TYMPANIC MEMBRANE PERFORATIONS SECONDARY TO BLAST TRAUMA- AN EXPERIENCE OF 74 AFFECTED EARS

SHUJAAT ABBAS[1], MUHAMMAD ARSHAD[2], SHAKEEL GHANI[3]

ABSTRACT

OBJECTIVE: To determine the rate of spontaneous healing in different size of perforations and to analyze associated findings in cases of tympanic membrane perforations secondary to blast trauma.

STUDY DESIGN: Retrospective Observational study

PLACE AND DURATION: Department of ENT CMH Peshawar from 1st January 2009 to 31st December 2010.

PATIENTS AND METHODS: Data of all patients diagnosed asblast induced 'tympanic membrane perforation' presenting from 1st January 2009 to 31st December 2010 was retrieved and analyzed. Depending upon size of perforation ie small, medium and large, cases were divided into three groups. All cases were managed conservatively for 3 months. Rate of Spontaneous healing, any surgical intervention and its outcome were analyzed in these three groups.

RESULTS: Fifty three patients with tympanic membrane perforation due to blast injury fulfilled the criteria to be included in this study. 32 (60.38%) patients had unilateral perforation and 21(39.62%) had bilateral perforation thus the total number of ears included in study was 74.Age range was 10 to 55 years with mean age 29.07+-8 years. Spontaneous healing was 94% in small perforations, 70.83 % in medium and 12.9 % in large perforations in three months' time.

CONCLUSION: Further studies are required to find out the optimum time of surgical intervention to achieve best results in medium and large perforations.

KEYWORDS: Blast Trauma, Tympanic Membrane, Traumatic Perforation. Myringoplasty.

INTRODUCTION

Primary injuries to the ear due to blast trauma are caused by high pressure wave followed by a negative phase. Sudden pressure changes affect all gas containing organs of the body, and ear being one of the most exposed and delicate organ is frequently involved. Pressures up to 5 pound per square inch (psi) can rupture the tympanic membrane, and pressures up to 15 psi can cause ruptures in 60% of cases. Perforations are usually due to positive component of the pressure wave[1].

Spontaneous healing in tympanic membrane perforation due to blast trauma has been reported in literature from 50 to 80%, with better results in smaller perforations[2].Traumatic perforations of tympanic membrane have excellent prognosis[3]. The gold standard for management of tympanic membrane perforations due to blast trauma has been to deal the cases conservatively. There are proponents of early intervention but has been limited to only the approximation of torn edges under general anesthesia. Definite management should be delayed up to three months to allow for spontaneous resolution[2,4].

Common otologic manifestations of blast trauma are tinnitus, tympanic membrane perforation and open wound[5]. Most common symptoms encountered include hearing loss, ringing and drainage[6]. Otologicaltrauma is seldom confined to one portion of the ear. Involvement of external ear and inner ear may be there. Involvement of inner ear is characterized by vertigo, tinnitus and sensorineural hearing loss which tend to be permanent over time[7,8].

Objective of this study was to determine the rate of spontaneous healing, effect of size of perforation on healing, and to analyze the associated findings, surgical intervention and its outcome in blast induced tympanic membrane perforations.

1. Department of ENT CMH Peshawar
2. Associate Professor of ENT
Yusra Medical College Rawalpindi
3. Assistant Professor ENT
Mohtarma Benazeer Bhutto Shaheed Medical College,
Mirpur Azad Kashmir

Correspondence to:
Muhammad Arshad
Associate Professor of ENT
Yusra Medical College Rawalpindi
Email: drchohaan@gmail.com

METHODOLOGY

This was a retrospective observational study in which records of the patients, who were diagnosed as perforation of tympanic membrane due to blast or were admitted with other blast injuries and also had associated perforation of tympanic membrane, from 1st January 2009 to 31st December 2010, were retrieved. Patients follow up records were also retrieved. The cases, in which record was not available up to complete spontaneous healing of tympanic membrane perforation or upto two months after tympanoplasty to assess the outcome of surgery, were excluded from study. Patient's records were analyzed thoroughly. Patient's age, sex, associated symptoms, otoscopic findings were noted. Depending upon size of tympanic membrane (TM) perforation at the time of presentation, patients were divided into three groups. Group I having small perforation (< 25% of area of TM), Group II having medium perforation (25-50% of area of TM) and Group III having large perforation (>50% of area of TM). Hearing levels of patients in these three catagories were also noted.

All the patients were managed conservatively for 3 months as per the practice in vogue. They were advised to report in ENT

out-patient department fortnightly in routine for ear examination. Complete otoscopic examination was done on each visit. Surgical intervention was done in cases in which there was no spontaneous healing of tympanic membrane in three months' time. Post operative otoscopic findings were also noted. Outcome of surgery ie closure of perforation or residual perforation were noted. Record of complications was also noted and analyzed.

RESULTS

During this period 60 patients were admitted with tympanic membrane perforation due to blast trauma. In 7 cases complete record of follow up was not available so they were excluded from study.53patients fulfilled the criteria to be included in the study. Among these patients 21(39.62%) had damage to both ear drums whereas 32 (60.38%) had perforation of only one ear, thereby making the total number of tympanic membrane perforations studied as 74. All the patients were male. Age range was 10 to 55 years with mean age 29.07+-8 years. Average time between injury andadmissionwas1.7 days. At the time of otoscopic examination depending upon size of perforation (area of tympanic membrane involved) they were categorized Small (<25% of area), medium (25-50% of area) Large (>50% of area). Number of perforations in different categories is shown in figure - 1.All the patients complained of hearing loss. Associated findings like tinnitus, vertigo, discharge, bleeding foreign bodies in ear etc are revealed in Table-I. Pure tone audiometry wasdone on presentation. Table -II reveals hearing threshold at the time of admission in three categories of tympanic membrane perforations according to size.

