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Original Research Article

Study on impact of duration of tympanic membrane perforation on hearing loss and audiological outcome after surgery

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ABSTRACT

Background: The aim of the study was to assess impact of duration of tympanic membrane perforation on hearing loss and postoperative audiological outcome using pure tone audiogram.
Methods: The present study was conducted on 100 patients in department of ENT and HNS, SMGS Hospital, Government Medical College Jammu during a time period of November 2018 to October 2019. All the patients with age 15 to 60 years who presented with tympanic membrane (pars tensa) perforation were included in the study.
Results: In our study, mean preoperative hearing loss (AC threshold) of group A was 36.23±1.07 dB and of group B was 25.67±6.38 dB. Group C had mean preoperative hearing loss (AC threshold) of 28.78±6.50 dB. Mean preoperative air-bone gap (AB gap) of group A was 12.9±8.05dB and of group B was 13.86±4.19 dB. Group C had mean preoperative air-bone gap (AB gap) of 16.47±5.51 dB. Postoperatively, pure tone threshold at three months was least in group B (15.09±5.80 dB), followed by group C (15.68±4.66 dB) and group A (19.33±2.81 dB). Whereas, postoperative AB gap at 3 months was least in group C (10±3 dB), followed by group C (8.44±3.59 dB). Group B had maximum postoperative AB gap of 8.49±4.34 dB.
Conclusions: This study did not show any correlation between duration of disease and degree of hearing loss.

Keywords: Chronic otitis media, Duration of tympanic membrane perforation, Hearing loss

INTRODUCTION

The goals of management of CSOM are two-fold: disease eradication and closures of the tympanic membrane perforation. The treatment of CSOM could be nonsurgical, surgical, or combined modalities.[1,2] Proper and timely management in acute phase should reduce the incidence of developing complications.[3]

However, there are still a large number of patients delaying in getting timely and proper management of their disease mainly due to low awareness coupled with financial constraints. Many studies show that patients with complicated CSOM belong to a lower socioeconomic status and had low awareness of complications of CSOM.[3]

Most common cause of hearing loss is CSOM. Hearing loss caused by safe type of CSOM is mainly conductive.[4] SNHL is mainly seen in unsafe type of CSOM due to labyrinthitis.

Middle ear and inner ear is separated by round window and this window is semi-permeable membrane. Round window membrane is the main portal for the passage of noxious substance to the labyrinth. The thickness in round window membrane in CSOM changes to 3-5 times as compared to control.[5] The possibilities of SNHL in CSOM helps the surgeon to counsel the patients to have a realistic knowledge about the hearing improvement after surgical intervention and about forestall of occurrence of SNHL by early surgical intervention.[6]

METHODS

The present prospective study was conducted in department of ENT and Head Neck surgery, SMGS Hospital, Government Medical College Jammu, which is tertiary care centre, for a period of 1year from November 2018 to October 2019 after seeking permission from institutional ethics committee. The study included randomly selected 100 patients of either sexes, aged between 15-60 years presenting with inactive mucosal type of COM. All patients between 15-60 years of age with tympanic membrane perforation (pars tensa) were included in the study.

Exclusion criteria

Patients with following criteria were excluded- (a) age below 15 years and above 60 years of age; (b) having sensorineural or mixed hearing loss; (c) with atticoantral disease, attic/posterosuperior marginal perforation or cholesteatoma; (d) found to have ossicular destruction intraoperatively; (e) not willing to participate; and (f) having myringosclerosis. Informed consent was obtained. Detailed history of the patient was taken. After systemic examination, detailed examination of ear, nose and throat was done. Ear examination was done using Bull´s eye lamp, otoscope and microscope/otoendoscope. Tuning fork test using (256, 512, 1024 Hz tuning forks) were done. The type, degree and frequency of hearing loss were determined by pure tone audiometry using audiometer (Elkon 3N3 multi diagnostic) in acoustically controlled room. Depending upon the duration of disease, perforations were divided into 3 groups: (a) group A≤1 year; (b) group B= 1-5 years; and (c) group C≥5 years.

