Main Article

Clinico-audiometric Features and Role of Steroids in Acute Acoustic Trauma

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ABSTRACT

Introduction

Acute acoustic trauma implies injury to ear due to explosive blast or impulse noise. It primarily results in sensorineural hearing loss, but also causes tinnitus, earache, ear fullness, unsteadiness or sleep disturbance etc. There is no gold standard treatment protocol which has been found to be convincing. This study was done to compare clinic-audiological recovery in early and late cases following oral steroid therapy.

Materials and Methods

A prospective study was conducted with 40 patients of 18 to 45 years of age suffering from Acute acoustic trauma. Patients reporting within 7 days were considered 'early cases' (Group A) and those reporting between 8th to 28th day were considered 'late cases' (Group B). Following thorough clinical examination, hearing thresholds were recorded before and after treatment with oral prednisolone instituted at 1mg/kg body weight for 7 days tapering over next 7 days. Follow-up audiograms were done on 15th day and 6 months later.

Results

Tinnitus, hearing loss, earache, unsteadiness and tympanic membrane perforation were found in 95%, 90%, 60%, 15% and 30% patients respectively. Majority audiogram showed Type II pattern with high frequency loss. Only 5.26% showed dip at 4kHz. Steroid therapy significantly improved air and bone conduction thresholds in both groups, however, inter-group comparison was not significant. Moreover, early reporters showed significantly better resolution of associated autological features than late reporters.

Conclusion

Study results underline beneficial effect of oral corticosteroids in the treatment of early as well as late presentation of Acute acoustic trauma.

Keywords

Acute Acoustic Trauma; Hearing Loss; Tinnitus; Audiogram; Thresholds; Steroid

Noise is acoustically made up of numerous sound waves with anarchically distributed amplitude and phase ratios, causing an unpleasant sensation.[1] Ear is most vulnerable organ to incur injury from blast pressure wave. If the ear is exposed to blast noise, at a sound intensity of 120 dB or higher, there is risk of acoustic trauma resulting in damage to sensitive structures of middle and inner ear. Clinically, the important consequence of loud noise is unilateral or bilateral hearing loss with tinnitus and earache. A reversible elevation of auditory thresholds produced by noise exposure is known as Temporary threshold shift, which spontaneously improves in a few days. An irreversible elevation of auditory threshold is associated with permanent pathological changes in cochlea known as Permanent threshold shift, in which hearing does not return to normal.

The term, acute acoustic trauma (AAT), is often used to encompass injury to the ear due to explosive blast or due to impulse noise. Explosive blast injury refers to otological trauma due to detonation of explosives. Impulse noise may be defined as a single-pulse sound or a burst of sound with a duration of between 0.001 second and

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01 second, typically equal to or greater than 140dB, which rapidly rises to a sharp peak and then quickly fades.[2]

Majority of research has been limited to the sensorineural hearing loss (SNHL) and its recovery pattern. The otological features, other than hearing loss, seem to have seldom gained place in the available scientific literature. There is no gold standard or established protocol of treatment of AAT because the evidence regarding the effectiveness of such treatments is not particularly convincing. A study was, hence done in a tertiary care hospital of Indian Army with the objectives to study the clinical features, to compare the baseline audiological findings with subsequent alteration in thresholds on 15th day after steroid treatment and at the end of 6th months in early and late cases of AAT.

Materials and Methods

A prospective cohort study was conducted over 18 months with 40 patients of AAT in the age group of 18 to 45 years. Patients were categorized, randomly in two grouped, based on day of reporting following AAT. Patients reporting within 7 days were considered 'early cases' and kept in Group A and those reporting between 8th to 28th day were considered 'late cases' and kept in Group B. Patients presenting after 28 days or already on treatment or those with noise induced hearing loss other than acoustic trauma as well as the individuals with diabetes and cardiovascular morbidity were excluded from the study. Approval for the study was obtained from Institutional Ethics Committee. Written consent was taken from each patient prior to inclusion in the study. Detailed clinical history was recorded for each patient with emphasis on age, gender, profession, date of acoustic trauma and otological symptoms.

