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Original Research Article

Clinical and audiological evaluation of post traumatic hearing loss

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ABSTRACT

Background: Post traumatic hearing loss is one of the most common problems encountered among trauma victims. It can manifest as conductive, sensorineural or mixed hearing loss. It is against this background that the study evaluated the clinical and audiological outcome of 47 patients of trauma.
Methods: A descriptive longitudinal study was conducted over a period January 2017 to March 2018. Follow up was done after 3 months of discharge. Study consisted of 47 patients presenting with features of trauma related injuries. After carrying out systematic clinical, audiometric and radiological evaluation, patients were managed conservatively.
Results: Of the 47 patients studied, 89.98% were related to road traffic accidents (RTAs); and 76.60% were under the influence of alcohol at the time of trauma. Among the 32 cases of the RTAs involving two wheelers, 29 patients (90.62%) were not using protective devices like helmet. Nearly 90% of patients had temporal bone fracture. Audiological evaluation confirmed hearing loss in 77% of patients at presentation. There was significant improvement of hearing thresholds with 51% attaining normal hearing at follow up with conservative management.
Conclusions: Post traumatic hearing loss was very common, conductive hearing loss being the most common type. It resolved over a few days to few weeks post injury. Timely diagnosis and management with early steroid therapy showed encouraging results for patients with traumatic sensorineural hearing loss or mixed hearing loss.

Keywords: Post traumatic hearing loss, Temporal bone injury, Otic capsule violating fractures, Wilcoxon matched pairs test

INTRODUCTION

The temporal bone is the key constituent of middle cranial fossa and houses many important structures like the facial nerve, vestibulocochlear nerve, cochlea and labyrinth, ossicular chain, tympanic membrane, external auditory canal, temporomandibular joint, lower cranial nerves, jugular vein, and carotid artery.[1] In addition to these, temporal bone fracture may also cause injury to the adjacent intracranial structures such as the temporal lobe of brain and meninges, abducens nerve, and brainstem, with resultant complications like cerebrospinal fluid (CSF) fistula, meningitis, and brain herniation.[1,2] Hearing loss is probably the most common presentation of temporal bone fractures[2]. Hearing loss occurs in as many as 24-66% and even up to 71% of patients with temporal bone trauma following head injury.[3,4] In a country like India where RTAs and assault related injuries are widely prevalent, temporal bone trauma cases are increasingly being presented to trauma centres. It is against this background that the present study is making an attempt to evaluate the clinical and audiological evaluation of hearing loss in post-traumatic cases presented to our tertiary centre.

METHODS

A descriptive longitudinal study was conducted at government medical college, Thiruvananthapuram,

Kerala, India during a period from January 2017 to June 2018 on patients presenting following trauma. A written informed consent was obtained from all respondents. All cases of post traumatic patients following history of RTAs, fall, assault or sports-related injuries presenting at government medical college hospital, Thiruvananthapuram were included in the study. Patients who did not give consent to be a part of the study were excluded from the study. A total of 47 cases were reported during the study period. Follow up was conducted after 3 months, during which 43 cases turned up while 4 patients were lost to follow up.

The relevant information was collected using a pre-tested structured proforma. Detailed clinical, audiometric and radiological evaluations were done as per the institutional protocol. The hearing assessment was done by both tuning fork tests (TFTs) and pure tone audiometry (PTA). TFTs are initially used to provide early diagnostic information on hearing, when audiometry is either not available or possible. Trauma patients cannot be evaluated by PTA because they are mostly unconscious or sedated. Bedside evaluation with a 512 Hz tuning fork is a reliable method to screen for a conductive hearing loss (CHL) or sensorineural hearing loss (SNHL).[2] The most commonly used tuning fork has a frequency of 512 Hz. The rationale for using the 512 Hz tuning fork includes optimum decay time, minimal number of overtones and relation to speech frequency. Simplicity is the major strength of the TFTs. There are different TFTs described in literature; but the Rinne and Weber tests are complementary to each other and form the most widely used TFTs for screening. Despite the criticism against tuning fork with regards to their sensitivity, these tests have survived the onslaught of the electronic and computerized screening options available today, and have stood the test of time. TFTs have a role in confirming the audiogram, which may give spurious results because of poor-fitting ear phones or due to variations in equipment or varying expertise of testing personnel.