Data was collected in the constructed proforma to evaluate effect of site, size and duration of perforation on the degree of hearing loss. After workup, all patients were taken up for surgery (myringoplasty) under general anesthesia/local anesthesia. Temporalis fascia graft was used for tympanic membrane repair. Underlay technique was used in this study. Pure tone audiometry was done at 1 month and 3 months after surgery to evaluate the hearing outcome after surgery.

Statistical analysis

Data regarding duration of disease, preoperative hearing loss, Air-Bone gap closure and complications was entered in Microsoft excel Spread Sheet and analysed and compared using the Statistical package for social sciences (SPSS) software (version 21 for Windows). Appropriate statistical analytical tests were applied as per the advice of statistician.

RESULTS

In our study, maximum patients were in age group 21-30 (33%). 10 patients were in the age group 51-60 (10%). Mean age in our study of 100 patients was 31.34±12.58.

In our study, there were 64 females (64%) and 36 males (36%). In our study, left ear was involved in 51% patients, right ear was involved in 27% and both ears were involved in 22% of patients.

In our study, 64 patients (64%) presented with otorrhea and hearing loss followed by only otorrhea in 19 patients (19%), otorrhea with otalgia in 7 patients (7%) and otalgia with tinnitus in 6 patients (6%).

Hearing loss only was complaint of 3 patients (3%) and only 1 patient (1%) presented with otorrhea, hearing loss and tinnitus in combination. In our study, majority of patients 72 (72%) belonged to group C followed by group B having 25 (25%).

In our study, mean preoperative hearing loss (AC threshold) of group A was 36.23±1.07 dB and of group B was 25.67±6.38 dB. Group C had mean pre-operative hearing loss (AC threshold) of 28.78±6.50 dB patients. Group A had only 3 (3%) of patients.

The difference in pre-operative hearing threshold (AC threshold) between group A and B and group B and C was significant statistically. However, the difference of preoperative hearing threshold (AC threshold) between group A and C was not significant statistically.

In our study, mean preoperative air-bone gap (AB gap) of group A was 12.9±8.05 dB and of group B was 13.86±4.19 dB. Group C had mean preoperative air-bone gap (AB gap) of 16.47±5.51 dB.

The difference in pre-operative air-bone gap (AB gap) between all the three groups was not significant statistically. In our study mean pure tone threshold after three months was least in group B (15.09±5.80 dB), followed by group C (15.68±4.66 dB) and group A (19.33±2.81 dB).

In our study, mean postoperative AB gap at 3 months was least in group C (10±3 dB), followed by group C (8.44±3.59 dB). Group B had maximum post-operative AB gap of 8.49±4.34 dB.

Table 1: Age distribution.

Age group (years)	No. of patients	Percentage (%)
11-20	22	22
21-30	33	33
31-40	24	24
41-50	11	11
51-60	10	10

Table 2: Sex wise distribution of patients.

Sex	No. of patients	Percentage (%)
Male	36	36
Female	64	64

Table 3: Symptoms.

Symptoms	No. of patients	Percentage (%)
Hearing loss, otorrhea	64	64
Otorrhea	19	19
Otorrhea, otalgia	7	7
Otalgia, tinnitus	6	6
Hearing loss	3	3
Otorrhea, hearing loss, tinnitus	1	1

Table 4: Comparison of AC threshold between the groups.

Groups	T value	P value	Significance
Group A vs group B	2.81	0.009	S
Group A vs group C	1.97	0.052	NS
Group B vs group C	2.07	0.041	S

Table 5: Comparison of AB gap between the groups.

Groups	T value	P value	Significance
Group A vs group B	0.34	0.73	NS
Group A vs group C	1.08	0.28	NS
Group B vs group C	1.17	0.24	NS

Table 6: Hearing threshold improvement with respect to duration of symptoms.