All the cases were managed conservatively for three months. Only in 5 cases suction cleaning of the ears was done because of foreign particles in ears. Follow-up was done on monthly bases. At three months timeout of 19 small perforations, 18 (94%) tympanic membranes healed spontaneously and one progressed to chronic suppurative otitis media. Among the 24medium perforations17(70.83%) healed spontaneously by three months time.. Remaining 8 cases in which there was no healing in three months underwent myringoplasty with success in 6 cases. Out of 31 cases of large perforations spontaneous healing was seen in only 4 (12.9%) cases. Twenty five damaged membranes were repaired (remaining 2 individuals not opted for surgical treatment), with successful outcome in 21 cases (86.4%). Individuals with bilateral perforation were operated on both sides with minimum one month interval.

TABLE-I: ASSOCIATED FINDINGS AT THE TIME OF PRESENTATION (n=74)

Findings	No of ears	Percent
Complaint of Hearing loss	74	100.00
Tinnitus	67	90.54
Vertigo	18	24.32
Discharge/bleeding from ear	4	5.40
Clotted blood on tympanic membrane	15	20.27
Debris in ear	5	6.75
Ossiculardemage	7	9.46

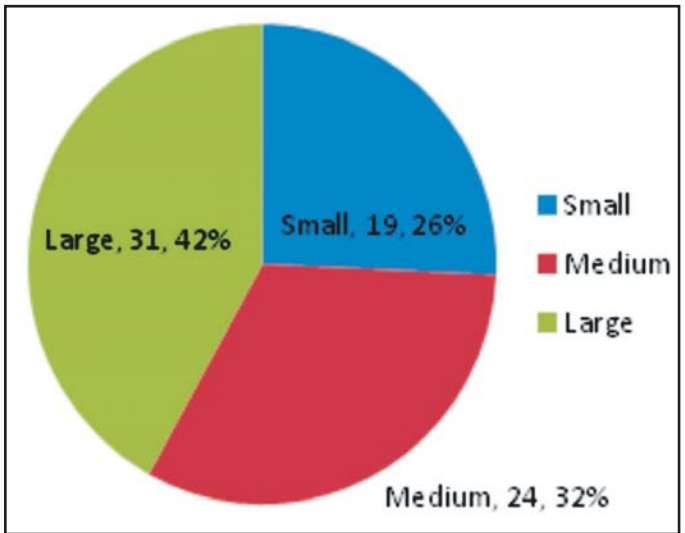

FIGURE - 1: NUMBER OF EARS IN THREE CATEGORIES ACCORDING TO SIZE OF TYMPANIC MEMBRANE PERFORATION

TABLE-II: HEARING THRESHOLD AT THE TIME PRESENTATION IN THREE CATEGORIES OF PERFORATIONS, SMALL. MEDIUM AND LARGE.

Hearing threshold	No of ears in				Percent
	Small	Medium	Large	Total	
< 20	2	0	0	2	2.70
20-40	16	12	0	28	37.84
40-60	1	9	14	24	32.43
60-80	0	2	11	13	17.57
>80	0	1	6	7	9.46

DISCUSSION

Fifty three patients having perforation of tympanic membrane due to blast along with other injuries or as isolated injury were included in study. Out of these21 (39.6%) had bilateral perforation of ear drums thus making the total number of ears studied 74. In another study out of 110 blast-injured patients, 18 (16%) patients suffered tympanic membrane perforation, of which nine (50%) patients suffered bilateral tympanic membrane perforation[6]. Yet another study also reveals 16% of the victims of blast injury having perforation of tympanic membrane and most of them had large perforation[7]. Up to 65% perforations were total or near-total perforations in an other study on blast induced injuries [8]. In our study 41.6% perforations were large involving more than 50% area of tympanic membrane.

Age range was 10 to 55 years with mean age 29.07+-8 years and all the patients were male. This is because most of the sufferers were soldiers. Average time between injury and admission was 1.7 days.

Out of 74 perforated ear drums in 39 (52%) perforations spontaneous healing was seen in three months time. The spontaneous healing of tympanic membrane perforation from explosive injury was upto (74.19%) in a study[9]. In our study in small perforations spontaneous healing was upto 94% while in large perforations it was only 12.9%. So the debate arises that should large perforations which are doomed to stay open be repaired at an early stage so as to protect the individual from long term ear care and problems of chronic suppurative otitis media. Reitenour et al in a study of American blast victims found perforations of larger size to be less common as compared to linear tears with better spontaneous healing in linear tears. The authors have further suggested that early surgical intervention be carried out in large perforations[7].

Helling reported poor outcome after conservative methods in large perforations in Kenyan embassy bombings with[10]. Similar findings have been published by Pahor while studying Birmingham bus bombing[11]. Kornenberg et al have advocated early myringoplasty as a mean of saving the serviceable hearing and preventing cholestaeatoma[12]. Horrocks has even questioned the idea of conservative management, and stated that blast trauma ear like any other trauma should be treated with immediate debridement and tympanoplasty thereby achieving a 90% success rate[1].

CONCLUSION

Further studies are required to find out the optimum time of surgical intervention to achieve best results in medium and large perforations.

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