Audiometry is the true measure of threshold sensitivity and is considered the "gold standard" for hearing assessment. PTA is the most clinically used audiometric test. PTA helps to document the baseline hearing status as most patients may have the involvement of the hearing apparatus in trauma. The radiological evaluation was done using high resolution computed tomography (HRCT) temporal bone. All the cases were initially managed conservatively. The CHLs were mostly caused by initial hemotympanum or effusion, which resolved after the resolution of the cause over a few days to few weeks post injury. The management of SNHL and mixed hearing loss consisted of administration of intravenous steroids such as methylprednisolone or dexamethasone complemented with other supportive measures like head end elevation and multivitamins. Use of steroids in trauma related SNHL and mixed hearing loss was in accordance with the institutional protocol, in order to harness the efficacy of steroids in countering inflammation and ischemia associated with trauma. Follow up was conducted after 3 months to assess the recovery parameters with respect to hearing impairment using TFTs and PTA.

The data collected were coded and entered into Microsoft excel worksheet and analyzed using the statistical software SPSS for windows (version 16.0). Quantitative variables were summarized on mean and standard deviation (SD). The categorical variables were summarized as proportions and percentages based on the frequency of occurrence. Pearson's chi-square (χ^2) test was employed to assess whether the proportions of observations falling in different categories were same as expected. A pre-requisite for the χ^2 test is to have the expected frequencies in each cell be greater than 5. The Fisher's exact test was relied upon to overcome the problem when such situation was encountered.[5] A probability value $p<0.05$ was considered statistically significant.

The effect size (ES) was estimated to assess the magnitude of the observed effect independent of the sample size.[6] The effect size for the chi square test was computed as:

$$\frac{\chi 2}{(N)*(K-1)}$$

Where, N=total sample size across all categories, and K=number of categories.

The suggested threshold levels for ES are: 0 to 0.2 representing small ES; 0.3 to 0.5 representing medium ES; and more than 0.5 representing large ES.[6]

The paired t-test could not be conducted as the differences of the paired observations of PTA scores were not found to be normally distributed when the Shapiro-Wilk (S-W) test was conducted. Hence, McNemar test of correlated proportions was employed to evaluate whether a statistically significant change in proportions have occurred among patients with hearing loss at two points of time, viz., at the time of presentation and follow up.[5] The test is particularly useful in situations of repeated measures for dichotomous categorical data.[6] The Wilcoxon matched-pairs test, a non-parametric equivalent of the paired t-test was employed to assess whether the changing composition of the type of hearing loss at the time of presentation and follow up was statistically significant or not. The ES of the Wilcoxon Z was estimated by the formula: $\frac{Z}{\sqrt{N}}$

RESULTS

A total of 47 trauma cases were presented during the study period. RTAs constituted the major cause, accounting for nearly 83% of trauma cases in this study. This was followed by fall from height (12.76%). There was one case each of assault and sports-related injury. Of

the 39 RTAs, 32 cases were involving two-wheelers (82.05%). Only 3 out of 32 two-wheeler drivers were using protective devices like helmet at the time of trauma. The influence of alcohol was detected in 36 out of 47 (76.60%) presented trauma cases. The preponderance of young male patients was high. The number of male patients was 40 (85%) while the female patients were just 7 (15%), with a male-female ratio of 5.71:1. The age of patients varied from 5 years to 53 years, with a mean age of 32.72 years±12.74 SD. The most common age group was 16-30 and 31-45 (36.17% each), followed by 46-60 years (19.15%).

The status of the tympanic membrane (TM) was assessed using the otoscope (Figure 1). Approximately two-third of the patients had retracted/congested/perforated TM/evidence of hemotympanum. Hemotympanum was observed in about one-third of cases (Table 1 and Figure 2a and b). One case had co-existing retracted and congested TM of the same ear.

Table 1: Status of the TM at presentation.

