

Chemical cautery with 50% silver nitrate solution and patching with gel foam in closure of tympanic membrane perforation

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Abstract

Background: Surgical correction of tympanic membrane perforation is myringoplasty. Procedure contains its own complications, anaesthesia risks, psychological trauma, along with long waiting periods for patients, especially in a tertiary care centre. This study aims at analysing the outcomes of chemical cauterization of perforation margins and patching with gel foam, performed as an office procedure in select cases. **Materials and Methods:** It is an Interventional study where the patients presenting to ENT OPD who are diagnosed with tympanic membrane perforation due to inflammatory causes and traumatic causes within the age group 15-75yrs are studied. Thirty-five patients with small TM perforations were taken up for the study. The margin of the perforation was cauterized using silver nitrate 50% that was repeated up to six times. The procedure was considered successful if there was no residual perforation within the follow-up period. Postoperative audiometry was performed before cauterization then at 3 months after. Results - 35 cases were included in this study. Inflammatory pathology was the most common aetiological factor. Number of applications ranged from 1 to 3. The procedure was successful in 31 cases (89%). All traumatic perforation, residual perforation post-surgery cases healed well. All 4 cases with treatment failure had inflammatory aetiology. Conclusion – In patients with small, central, dry perforation of tympanic membrane, chemical cauterization using silver nitrate 50% and patching with gel foam can yield results comparable to that of surgery, while abating the morbidity and psychological trauma of surgery and saving time for both patient and doctor.

Keywords: Cautery, myringoplasty, silver, tympanic membrane

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INTRODUCTION

Tympanic membrane (TM) plays a significant role in the hearing physiology as well as in the pathophysiology of chronic otitis media. TM helps in sound waves transmission to sound conducting system of the middle ear;

thus, any TM perforation can result in conductive deafness. Moreover, TM perforation can significantly impair the patient quality of life. Therefore, repair of TM perforations is required regardless of its size to avoid morbidities such as hearing loss, chronic otorrhea, and cholesteatoma formation.¹ Many graft materials are available like perichondrium,^{2,3} temporalis fascia,⁴ cartilage,^{4,5} fat, and platelet-rich plasma (PRP).³ Surgical correction of perforation is the commonest modality of treatment but it carries its own morbidities. Complications of surgery include damage to chorda tympani nerve, middle ear ossicles, tear of tympanomeatal flap, violation of tissue planes and middle ear, besides the risk of anaesthesia and psychological trauma of surgery. Residual or re-perforations can require multiple surgeries to reconstruct, which, in turn, may limit donor fascia in the operative field and can increase donor site morbidity. Failure rates

increase with history of recurrent infections and revision myringoplasty. Agent used for chemical cautery are silver nitrate or trichloroacetic acid. The first recorded use of silver nitrate for the closure of TM perforations was carried out by Wilde and Hewson in 1848. Derlacki reported a 75% closure rate in 1227 patients by average of >14 office settings.⁷ The principle of chemical cauterization is that after application, it breaks up fibrosis and promotes granulation and new tissue formation at the margin of the perforation.⁸ The aim of this study was to assess the effectiveness of margin cauterization with silver nitrate 50% solution and patching with gel foam closing small TM perforation as an office-based procedure.

METHODS

The study was carried out in a tertiary care centre in North Kerala from January 2018 to January 2019. The cases were selected amongst those attending the outpatient department during the study period, based on history, clinical assessment, examination under microscope, oto-endoscopy and pure tone audiogram. Cases were taken after getting informed consent.

Inclusion criteria

Inclusion criteria were small perforation involving single quadrant of pars tensa or < 25% area of pars tensa; size not exceeding 4 mm in diameter; ear dry for at least 3 weeks; air bone gap <40 dB.

Exclusion criteria

Exclusion criteria were air bone gap >40 dB; marginal perforation; discharging ear; any localized retraction pockets; epithelium ingrowth along margins of perforation; granulations; oedematous middle ear mucosa.

Procedure

Local anesthesia was by keeping a cotton ball soaked in 4% lignocaine in the external auditory canal under endoscopic guidance, preventing lignocaine from entering the middle ear cavity. Under Endoscopic visualisation, the margins of perforation were de-epithelialised with 50% silver nitrate solution using a fine tipped applicator. Care was taken to avoid spillage of the solution inside the middle ear cavity. Gel foam was trimmed to provide approximately 1-2 mm overlapping margins of the perforation. It was placed over the perforation using alligator forceps. Subsequently, a cotton-tipped applicator soaked in steroid-containing ciprofloxacin ear drops was used to wet the gel foam to enable it to get attached to the remaining tympanic membrane. Neither oral antibiotics nor topical drops were prescribed post procedure, with the instructions to avoid nose blowing and avoid water entering into the ear. No packing of external auditory canal was done.

