AUDIOLOGICAL EVALUATION IN PATIENTS OF CSOM WITH CHOLESTEATOMA

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ABSTRACT

INTRODUCTION

Cholesteatoma of the ear is a common disease encountered by otologists all over the world. Congenital, primary acquired and secondary acquired are the terms described to denote the types of cholesteatoma. All the above types cause deafness but the correlation between the type and degree of hearing loss remains doubtful.

AIM

To evaluate the hearing loss in all types of cholesteatoma patients and analyse the association between nature of hearing loss and the type of cholesteatoma.

MATERIALS AND METHODS

The present study is a cross-sectional cohort study of cholesteatoma patients undergoing surgery. Air, bone conduction thresholds, PTA, air bone gaps and preoperative ossicular status were studied and analysed in all types of cholesteatoma.

RESULTS

One hundred and sixty two patients aged between 8 and 65 were included in the study. Nineteen patients had congenital cholesteatoma, 58 had primary cholesteatoma and 85 had secondary cholesteatoma. All patients had increased air, bone conduction thresholds, PTA thresholds and large air bone gaps on pure tone audiometry, whereas secondary cholesteatoma patients showed higher mean values for loss of hearing across all frequencies compared to other types.

CONCLUSIONS

The correlation between losses of hearing and damage caused by cholesteatoma of all types especially acquired secondary type was evident from this study showing higher degrees of loss of hearing in all frequencies and larger air bone gap.

KEYWORDS

Hearing loss; Cholesteatoma; Suppurative otitis media; Audiometry; PTA; Air Bone Gap.

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INTRODUCTION: Cholesteatoma is defined as thin sac like structure of skin in any air-filled area of the temporal bone, and can be congenital or acquired.[1] Acquired middle-ear cholesteatoma is classified according to its origin as primary or secondary.[2,3,4,5,6] The primary type originates from pars flaccida retraction due to constant negative middle ear pressure and the secondary type from inflammatory disease of middle ear involving the pars tensa tympanic membrane.[5,7,8] Studies show higher incidence and prevalence of Cholesteatoma in developing countries confirming its association with low socioeconomic status, poor hygiene, and delay in seeking health care or poor health services.[9,10] Cholesteatomas cause damage to adjacent structures by pressure necrosis and by osteoclasts with hyperproliferative characteristics (Cytokeratin 16, KI67, and inflammatory cytokines). In addition, ossicular chain erosion results in hearing loss and due to the presence of fetid otorrhoea they cause psychosocial damage.[4,11,12] Consensus opinion correlating the influence of the type of cholesteatoma on hearing loss or concerning the frequencies most affected is not available in literature.[11,13,14,15,16,17] Most studies have shown that there is an association between ossicular chain erosion and magnitude of hearing loss and that the most affected ossicle is the incus.[12,15,17]

AIM: To evaluate the hearing loss in all types of cholesteatoma patients and analyse the association between nature of hearing loss and the type of cholesteatoma.

MATERIALS AND METHODS: The present study was conducted at Government Hospital attached to Gandhi Medical College, Secunderabad between May 2010 and 2013. It was approved by an ethical committee of the Hospital. The present study is a prospective study conducted on patients operated at the ENT Department for cholesteatoma.

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Inclusion Criteria: 1. Patients aged between 8 and 65 years. 2. Patients diagnosed with cholesteatoma on otoscopy and microscopic ear examination.

Exclusion Criteria: Patients who had undergone ear surgery previously for cholesteatoma. All the patients were subjected to pure tone audiometry with determination of mean air thresholds at 250 to 8000 kHz and bone thresholds at 500, 1000 and 4000 kHz. Air-bone gaps were also recorded separately at 500, 1000, 2000 and 4000 kHz. All the variables were observed at age, gender, type of cholesteatoma. The type of cholesteatoma was classified according to clinical history, physical examination data, and intra-operative findings. All the patients were subjected to either canal wall-up (CWU) mastoidectomy with tympanoplasty or canal wall-down (CWD) mastoidectomy with tympanoplasty. A special note was mentioned about the status of the ossicular chain erosion. Statistical analysis was performed using standard statistical methods. The correlation between mean hearing losses and the type of cholesteatoma was done by using Pearson's Chi-square test and Wilcoxon–Mann–Whitney test.

OBSERVATIONS AND RESULTS: The present study includes 162 patients attending the Government General Hospital attached to Medical College, Kerala for their complaints of ear disease and diagnosed as cholesteatoma and underwent surgery. Among the 162 patients, 109 were males and 53 patients were female with a male-to-female ratio of 2.05:1. The patients were aged 8 to 65 years with a mean age of 37.6±17.45. The left ear was affected in 59.25% of ears operated and the remaining was affected in the right ear. Congenital cholesteatoma was observed in 19(11.72%); 58(35.80%) had primary acquired cholesteatoma and 85(52.46%) patients were found to have secondary acquired cholesteatoma (Table 1).