A thorough clinical ear, nose, throat (ENT) examination was done. Hearing thresholds were recorded by modified Hughson-Westlake method on Hortmann Audio master PA444 audiometer in the frequencies 0.5kHz, 1kHz, 1.5 kHz, 2 kHz, 4 kHz, 6 kHz and 8kHz for air and bone conduction in both ears. Pure Tone Audiogram (PTA) was done before and after the treatment with oral steroids. Average of four frequencies at 500Hz, 1kHz, 2 kHz, 4 kHz was considered as Air conduction (AC) and Bone conduction (BC) threshold. First PTA was done at the time of reporting, before starting oral steroid. Each patient was treated with oral prednisolone 1mg/kg body weight for 7 days tapering over next 7 days. Thereafter, PTA was repeated on 15th day (after tapering off steroid) and again at the end of 6 months during follow-up to compare them with the first PTA.

Data was summarized as Mean ± SE (standard error of the mean). Groups were compared by Student's t test and also by repeated measures two factor (groups x periods) analysis of variance. Significance of mean difference within (intra) and between (inter) the groups was done by Newman-Keuls post hoc test after ascertaining normality by Shapiro-Wilk's test and homogeneity of variance between groups by Levene's test. Categorical groups were compared by chi-square (χ^2) test. A two-tailed (α=2) p-value <0.05 was considered statistically significant. Analyses were done on SPSS software (Windows version 17.0).

Results

The present study evaluates clinical features, audiological findings and role of steroids in early and late cases of AAT. 40 patients, 21 of them reporting early (Group A, n =21) and 19 of them reporting late (Group B, n=19) were recruited. The age of patients in Group A and Group B ranged from 19-42 yrs and 22-45 yrs respectively with mean (± SE) being 31.19±1.73 yrs and 33.68±1.65 yrs respectively, and median 32 yrs and 34 yrs respectively. The mean age of Group B was slightly higher than Group A, however the difference was not statistically significant. There was male predominance with higher being in Group A, yet the difference was not statistically significant. Similarly, majority of patients were serving soldiers with sudden intense noise of firing being the mechanism of acoustic trauma, however the difference was not statistically significant. Thus, the comparisons in Table I concluded that the subjects of two groups were demographically matched and comparable and thus did not influence the study outcome measures. Age of two groups was compared by Student's t test whereas sex, occupation and mode of trauma were compared by χ^2 test.

Table I: Demographic characteristics of study subjects

VARIABLE		GROUP A (n=21)	GROUP B (n=19)	STUDENT-T TEST/ χ^2 VALUE	p VALUE
Age	Mean age	31.19 ± 1.73	33.68 ± 1.65	1.04	0.306
Gender	Male	20 (95.2%)	17 (89.5%)	0.48	0.489
	Female	01 (4.8%)	02 (10.55)		
Occupation	Veteran	01 (4.8%)	0 (0.0%)	6.95	0.326
	Farmer	0 (0.0%)	01 (5.3%)		
	House wife	0 (0.0%)	02 (10.5%)		
	Medical resident	01 (4.8%)	0 (0.0%)		
	Recruit	01 (4.8%)	0 (0.0%)		
	Serving soldier	17 (81.0%)	16 (84.2%)		
	Student	01 (4.8%)	0 (0.0%)		
Mode of trauma	Firing	19 (90.5%)	16 (84.2%)	0.36	0.550
	Noise exposure	02 (9.5%)	03 (15.8%)		

Tinnitus was complained by all the 21 patients in Group A, and by 17 patients (89.5%) cases in Group B. Hearing loss was present in 19 (90.5%) and 17 (89.5%) cases respectively in Group A and Group B whereas earache was present in 16 (76.2%) and 8 (42.1%) cases respectively (Fig 1). The comparison of chief complains in two study groups showed a statistically significant difference with respect to earache as evident by x^2 =4.83 and p value 0.028, whereas the difference was found not significant in tinnitus or hearing loss.

