



Evaluating The Safety Profile And Closure Rates Of Chemical Cauterization In Small Central Eardrum Perforations

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Abstract

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Introduction

Persistence of Tympanic membrane perforations has been challenging to medical science from long time. Many methods have been used for the closure of tympanic membrane perforations. In developing countries like ours, where tertiary care is not available to everyone, good treatment options should be easily feasible. Cost effective and short procedures like chemical cauterization of tympanic membrane perforations can be good option for restoring tympanic membrane integrity^[1,2].

Cauterization can help in establishing natural pattern of migration of epithelium of perforated tympanic membrane to achieve effective healing. Surgical repair of perforated tympanic membrane using various types of tissue grafts and patching materials have been done but treatment using chemical cauterization of small perforations can prove to be highly effective, safe, less time consuming, and cost-effective treatment option^[1,3,4].

While surgical closure of tympanic membrane perforation still remains the choice of management in many cases but effective closure of tympanic membrane perforation can also be achieved by using chemical cautery and patch technique for small and moderate sized central perforations^[5,6,7]. Although closure of perforations using surgery is extensively tried method, still cost, hospitalization and fear of surgery make closure of small perforations using chemical cautery a favored method^[8,9,10].

The guidelines to be kept in mind when promoting healing of perforation by acid cautery of the rim is as follows: The outer squamous epithelium that has grown inward across the edges must be destroyed repeatedly, to permit fibroblastic proliferation of the fibrous layer. The rim of perforation should be kept moist as drying can kill young fibroblasts and mild irritation of perforation edges to cause hyperaemia that stimulates fibroblastic proliferation^[11,12,13].

So, this study was done in an attempt to evaluate the safety of chemical cautery using trichloroacetic acid on small central dry tympanic membrane perforations.

Aim and objective

To study the safety and efficacy of chemical cauterization in treatment of small central tympanic membrane perforations using Trichloroacetic acid.

Material and method:

This interventional study was conducted on 52 patients attending the OPD of otorhinolaryngology (ENT) and head and neck surgery in SMGS & Government Medical college and Hospital, Jammu for a period of 1 year, presenting with small, central, dry tympanic membrane (TM) perforations, after due approval from institutional ethical committee of the institute.

Inclusion Criteria

1) Patients presenting with Grade 1 (<25% involvement of TM),

- 2) Traumatic Tympanic membrane perforations.
- 3) Any gender
- 4) Age > 18 years
- 5) Ear must be dry (without discharge) for at least 4 weeks.

Exclusion Criteria

- 1) Patients with Non traumatic, wet Tympanic membrane perforations or active ear discharge.
- 2) Large traumatic perforations (Grade 2&3).
- 3) Patients with active external or middle ear disease.
- 4) History of previous ear surgery.

A detailed history followed by thorough clinical examination of ear, nose and throat was carried out and relevant details were recorded. Eustachian tube patency was ascertained by Valsalva's manoeuvre. Patients having pus discharge from diseased ear while examination were subjected to culture and sensitivity testing; appropriate antibiotics were given to the patients to maintain the ear dry for at least 4 weeks.

Otoscopic Examination was done in every case to confirm perforation size, location and the status of the middle ear mucosa. Those with Grade 1 TM perforations (<25% involvement) were included in our study, grade 2 (25-50%) and grade 3 (>50%) were not included. After otoscopy, Pure tone audiometry was performed by same audiologist before and after treatment and the hearing level was recorded to assess the degree of hearing loss.

All the data was tabulated in MS excel. The categorical data including treatment success and failure was calculated using Chi square test and pre and post treatment hearing improvement was calculated using Paired t test with p value <0.05 was considered statistically significant.

Procedure:

A written informed consent was obtained from all the patients before undergoing treatment. It was performed as an OPD procedure. the procedure was performed by same treating surgeon. Lignocaine 4% drops were used to anaesthetize the external auditory canal & tympanic membrane. Cauterization of the tympanic membrane perforation was carried out under microscopic visualization with 10% trichloroacetic acid (TCA). A small cotton bead attached to the

pointed end of Jobson Horne probe moistened with TCA was used to apply TCA at the epithelium lining the perforated margins until a white cauterized margin was created. Once blanching of rim was completed, sterile cotton was placed over the perforation.

Repetition of cautery was done after 2 weeks intervals in cases requiring more treatment till healing was achieved up to a maximum of 3-4 times.

After the procedure, dry ear instructions along with oral antibiotics, oral anti-allergic agents and nasal decongestant drops were given till the next follow up.

Weekly follow ups were done till 8 to 10 weeks. Once the perforation closed, case was considered successful.

