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A Study of Effectiveness of Trichlo-Acetic Acid in Closure of Tympanic Membrane Perforations

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ABSTRACT
Chronic Suppurative Otitis media is the most common pathological condition seen in ENT OPD. There are different methods in closure of tympanic membrane perforations. Traditionally we were using older surgical method for the closure of the tympanic membrane but now recently there are different methods in closure of perforation. One such method is chemical cauterization using trichloro-acetic acid. In this study, 0.33% of trichloro-acetic acid has been taken for cauterization. It works by breaking the outer layer of squamous epithelium that grows inwards in the tympanic membrane. By destroying this layer, fibroblastic proliferation occurs. This leads to closure of tympanic membrane perforations. Audiological outcome of 5-25 decibels improvement in hearing has been seen. In this study we have taken 50 patients of which 18 males and 32 females. All the patients underwent preop and postop audiometry assessment. All the patients who underwent chemical cauterization for the closure of tympanic membrane were subjected to hearing test after 3 months. All the patients had hearing improvement with perforation sealed. This type of procedure are scar less and minimally invasive.

INTRODUCTION

Chronic suppurative otitis media (CSOM) is one of the major public health problems in day to day basis[1,2]. Patients present with ear discharge, hearing loss, aural pain, tinnitus and aural fullness. It is the most common among adults worldwide, starting in early life[1]. However, in the worldwide, frequent upper respiratory tract infections and healthcare compound problems make the disease prevalent among c adults since early life[1,3-6].

A Chronic suppurative otitis media (CSOM) is defined as a chronic inflammation of the middle ear and mastoid cavity with persistant ear infection, ear discharge with hearing loss[4-6] .Adoga[1] has mentioned that the complications associated with chronic otitis media (COM) with hearing loss are nearly always significant. Prevalence of hearing loss in COM ranges from 9-83%[1,4,5].

Closure of tympanic Membrane Perforations usually require surgical repair. From 17th-19th centuries, several techniques were used for closure of tympanic membrane perforations. In 1887, paper patch method has been developed by Blake. In 1876, Rossa used cauterizing agents like silver nitrate, over the edges of the perforation to promote closure of the perforations. In 1895, 0.33% of Trichloroacetic acid was used for the first time by Joynt for the closure of tympanic membrane perforations[5]. In 1952, Wullstein used split-thickness skin graft for closing perforations[7]. Following that, Zöllner described with a similar graft technique[8]. Zöllner and Wullstein introduced microscopic assisted tympanoplasty. Later the other graft materials, using fascia lata were described by Zollner (1956), Heerman used temporalis fascia (1958) and Shea described with vein grafts (1960). Since then other graft materials have been used such as cartilage, periosteum, perichondrium, fat, subcutaneous tissue, amniotic membrane, dermal matrix, fibro-blasts and sclera. Lou Z used gelfoam patch over the perforation with Basic fibroblast growth factor (FGF)[10,11] in closure of traumatic perforations[11].

In this study we are using trichloro-acetic acid for the closure of tympanic membrane which works by breaking up the outer layer of squamous epithelium that has grown inwards across all the five layers of the tympanic membrane. By destroying this layer, fibroblastic proliferation can proceed. Mild irritation also induces fibroblastic proliferation via hyperemia. The fresh edges are kept moist to prevent dessication and inactivation of fibroblasts.

MATERIALS AND METHODS

In this study, we have taken 50 patients who are attending out-patient department of ENT of Swamy Vivekanandha Medical College and hospital. The patients have been selected under the criteria of small to medium sized dry central perforations. A detailed history and examination was carried out. The patient's informed consent has been taken. Pre-op audiological assessment has been done. All the patients underwent thorough cleaning of the external auditory meatus. Local anaesthesia with cotton ball soaked in 4% xylocaine was applied in the external auditory canal over the tympanic membrane.

Using 0 degree endoscope, perforation margins have been visualized. 0.33 percent of trichloro-acetic acid soaked in cotton bead with Jobson's probe is stroked over the edges of the perforation from inward to outward direction. It was carried out over the epithelial lining to retain the epithelial progression over meatal surface with a distance of 0.5-1 mm, producing blanching over the surface.

