

“A Clinical Study of Traumatic Perforation of Tympanic Membrane”

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Abstract:

Objectives: To evaluate the various etiologies of traumatic tympanic membrane perforations and their prognosis and outcome with its various means of management. In this study most of the patients were females with their presenting complaint was hearing loss, on pure tone audiogram shows conductive in nature with 26-35 dB hearing loss. In all these cases the healing rate was 100% in conservative as well as myringoplasty treatment.

Methods: Study design: Prospective study, Study period: November 2011- may 2013, Place of study: Sri Venkateshwara ENT Institute, Victoria Hospital and Bowring and Lady Curzon Hospital attached to BMCRI, Bangalore, Sample size: 50.

Results: In our study, none of the patients got infected in the conservative treatment group. The average time taken for healing by the uninfected cases was 34.78 days. The shortest time taken was 21 days and the longest was 75 days and it can be shown the improvement in hearing as shown by the audiometry report in both the groups, conservative treatment (18.375dB) and Myringoplasty group (19.44 dB).

Conclusion: Overall healing rates in both the conservative group as well as myringoplasty group were 100%. There was no significant difference in the time taken for the tympanic membrane to heal completely in both the conservative (34.78 days) as well as myringoplasty group (33.83 days). In our study, it can be concluded the improvement in hearing as shown by the audiometry report in both the groups, conservative treatment (18.375dB) and Myringoplasty group (19.44 dB).

Key Words: Traumatic perforation of tympanic membrane; Pure Tone Audiometry; Tympanometry.

I. Introduction

The incidence of perforations of the tympanic membrane due to trauma is on the increase consequent to trauma is on the increase consequent to increased violence and accidents seen in present day life¹. It can also result from attempts of self-cleaning of the ear, scratching the ear with sharp objects and due to various iatrogenic causes. Traumatic perforation of the tympanic membrane is a common injury that is under reported, hence there is a need to educate on unskilled removal of foreign body, early identification, evaluation and referral of patients so as to reduce the morbidity.

It is sometime associated with injuries of the ossicular chain and inner ear. It is a source of great concern for otorhinolaryngologist to restore completely the functional integrity of tympanic membrane and associated structures^{2,3}. An unhealed perforation has got a definite impact on the lifestyle of the patient interfering with his occupational and recreational activities.

The risk of failure of spontaneous healing is very real resulting in persistent perforation with its associated problems like infections, hearing loss and late developing cholesteatoma⁴.

Closing a perforation has the following advantages like improvement in hearing, that the patient can tolerate getting water in to the ear like swimming, taking shower etc. and that recurrent ear discharges is unlikely to occur during upper respiratory tract infections^{5,6}.

Traumatic perforation of the tympanic membrane is a common injury that is under-reported; there is the need to educate on unskilled removal of foreign body, early identification, evaluation and referral of patients so as to reduce the morbidity. Although traumatic TM perforations have good prognosis, it is necessary to induce patients with profuse explanations for possible complications to visit the out-patient clinic until the wound has healed completely^{7,8}.

II. Aims And Objectives Of The Study

- 1) To evaluate the various etiologies of traumatic tympanic membrane perforations.
- 2) To evaluate the prognosis and outcome of traumatic tympanic membrane perforations by various means of management.

Methods of collection of data:

A. Study design: Prospective study

B. Study period: November 2011- may 2013

C. Place of study: Sri Venkateshwara ENT Institute, Victoria Hospital and Bowring and Lady Curzon Hospital attached to BMCRI, Bangalore.

D. Sample size: 50

E. Inclusion Criteria:

- 1) Subjects 18-50 years of age and of both the sexes irrespective of socioeconomic status.
- 2) Able to comply with study procedures.
- 3) Informed written consent in English or Kannada.

