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HEARING IMPAIRMENT CAUSED BY WAR

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ABSTRACT

120 cases of Iranian soldiers complaining of hearing loss, were studied over a period of three years at the Ghaem Medical Center in Mashad, Iran. There was adequate information in 111 cases that their engagement in different types of explosions had caused their hearing impairment. The following aspects were evaluated:

1- Categorization of their hearing impairment.

2- The otoscopic findings.

3- The severity of the hearing impairment, the side of involvement and their relation to the type of explosion.

This study while implying that war seems to be a major factor in causing hearing impairment, intends to clarify some of the cause and effect relations also. The hearing impairment caused by war can be of different types and severity and will be a real handicap.

The abrupt loud impact noise and blast wave exposure are considered to be causes of hearing impairment. In our series of 111 cases the different types of sensorineural hearing loss are more common than simple ruptured ear-drums.

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INTRODUCTION

The live weapons, artillery, heavy bombings and explosions are the cause of many lives lost and handicapped from war all over the world. Hearing impairment is one of the ailments resulting from war, and little is written about it. Although researchers have experimentally developed similar situations in order to study the subject[2,5,7,8] clinical work and reports on humans are quite few.[3,4,6]

Unlike the very gradual and continuous type of damage to the cochlea caused in industrial conditions[1,3] hearing damage due to military activities is secondary to the loud impact noise and blast wave exposure[5] appearing in a matter of seconds. A closer situation in the research works of Voldrich was created stimulating the experimental ears with 145 dB in 3 minutes. Roberto and co-workers[7] have made a similar

Table I- Types of hearing impairment in war

	Type of hearing loss	cases	%
1	Sensorineural	54	46.7
2	High frequency	31	29
3	Conductive	24	22.4
4	Functional	2	1.9
	Total	111	100%

Table II- Otoscopic findings

Types of hearing impairment	Perforated eardrum				Hemotympanum	Intact Drum	Total
	Trauma of war		Unrelated				
	Bi-lateral	Uni-lateral	Bi-lateral	Uni-lateral			
Conductive	5	8	2	3	1	5	24
Sensorineural	-	3	1	5	-	45	54
High-frequency	-	2	-	1	-	28	31
Functional	-	-	-	-	-	2	2

experiment on sheep and chenchillas with 160 dB, and an acute mechanical fracture of the organ of Corti was demonstrated. The damage to the basilar membrane and Hensen cells are part of the histopathology caused by the loud impact noise in the experiments of Voldrich.[2] Finally if the victim survives the other injuries, acoustically, a precox aged ear with severe handicap will result from these types of traumatic exposures.

While our experience in every day clinical work speaks in favor of membrane perforations, rupture of the eardrum, etc., documents pointing to what happens in the auditory system of a soldier whose ears are being damaged are scarce.[2,6] The clinical history mostly reports of accidental explosions near the firemen[4] and may be quite different from the real military experiences presented in this paper. The therapeutic aspect is only confined to the ruptured eardrum, a clinical finding which is not the main problem. The sensorineural deafness is the major part of the ailment caused by war as is shown in this presentation.

MATERIAL AND METHOD

A clinico-audiological study was designed to include those soldiers who were complaining from hearing impairment caused by war. This study was performed at the ENT out-patient department of the Ghaem Medical Center in Mashad, Iran. One hundred and twenty soldiers were originally brought into this prospective study. They were followed for a period of three years. Nine of them were dropped because they did not have adequate information to confirm their hearing impairment was caused by war trauma. The data collected from 111 cases are summarized as follows:

Categorization of the hearing impairment: The hearing loss of the troopers were classified in the following four groups:

Table III- The severity of hearing loss.

Type of hearing impairment		The severity of hearing loss			
		Dead ear	Severe	Moderate	Mild
Unilateral conductive		-	1	3	2
Bilateral conductive		-	-	12	3
Unilateral Sensorineural		1	6	3	1
Bilateral Sensorineural		12	10	9	12
	Total	13	17	27	18
	%	17.3	22.7	36	24

Sensorineural hearing loss,

High frequency loss. This type of sensorineural hearing loss is seperately categorized because of its specific relation to the abrupt loud impact noise of a handgun,

Conductive hearing loss, corresponding to rupture of the eardrum or ossicular chain derangement.