TM status	Frequency	%
Normal	16	32.65
Retracted	2	4.08
Congested	5	10.20
Perforated	9	18.38
Hemotympanum	17	34.69

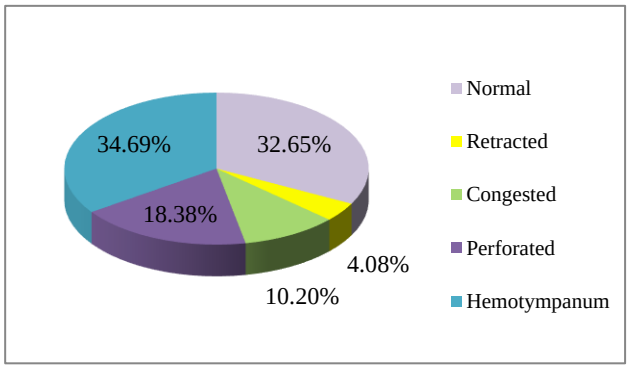

Figure 1: Status of TM at presentation.

The hearing assessment based on tuning fork tests revealed that 37 out of 47 cases (78%) had post traumatic hearing loss (Table 2). The χ^2 test revealed that the observed frequencies were as expected ($p>0.05$). PTA could not be conducted in 3 specific cases at presentation; one case due to bed ridden condition on account of intra-abdominal injury, the second case due to active CSF otorrhoea, and the third due to post-admission manifestation of alcohol withdrawal symptoms. The hearing assessment based on PTA revealed hearing loss in 77% cases, leaving just 23% with normal hearing at the time of presentation (Table 3 and Figure 3). The χ^2 test revealed that the observed frequencies were as expected ($p>0.05$). The effect size was also small, indicating that the divergence between observed and expected frequencies were insignificant.

Table 2: Hearing assessment at presentation based on TFTs.

Hearing status	Frequency	Percent (%)
Normal	10	21.28
Hearing loss	37	78.72
Total	47	100.00

χ^2=1.225; DF=1; exact p=0.333; ES=0.026

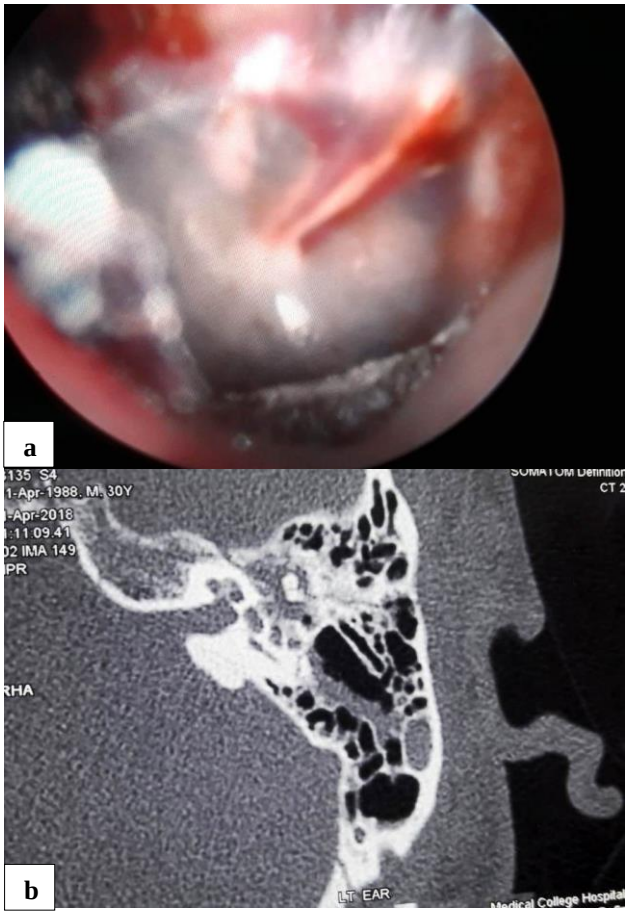

Figure 2: (a) Hemotympanum of the left ear, (b) hemotympanum of the left ear with intact ossicular chain.

Table 3: Hearing assessment at presentation based on PTA.

Hearing status	Frequency	%
Normal	10	22.73
Hearing loss	34	77.27
Total	44	100.00

χ^2=0.736; DF=1; exact p=0.413; ES=0.17

The degree of hearing loss at presentation was assessed based on the norms prescribed by American speech-language-hearing association (ASHA) and presented in (Table 4).[7] It was found that majority of the cases suffered from mild (27.28%) to moderate (22.73%)

hearing loss. Severe and profound hearing loss was noted in one case each.