F. Exclusion Criteria:

- 1) Subjects less than 18 years and above 50 years.
- 2) Subjects underwent any form of ear surgery involving tympanic membrane in the past.
- 3) Subjects having middle ear infections.
- 4) Tympanic membrane perforations caused due blast injuries.

H. Methodology:

After obtaining clearance and approval from the Institutional Ethics Committee, 50 patients fulfilling Inclusion/Exclusion who give Informed Consent (Annexure 1) will be included in the study.

Data is collected from the patients presenting to the ENT department. Following data will be collected from case sheets of patients in a Study Proforma (Annexure 3).

G. Statistical analysis:

Quantitative or qualitative results will be analyzed using Z-score or chi square test wherever applicable.

III. Observation And Results

FIG NUMBER: 1

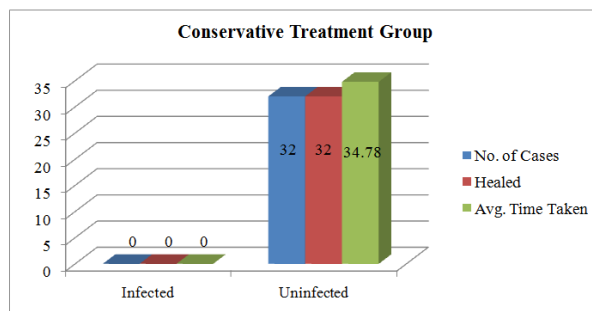


Table number: 1

Conservative Treatment Group

	No. of cases	Healed	Avg. time Taken (days)
Infected	0	0	0
Uninfected	32	32	34.78

In our study, none of the patients got infected in the conservative treatment group. The average time taken for healing by the uninfected cases was 34.78 days. The shortest time taken was 21 days and the longest was 75 days.

Fig Number: 2

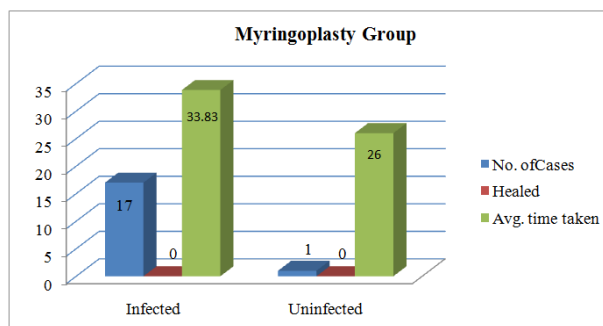


Table number: 2
Myringoplasty Group

	No. of cases	Healed	Avg. time Taken (days)
Infected	17	0	33.83
Uninfected	1	0	26

In our study, out of 18 cases in the myringoplasty group 17 cases (34%) were infected. Only 1(2%) case was uninfected. The average time taken by the uninfected case to heal was 33.83 days. Uninfected ear took an average time of 26 days for complete healing.

FIG NUMBER: 3

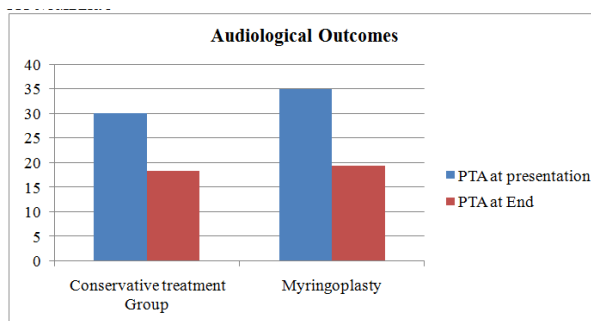


Table number: 3
Audiological Outcomes

	PTA Avg. at presentation (dB)	PTA Avg. at end (dB)
Conservative Treatment Group	30.1563	18.375
Myringoplasty Group	35	19.44

In our study, it can be concluded the improvement in hearing as shown by the audiometry report in both the groups, conservative treatment (18.375dB) and Myringoplasty group (19.44 dB)