Functional

Table I summarizes this categorization.

The otoscopic findings are summarized in Table II. The perforated eardrum was considered to be unrelated to the trauma of war when the soldier had a strong positive history of a previous ear infection.

The severity of the hearing loss: The degree of the hearing loss was studied in those whose hearing problem was sensorineural or conductive. Table III summarizes this part of the study.

Hearing impairment and its relation to the type of explosion: The history of the type of explosion was asked for and the number of cases was recorded in Table IV.

Table IV- Hearing impairment relating to the type of explosion

Type of Explosion → / Type of hearing impairment	Handgun Submachine gun RPG		Heavy Artillery		Bomb and Mine Explosions		Known Cases
	Cases	%	Cases	%	Cases	%	
Sensori-neural	16	40	18	45	6	15	40
High - frequency	16	53	6	20	8	27	30
Conductive	3	14	4	18	15	68	22
Functional	1				1		2
Total	36	38	28	30	30	32	94

RESULTS

In this study, sensorineural hearing loss was the most common type of hearing impairment and the severity of this complication places war trauma as the foremost factor causing hearing handicaps.

The abrupt loud impact noise of heavy explosions and continued handgun shooting as well as the blast wave exposure are considered to be the major factors responsible for producing sensorineural hearing loss.

The complications within the auditory system are studied in more detail pointing to the possibility of a cause and effect relation between the type of explosions and the type of hearing impairment.

DISCUSSION

111 cases of hearing impairment caused by war, were the subject of this clinico-audiologic assessment over a period of three years. Adequate history was obtained and physical exam performed to verify that the patient's hearing impairment has resulted from the soldier's engagement in different types of explosions.

This limited study while not sufficient to draw a statistical conclusion, may be able to comment on the following facts with some degree of certainty:

War is a major source of loud impact noise and will increase the incidence of hearing impairment.

Consideringof the type of hearing impairment and its severity, the conclusions drawn from Tables I and II may suggest that 76 of the hearing impairments are classified as sensorineural and 50 of them will either have a dead ear or severe hearing loss. Thisstudy points to the significance of war trauma as a major factor causing hearing handicaps.

Perforated eardrum while still a point of interest to both the author's and trooper's interest, is just a physical finding more common with the conductive type of hearing loss. The aim of this paper was to demonstrate the higher incidence of sensorineural hearing loss , its severity and the handicap caused by war (Tables II, III).

As far as the type of explosions are concerned there may be possibility of a cause and effect relation between the type of explosions and the type of hearing impairment. Thus, the high frequency sensorineural hearing is mostly caused by handguns and the conductive hearing loss is the result of bomb and mine explosions (Table IV).

REFERENCES

1. Ward W D: Noise-induced hearing loss. Otolaryngology. 2nd edition, vol. 2, W.B. Saunders Co. 1980.
2. Voldrich L, et al: Comparative method for the study of structural damage in acoustic trauma. Laryngoscope, 1887-1891, 1980.
3. Mc Gill T J, et al: Human cochlear changes in noise-induced hearing loss. Laryngoscope 1293-1301, 1970.
4. Merwin G E, et al: Paper patch of blast rupture of the tympanic membrane. Laryngoscope 835, 1980.
5. Phillips Y, et al: Blast injuries of the ear in militaryoperations. The Annals of Otology, Rhinology, Laryngology 1989. Supplement 140, May 1989.
6. Casler J D, et al: Treatment of the blast injury to the ear. The Annals of Otology, Rhinology, Larynology 1989, Supplement 140, May 1989.
7. Roberto M, et al: Damage of the auditory system associated with acute blast trauma. The Annals of Otology, Rhinology, Laryngology 1989, Supplement 140, May 1989.
8. Richmond D R, et al: Physical correlates of eardrum rupture. The Annals of Otology, Rhinology, Laryngology 1989, Supplement 140, May 1989.