

# Management of Traumatic Perforations of the Tympanic Membrane: A Clinical Study

<sup>1</sup>S Saimanohar, <sup>2</sup>Raveendra P Gadag, <sup>3</sup>Vijayalakshmi Subramaniam

## ABSTRACT

**Objective:** To compare the outcome of conservative management vs surgical intervention (realignment of torn edges) in traumatic perforations of the tympanic membrane (TM).

**Design:** Cohort study, Interventional, Observational, Prospective.

**Setting:** Karnataka Institute of Medical Sciences, Hubli, Karnataka.

**Patients:** All patients attending the Department of Otolaryngology with otological injuries.

**Interventions:** Patients with isolated traumatic tympanic membrane perforations without evidence of temporal bone fractures were managed either conservatively or surgically by realigning the torn edges of perforation under local anesthesia and supporting with gelfoam.

**Main outcome measures:** Healing of perforation, duration taken for complete healing and hearing outcome by pure tone audiometry.

**Results:** Perforations in patients taken up for surgical intervention healed faster. Though the difference in outcome, i.e. healed TM perforation between the 2 groups was not statistically significant, the difference in duration taken for healing was observed to be statistically significant ( $p < 0.05$ ).

**Conclusion:** Minimal surgical intervention involving realignment of torn edges of perforation and supporting with gelfoam enables faster healing.

**Keywords:** Perforations, Trauma, Tympanic membrane.

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**Conflict of interest:** None

## INTRODUCTION

Perforations of the tympanic membrane (TM) following direct or indirect trauma to the ear are commonly

encountered by the otolaryngologist. Most traumatic perforations heal spontaneously. However, realignment of torn edges of perforation by everting the edges and supporting the fragments with gelfoam are reported to hasten the healing process.<sup>1</sup> Fifteen cases of traumatic TM perforations were encountered during a 1 year period at the Department of Otolaryngology, Karnataka Institute of Medical Sciences, Hubli, Karnataka. Their clinical features, management and outcome of management is reported here.

## METHODOLOGY

A prospective, interventional and observational study of patients attending the department of otolaryngology for a 1 year period following otological injuries was undertaken. Patients suffering trauma caused by road traffic accidents, falls, assaults or blasts were included in the study. Those who presented with loss of consciousness, barotrauma, noise induced injury or thermal injuries to the ear were excluded. Patients with serious injuries requiring prolonged multispecialty management and with severe cardiovascular or cerebrovascular diseases were excluded. A total of sixty cases of otological trauma were encountered during the study period. Details of history and clinical examination findings including otological examination were recorded in specially constructed proforma. Patients were also subject to pure tone audiometry. They were either managed medically or surgically. The group which was managed medically was prescribed systemic antibiotics for 1 week and advised to keep the ear dry and not to apply any ear drops. They were followed up weekly. The patients who were managed with surgical intervention underwent examination under microscopy under local anesthesia (Fig. 1). Using sterile aseptic precautions, the external auditory canal was cleaned and small pieces of gelfoam were kept in the middle ear (Fig. 2). The margins of the perforation were everted and a piece of gelfoam with antibiotic ointment was placed over the perforation (Fig. 3). Prophylactic systemic antibiotics were prescribed for 1 week and patients were advised to keep the ear dry and followed up on weekly basis. Failures with dry perforations were taken for chemical cautery of the perforation edges after 4 weeks. The outcomes measured on follow-up were healing of perforation and hearing results by pure tone audiometry (PTA).

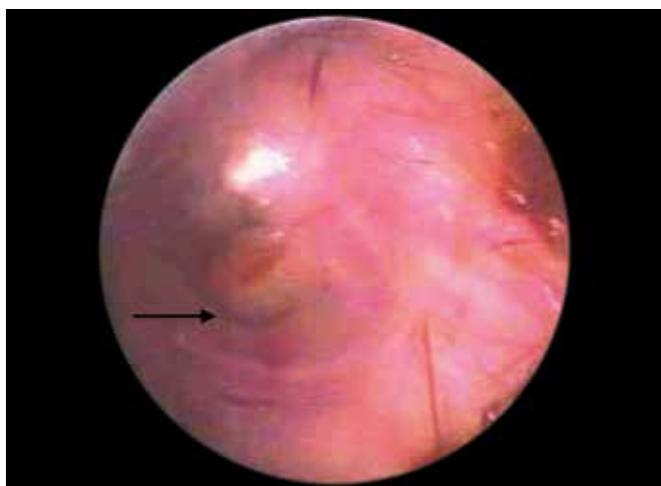
<sup>1,3</sup>Associate Professor, <sup>2</sup>Professor

<sup>1,3</sup>Department of Otorhinolaryngology, Yenepoya Medical College, Mangaluru, Karnataka, India