	Congenital		**Primary Acquired**		**Secondary Acquired**	
	n	**%**	**n**	**%**	**n**	**%**
Male	10	6.17	37	22.83	56	34.56
Female	09	5.55	21	12.96	29	17.90
Mean Age	14.50		29.60		32.35	
Total	**19**	**11.72**	**58**	**35.80**	**85**	**52.46**

Table 1: Showing the age, sex incidence and mean age of the patients (n=162)

Frequencies kHz	**Mean Air conduction Thresholds in dB**			**Mean Bone Conduction Thresholds in dB.**		
	Congenital	**Primary Acquire**	**Secondary Acquire**	**Congenital**	**Primary Acquire**	**Secondary Acquire**
250	42.4	49.8	58.2	14.3	15.4	18.2
500	46.4	47.6	58.8	14.2	16.8	17.4
1000	46.0	49.8	54.0	15.2	15.8	17.0
2000	44.8	50.4	55.4	16.2	16.4	18.2
3000	43.2	51.4	56.2	16.0	17.4	17.6
4000	45.4	50.0	53.2	15.4	16.3	17.3
5000	46.7	44.8	52.7	16.4	16.0	18.0
6000	45.3	43.4	54.3	17.1	17.7	18.1

Table 2: Showing mean air conduction, bone conduction values in three types of Cholesteatoma (n=162)

The mean air conduction thresholds in all frequencies were raised in all types of cholesteatoma but the loss was highest in secondary acquired cholesteatoma which was ranging between 52.7 dB in 5000 kHz to 58.8 dB in 500 kHz frequencies. Similarly, in the congenital cholesteatoma the lowest air conduction threshold was in 250 kHz (42.4 dB) and the highest in 5000 kHz (46.7 dB)**.** The bone conduction thresholds did not show much variation between the three types of cholesteatoma and ranged between 14.2 dB to 18.2 dB in all frequencies (Table 2).

Frequencies kHz	**Mean a-b gap dB**	**Mean a-b gap dB**	**Mean a-b gap dB**	**P value**
	Congenital	**Primary Acquired**	**Secondary Acquired**	
250	28.20	32.50	36.04	
500	26.20	34.20	37.02	
1 kHz	26.40	31.37	38.75	0.017
2 kHz	22.40	23.30	34.01	0.007
3 kHz	26.40	28.40	36.79	0.055
4 kHz	24.30	30.20	35.30	
5 kHz	23.20	30.30	33.20	
6 kHz	21.20	31.20	30.30	

Table 3: Showing the mean a-b gap in three types of Cholesteatoma (n=162)

The mean air-bone gap was highest in the secondary acquired cholesteatoma ranging from 30.30 to 38.75, between 23.30 dB and 34.20 dB in primary acquired cholesteatoma and lowest in congenital cholesteatoma between 21.20 dB and 28.20 dB (Table 3).

Mean PTA	Congenital-dB	Primary Acquired-dB	Secondary Acquired-dB
Pre-operative	46.40	49.26	57.46
Post-Operative	22.20	28.25	32.10
Mean a-b Gap			
Pre-operative	24.78	30.17	35.17
Post-Operative	15.50	14.25	15.40
a-b Gap closure	13.28	15.92	19.77

Table 4: Showing the pre and post-operative mean PTA and a-b gap (n=162)

The preoperative mean PTA values for congenital cholesteatoma was 46.40 dB and the postoperative PTA values were 22.20 dB and a-b closure of 13.28 dB. In patients with primary acquired cholesteatoma, the preoperative mean PTA values were 49.26, postoperative PTA was 28.25 dB and a-b gap closure was 15.92 dB. In acquired cholesteatoma, the values were 57.46 dB, 32.10 dB and 19.77 dB respectively (Table 4). Expression of hearing loss in terms of its degree, it was observed that the severity was more in secondary acquired cholesteatoma patients, lesser in patients with primary acquired cholesteatoma and least in congenital cholesteatoma patients analysed at all frequencies, PTA and a-b gap findings. There was no statistically significant difference in mean bone threshold between primary and congenital cholesteatomas; however, the mean air threshold and the mean a-b gap were higher in patients with secondary cholesteatoma (Table 4). Only 11 patients (6.79%) had an intact ossicular chain observed preoperatively. Six of them were with congenital cholesteatoma, three with primary cholesteatoma and two with secondary acquired cholesteatoma.

