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TO DETERMINE THE FACTORS AFFECTING HEALING OF TRAUMATIC PERFORATION OF TYMPANIC MEMBRANE

Otolaryngology

Dr.Vigneshwar RK* Junior Resident, Department of ENT, Sri Siddhartha Medical College, Tumkur, Karnataka, India. *Corresponding Author

Dr. Mohan Mogarnad Professor, Department of ENT, Sri Siddhartha Medical College, Tumkur, Karnataka.

Dr. Naveen Senior Resident, Department of ENT, Sri Siddhartha Medical College, Tumkur, Karnataka, India.

Dr. Raffee Arifa Junior Resident, Department of ENT, Sri Siddhartha Medical College, Tumkur, Karnataka, India.

ABSTRACT

Background: The aim of the study was to determine the factors affecting healing of traumatic perforation of tympanic membrane.
Methods: 42 patients were taken in our study who reported within one weeks of a history of trauma to ear with no previous history of middle ear pathology. Data was collected and patients were treated.
Results: 42 patients were studied (19 males and 23 females); age ranging from 18 years to 50 years. Laterality of trauma was found to be more in left ear. Aural Fullness/Ear blockage followed by pain in ear were the most common presenting complaints. Most common etiology was found to be assault and antero-inferior quadrant was found to be most commonly involved.
Conclusions: Traumatic perforations have a very good prognosis if they are treated at the right time. It was common in young adult females, caused often by assaults, presented with aural fulless/blockage and pain, perforations were located in antero-inferior part of TM and most healed well. Factors affecting healing of the perforation were postero-superior location, large size, duration of presentation and mainly not following dry ear precautions.

KEYWORDS

Trauma; Perforation; Tympanic membrane; Healing; Outcome

INTRODUCTION:

Traumatic tympanic membrane perforation is an injury of the eardrum, which is frequently faced by otolaryngologists. The tympanic membrane is a delicate translucent fibrous membrane which separates the external from the middle ear. It produces a rupture, tear or perforation when traumatized. The tympanic membrane injury can predispose to middle ear infection which has morbid consequences including facial nerve paralysis, formation of cholesteatoma, perilymph fistula, and intracranial infections and may require ear and intracranial exploration [1]. A tympanic membrane perforation results in hearing loss by diminishing the impedance mismatch and decreasing the pressure differential induced by sounds, leading to decreased ossicular coupling [2]. Multiple factors, such as perforation size, sound frequency tested, middle ear space dimensions, and mastoid volume, determine the degree of hearing loss associated with tympanic membrane perforation [3].

Treatment of traumatic tympanic membrane perforation range from inactive watchful waiting, or active surgical intervention [4]. Otolaryngologists have however been advised to be reluctant in offering surgical intervention in cases of traumatic perforation as most patients will heal spontaneously within two months [5]. Active interventions include topical application of substances like epidermal growth factor, enoxaparin, and ascorbic acid to stimulate epithelization for quick closure or to prevent formation of sclerotic plaques in the perforated membrane [6-8]. Rupture due to air pressure change occurs mostly in the anteroinferior quadrant of tympanic membrane. Atrophic segments are likely to rupture at pressure change at least 50% lower than a normal tympanic membrane [9]. Fracture bone of skull is an important cause when the fracture line involves the attachment line of tympanic membrane. Lightning strike may cause rupture as rapid heating of intracorporal gas and increased middle ear pressure [10].

The objectives of this study are:

- To evaluate the various factors affecting healing in patients with traumatic perforation of tympanic membrane.
- To assess the characteristics of perforation with respect to healing.
- To correlate the time duration of healing in various etiological factors.

MATERIALS AND METHODS:

With institutional review board approval, this prospective observational study was conducted on 42 patients presenting to the ENT OPD in Sri Siddhartha Medical college from January 2020 to January 2021.The inclusion criteria was the Patients aged between 18 to 50 years of age of both gender presenting with traumatic perforation of tympanic membrane within one weeks of a history of trauma to ear. Patients with history of any ear pathology and previously operated patients in the same ear and patients who were lost to follow up were excluded from the study.