The principles of repair of perforation by chemical cautery is as follows: The outer stratified squamous epithelium that has grown inwards across the edges prevents spontaneous closure of the perforation. This epithelium must be destroyed to permit fibroblastic proliferation of the fibrous layer. Hyperaemia stimulates fibroblastic proliferation and should be induced by mild irritation of perforation.

The pre-treatment audiogram was compared with the post-treatment audiogram to know the hearing improvement after 8 to 10 weeks.

Results

A total of 52 patients were included in the study out of which 22 were males and 30 were females (Figure 2). The patients were in the age group of 18 to 56 years with the mean age of 35 ± 3.6 years with maximum patients in the age group of 28 to 45 years (Table 1, Figure1). Out of 52 patients, 28 patients (53.85%) had history of traumatic ear perforation after physical assault, 12 patients (23.07%) had self-inflicted perforation while ear cleaning, 8 patients (15.38%) had iatrogenic traumatic perforation (after Foreign body ear removal) and 4 (7.69%) had developed perforation after ear syringing. Majority of the patients had an Air Bone gap in the range of 15 to 40 dB before treatment and came below 20dB after treatment (Table no. 2).

Out of the 52 patients, perforation was closed successfully in 38 patients with overall success rate of 73.07%. Whereas in 14 patients the perforation did not close completely but the size of the perforation was reduced and there was improvement in hearing. Majority of the patients required 2 to 3 TCA

applications for complete healing of perforation with average duration of around 8 weeks (Table 3 and figure 3). No adverse reaction was noted.

Table 1: Age distribution

Age range	Males	Females
18-27 years	03	06
28-37 years	09	09
38-47 years	08	11
48-57 years	02	04
Total	22	30

Figure 1: Age distribution

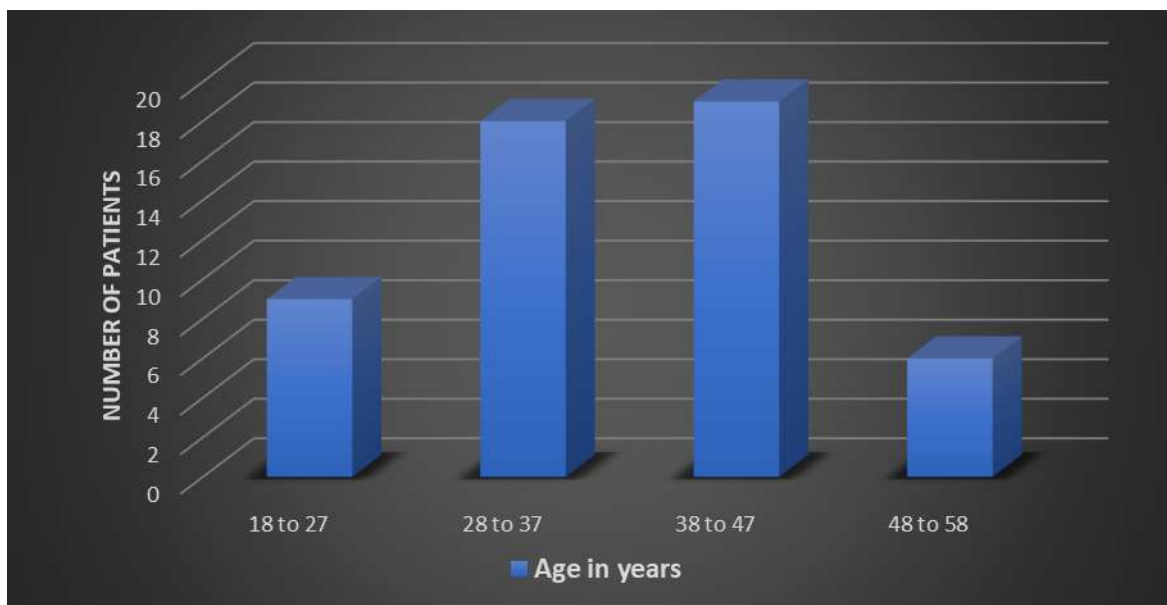
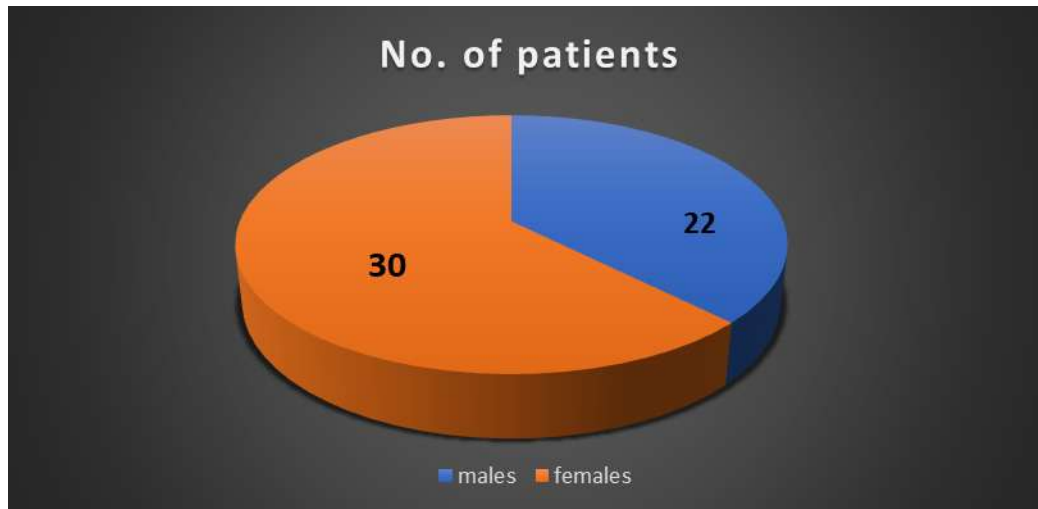
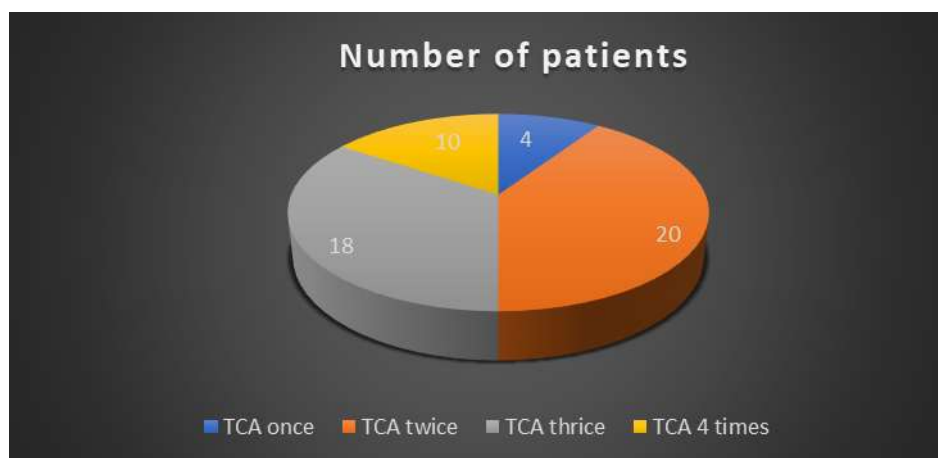