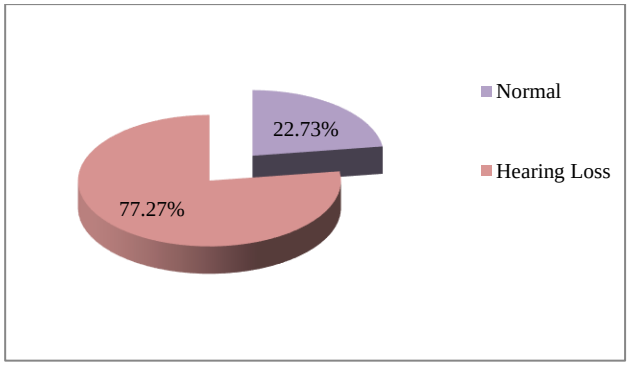

Figure 3: PTA based hearing status at presentation.

Table 4: Degree of hearing loss at presentation based on PTA.

Degree of hearing loss	Hearing loss range (dB HL)	Frequency	%
Normal	0-15	10	22.73
Slight	16-25	5	11.36
Mild	26-40	12	27.28
Moderate	41-55	10	22.73
Moderately severe	56-70	5	11.36
Severe	71-90	1	2.27
Profound	>91	1	2.27
Total	-	44	100.00

Hearing loss classification based on PTA indicated that nearly two-third of patients suffered from conductive hearing loss while about 6 per cent had sensorineural hearing loss, 29% cases developed mixed hearing loss (Figure 4). Fisher's exact test was carried out instead of classical chi square test because one cell (that of SNHL) was having frequency less than 5. The exact probability value was greater than 0.05 and hence the test was non-significant. Hence, the null hypothesis of no difference between the observed and expected frequencies of hearing loss was accepted. The small effect size also highlighted the minimal deviations between the observed and expected frequencies.

HRCT temporal bone was relied upon to detect the nature and extent of temporal bone fracture. Temporal bone fractures (TBFs) were recorded in 42 patients (89%), out of which 37 (79%) were unilateral fractures. There were 5 (11%) bilateral fractures. The traditional classification of TBF based on fracture line with respect to the long axis of the petrous ridge revealed that out of 47 TBFs recorded, 28 (60%) were longitudinal fractures and 6 (13%) were transverse fractures (Table 5 and Figure 5a and b). Mixed fractures were 13 (28%) in number.

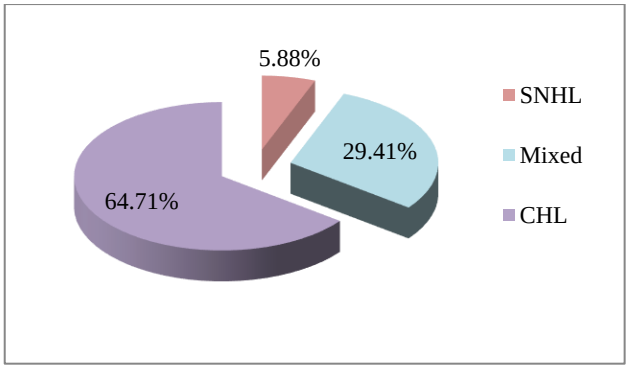

Figure 4: Type of hearing loss at presentation based on PTA.

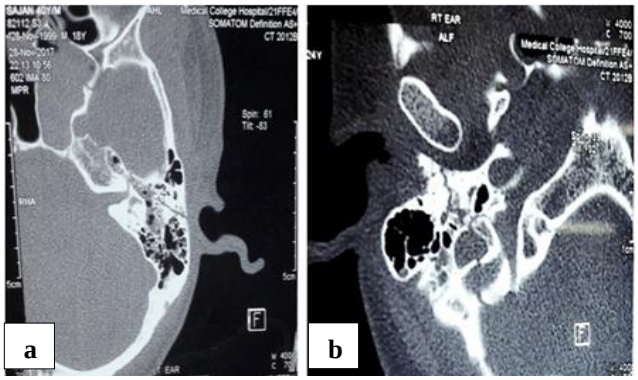

Figure 5: (a) Longitudinal fracture of the left ear, and (b) transverse fracture of the right ear.

Table 5: Conventional classification of TBF.

Type of TBF	Number	%
Longitudinal fracture	28	59.57
Transverse fracture	6	12.77
Mixed fracture	13	27.66
Total	47	100.00

Table 6: TBF based on otic-capsule disruption.