Demographic data, date, mode of trauma, otoscopy, and tuning fork test, followed by Endoscopic examination of the ear were recorded in specially constructed proforma. Patients presenting to us within 1 week of trauma underwent examination under microscope. Patients were treated conservatively with oral antibiotics, decongestants, anti-histamines and anti-inflammatory for 5-7 days to facilitate healing and to avoid upper respiratory tract infections. Patients were advised to avoid water entry into ears and to avoid self-cleaning.

Outcome of injury in terms of healing assessment at minimum of four, eight and twelve weeks post injury were assessed in terms of closure of the Tympanic membrane perforation, development of permanent perforation, and complications like infection. Healing assessment was thus classified as Good in complete closure of perforation without complications and Poor in non-closure of perforation with development of complications.

RESULTS:

In our study, we evaluated 42 patients of which 23(54.7%) are Females and 19(45.2%) are Males. In highest number of patients, perforations were found in the age group of (30-40) years which included 16 patients, followed by age group of (20-30) years which had 12 patients (Figure.1). Duration of injury before presentation ranged between 1st to 7th day maximum, being on 1st day about 24 patients (Table.1). Laterality of trauma was more towards the left ear in 29 patients (69%), while right ear was in about 12 patients (28.5%) and bilateral was seen in 1 patients (2.3%) (Table 2).

In our study group, almost half of the perforations were located in the Antero-inferior quadrant of the TM (54.76%). Among the other symptoms, Aural fullness/Ear blockage was seen in (78.5%) followed by pain (61.9%), tinnitus (52.3%), ear bleed (35.71%), hearing impairment (23.8%). (Table 3)

Table.1 showing day/duration of presentation after trauma

Duration of injury:	Number (n)	Percentage
1st day	24	57.1%
2nd day	09	21.4%
3rd day	05	11.9%
4th-7th day	04	9.5%

Table.2 showing laterality of injury

Laterality of injury	Number (n)	Percentage
Right	12	28.5%
Left	29	69%
Bilateral	01	2.3%

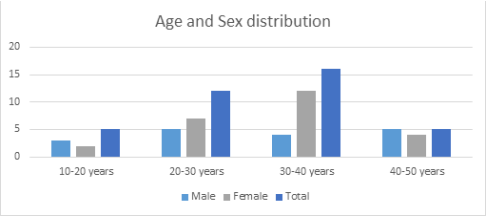

Figure.1 depicts the graphical representation of the frequency of occurrence of traumatic TM perforation in relation to age group and sex of the patients.

Table 3. showing distribution of presenting complaints.

Major complaints:	Number (n)	Percentage
Aural fullness	33	78.5%
Ear pain	26	61.9%
Tinnitus	22	52.3%
Ear bleed	15	35.71%
Hearing Impairment	10	23.8%

Overall, the common causes of the perforations were domestic assault in 21 patients, self-inflicted/ accidental injuries in 13 patients, and road traffic accidents in 8 patients. Whereas self-inflicted and road traffic accident-related injuries were prominent causes among the males, domestic assault and self-inflicted injuries were the prominent causes among the females (Table 4).

Table 4. Mechanism of the injuries in the TM perforations according to sex

Mechanism of injury	Male n =17 (%)	Female n = 25 (%)
Domestic assault	04 (9.5%)	15 (35.7%)
Accidental/Self inflicted	07 (16.6%)	06 (14.2%)
Road traffic accidents	05 (11.9%)	02 (4.7%)
Others	01 (2.3%)	02 (4.7%)

The clinical parameters that could be associated with affecting the healing of Traumatic Perforation of Tympanic Membrane were explored in (Table 5). After following up for four, eight and twelve weeks of the injury, after 12 weeks they were adjudged to be good in 35 patients (83%) healed without complications, while it was observed poor in 07 patients (17%) (Table 6).