DISCUSSION: The main aim of the present paper was to evaluate the hearing loss in all types of cholesteatoma patients and analyse the association between nature of hearing loss and the type of cholesteatoma. Three types of cholesteatoma were included in the present study; they were congenital, primary acquired and secondary acquired. The audiological tests conducted were air and bone conduction thresholds, PTA and a-b gap. Thresholds of hearing were calculated for frequencies ranging from 500 kHz to 6000 kHz. All the patients were subjected to either CWU or CWD mastoidectomy with tympanoplasty and recording the ossicular chain status. All the three types of cholesteatoma showed raised air conduction thresholds but the highest was with secondary acquired cholesteatoma. Similarly, the bone conduction thresholds showed no statistical significant difference among the three types. Air bone gap was highest in the secondary acquired type of Cholesteatoma. Similar studies by two authors showed preservation of the bone conduction thresholds and greater involvement of the air conduction thresholds at lower frequencies.[18,19] Theoretically also the secondary acquired cholesteatoma would result in gross hearing loss due to involvement of pars tensa and necrosis of incus and stapes.[12] The present study showed greater hearing loss in secondary acquired cholesteatoma patients. Mild-to-moderate hearing losses were found in congenital and primary acquired cholesteatoma patients.[19] However, few authors in literature opine that hearing loss is not an accurate clinical predictor of ossicular damage. But these studies as well as few other authors show this phenomenon reliable.[12,19] Another public health survey concluded that the reason behind the greater loss of hearing in these patients is lack of immediate medical attention and apathy on the part of the patients to undergo surgical treatment.[20] The present study also has few limitations such as it being a random study rather than a cohort study and hence generalisation of the observations is limited.

CONCLUSIONS: The secondary acquired cholesteatoma showed significant difference in hearing loss compared to the congenital and primary acquired varieties. It also resulted in higher thresholds of air conduction and larger a-b gap.

REFERENCES:

1. Schuknecht HF. Pathology of the ear. Lea & Febiger, Philadelphia 1993;2nd edn.
2. Ribeiro FAQ, Pereira CSB, Caldas Neto S, et al. Eds. Tratado de otorrinolaringologia. Sociedade Brasileira de Otorrinolaringologia. São Paulo, Rocca. 2011;2nd edn:p122–136.
3. Lim DJ, Saunders WH. Acquired cholesteatoma: light and electron microscopic observation. Ann Otol Rhinol Laryngol 1972;81(1):1–11.
4. Alves AL, Ribeiro FQ. O papel das citocinas no cholesteatoma adquirido da orelha média: revisão da literature. Rev Bras Otorrinolaringol 2004;70(6):813-818.
5. Soldati D, Mudry A. Knowledge about cholesteatoma, from the first description to the modern histopathology. Otol Neurotol 2001;22(6):723–730.
6. Fisch U, May J. Tympanoplasty mastoidectomy and stapes surgery. Thieme, New York. 1994;1st edn.
7. Costa SS, Hueb MM, Ruschel C. Otite média crônica cholesteatomatosa. Cruz OL, Costa SS Eds. Otologia clínica e cirúrgica. Revinter, Rio de Janeiro 2000;1st edn:197–216.
8. Olszewska E, Wagner M, Bernal-Sprekelsen M, et al. Etiopathogenesis of cholesteatoma. Eur Arch Otorhinolaryngol 2004;261(1):6-24.

9. World Health Organization (WHO). Chronic suppurative otitis media, burden of illness and management options. WHO, Geneva 2004.
10. Orji FT. A survey of the burden of management of chronic suppurative otitis media in a developing country. Ann Med Health Sci Res 2013;3(4):598–601.
11. Strunk CL. Cholesteatoma. Bailey BJ, Johnson JT, Newlands SD, Eds. Head and neck surgery–otolaryngology. Lippincott, Philadelphia 1993;4th edn:1635–1645.
12. Martins O, Victor J, Selesnick S. The relationship between individual ossicular status and conductive hearing loss in cholesteatoma. Otol Neurotol 2012;33(3):387–392.
13. Dornelles C, Costa SS, Meurer L, et al. Algumas considerações sobre colesteatomas adquiridos pediátricos e adultos. Rev Bras Otorrinolaringol 2005;71(4):536–546.
14. Stankovic MD. Audiologic results of surgery for cholesteatoma: short-and long-term follow-up of influential factors. Otol Neurotol 2008;29(7):933-940.
15. Jeng FC, Tsai MH, Brown CJ. Relationship of preoperative findings and ossicular discontinuity in chronic otitis media. Otol Neurotol 2003;24(1):29-32.
16. Carillo R, Yang NW, Abes GT. Probabilities of ossicular discontinuity in chronic suppurative otitis media. Otol Neurotol 2007;28(8):1034–1037.
17. Albera R, Canale A, Puimetto E, et al. Ossicular chain lesions in cholesteatoma. Acta Otorhinolaryngol Ital 2012;32(5):309–313.
18. Silveira Netto LF, Costa SS, Sleifer P, et al. The impact of chronic suppurative otitis media on children's and teenager's hearing. Int J Pediatr Otorhinolaryngol 2009;73(12):1751–1756.
19. Karini-Yazdi A, Saedi B, Fayezizadeh M, et al. Association between audiometric profile and intraoperative findings in patients with chronic suppurative otitis media. Iran J Otorhinolaryngol 2011;2(23):37–42.
20. Gragnolati M, Lindelow M, Couttolenc B. Twenty years of health system reform in Brazil: an assessment of the sistema unico de saúde. World Bank, Washington, 2013;16–18.