Type of TBF	Number	%
OCS fractures	43	91.49
OCV fractures	4	8.51
Total	47	100.00
Fisher's exact test	χ^2=0.246; DF=1; exact P=0.769; ES=0.005	

A new classification of "otic capsule sparing" (OCS) and "otic capsule violating" (OCV) system of temporal bone fracture classification proposed by Kelly and Tami was adopted by the facial nerve study group of the academy of otolaryngology. OCS fractures were 43 in number (91%) while only 4 (9%) were OCV fractures (Table 6 and Figure 6a and b). The Fisher's exact test was carried out in view of one cell (OCV fractures) having frequency less than 5. The exact probability value p>0.05 and hence the null hypothesis of no difference between the observed and expected frequency of OCS and OCV fractures was

accepted. The small effect size also indicated that deviations between the observed and expected frequencies were minimal.

The initial management of conductive hearing loss includes conservative measures like clearance of blood from the EAC under strict aseptic precautions, allowing time for recovery from TM injury and resolution of hemotympanum. According to the ASHA, 2015 suspected cases of ossicular chain disruptions have a high rate of spontaneous repair, with surgical intervention for perforation or conductive hearing loss undertaken only for those cases when these conditions persist for more than 6 months.[7] However, Toynton suggested a waiting period of 3 months prior to surgical intervention.[8] According to Brodie and Wilkerson, 80% of CHL resolves spontaneously without the need for surgical exploration.[9] They emphasized that exploratory tympanotomy and ossicular reconstruction be planned for CHL more than 30 dB which may persist more than 2 months after injury. OCV fractures are more commonly associated with inner ear involvement and SNHL. Trauma may cause round window or oval window membrane rupture causing perilymph leak and SNHL.[8] Systemic steroids are considered for patients with SNHL or mixed hearing loss.[2] In a more recent paper, significant improvement in conductive, mixed and sensorineural hearing loss has been reported in patients managed conservatively.[10] 16 out of 19 (84.21%) patients with CHL; 8 out of 11 (72.7%) patients with mixed hearing loss; and 6 out of 9 (66.67%) patients with SNHL showed clinical improvement after managing conservatively for 3 months. The authors concluded that the presence of SNHL at presentation did not indicate a poor prognosis for recovery. Persistent mild, moderate or severe mixed hearing loss can be managed with the use of amplification with hearing aids.[2]

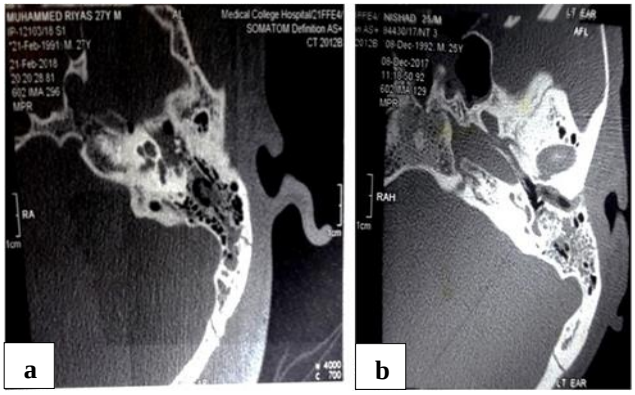

Figure 6: (A) OCS fracture and (B) OCV fracture of the left ear.

The hearing status was re-assessed with TFTs and PTA during the follow up visits after 3 months. 4 cases were lost to follow up. In the rest 43 cases reviewed, TFTs pointed out that post traumatic hearing loss came down drastically from 77% of cases presented initially to 44%. Otherwise, normal hearing was restored from 10 (23%) cases at the time of presentation to 24 (56%) cases at follow up (Table 7 and Figure 7). The McNemar test was also supportive of the above finding. The p value indicated that the improvement in hearing was statistically significant at α=0.01.