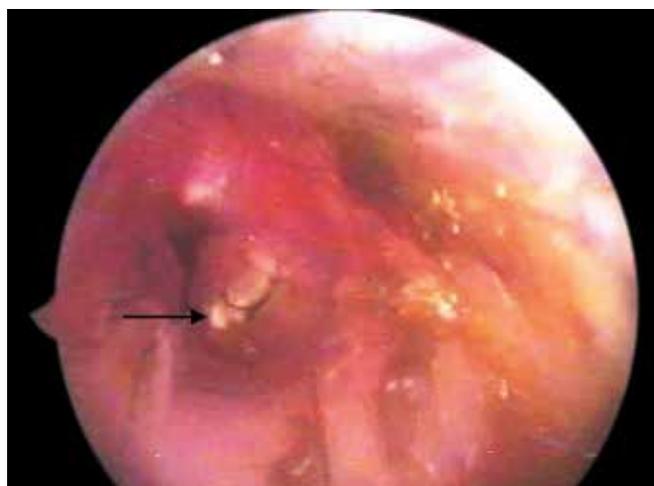
<sup>2</sup>Department of Otorhinolaryngology, Karnataka Institute of Medical Sciences, Hubli, Karnataka, India

**Corresponding Author:** Vijayalakshmi Subramaniam, Associate Professor, Department of Otorhinolaryngology, Yenepoya Medical College, Mangaluru, Karnataka, India, Phone: 08242204668 e-mail: vijisubbu@gmail.com





**Fig. 1:** Examination under microscopy showing traumatic perforation



**Fig. 2:** Gelfoam placed in middle ear

## RESULTS

A total of 60 cases of otological injuries were encountered during the study period of which 14 patients had traumatic TM perforations without temporal bone fracture. Of the 14 patients, one had a bilateral TM perforation. The cause for perforation was assault in 86.67% ( $n = 13$ ) cases and fall in 13.33% ( $n = 2$ ). Left TM was involved in 10 cases while right was involved in 5 cases. Hearing loss and ear pain were the commonest presenting symptoms followed by tinnitus and bleeding from the ear (Table 1).

Of the 15 cases of traumatic TM perforations, 9 were managed medically. Seven perforations healed without any complications. The average number of days taken for complete healing was 19 days with the longest being 28 days, in 1 patient, the perforation persisted for over 4 weeks and the patient was treated with chemical cauterization on weekly basis for 3 sittings following which the perforation healed. Only one patient developed ear discharge and later needed tympanoplasty. Six cases were managed by surgical intervention. All the perforations in this group healed. The average time taken for complete healing was 10.5 days with the longest being 21 days. There was no residual or persistent perforation or ear discharge in this group. An average air bone gap closure of 5 to 10 dB was obtained in all cases as evidenced by PTA done after complete healing in all cases. Although the difference in outcome in the patients considered for medical intervention and those treated surgically was

**Table 1:** Presenting symptoms of patients with traumatic tympanic membrane perforations

Symptoms	Number	Percentage
Hearing loss	12	80
Ear pain	10	66.67
Tinnitus	3	20
Ear bleeding	2	13.33



**Fig. 3:** Gelfoam placed over the perforation

not statistically significant, the difference in duration of healing was statistically significant ( $t = 2.421$ ;  $p < 0.05$ ) (Table 2).

## DISCUSSION

Traumatic perforations of the tympanic membrane are commonly encountered by the otolaryngologist. Direct or indirect trauma to the ear can produce varying types and sizes of perforations ranging from minute tears of the

**Table 2:** Comparison between medical management and surgical intervention

	Medical management group	Surgical intervention group
Total number	9	6
Healed	7 (77.78%)	6 (100%)
Average number of days required to heal	19 $\pm$ 6.66	10.50 $\pm$ 5.86 ( $t = 2.423$ ; $p < 0.05$ )
Required further management	2	0

pars tensa to massive injuries involving the TM, ossicular chain, labyrinthine windows and facial nerve. In this study of 60 cases of otological injuries were encountered. Fifteen cases of traumatic TM perforations without evidence of temporal bone fractures were considered for study.

Assault (hand slap) was the commonest cause of traumatic TM perforation followed by fall.

This was in accordance with previous studies which have reported hand slap as the commonest cause followed by self induced penetrating injuries, sports and swimming activities.<sup>2,3</sup>

The prognosis of traumatic perforations is reported to be excellent with most healing spontaneously.<sup>2-4</sup> Hence, conservative management has been recommended. However, some have recommended realignment of torn edges of perforation under general or local anesthesia and supporting the fragments using gelfoam.<sup>1</sup> This study aimed at comparing conservative management *vs* surgical management, i.e. realignment of torn edges in terms of healing of perforation and hearing outcome. Patients taken up for surgical intervention healed faster the average duration being 10.5 days in contrast to 19 days taken by the conservative management group. Though the difference in outcome, i.e. healed TM perforation between the 2 groups was not statistically significant, the

difference in duration taken for healing was observed to be statistically significant ( $p < 0.05$ ). Bringing together the perforated margins and the scaffolding effect given by the gel foam probably enabled faster healing.

## CONCLUSION

Although most traumatic perforations of the tympanic membrane heal spontaneously without any intervention, minimally invasive procedures like evertting the edges and supporting with gel foam definitely reduces the total period of healing.

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