Comparison of the associated features such as dizziness, headache, poor concentration sleep disturbance and past history of tinnitus between the two groups at the time of presentation showed that the differences were not statistically significant (Fig. 2).

Both ears were affected in majority of the patients. 38.1% and 21.1% cases suffered from tympanic membrane (TM) perforation and ear bleed in Group A and Group B respectively. Majority also suffered SNHL. However, difference of these variables in the two groups were not found significant (Table II).

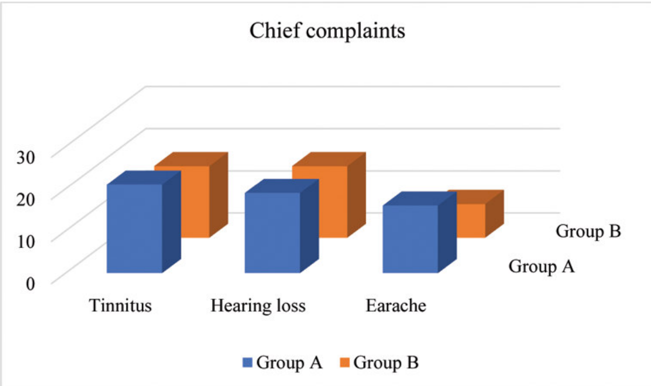

Fig. 1. Distribution of chief complaints

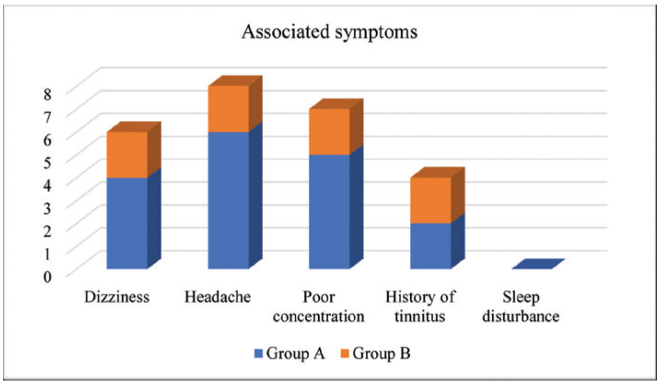

Fig. 2. Distribution of associated symptoms

Table II: Distribution of ear findings

VARIABLE		GROUP A (n=21)	GROUP B (n=19)	χ^2 VALUE	p VALUE
Laterality of ear	Bilateral	10 (47.6%)	11 (57.9%)	0.46	0.795
	Left ear	05 (23.8%)	04 (21.1%)		
	Right ear	06 (28.6%)	04 (21.1%)		
Otoscopy	Ear bleed	08 (38.1%)	04 (21.1%)	1.38	0.240
	TM perforation	08 (38.1%)	04 (21.1%)		
Hearing loss	No hearing loss	0 (0.0%)	02 (10.5%)	5.66	0.059
	CHL	08 (38.1%)	02 (10.5%)		
	SNHL	13 (61.9%)	15 (78.9%)		

First audiogram was done on the day of presentation in all the 40 patients. However, one patient in each group was lost to follow, hence excluded from the analysis leaving 20 patients in Group A and 18 patients in Group B for the analysis of results.

Mean AC threshold in left ear decreased with time in both study groups and the improvement over 6 months was proportionally higher in Group A as compared to Group B. Moreover, the mean AC threshold in left ear of Group B was comparatively higher than Group A on all occasions. Mean BC threshold in left ear decreased with time in Group A but it remained static in Group B in the PTA done on Day 15 and 6 months later, and the improvement over 6 months was proportionally higher in Group B as compared to Group A. Moreover, the mean BC threshold in left ear of Group B was comparatively higher than Group A on all occasions (Table III).