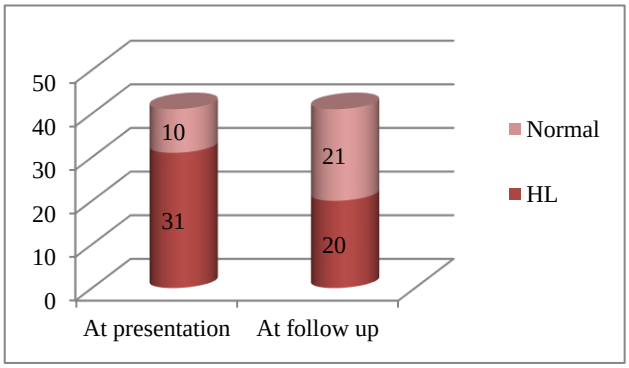

Figure 7: Comparison of hearing status based on PTA at presentation and follow up.

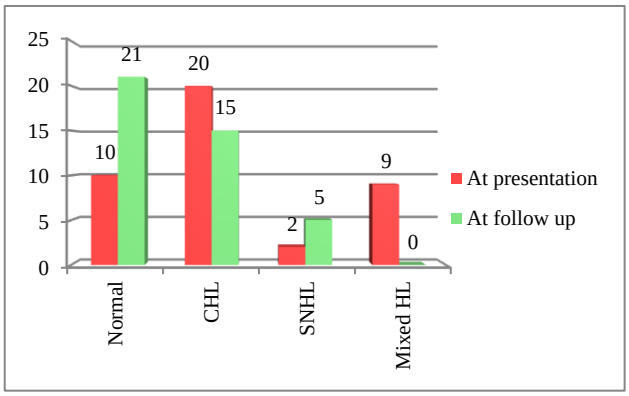

Figure 8: Changing status of hearing loss based on PTA at presentation and follow up.

Figure 9: Loss of ice cream cone appearence.

Similarly, out of the 43 cases who turned up for review, PTA could not be done in 2 specific cases. The reason in the first case was due to active ear infection and the second case refused to undergo PTA citing personal inconvenience at that point of time. As a result, PTA could only be done in 41 cases during the follow up. (Table 8). Normalization was done with 41 pairs of cases at presentation and follow up to have a more meaningful comparison. It is evident that post traumatic hearing loss reduced considerably from 31 to just 20 cases in a period of 3 months, representing a 36% reduction. The McNemar test conducted between hearing status at the time of presentation and follow up was statistically significant at α=0.01, leading to the conclusion that the sample proportions differed significantly. The large value for the effect size was also a pointer towards a significant impact of the management interventions made. Thus, it is concluded that the reduction in hearing loss was real and can not be attributed to chance.

Less than one fourth of patients (24%) had normal hearing initially at the time of presentation. More than half (51%) patients attained normal hearing within a period of 3 months (Table 9). Notable reduction in hearing loss occurred among the mild, moderate and moderately severe degree category of patients.

Two-third of hearing loss were conductive in nature at the time of presentation while 29% constituted mixed hearing loss. SNHL formed just 6% of cases. However during the follow up after 3 months, all the cases of mixed hearing loss resolved into either pure CHL or pure SNHL (Table 10 and Figure 8). The incidence of CHL also reduced considerably during this period. The Wilcoxon paired test was significant at α=0.01 with large effect size (0.64), providing statistical evidence to reduced hearing loss.

Table 7: Hearing status at presentation and follow up based on TFTs.

Hearing status	At presentation		At follow up	
	Frequency	Percent (%)	Frequency	Percent (%)
Normal	10	24.26	24	55.81
Hearing loss	33	76.74	19	44.19
Total	43	100.00	43	100.00
McNemar's test	McNemar statistic=8.113 (with continuity correction); DF=1; 2-tailed significance (p=0.004);			

Table 8: Hearing status at presentation and follow up based on PTA.

Hearing status	At presentation		At follow up	
	Frequency	Percent (%)	Frequency	Percent (%)
Normal	10	24.39	21	51.22
Hearing loss	31	75.61	20	48.78
Total	41	100.00	41	100.00
McNemar's Test	McNemar statistic=9.090 (with continuity correction); DF=1; 2-tailed significance (p=0.003);			

Table 9: Evaluation of degree of hearing loss at presentation and follow up.

Degree of HL	HL Range (dB HL)	At presentation		At follow up	
		Frequency	Percent (%)	Frequency	Percent (%)
Normal	0-15	10	24.40	21	51.22
Slight	16-25	5	12.19	6	14.63
Mild	26-40	11	26.83	7	17.07
Moderate	41-55	9	21.95	3	7.32
Moderately severe	56-70	5	12.19	3	7.32
Severe	71-90	-	-	1	2.44
Profound	>91	1	2.44	0	0.00
Total	-	41	100.00	41	100.00

Table 10: Changing composition of status of hearing loss at presentation and follow up.