Follow up

The patient was followed up once in two weeks till the perforation was completely healed or till 12 weeks. If the gel foam was not seen in place, the procedure was repeated. If the perforation did not heal in maximum 12 weeks, it was considered as treatment failure and patient was taken for surgical tympanoplasty. Once the perforation healed, a repeat pure tone audiogram was performed after 3 months to compare pre and post procedure hearing status.

Criteria for successful procedure were:

- Closure of perforation
- Closure of air bone gap to <15 dB

RESULTS

35 cases were studied of which 15 were males and 20 were females with age ranging from 15 to 56 years (average 34.6 years). All cases had central tympanic membrane perforations and surrounding pars tensa was well vascularized and non-atrophic. Perforations were classified based on the quadrant of pars tensa involved (Table 1), and the etiology of perforation (Table 2).

Table 1: Distribution of patients based on quadrant of pars tensa involved

Quadrant Involved	Number of Patients
ASQ	4
AIQ	13
PIQ	11
PSQ	7
TOTAL	35

ASQ: Antero-superior quadrant; AIQ: Antero-inferior quadrant; PIQ: Postero-inferior quadrant; PSQ: Postero-superior quadrant.

Table 2: Distribution of patients based on etiology of tympanic membrane perforation

Aetiology	Number of patients
Inflammatory	20
Traumatic	8
Iatrogenic	3
Residual perforation Post - surgery	4
Total	35

Most commonly involved quadrants were antero-inferior and postero-inferior. Commonest etiology of perforation was inflammatory, followed by traumatic perforation. 4 cases with residual perforation after previous surgical myringoplasty and 3 cases with history of myringotomy and grommet insertion in the past with persistent perforation (iatrogenic) were also included in this study. In all cases, the procedure was tolerated well without any complications. Number of applications ranged from 1 to 3. The procedure was successful (i.e. closure of perforation and air-bone gap within 15 dB) in 31 cases (89%). All cases of iatrogenic perforation healed well requiring one to two applications. The 4 cases with failure even after three

applications had inflammatory aetiology, 1 involving antero-inferior and 3 involving postero-superior quadrants. These were taken up for surgical myringoplasty later.

DISCUSSION

In permanent perforations, there is epithelialisation of margin. The success rate of surgical myringoplasty varies amongst authors and techniques exceeding 90% in most studies in primary repaired cases.¹ For some patients the risks, cost and inconvenience of surgery are significant concerns. These patients benefit from simple, inexpensive non-surgical office-based procedures, with the topical application of silver nitrate found to be the best individual procedure.⁷ Here we combine it with gel foam patching to bridge the perforation and promote healing. The use of paper patch in an outpatient setting has been a widely used technique for many decades. Several studies have demonstrated that paper patches can be used to promote the healing of perforated tympanic membranes while avoiding a formal surgical procedure.^{6,8} The use of gel foam in patching after application of silver nitrate (50%) has limited data regarding its efficacy. The size of tympanic membrane perforation has been reported to be the prognostic indicator for successful patch myringoplasty. In study by Golz *et al.* the closure rates were 55.7% in small perforations while that for larger perforations (>5 mm) the closure rate was 12.5%.⁶ They recommended paper patching as the first treatment option for tympanic membrane perforations smaller than 5 mm. Lee *et al.* evaluated only chronic otitis media and followed up the cases through five trials of paper patching, concluding that tympanic membrane perforations of less than 4 mm had significantly higher closure rates.¹⁰ Park *et al.* have also reported that the outcome predictor of paper patch myringoplasty was perforation size.⁹ Other authors too have also found paper patching to be disappointing for larger perforations. Hence in this study only perforations up to 4 mm diameter was included. We did not use any oral antibiotics post procedure based on the study of Kotecha *et al.* concluding that prophylactic antibiotic did not influence the success rate of myringoplasty.¹⁰ The success rate of procedure in our study is 89% which is similar to or better than that reported by various authors.^{9,11-16} However, our general success rate is lower than that reported by Lou *et al.*¹⁷ In their study, almost 98% of 504 cases with traumatic TM perforations were acute onset (within 1 month after a trauma), and a spontaneous healing rate of 89% cases was reported. In our study, all perforations with traumatic etiology healed well, whereas the ones in which the procedure failed had inflammatory etiology. The possibility of performing this as an out-patient procedure has cut down the waiting list and created time and space for other surgical procedures.

CONCLUSIONS

In carefully selected patients with small central perforation of tympanic membrane, chemical cauterization of margins using silver nitrate and gel foam patching can yield results comparable to that of surgery, while abating the morbidity and psychological trauma of surgery. Though multiple visits are required, it is a safer and more money saving procedure. Since it can be performed as an out-patient procedure, it saves the patient from long waiting periods for surgery. Also, with requirement of minimal sophisticated equipments, this can be tried out even by practitioners working at a peripheral set up.

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