Duration of disease (AC)	Mean±SD		
	Pre-op AC	**Post-op AC at 1 month (dB)**	**Post-op AC at 3 months (dB)**
Group A (<1 year)	36.23±1.07	22.33±6.11	19.33±2.81
Group B (1-5 year)	25.67±6.38	19.91±6.61	15.09±5.80
Group C (≥5 year)	28.78±6.50	20.75±5.91	15.68±4.66

Table 7: Air bone gap improvement with respect to duration of perforation.

Duration of disease (AB)	Mean±SD		
	Pre-op AB	**Post-op AB at 1 month (dB)**	**Post-op AB at 3 months (dB)**
Group A (<1 year)	12.9±8.05	10.66±5.03	10±3
Group B (1-5 year)	13.86±4.19	10.32±3.78	8.49±4.34
Group C (≥5 year)	16.47±5.51	11.29±4.24	8.44±3.59

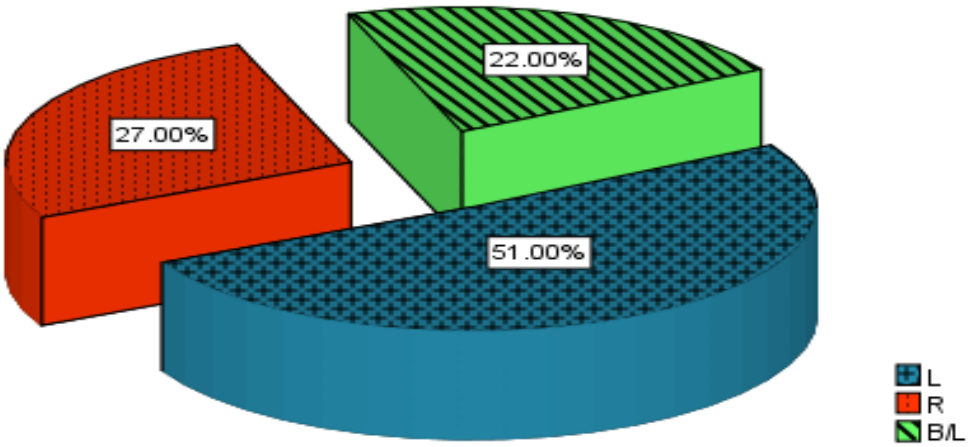

Figure 1: Laterality.

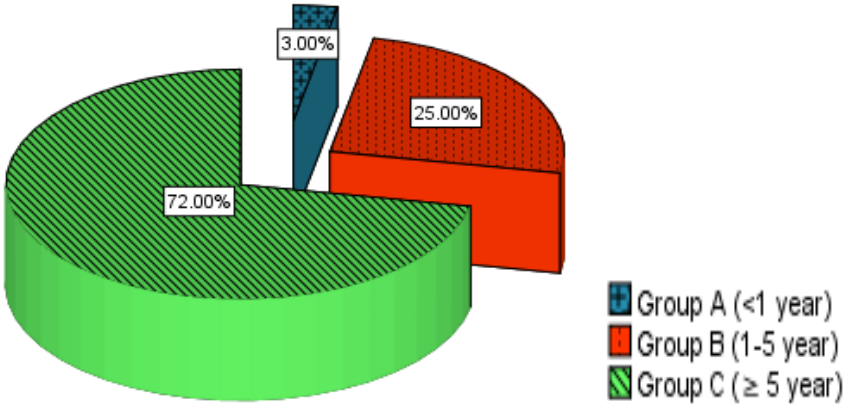

Figure 2: Duration of disease.