A small prick has been done in patient's finger tip., using gelfoam blood has been collected and carefully placed over the cauterized area of the perforation using 0 degree endoscope[9]. After cauterization, patient has been given a course of antibiotics, analgesics, steroid nasal spray for a period of one week. Patient is advised to avoid coughing and sneezing with closed mouth for a period of two weeks. After complete closure of tympanic membrane, patient underwent post-operative hearing assessment after three months.

RESULTS AND DISCUSSIONS

In this study we have taken 50 patients, out of which 18 males and 32 females Fig. 1.

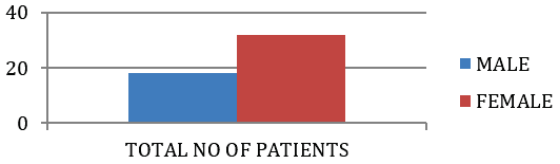

Fig. 1: Total no of patients taken in study according to sex ratio

Here the patients age ranges between 15-50 years are included in this study. Maximum numbers of patients are between 25-40 years age group Fig 2. Etiologies of the perforations mainly due to traumatic and inflammatory conditions are taken in this study. Most of the patients had small perforation involving one quadrant of tympanic membrane only.

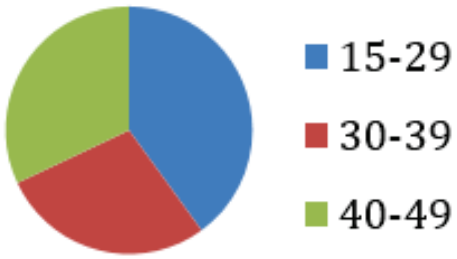

Fig. 2: Age Distribution Taken in the Study Population

All the patients underwent thorough ear, nose and throat examination. Otoscopic examination was done under 0 degree endoscope and the results are recorded. Most common etiological factors are inflammatory and traumatic out of which 28 patients due to traumatic causes and 23 due to inflammatory causes. Pre-op and post-operative air-bone gap has been recorded for all the 50 patients. Pre-operative air-bone gap range between 26-35 decibel with average air-bone gap of 28.5 db. The post-operative air-bone gap range between 18-25 decibel with average of 20.6 decibels Table 1.

Table 1: 3 Comparison of Pre op and Post op Audiology Frequency.

Audiology Frequency	Total no of PRE OP audiology frequency	Total no of POST OP audiology frequency
15db-20db	-	30
21db-30db	40	10
31db-35db	10	-

The average hearing improvement in the chemical cauterisation was 7.9 decibel and their clinical condition improved symptomatically.

Although the surgical methods are used for the closure of the tympanic membrane, yet the fear of operation, expenses has been reduced by using chemical cauterization method. The patient who had small to medium sized perforations with normal Eustachian tube function and cochlear function with no active predisposing foci in nose and throat can be taken for chemical cauterization method. In the present study, TCA has been applied over the margins of the perforation using zero degree endoscope as done by Dunlap and Schuknecht[15]. The principle of cauterization lies in the destruction of the outgrown squamous epithelium by repeatedly irrigating the edges of the tympanic membrane by using trichloro-acetic acid thus enabling the growth of fibro-blastic proliferation[16] Bala *et al.* found the success rate was 96% following use of TCA in small tympanic membrane perforations[17] Mourya *et al.* stated that 94.54% of significant improvement in hearing post-operatively in this method. In this study, by using trichloro-acetic acid with gelfoam act as a hemostatic agent. Numerous advantages of using gel-foam include non-antigenecity, biocompatibility, non-toxicity and simplicity of handling. It provides adequate hemostasis whether it is in dry or wet state which is effective in closure of tympanic membrane perforations. It supports migration of squamous epithelium which can lead to adhesion and fibrosis around the tympanic membrane.

The main advantages of chemical cauterization by TCA are its easy availability, easy storage and easy to use. It can be done under IV sedation using endoscopic method. By doing the surgery in hypotensive anaesthesia it reduces blood loss with good field of surgery. Most importantly the main advantage by using TCA was fast healing with less post operative complication.

CONCLUSION

The recent trend of using Trichloro-acetic acid is the most effective method for the closure of tympanic membrane with small perforations. Trichloro-acetic acid has significant improvement in hearing post-operatively. Closure of perforation by using Trichloro-acetic acid is easy, cost-effective, cosmetically better and fast healing, avoids hospitalization for long period of time.

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