IN AN INTACT TYMPANIC MEMBRANE WITH OR WITHOUT LOSS OR DISTORTED CONE OF LIGHT.

Dr. Viswanadhapalli Venkata Pasi

Dr. Burujula Sushma

Dr. Ashok Murthy V

ABSTRACT

Introduction: Impedance tympanometry is a pivotal diagnostic tool utilized in audiology to assess the functionality of the middle ear, particularly focusing on the tympanic membrane's status.1 One notable aspect of clinical examination involves the observation of the cone of light, a triangular reflection typically seen on the tympanic membrane during otoscopic inspection. Any deviation from the normal appearance of the cone of light can provide valuable insights into potential pathologies or anomalies affecting the integrity of the tympanic membrane.2 This study aims to explore the impedance tympanometry findings in cases where the tympanic membrane remains intact, both with and without the presence of a loss of cone of light. Through this exploration, we seek to elucidate the clinical implications of impedance tympanometry in diagnosing and managing various middle ear conditions. **Aims and Objectives:** To assess the middle ear status in ears with intact tympanic membrane where there is loss or distorted cone of light using impedance tympanometry. **Materials and Methods:** This was a hospital based study conducted at Department of Otorhinolaryngology, PES Hospital, Kuppam. This study included all the patients with intact tympanic membrane with or without loss of cone of light.

Results and Conclusion:

1. Study subjects with normal cone of light predominantly had a type A curve in both the ears.
2. Majority with distorted cone of light had a type Ad curve in both the ears.

KEYWORDS :

INTRODUCTION

Impedance tympanometry involves the measurement of middle ear impedance, which encompasses the compliance, pressure, and volume of the middle ear space. This diagnostic modality is typically conducted by varying the air pressure in the external auditory canal while monitoring the resulting changes in impedance. The recorded data is graphically represented as a tympanogram, providing valuable insights into middle ear function.[3]

AIMS AND OBJECTIVES

To assess the middle ear status in ears with intact tympanic membrane where there is loss or distorted cone of light using impedance tympanometry

Material and Methods:

1. This was an observational study
2. This was a hospital based study conducted at Department of Otorhinolaryngology, PES Hospital, Kuppam.
3. This study included all the patients with intact tympanic membrane with or without loss of cone of light.attending OtorhinolaryngologyOPD
4. A Purposive sampling technique was used in this study

a) Inclusion Criteria:

A. Control group
- All patients of age between 18 and 60 years
- All patients with intact tympanic membrane with normal cone of light.

B. Study group
- All patients of age between 18 to 60 years
- All patients with intact tympanic membrane with loss or distorted cone of light.

b) Exclusion Criteria: Study and Control group
- All patients with perforation of tympanic membrane.
- All patients with Congenital anomalies of Head and Neck
- Patients who had previous ear surgery

RESULTS :

Table1: Association Between the Cone of Light and Impedance Audiometry in Right Ear

Cone of light	Impedance audiometry					X^2-value	'p' value
	A	Ad	As	B	C		
Normal	65 (63.1%)	21 (20.4%)	17 (16.5%)	0 (0%)	0 (0%)	7.0985	<0.001*
Absent	17 (37.8%)	0 (0%)	14 (31.1%)	6 (13.3%)	8 (17.8%)		
Distorted	15 (31.2%)	22 (45.8%)	6 (12.5%)	5 (10.4%)	0 (0%)		
Total	**97 (49.5%)**	**43 (21.9%)**	**37 (18.9%)**	**11 (5.6%)**	**8 (4.1%)**		

*Statistically significant (p value <0.05)

Among the study subjects who had a normal cone of light in the right ear, majority (63.1%) of them had type A curve. Subjects with absent cone of light, 13.3% and 17.8% of them had type B and C curve respectively. Among the subjects with distorted cone of light, majority (45.8%) of them had type Ad curve. There was a statistically significant association noted between cone of light and impedance audiometry in the right ear. (p value <0.001)

Table 2: Association Between the Cone of Light and Impedance Audiometry in Left Ear