Hearing status	At presentation		At follow up	
	Frequency	Percent (%)	Frequency	Percent (%)
Normal	10	24.39	21	51.22
CHL	20	48.78	15	36.59
SNHL	2	4.88	5	12.19
Mixed HL	9	21.95	0	0.00
Total	41	100.00	41	100.00
Wilcoxon test	Z=- 4.093; DF=3; 2-tailed significance (p=0.000) ES=0.64			

DISCUSSION

RTA was the major cause of trauma in the study. Road accidents have been recognized as a major public health problem worldwide. High intensity trauma to skull can cause temporal bone injuries with associated damage to the hearing apparatus.

The significant male preponderance of cases reported could be attributed to more road traffic accidents involving males, especially involving two-wheeler riders as in this study. There are reports highlighting males being three to four times more prone to trauma than females.[11-13] As most of the RTA cases were two-wheeler riders than pedestrians, it may be attributed to the difference in driving habits in male and female drivers. Female drivers, by and large, tend to be less rash and more cautious than male drivers who exhibit more risk taking behaviour.[11, 13-14]

It has also been well documented that different age groups of people have different risk exposure.[11-13] Age is considered as a predisposing as well as prognostic factor in trauma. Though youngsters have better road awareness and reflexes, they also turn out to be rash in their driving habits, contributing to accidents. Elderly people with poor vision, motor/coordination deficits and impaired balance are also at greater risk of getting injured. In the present study more cases (72%) were reported from the young age groups (16-30 years) and middle-aged groups (31-45 years). In other words, adolescents and young adults are at a higher risk of traffic accident-related injury and subsequent post-traumatic hearing loss. The main causes of RTAs in developing countries have been reported as over speed, failure to use protective devices like helmets in two-wheeler driving and seatbelts in four-wheeler driving.[14]The pattern is not different in the present study also, with nearly 82% of the RTAs involving two-wheelers with 90% of two-wheeler drivers not using helmet at the time of trauma.

Impairment of alertness by alcohol is well substantiated.[11-13,15] As many as 77% of trauma victims in the present study were detected to be under the influence of alcohol at the time of presentation at the study centre. The pattern that emerged can be summed up as intoxicated driving by young rash drivers with less driving experience coupled within adequate protection like helmet culminating in trauma.

The different causes of hearing loss following temporal bone injuries include blood clots in EAC, TM perforation, CSF fluid or blood within middle ear, ossicular disruption (leading to loss of the normal "ice cream cone" appearance on HRCT, as shown in Figure 9), perilymph fistula, acoustic trauma, fracture of otic capsule, labyrinthine or brainstem concussion.[8,16-19] Two third of the trauma patients in the present study had retracted, congested, perforated TM or evidence of hemotympanum (67.35%) whereas only one third had normal TM (32.65%). Evidence of hemotympanum was noted in one out of every three patients studied (34.69%).

The hearing assessment using tuning fork and PTA highlighted widespread post traumatic hearing loss in a vast majority (more than two-third) of cases. Past workers have reported post-traumatic hearing loss above 62 to 71% following temporal bone trauma.[4,17] The type of hearing loss varied from slight hearing loss to profound hearing loss. The majority of the cases suffered either from mild (27.27%) or moderate (18.18%) hearing loss. One case each suffered from severe and profound hearing loss.

Conductive hearing loss was the most common type encountered, accounting for two third of the cases. Nearly one third of the cases had mixed hearing loss, while SNHL was recorded in two cases. The Fisher's exact test showed that the observed frequencies were in accordance with the expected frequencies reported in the past.[17] The effect size also indicated that the deviations between the observed and expected frequencies were minimal. CHL may be due to blood clots in the EAC, TM perforation, hemotympanum or ossicular disruption.[19-20] The prognosis of post-traumatic hearing loss of the conductive type is fairly good.[21] In 80% cases, the hearing improved spontaneously up to the normal range. Spontaneous improvement is most pronounced within the first 3 weeks after the trauma.[21] Disruption of membraneous labyrinth, interruption of cochlear blood supply, cochlear concussion/hemorrhage, acoustic trauma, perilymph fistula and delayed endolymphatic hydrops due to endolymphatic duct obstruction by the fracture and sympathetic hearing loss may lead to SNHL.[1,8,22] The prognosis of post-traumatic SNHL is usually poor. Mixed hearing loss can occur with combined injuries to external, middle and inner ears.[1] It generally resolves into pure CHL or SNHL in due course.