Table III: Mean AC and BC thresholds on different days in both study groups

LATERA-LITY	THRESHOLDS IN dB	GROUP A (n=20)			GROUP B (n=18)		
		DAY 1	DAY 15	6 MONTHS LATER	DAY 1	DAY 15	6 MONTHS LATER
Left ear	AC threshold	35.30 ± 2.56	27.50 ± 1.91	27.10 ± 1.80	45.33 ± 4.08	41.00 ± 3.75	40.67 ± 3.77
	BC threshold	25.15 ± 2.21	21.30 ± 1.74	21.10 ± 1.74	34.33 ± 3.33	28.00 ± 2.42	28.00 ± 2.42
Right ear	AC threshold	35.80 ± 2.53	26.30 ± 1.84	26.50 ± 1.57	37.89 ± 2.64	30.78 ± 2.22	30.78 ± 2.22
	BC threshold	24.10 ± 2.10	21.00 ± 1.79	21.10 ± 1.67	28.89 ± 2.79	25.33 ± 2.25	25.11 ± 2.24

Table III also shows that mean AC threshold in right ear decreased with time in both study groups and the improvement over 6 months was proportionally higher in Group A than Group B, though a slight elevation in threshold was observed in Group A at 6 months as compared to day 15. Whereas in Group B, it remained unchanged during that period. Moreover, mean AC threshold in right ear of Group B was comparatively higher than Group A on all occasions. Mean BC threshold in right ear decreased with time in Group B but a slight elevation in threshold was observed in Group A at 6 months as compared to day 15. The improvement over 6 months was similar in both the groups. Moreover, mean BC threshold in right ear of Group B was comparatively higher than Group A on all occasions.

Using Newman-Keuls test, it was found that the differences of mean AC threshold in both the ears between Day 15 and 6 months later as compared to Day 1 were statistically significant (p-value <0.05) in both groups. However, the differences between Day 15 vs 6 months later were statistically not significant (p-value >0.05) in either group (Table 6). While analysing the BC thresholds, it was found that the differences of mean BC threshold in both the ears on Day 15 and 6 months later as compared to Day 1 were statistically significant (p-value <0.05) in both the study groups. However, the differences between Day 15 vs 6 months later were statistically not significant (p-value >0.05) in either of the study groups (Table IV).

Table IV: Mean difference in AC and BC thresholds over the study period in both groups

SIDE	MEAN dB THRESHOLDS	DAYS OF PTA	GROUP A (n=20)		GROUP B (n=18)	
			MEAN DIFFERENCE	p-VALUE	MEAN DIFFERENCE	p-VALUE
Left ear	AC thresholds	Day 1 vs Day 15	7.80 (22.1%)	<0.001	4.33 (9.6%)	0.001
		Day 1 vs 6 months later	8.20 (23.2%)	<0.001	4.67 (10.3%)	0.001
		Day 15 vs 6 months later	0.40 (1.5%)	0.751	0.33 (0.8%)	0.792
	BC thresholds	Day 1 vs Day 15	3.85 (15.3%)	0.003	6.33 (18.4%)	<0.001
		Day 1 vs 6 months later	4.05 (16.1%)	0.005	6.33 (18.4%)	<0.001
		Day 15 vs 6 months later	0.20 (0.9%)	0.872	0.00 (0.0%)	1.000
Right ear	AC thresholds	Day 1 vs Day 15	9.50 (26.5%)	<0.001	7.11 (18.8%)	<0.001
		Day 1 vs 6 months later	9.30 (26.0%)	<0.001	7.11 (18.8%)	<0.001
		Day 15 vs 6 months later	0.20 (0.8%)	0.879	0.00 (0.0%)	1.000
	BC thresholds	Day 1 vs Day 15	3.10 (12.9%)	0.006	3.56 (12.3%)	0.001
		Day 1 vs 6 months later	3.00 (12.4%)	0.003	3.78 (13.1%)	0.001
		Day 15 vs 6 months later	0.10 (0.5%)	0.919	0.22 (0.9%)	0.820