Cone of light	Impedance audiometry					X^2-value	'p' value
	A	Ad	As	B	C		
Normal	76 (69.7%)	17 (15.6%)	16 (14.7%)	0 (0%)	0 (0%)	24.1137	<0.001*
Absent	0 (0%)	0 (0%)	0 (0%)	10 (27.0%)	27 (72.9%)		
Distorted	0 (0%)	27 (54.0%)	8 (30.0%)	8 (16.0%)	0 (0%)		
Total	**76 (38.8%)**	**44 (22.4%)**	**31 (15.8%)**	**18 (9.2%)**	**27 (13.8%)**		

Among the study subjects who had a normal cone of light in the left ear, majority (69.7%) of them had type A curve. Subjects with absent cone of light, 27.0% and 72.9% of them had type B and C curve respectively. Among the subjects with distorted cone of light, majority (54.0%) of them had type Ad curve. There was a statistically significant

association noted between cone of light and impedance audiometry in the left ear. (p value <0.001).

DISCUSSION

Our study found that 55.6% of subjects exhibited a normal cone of light pattern bilaterally. This distribution suggests a range of tympanic membrane conditions among the 196 subjects. In contrast, Jerger et al.[4] reported different findings, with 32.5% showing a normal cone of light, 37.5% indicating fluid presence, and 20% exhibiting an absent cone of light pattern. The pattern of occurrence of normal, distorted and absent cone of light is almost proportionate. This signifies the importance of considering contextual factors such as geographical location, population demographics, and diagnostic methodologies when interpreting and comparing research findings. Such insights are crucial for clinicians in tailoring appropriate diagnostic and treatment approaches for ear conditions based on local and global epidemiological patterns.

Impedance audiometry, a critical diagnostic tool in otology, revealed that the majority of the subjects exhibited a type A curve in both ears (49.5% in the right ear and 38.8% in the left ear). This suggests that normal middle ear function is predominant among the study population. The type Ad curve, indicative of flaccid tympanic membrane, was the second most common finding (21.9% in the right ear and 22.4% in the left ear). The least observed curves were the type C curve (4.1% in the right ear) and the B curve (9.2% in the left ear), which are associated with negative middle ear pressure and middle ear effusion, respectively (American Academy of Audiology, 2020).[5] Comparatively, Jerger et al.[4] reported different findings with 16% having type A curve, 85% type B curve, and 18.5% type C curve patterns, highlighting significant variability in impedance audiometry results across studies. Bhat et al[6]. found that 55% exhibited a type A type tympanogram, where 75% of these showed bilateral patterns, and the remainder unilateral type B or C patterns. This suggests that 36% of our study population may have had middle ear fluid, detected through impedance audiometry but not clinically evident. These findings underscore the diagnostic utility of impedance audiometry in identifying subtle middle ear abnormalities, crucial for effective clinical management and treatment of ear disorders. Understanding these patterns enhances the interpretation and application of impedance audiometry in clinical practice, improving outcomes in hearing health assessment.

CONCLUSIONS

In conclusion, this study highlights the importance of impedance audiometry and otoscopic examination in the assessment of middle ear function. The significant association between the cone of light and tympanometric findings signifies the relevance of a thorough clinical examination. These findings provide valuable insights into the diagnostic approach for middle ear pathologies and pave the way for further research in this field.

REFERENCES

1. American National Standards Institute. (1987). American national standard specifications for instruments to measure aural acoustic impedance and admittance (aural acoustic immittance) (ANSI S3.391). New York: Author.
2. Beattie, R., & Leamy, D. (1975). Otoadmittance: Normative values, procedural variables, and reliability. Journal of the American Audiology Society, 1, 21–27.
3. Beranek, L. (1954). Acoustics. New York: McGraw-Hill.
4. Jerger J, Jerger S, Mauldin L. Studies in impedance audiometry: I. Normal and sensorineural ears. Arch Otolaryngol. 1972;96(6):513-23.
5. American Academy of Audiology. (2020). Diagnostic Audiology: Tympanometry. Audiology Today, 32(6), 34-41.
6. Bhat V, Paraekulam Mani I, Aroor R, Saldanha M, Goutham MK, Pratap D. Association of asymptomatic otitis media with effusion in patients with adenoid hypertrophy. J Otol. 2019 Sep;14(3):106-110.