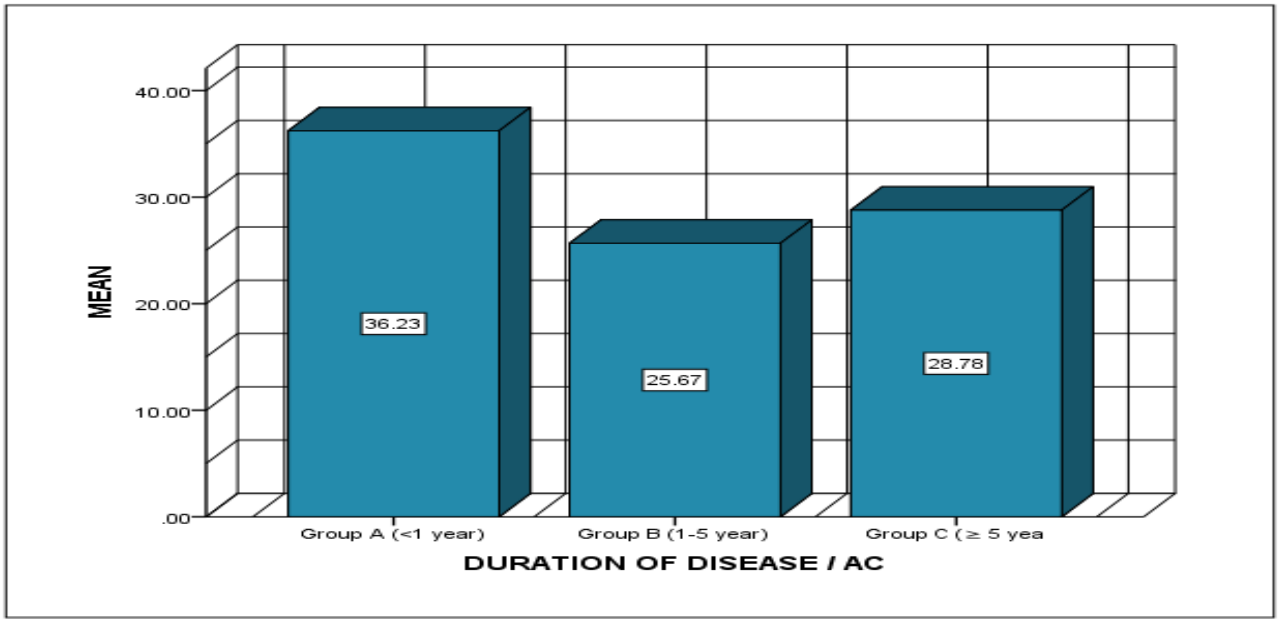

Figure 3: Duration of disease and AC threshold.

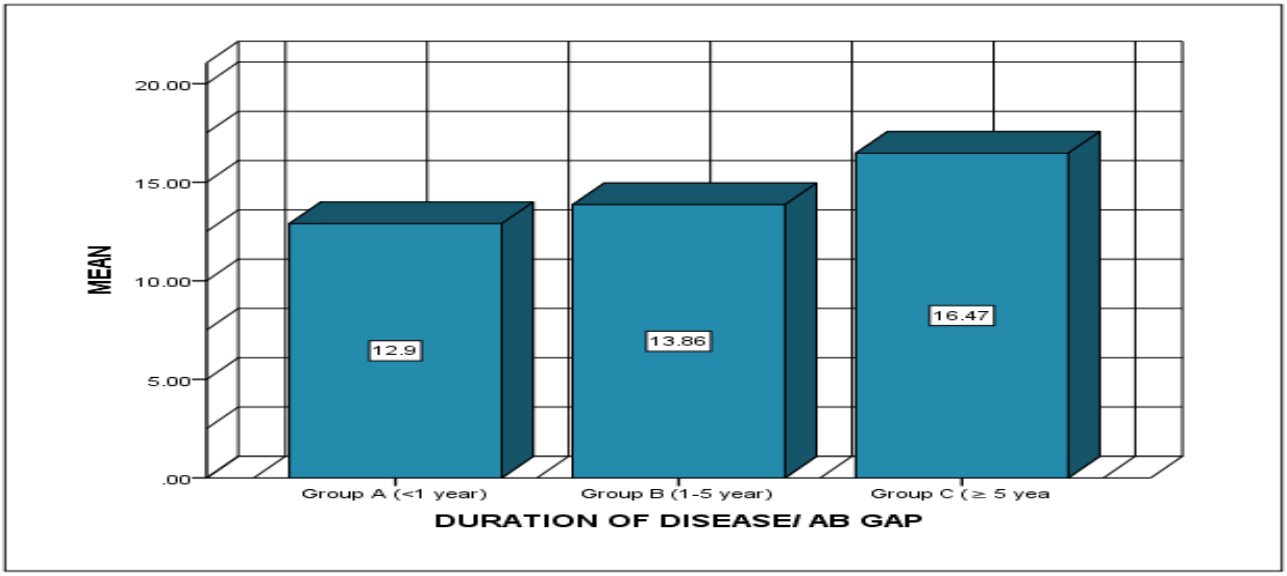

Figure 4: Duration of disease and AB threshold.