Similarly, using Newman-Keuls test, it was found that the differences of mean AC threshold in left ear between Group A and B on Day 15 and 6 months later were statistically significant (p-value <0.05). However, the difference on Day 1 was statistically not significant (p-value >0.05) (Table V). The difference of mean BC threshold in left ear between the two study groups on Day 1 was found statistically significant (p-value <0.05). However, the difference on Day 15 and 6 months later was statistically not significant (p-value >0.05). Similarly, the differences of mean AC or the BC thresholds in right ear between Group A and B on different days of audiometry were found statistically not significant (p-value >0.05) (Table V).

Table V: Comparison of difference of mean AC & BC thresholds between two groups

LATERALITY	THRESHOLDS IN dB	DAY OF AUDIOGRAM	COMPARISON BETWEEN GROUP A AND GROUP B	
			MEAN DIFFERENCE (%)	p-VALUE
Left ear	AC	Day 1	10.03 (22.1%)	0.106
		Day 15	13.50 (32.9%)	0.016
		6 months later	13.57 (33.4%)	0.015
	BC	Day 1	9.18 (26.7%)	0.038
		Day 15	6.70 (23.9%)	0.117
		6 months later	6.90 (24.6%)	0.242
Right ear	AC	Day 1	2.09 (5.5%)	0.503
		Day 15	4.48 (14.5%)	0.478
		6 months later	4.28 (13.9%)	0.174
	BC	Day 1	4.79 (16.6%)	0.402
		Day 15	4.33 (17.1%)	0.614
		6 months later	4.01 (16.0%)	0.392

Majority of audiogram did not have a dip in either ear in any of the groups under study, whereas 20% each in right and left ears in Group A and 22.2% and 33.3% in right and left ear respectively in Group B showed a dip at 4 kHz (Table VI). Analysis and comparison of the audiometric dips at different frequencies in the two ears in both groups showed that the result did not differ significantly.

Table VI: Comparison of the audiometric dips

LATERALITY	FREQUENCY	GROUP A (n=20)	GROUP B (n=18)	χ^2 VALUE	p-VALUE
Right ear	Dip at 3 kHz	04 (20%)	0 (0.0%)	5.91	0.116
	Dip at 4 kHz	04 (20%)	04 (22.2%)		
	Dip at 6 kHz	0 (0%)	02 (11.1%)		
	No dip	12 (60%)	12 (66.7%)		
Left ear	Dip at 3 kHz	02 (10%)	02 (11.1%)	2.48	0.478
	Dip at 4 kHz	04 (20%)	06 (33.3%)		
	Dip at 6 kHz	02 (10%)	0 (0.0%)		
	No dip	12 (60%)	10 (55.6%)		

Audiographic patterns were analysed in our study according to Song KT et al into four types. Type I showing a typical C5 dip hearing pattern, Type II showing normal hearing in the audible range, but an abrupt decrease in hearing level at high frequencies, Type III showing sloping from an audible range and deepening with higher frequencies and Type IV showing a decrease in hearing level at all frequencies.[3] 40% audiogram in Group A had

Type IV pattern, which was surprisingly absent in Group B. Type III pattern was comparatively higher in Group B. Group B also had two cases (11.1%) with Type I pattern in left ear. Comparing the pattern of audiograms of two groups, χ^2 test showed significantly different pattern between the two groups (χ^2=13.93, p-value 0.008) (Fig. 3).