It revealed that duration of injury before presentation, size of the perforation and postero-superiorly located perforations have negative impacts on the healing of perforation.

Table 5. Factors associated with healing of traumatic TM perforation

	Treatment outcome after 3rd month		
Age group	**Number (n)**	**Percentage (%)**	**Healed**
10-20	05	11.9%	100%
20-30	12	28.5%	83.3%
30-40	16	38%	75%
40-50	09	21.4%	66.6%
Sex:			
Male	19	45.2%	78.9%
Female	23	54.7%	78.2%
Duration of injury:			
1st day	24	57.1%	91.6%
2nd day	09	21.4%	88.8%
3rd day	05	11.9%	60%
4th-7th day	04	9.5%	25%
Laterality of injury			
Right	12	28.5%	75%
Left	29	69%	72.4%
Bilateral	01	2.3%	40%
Site of Tympanic membrane perforation			
Antero-superior	00	00	00
Antero-inferior	23	54.76%	100%
Postero-inferior	15	35.71%	80%
Postero-superior	04	9.5%	25%

Table 6. showing treatment outcome in our present study group

Total number of patients	Number (n)	Percentage (%)
Healed	35	83
Not healed	07	17
1.Tympanoplasty type-1	04	10
2.Trichloroacetic acid cautery	03	7
3.Residual perforation	01	2

DISCUSSION:

Traumatic TM perforation is a common clinical condition and most of them heal spontaneously within 4 weeks [11] .In our present study of 42 patients, it has been found that age group between 20-40 years is found to be more affected which is comparable to the study done by Sogebi et al which had a mean age of 33.8 years [12]. In our study, Females patients (54.7%) predominated over the male (45.2%) population. Lindeman et al. reported greater prevalence among females similar to study reported by Lou et al. The preponderance of the left ear compared to the right ear found in our study was similar to the study done by Sarojamma et al, who opined that it may be due to the fact that slap from a right-handed person tends to slap the victim over the left ear [13].

In our present study, mechanisms of traumatic tympanic membrane perforations revealed a trend similar to those reported from Sarojamma et al [13]. Assault (45.2%) is the commonest cause of traumatic tympanic membrane perforation in our study like in other previous reports (37.4–86.4%) [14] which was done by kraus at al. While assault and traffic accident were common among the male patients, domestic assaults was prominent among the female patients. Lou et al, reported that slap or a fist by a spouse or lover was responsible for more than half of cases of traumatic tympanic membrane perforation in their study [15].Attempt at removing foreign body, self ear cleaning with variety of objects like cotton bud, pin head, match stick and wax removal in an unskilled manner either by the parents or quacks with tympanic membrane perforation was a common cause found [15].

Most traumatic perforations have a tendency to heal spontaneously. In our study we found 83% (35) cases healed completely at 3 months which is similar to the study done by Afolabi et al whose study showed 91% spontaneous healing. Other 7 patients (17%) had poor outcome. Two main factors that predispose to failure of the perforation to heal are loss of tissue and secondary infection [16]. We observed in our study that the tympanic membrane healed spontaneously with prophylactic antibiotic cover & strict observation of the instruction not to allow water or any other fluid enter into the ear. If the perforation fails to close spontaneously in 3-6 months (in absence of infection), surgical closure is indicated. In our study, 4 (10%) patients underwent Type-1 tympanoplasty, 3 (7%) underwent trichloroacetic acid cautery and 1 (2%) had residual perforation.

The healing outcome may be related to the location of the perforation, in our study perforation was located in the antero-inferior quadrant (54.76%) and in the postero-superior quadrant (9.5%). Postero-superior perforations was associated with poor outcome in this study. Other studies have however reported contrary findings that the rate of spontaneous healing did not vary with location of the TM perforation.[17] One reason for this difference may be the relatively small sample sizes from these studies compared with the larger sample sizes from other reported series.[17].