DISCUSSION

In our study, the most commonly affected age group was 21-30 years (33%) (Table 1). Our observation was similar to Sood et al.[7] but differed from the studies of Nahata et al and Bhusal et al.[8,9] where the most common age group was 15-24 years.

In our study, there were 36 males and 64 females (male: female 1: 1.77) (Table 2). Our finding was similar to that of Nahata et al, Maharjan et al and Ibekwe et al.[8,10,11] where female preponderance seen but differed from the findings of Pannu et al and Nepal et al where there was male preponderance.[12,13]

In our study, left ear was found to be mostly affected (51%). This finding was consistent with that of Maharjan et al, Pannu et al, Ibekwe et al and Ribeiro et al.[10,11,12,14] However, it was contrary to study of Nahata et al who showed that bilateral ear involvement was more common.[8]

The most common symptom in our study was otorrhea with hearing loss in 64%, followed by otorrhea only in 19%, otorrhea with otalgia in 7% and tinnitus with otalgia in 6% patients. Gulati et al.[15] in their study reported that main symptoms was hearing loss and otorrhea similar to our findings whereas, Sood et al observed otorrhea in 98%, consistent with results of Kumar et al and Nahata et al.[7,8,16]

All the ears included in our study had a mild degree of hearing loss. One possible reason may be the exclusion of unsafe ears and ears with ossicular and mastoid pathology from the study. This finding was similar to the study of Nahata et al where most ears had mild hearing loss but differed from that of Maharjan et al because he found that most of ears had a moderate degree of hearing loss.[8,10]

In our study, on the basis of duration of symptoms, perforations were divided into three groups as stated previously. The highest number of ears was seen in group III (72%), while the lowest number was seen in group I (3%). This was consistent with Nahata et al who found that group III was most commonly involved (43%), while group I was most commonly involved (47%) in the study of Pannu et al and Sood et al.[7,8,12] However, John et al in his study, observed that group II had highest number of perforations (62%).[17]

In our study, we did not find any significant correlation between duration of symptoms and the degree of hearing loss. This is in agreement with Sood et al who also observed no correlation between duration of symptoms and degree of hearing loss.[7] The degree of hearing impairment (in the 30 to 60 dB range) is poorly correlated with the extent of tissue destruction, because inflammatory tissue in the tympanic cavity can itself conduct acoustic vibrations and thus partly compensate for a pathological deficit.[18] However, Maharjan et al in their study found a strong correlation between duration of ear discharge and degree of hearing loss.[10] John et al also found that hearing loss increased as the duration of disease increased at all the frequencies.[17] Comparison of average hearing loss in all the three groups showed that average hearing loss increased, and it was statistically significant.

Post-operatively on pure tone audiometry, group A (<1 year) have shown maximum (16.9 dB) improvement in pure tone average postoperatively. Group B showed an improvement of (10.58 dB), and group C showed an improvement of (13.1 dB) postoperatively.

All patients had excellent hearing improvement with 0-10 dB postoperative AB gap, with group A having maximum postoperative AB gap of 10 dB, followed by group B (8.49 dB) and group C (8.44 dB). However, there was not enough literature available to compare the postoperative outcome with respect to the duration of disease.

Limitations

The limitations of the present study were a limited sample size and there was no long-term follow-up. Moreover, the analysis is based to the information collected from the patients regarding duration of their symptoms which may not be accurate.

CONCLUSION

This study did not show any correlation between duration of disease and degree of hearing loss. Also, there was no correlation between duration of tympanic membrane perforation and postsurgical audiological outcome.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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