Presenting symptoms and status of TM was followed up for 6 months. Resolution of these symptoms was analysed in both the study groups. TM perforation in 8 cases in Group A and 4 cases in Group B, associated with hearing loss and tinnitus, was found to heal spontaneously with resolution of symptoms in 6 cases in Group A; but was found unhealed with persistence of symptoms in all the 4 cases in Group B. Besides, the incidence of unresolved symptoms was 35.6% higher in Group B (55.6%) than Group A (20.0%). The difference was found to be significant (x^2=14.51, p-value 0.024) on comparing the symptom resolution between the two study groups (Fig. 4).

Discussion

Majority of the patients presenting with AAT in this study were the soldiers serving in Indian Army, who were exposed to the loud noise of firing a rifle of Indian Small Arms System (INSAS) during regular practice. Only few patients came with exposure to loud noise after bursting crackers on Diwali. Out of the total of 40 cases, 21 reporting within 7 days of acoustic trauma were placed in Group A and 19 reporting between 8th to 28th day of acoustic trauma were placed in Group B.

There were 37 males and 2 females with the average mean age of 32 years in this study where 82.5% of them were serving soldiers. Rezaee M et al. studied acoustic trauma in male military personnel in Tehran with the mean age of 20.08±2.61 years.[4] In a study involving 100 infantry soldiers, Munjal KR et al observed that the older infantrymen with longer military service had a longer recovery period and more incidence of permanent hearing loss owing to repeated impulse noise trauma of weapon firing.[5]

By definition, Acoustic trauma includes only one

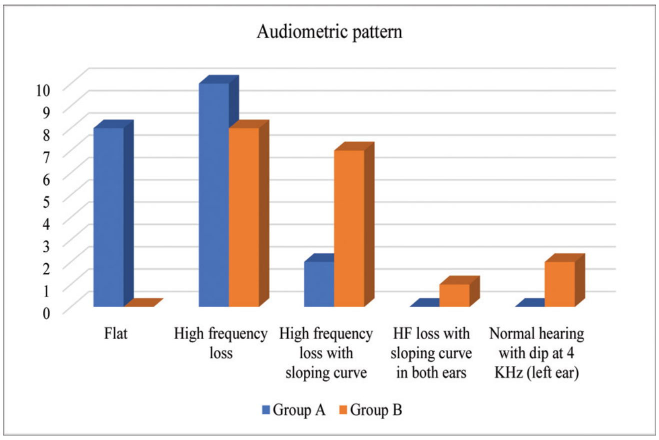

Fig. 3. Analysis of Audiometric pattern

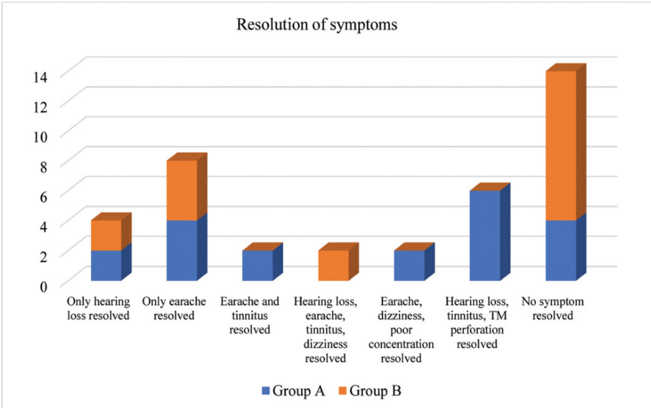

Fig. 4. Analysis of resolution of symptoms after 6 months

clinical feature, i.e. hearing loss. However, other subjective symptoms such as tinnitus, earache, ear fullness, unsteadiness or sleep disturbance etc are also not infrequent. Tinnitus and hearing loss have been reported as chief complaints by most of the scientific studies. In the present study, tinnitus, hearing loss, earache and unsteadiness were complained by 95%, 90%, 60% and 15% patients respectively. Lachaux J et al[6] in a retrospective study in 419 French soldiers reported tinnitus (87.4%) as the most frequent symptom followed by hypoacusis (35.1%) and earache (21.2%). Moon IS et al[7] evaluated 189 South Korean soldiers who had otologic symptoms after rifle shooting exercises without using any hearing protection and reported tinnitus in 94.2%, hearing impairment in 55%, ear fullness in 49.2%, headache in

38.1%, dizziness in 28%, and insomnia in 20.1% cases. On the contrary, Tazikei MH et al,[8] who reviewed the medical files of 256 war victims in Iran, reported aural symptoms in 55 of these subjects, out of which only 5.4% suffered from tinnitus.