IV. Discussion

1. Age

The incidence of traumatic perforation was reported to be higher among the young, active females, Lindeman (1987), Kirstenson (1992), and Berger (1994). In this series, 72% of the patients were in the age group of 18-40 years. Out of this, the maximum incidence (48%) was among 21-30 years age group. The youngest patient was a 19 year old girl who sustained traumatic perforation of the right tympanic membrane as a result of slap injury. The oldest patient was a 50 year old man who had a right tympanic membrane perforation as a result of scratching the ear canal by a match stick. Lindeman et al (1987) reported a mean age of 24.1 years and Berger et al (1994) reported a mean age of 21.7 years in their series.

2. Sex Distribution

In our study the incidence of traumatic perforation of the ear drum was found to be more among females (58%).

This is similar to studies done by Lindeman et al (1987) who reported a greater incidence among females. But Camnitz (1985), reported prevalence among males. The females form the majority in our out patient attendance, the most common reason being domestic violence by their family members. Traumatic perforation of tympanic membrane among females were mainly caused by slap injury.

3. Hearing Loss

In our study, majority of patients (62%), presented with conductive hearing loss in the range of 26-35dB, 22% of patients with ≤ 25 dB and only 8% of patients presented with ≥ 36 dB hearing loss. This study shows that, in majority of the patients, perforation of tympanic membrane results in minimal hearing loss in the range of 26-35dB .

4. Mode Of Injury

In our study, the most common etiology for traumatic perforation of tympanic membrane was injury caused due to slapping (50%). Direct trauma accounted for 28% of cases. Iatrogenic i.e during removal of

foreign body accounted for 6% of cases. Blast injury leading to rupture of tympanic membrane was rare and contributed to 4% of cases.

Camnitz (1985), Lindeman (1987), Berger (1994) have reported percussional injury as a common cause for traumatic rupture of the ear drum.

5. Laterality Distribution

In our study left eardrum was found to be more commonly affected (66%). The right eardrum was affected in 34% cases and there were no cases of bilateral perforations.

The predilection for the left ear may be due to the fact that slap was a major etiological factor in this series and a right handed person tends to slap the victim over the left ear. Lindeman (1987), Berger (1994) reported a similar predilection for the left ear.

6. Size Of Perforation

In our study out of the 50 patients with single perforation, 28 patients had grade I perforations involving only one quadrant of the tympanic membrane .

19 patients had larger grade II perforations involving two quadrants of the eardrum. 3 patients had grade III perforations involving three quadrants of the tympanic membrane. No patients had grade IV perforation. Most of the workers who studied traumatic perforations have reported a prevalence of small sized perforations involving only one quadrant of the tympanic membrane. Friedman (1948), Jordan (1952), Lindeman (1987), Berger (1994).

7. Quadrants Involved

In our study, posteroinferior quadrant of the tympanic membrane was found to be affected most commonly. Out of the 50 cases, 29 (58%) were in the posteroinferior quadrant. In 19 patients, the anteroinferior quadrant was involved (38%) . Thus the lower half of the eardrum was found to be involved in 96% of the cases.

Posteroinferior quadrant seems to be more vulnerable to the trauma since it is more laterally placed and more easily accessible. Direct trauma is more likely to damage the posteroinferior quadrant. During slap the pressure wave travels along the posterior canal wall and strikes the posteroinferior quadrant first thereby creating a perforation there.

8. Large Perforations – Quadrants Involved

In our study in the case of large perforations, posterior half of the eardrum was found to be most commonly affected. Out of 6 grade II perforations, 4 were involving the posterosuperior and posteroinferior quadrants (Table 7). Korkis (1964) reported that the anteroinferior quadrant was the commonest site of traumatic perforation of tympanic membrane. Lindeman (1987), Berger (1994) also agreed with his finding

9. Presenting Complaints

In our study, impaired hearing was the commonest complaint (48%), the next common complaint was tinnitus (18%) followed by bleeding from ear (14%) and earache (12%), (Table 8). Friedman (1948) reported impaired hearing as the commonest symptom in his series. In Berger's (1994) series, hearing loss was the most common presenting complaint (69.5%) followed by tinnitus (45.1%).