CONCLUSION:

This study thus concludes that Traumatic TM perforation was common in young adult females, caused often by assaults, presented with aural fullness, ear pain and tinnitus , perforations were located in antero-inferior quadrant of the TM most of which healed well. Traumatic perforations have a very good prognosis rate if they are treated at the

right time by the ENT specialists. Factors affecting healing of the perforation were postero-superior location, large size, duration of presentation. We would like to stress on the fact that ear dry precautions are very important for the healing of perforations and they should be clearly explained to the patients.

REFERENCES:

1. Guenzani S, Mereu D, Messersmith M, Olivari D, Arena M, Spanò A. Inner-ear decompression sickness in nine trimix recreational divers. Diving Hyperb Med. 2016;46:111–6.
2. Voss SE, Rosowski JJ, Merchant SN, Peake WT. Middle-ear function with tympanic-membrane perforations, I: measurements and mechanisms. J Acoust Soc Am. 2001;110 (3, pt 1):1432-1444.
3. Mehta RP, Rosowski JJ, Voss SE, O'Neil E, Merchant SN. Determinants of hearing loss in perforations of the tympanic membrane. Otol Neurotol. 2006;27(2):136-143.
4. Jellinge ME, Kristensen S, Larsen K. Spontaneous closure of traumatic tympanic membrane perforations: observational study. J Laryngol Otol. 2015;129:950–4.
5. Smith M, Darrat I, Seidman M. Otologic complications of cotton swab use: one institution's experience. Laryngoscope. 2012;122:409–11.
6. Bilge A, Gunes A, Dagli M, Koybasioglu FF, Guvey A. The impact of topical and systemic enoxaparin sodium use on traumatic tympanic membrane perforation and myringosclerosis. Eur Arch Otorhinolaryngol. 2016;273(10):3035-41.
7. Güneş A, Mutlu M, Akin İ, Köybaşioğlu F, Güvey A, Karasu MF, et al. The Impact of Systemic and Local Administration of Ascorbic Acid on Traumatic Perforation of Tympanic Membrane and Myringosclerosis. J Int Adv Otol. 2015;11:48–52.
8. Toner JG, Kerr AG. Ear trauma. In: Booth JB, Kerr. Advisory AG, Grooves J, editors. Scott-Brown's Otolaryngology. 6th edition. London: Butterworths Meinemann;1997.
9. Gray RF, Hawthorne M. Synopsis of Otolaryngology. 5th edition. Butterworths Meinemann: London; 19
10. Pusz MD, Robitschek J. Traumatic hearing loss in the context of blast-related tympanic membrane perforation. Mil Med. 2017;182(1): e1645–e1648.
11. Lou ZC, Lou ZH, Zhang QP. Traumatic tympanic membrane perforations: a study of etiology and factors affecting outcome. Am J Otolaryngol. 2012;33:549–55.
12. Sarojamma, Saurabh R, Satish HS. A clinical study of traumatic perforation of tympanic membrane. IOSR J Dental Med Sci. 2014;13(4):24–8.
13. Kraus F, Hagen R. The Traumatic Tympanic Membrane Perforation - Aetiology and Therapy. Laryngorhinootologie. 2015;94:596–600.
14. Lou ZC, Lou ZH, Zhang QP. Traumatic tympanic membrane perforations: a study of etiology and factors affecting outcome. Am J Otolaryngol. 2012;33:549–55.
15. Afolabi OA, Aremu SK, Alabi BS, Segun-Busari S. Traumatic tympanic membrane perforation: an etiological profile. BMC Res Notes. 2009;21(2):232.
16. Orji FT, Agu CC. Determinants of spontaneous healing in traumatic perforations of the tympanic membrane. Clin Otolaryngol. 2008;33:420-6.
17. Ibekwe TS, Adeosun AA, Nwaorgu OG. Quantitative analysis of tympanic membrane perforation: a simple and reliable method. J Laryngol Otol. 2009 Jan;123:e2. doi: 10.1017/S0022215108003800.