Even a small-arm firing creates a blast wave containing both a blast wind and a shock wave resulting in overpressure at air-tissue interfaces. Though the estimated pressure of 08-56 kPa is required to rupture the human tympanic membrane, the damage has been reported by loud acoustic waves which barely create an overpressure of 0.3kPa.[2] In the present study, 30% cases suffered perforation of TM which is comparable to the reported incidence of 27.3% by Demiray E et al[9] but in contrast with the incidence of only 12.73% reported by Tazikei et al.[8]

The audiometric notch has long been recognised as a clinical sign of exposure to noise, and although the classic association is between continuous exposure to noise and a notch at 4 kHz, notches have been also been observed at 6 kHz in people exposed to impulse noise and at 3 kHz with low frequency noise.[10] Gravendeel and Plomp, in 1959, in a study of hundreds of soldiers exposed to light firearm, reported that the average place of the dips to be 5.9 kHz. They emphasized that although a 4 kHz notch might be found, the maximum loss might lie anywhere between 6 and 8 kHz.[11] This observation was also supported by Salmivalli who found the dip appearing at 5.5 kHz.[12] In our study, only 21.0% in right and 26.3% in left ears showed a dip at 4 kHz and the numbers did not differ significantly in either group under study.

Audiographic patterns were analysed according to Song KT et al into four types in our study. Type I showing a typical C5 dip hearing pattern, Type II showing normal hearing in the audible range, but an abrupt decrease in hearing level at high frequencies, Type III showing sloping from an audible range and deepening with higher frequencies and Type IV showing a decrease in hearing level at all frequencies.[3] Type I pattern was observed in 11.1% in Group B but not found in Group A. Type II pattern was observed in 50% in Group A and 44.4% in Group B. Type III pattern was observed in 10% in Group A and 38.9% in Group B. Type IV pattern was observed in 40% in Group A but not found in Group B. Using the same classification, Moon IS et al reported normal hearing in 18.5% of the cases, Type I in 21.8%, Type II in 40.3%, Type III in 18.5%, and Type IV in 0.9%.[7] In general, it is the Type I pattern which is usually seen in NIHL, however, in our study as well as in the study done by Moon IS et al[7] Type II hearing loss was more prevalent than Type I.

Acoustic trauma from gunshot results from high acoustic energy and pressure waves resulting in rupture of the organ of Corti, its separation from the basilar membrane and fracture and displacement of hair cell stereocilia. Therapeutic modalities aim to reduce the cellular hyperreaction, repair the impaired microcirculation and remove the metabolic byproducts of sensory cell damage. The modalities include systemic steroid, intratympanic steroid, antioxidants, microvasculature dilators, neurotrophins, vitamins, minerals, hyperbaric oxygen therapy (HBOT) or a therapeutic cocktail of these modalities. Steroids participate in forming ionic balance in the inner ear, stabilization of the cell membrane, and increased perfusion and inhibition of anti-inflammatory cytokines.[13] Administration of systemic with intratympanic steroid treatment has been claimed to result in better hearing outcomes than with systemic steroids alone[14]. Antioxidants like N-acetylcysteine with a total daily dose of 2700 mg, may be a safer alternative to steroids in countering free oxygen radicals and oxidative stress by providing 6-7% reduction in hearing threshold shift rate.[15] Neurotrophin-3 and brain derived neurotrophic factor promote the recovery of number of ribbon synapses as well as their function after noise induced trauma.[16] Magnesium by reducing apoptosis of hair cells by a decrease in calcium flow into the cell, reduces reactive oxygen species formation.[17] Oral Prednisolone 60 mg for 7 days plus daily sessions of HBOT for 10 days has been advocated by Bayoumy AB et al.[18]