Figure 2: Gender distribution**Table 2: Average Air-Bone gap**

S.No.	AIR BONE GAP (ABG)	Value in dB
1.	Pre-treatment ABG	22.6
2.	Post-treatment ABG	12.4
3.	Hearing Improvement	10.2

Hearing improvement after treatment was statistically significant with p value <0.05.

Majority of the patients required 2 to 3 TCA applications with an average of 2.65 applications. Patients requiring 3 to 4 times application took more time to heal or had incomplete healing.

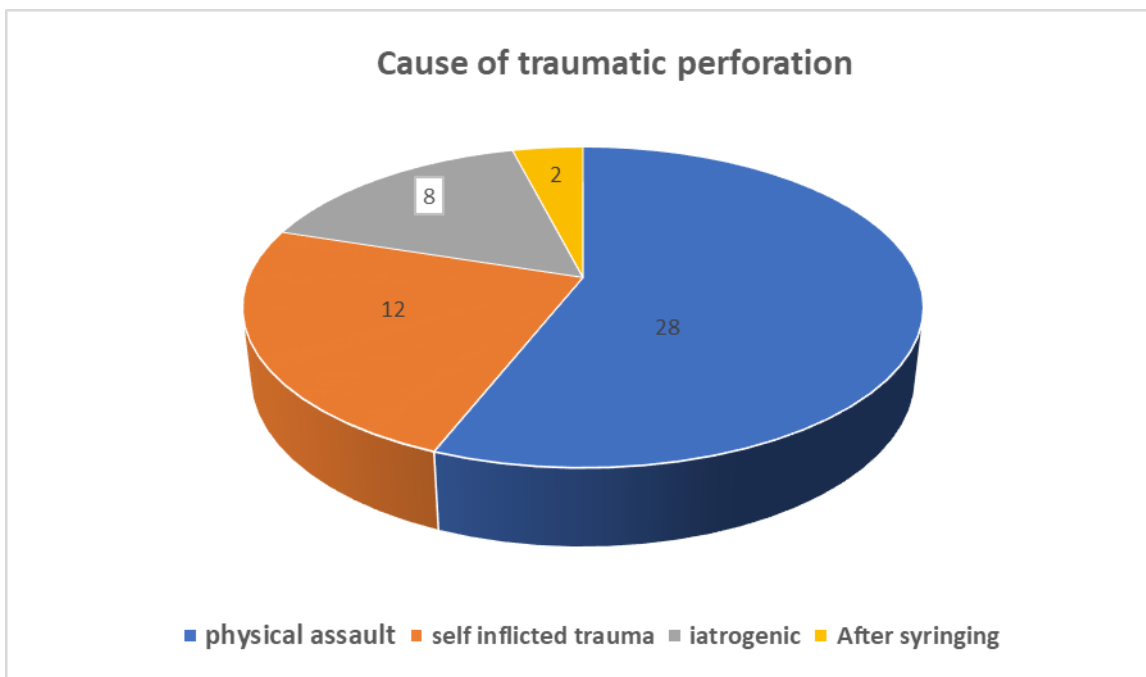
Figure 3: Number of TCA Applications

Most of the patients were treated with maximum 2 times application of TCA(Fig; 3), while few healed after 3rd application. Patients with associated systemic illness like Diabetes, hypertension or deranged lipid profile took

more time to heal with upto 4 applications of TCA. Those not improving even after 4 applications didn't heal and no more TCA application was given.

Out of 52 patients, 28 patients (53.85%) had history of traumatic ear perforation after physical assault, 12 patients (23.07%) had self-inflicted perforation while ear cleaning, 8 patients (15.38%) had iatrogenic traumatic perforation (after Foreign body ear removal) and 4 (7.69%) had developed perforation after ear syringing (Figure 4).

Figure 4: Causes of traumatic TM perforation



Discussion

Tympanic membrane perforation causes a conductive hearing loss that can range from negligible to 50 dB^[11]. It can be very troublesome to the patient if not treated and newer modalities are being tried for better management and improved hearing. This study was conducted on 52 patients presenting with central Tympanic membrane perforation in our ENT OPD meeting the inclusion criteria. Also, average pre-treatment Air bone gap in the study cases was 22.6 dB which improved after chemical cauterization to an average of 10.2 dB. Out of the 52 patients, perforation was closed successfully in 38 patients with overall success rate of 73.07%. The average duration for obtaining complete closure of tympanic membrane perforation in our study was around 8 to 10 weeks with few cases where healing was not complete even after 3 to 4 applications of TCA.

This study compares well with other similar studies conducted in the past. Derlacki et al. performed a study

including 143 cases out of which 14 cases were of traumatic origin and 129 cases of inflammatory origin^[4]. They achieved a success rate of 75.6% using Trichloroacetic acid with average hearing gain of 16.3 dB which is similar to our study.

Another study conducted by Parth *et al*^[1], achieved 75% success rate with chemical cauterization with average of 2.53 TCA applications with average hearing improvement of 9.3dB which is comparable to our study.

In our study, majority of the patients required 2 to 3 TCA applications (38 patients) and we achieved complete closure of perforation in 73.07% cases. Juers^[5] in his study reported an 88% success with an average of 3.7 applications similar to our study.

T.santhi *et al*^[6], reported 73.75% success rate using chemical cauterization for tympanic perforations. K.S. Uppal *et al*^[7] and K. Narendra *et al*^[8], in their study achieved 78% and 83% success rates respectively with an average hearing gain of 9.3 dB in these studies and

the average number of applications was 2.8 and 2.5 in the studies done by K.S. Uppal *et al.* and K. Narendra *et al.* respectively which is similar to our present study. Cautery of perforation margin was carried out with 50% trichloroacetic acid (TCA) by Singh *et al.* [14] and good results with complete healing of small dry perforations was achieved.

The healed tympanic membranes appeared normal in all respect, since the membrane obtained by cauterization method has all the layers of normal tympanic membrane. Chemical cauterization can be considered as a first line in the management of small to moderate size perforations with dry ear before attempting surgical closure.

Limitation

Although chemical cauterization is an OPD procedure but weekly visits and multiple applications of TCA make it cumbersome and inconvenient to certain patients. Moreover, this study included lesser number of patients.

Conclusion

The present study has led to the following conclusions that smaller perforations with dry ear for more than at least 4 weeks had better healing rate with TCA application. Large perforations took more time and may or may not get reduced to smaller size. Those with traumatic perforation had a better healing rate as compared with inflammatory or infective cause. The correction of primary etiological factors resulting in perforation can improve closure rate. Patients were more willing to undergo this treatment than undergoing surgery, moreover it was performed as an OPD procedure making it convenient for patients. Also, surgical complications of middle ear surgery can also be avoided making it a first line treatment option in small tympanic membrane perforation cases.

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