HRCT scan revealed that nearly 90% of the trauma victims in the study had TBFs, with about 79% being unilateral while the remaining 11% being bilateral. Out of these, 60% were longitudinal fractures whereas 13% were transverse fractures, and 28% were mixed in nature. In a former study, longitudinal fractures constituted 70-80%, transverse fractures 10-30% and mixed fractures up to 20%.[23] In another study, 64% were longitudinal fractures, 23% transverse fractures and 13% mixed fractures.[24] In yet another study,[4] longitudinal fractures formed 72%, transverse fractures 20% and mixed fractures 9%. In view of the wide variation in the frequency of fractures based on the conventional classification, a goodness of fit using the chi square test was not attempted.

As per the new classification of temporal bone fractures, around 92% of the fractures were OC sparing, while around 9% accounted for OC violating type of fractures. In an earlier study, 80% fractures were reported as OC sparing and 20% as OC violating out of 234 temporal bone fractures studied.[25] A more recent study reported

that OC sparing fractures occur far more frequently (>94 %) than fractures that violate the OC (<6%).[26] The exact probability value of the Fisher's test and the small effect size were supportive of the second finding.

The review of hearing status at follow up using TFTs highlighted that the hearing loss reduced from 76% cases to 44% of cases after 3 months, recording a drastic fall. The PTA also revealed an identical recovery rate with a reduction of post traumatic hearing loss from 76 to 48% cases. The McNemar test in both the cases confirmed that the paired proportions of patients with hearing loss (Tuning Fork as well as PTA based) differed significantly at presentation and follow up. This difference was real, and cannot be attributed to chance. The severity of hearing loss also reduced during this period, especially for the moderate and moderately severe categories.

There was a change in the composition of the type of hearing loss at presentation and follow up. Normalcy returned to 51.22% cases in terms of degree of hearing loss. There was a fall in CHL from 20 cases to 15, but the number of SNHL cases increased from 2 to 5. This can be attributed to some cases with mixed hearing loss resolving to SNHL. There were 9 cases of mixed hearing loss, out of which 3 reverted to pure SNHL at the time of follow up while 6 cases resolved to conductive hearing loss. CHL due to initial hemotympanum or effusion may resolve over a few days to few weeks post injury.[1] CHL may persist only due to the presence of TM perforation or ossicular disruption, which occurs in 20% of the patients.[1] Resolution of post traumatic SNHL is possibly due to the efficacy of steroids on inner ear inflammation and ischemia induced by trauma. Surgery is contraindicated if the SNHL is present in the only hearing ear. The Wilcoxon signed ranks test based on PTA scores revealed that there was statistically significant improvement in hearing status at α=0.01 at follow up.

Among the cases followed up after 3 months, a total of 11 persons had persistent hearing loss which needed further attention. Among them, 6 patients had CHL and the rest 5 had SNHL. Out of the 6 cases with CHL, 1 case each had persistent TM perforation and ossicular disruption on imaging, while another patient had TM perforation and ossicular disruption co-existing on HRCT scan. All these 6 cases with significant residual CHL were advised exploratory tympanotomy with or without ossiculoplasty, but were reluctant to undergo surgery citing personal reasons. The 5 patients with residual SNHL were rehabilitated with hearing aid amplification.

CONCLUSION

RTAs were the major cause of trauma with two-wheelers involved in large number of cases. The study subjects were predominantly young male patients in the age group of 16-45 years, who did not use any adequate protective devices like helmet, and were driving under the influence of alcohol. Temporal bone fractures were present in majority of trauma cases, mostly unilateral in nature. Post traumatic hearing loss was very common with CHL being reported in nearly two-third of patients. The prognosis of post-traumatic hearing loss of the conductive type was fairly good. However, early evaluation and timely diagnosis are critical for patients with traumatic SNHL or mixed hearing loss with SNHL elements. Initial management with early steroid therapy showed encouraging results in such cases.

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