In our study, the patients were treated with corticosteroids only. No other modality of treatment was applied to avoid any confounding synergistic beneficial effect. With oral prednisolone 1mg/kg body weight for 7 days tapering over next 7 days, it was observed that AC thresholds in left ear of patients of both study groups significantly improved (p value <0.05) on 15th day and

6 months later, compared to the thresholds on the 1st day. The difference between the two groups was also statistically significant (p value <0.05), thus suggesting a superior benefit of steroid therapy in improving AC thresholds of left ear in the patients who reported within 7 days of acoustic trauma. BC thresholds in left ear of patients of both study groups were found to have significantly improved (p value <0.05) on 15th day and 6 months later, compared to the thresholds on the 1st day. However, the difference between the two groups was not statistically significant (p value >0.05), thus suggesting no superior benefit of steroid therapy in improving BC thresholds of left ear in the patients of two groups. In the right ear of the patients of both the study groups, the AC as well as BC thresholds were found to have significantly improved (p value <0.05) on 15th day and 6 months later, compared to the thresholds on the 1st day. However, the difference between the two groups was not statistically significant (p value >0.05), thus suggesting no superior benefit of steroid therapy in improving AC or BC thresholds of right ear in the two groups.

Zloczower E et al published their study of 263 healthy military personnel presenting with AAT where 126 soldiers (48%) received no treatment and 137 (52%) received oral prednisolone in the dosage of 1mg/kg/day. Subjects in the steroids group demonstrated 13–14 dB average improvement in BC thresholds at 3 and 4 kHz (p value 0.001) and additional 7–8 dB average improvement in AC thresholds at 6 and 8 kHz, compared with the nontreatment group (p value < 0.0001). Subjects who were treated within 24 hours and those who initially presented with worse hearing losses (>35 dB) demonstrated significantly better hearing outcome.[19] Yehudai N et al published their study of 186 healthy soldiers presenting with AAT where 21 (23%) presenting within 7 days received oral prednisolone in the dosage of 1mg/kg/day for 7-10 days and 71 soldiers (77%) reporting a week after the trauma received no treatment. The mean BC improvements from the first to the last hearing test in the steroid-treated group were significantly higher (p value 0.01 for 0.5–4 kHz) than the mean reciprocal improvement in the nonsteroid group.[20]

Above two studies show significant improvement in AC and BC thresholds in AAT treated with oral steroids. Moreover, Zloczower E et al reported that the subjects who were treated within 24 hours demonstrated significantly better hearing outcome. Our study shows that steroid therapy did prove to be beneficial in improving AC and BC thresholds in both the study groups when pre-treatment threshold on the first day was compared with post-treatment thresholds on 15th day and 6 months later, but the improvement was not statistically significant when inter-group comparison was done.

Besides hearing loss, other features like earache, tinnitus, dizziness, poor concentration and TM perforation were found to resolve significantly better in Group A as compared to Group B suggesting that the cases of AAT reporting early respond better to steroid therapy.

Conclusion

AAT is a common consequence of exposure to high impulse noise occurring in soldiers in the training area or in combat. There is a hesitancy in wearing hearing protection devices among them, not only because of a perceived sense of machoism but also due to muffling of operational awareness during combat. There is lack of consensus on the current recommended treatment and no specific drug therapy has been proven to completely reverse the permanent threshold shift or to provide relief from other associated symptoms. Although further studies and larger sample of patients are required to draw firm conclusions, the results of our study do underline the beneficial effect of oral corticosteroids in the treatment of early and late presentation of ATT.

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