10. Margins Of Perforation

In our study, ragged margins of perforations were found in 33 cases (66%), followed by inverted margins in 13 cases (26%) and everted margins in 4 cases (8%).

11. Hearing Loss

In our study, majority of patients (62%), presented with conductive hearing loss in the range of 26-35dB, 22% of patients with ≤ 25 dB and only 8% of patients presented with ≥ 36 dB hearing loss.

Korkis (1946) reported 98.8% incidence of hearing loss of more than 36 dB.

11. Conservative Treatment Group

In our study, none of the patients got infected in the conservative treatment group. All the uninfected cases healed spontaneously. Repeat audiogram was advised every week.

The average time taken for healing by the uninfected cases was 34.78 days. The shortest time taken was 21 days and the longest was 75 days, (Table 12). Korkis (1946) reported 29.4 days and 38 days as the mean time taken for healing in the case of uninfected and infected perforations respectively. The overall healing rate achieved in this group was 75%. Berger (1994) reported 94.8% spontaneous healing.

12. Myringoplasty Group

In our study, out of 18 cases in the myringoplasty group 17 cases (34%) got infected. The average time taken by the only 1(2%) uninfected case to heal was 26 days after the surgery. Infected ears took an average time of 33.83 days for complete healing after the surgery. This is statistically significant ($p < 0.01$) implying that infection delayed the healing process.

Repeat audiogram was done three weeks after pack removal and then repeated every week. All the cases healed completely with an overall rate of closure being 100%.

The average time taken by the uninfected ears in the two groups were statistically not different from each other implying that the treatment modality offered did not influence the rate of healing. Infection was found to delay the healing process in the myringoplasty group to a significant extent. There was no significant difference between the two groups in relation to the overall healing rate. In addition to delaying the healing process, infection was found to reduce the chances of closure of perforation also.

13. Audiological Outcomes

In our study, it can be concluded the improvement in hearing as shown by the audiometry report in both the groups, conservative treatment (18.375dB) and Myringoplasty group (19.44 dB).

14. Total Cases

In our study 17 (34%) of cases got infected and 33 (66%) remained uninfected. None of the infected cases healed in 10 weeks. Average time taken for uninfected cases (66%) to undergo spontaneous healing was 34.78 days. Infected ears who underwent myringoplasty took an average time of 33.83 days for complete healing after the surgery.

V. Conclusion

1. Traumatic perforation was found to be more common among females in the age group of 21-30 years.
2. The most common presenting complaint was hearing loss.
3. Most common cause for the perforation was due to slap injury.
4. Majority of the patients had single grade I perforation.
5. Majority of patients presented with conductive hearing loss in the range of 26-35dB.
6. Majority of the traumatic perforations of the tympanic membrane was noted in the left ear.
7. Posteroinferior quadrant was found to be affected most commonly.
8. Most of the perforations were having ragged margins.
9. Treatment modality employed did not seem to influence the time taken for complete healing.
10. Infected ears took more time for complete healing (33.78 days) compared to the uninfected ears (26 days).
11. In our study all the infected cases which remained unhealed even after 21 days of conservative treatment, underwent myringoplasty using temporalis fascia graft using underlay technique.
12. In our study, the cases presenting with grade II and grade III perforation underwent myringoplasty.
13. Overall healing rates in both the conservative group as well as myringoplasty group were 100%.
14. There was no significant difference in the time taken for the tympanic membrane to heal completely in both the conservative (34.78 days) as well myringoplasty group (33.83 days).
15. In our study, it can be concluded the improvement in hearing as shown by the audiometry report in both the groups, conservative treatment (18.375dB) and Myringoplasty group (19.44 dB).

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