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ENT

CLINICAL STUDY OF ENDOSCOPIC AND MICROSCOPIC TYMPANOPLASTY FOR THE TREATMENT OF CHRONIC OTITIS MEDIA

Dr Reddy Abhilash*

MBBS MS (ENT), Final Year Post Graduate Student in MS ENT Dept of ENT NRI Academy of Sciences NRI Medical College and Hospital and Research Centre Chinakakani 522 503 Mangalagiri Mandal Guntur Dist Andhra Pradesh India *Corresponding Author

Dr Y Satya Prabhakara Rao

MSDLO, Professor and HOD Dept of ENT NRI Academy of Sciences NRI Medical College and Hospital and Research Centre Chinakakani 522 503 Mangalagiri Mandal Guntur Dist

ABSTRACT The clinical research work-study is to evaluate endoscopic and microscopic middle ear surgery for the repair of tympanic membrane perforation in the treatment of chronic otitis media (COM) without cholesteatoma. Microscopic Ear Surgery using a post-auricular approach is the most common tympanoplasty technique before the evolution of endoscopes. Endoscopic Ear Surgery, with the advent of new instruments, became a more powerful surgical method in the treatment of ear disease [2] Endoscopic Ear Surgery, now called transcanal endoscopic ear surgery TEES, provide wide-angle vision with high resolution and magnification of structures of the middle ear. The endoscopic ear surgery helps to direct visualization of hidden areas such as the sinus tympani, the epi tympanum, meso tympanum, and the hypotympanum [3, 4, 5]. The present study evaluates the tympanoplasties to treat chronic otitis media without cholesteatoma. The study compares the surgical outcome of hearing restoration rates. It also helps to study the variant anatomy of the middle ear and pathology of csom at the time of surgery.

Material and Methods: The clinical study of endoscopic and microscopic tympanoplasty for the treatment of csom work done in the Department of Otorhinolaryngology and Head and Neck Surgery, NRI Medical College and Hospital and Research Centre Chinakakani, all patients seeking services came to Dept of ENT with a diagnosis of tubotympanic type of CSOM pathology were selected. The sample size is 30 patients with ears divided into two groups, Group A microscopic and Group B endoscopic surgery.

Conclusion: The study showed no statistically significant differences observed between two groups regarding surgical outcome and hearing. The endoscopic group resulted in the successful healing of 96.2% of ears, whereas the microscopic group leads successful healing in 92% of cases. The average hearing gain was 10.2 ± 6.5 dB in group A and 12.4 ± 7.5 dB in group B. The endoscopic transcanal approach introduced a new perspective to ear surgery in the management of csom.

KEYWORDS : Endoscopic Tympanoplasty, Microscopic Tympanoplasty, CSOM, Endoscopic Ear Surgery, Myringoplasty, Sinus Tympani.

INTRODUCTION

The clinical study evaluates the endoscopic and microscopic middle ear, the tympano-plasty surgery for the treatment of chronic otitis media without cholesteatoma. Myringoplasty, also called type 1 tympanoplasty, is commonly performed in operation to repair a perforated tympanic membrane. And to recover the hearing loss in cases of chronic otitis media (COM) without cholesteatoma [1]. Conventional microscopic ear surgery (MES) using the post-auricular approach remains the most common tympanoplasty technique, requires a large surgical incision, results in a visible scar, and increased discomfort after surgery. Although Endoscopic Ear Surgery (EES) introduced in 1960, it did not attract much attention, but with the advent of endoscopes and other instruments, endoscopic ear surgery superior technique in the management of ear disease [2]. The Transcanal Endoscopic Ear Surgery (TEES) provides wide-angle vision at a high resolution and enabling magnification of the structures of the middle ear (figure6). The examination of hidden areas, such as the hypotympanum, sinus tympani, epitympanum, and the mesotympanum [3, 4, 5]. The present study evaluates the tympanoplasty to treat COM without cholesteatoma. And compare the middle ear anatomy and pathology surgical outcome, hearing restoration rates.

MATERIALS AND METHODS

The study conducted in 30 selected patients with perforation of TM ears treated surgically by endoscopic or microscopic tympanoplasty. Cases are chosen for the treatment of COM, in the absence of cholesteatoma, in our hospital at the Department of Otorhinolaryngology-Head and Neck Surgery, NRI Medical College and Hospital, Chinakakani during the period from 2017 to 2019. Comparisons between the two groups, Group A microscopic and Group B endoscopic technique, focused on the following: (I) surgical outcome and restoration of hearing (II) successful healing of tympanic membrane perforation and postoperative complications; and (III) the duration of surgery and type of anesthesia. All patients followed for four months after surgery. Endoscopic ear surgery adopted as the primary procedure, and Microscopic ear surgery used as a technique for patients who are not suitable for TEES. The data collected and analyzed.

Exclusion Criteria

the following patients excluded patients with the pre-operative or intra-operative diagnosis of cholesteatoma. And patients with cholesterol granuloma, tympanic membrane retraction pocket. Previous atticotomy or mastoidectomy, facial nerve paralysis, and history of prior ear surgery excluded.

Audiological Assessment:

All the patients investigated and evaluated for hearing status by pure tone audiometry (PTA). And the results analyzed pre and postoperatively. In each patient, the mean hearing threshold and air-bone gap (ABG) measured by averaging hearing thresholds at 0.5, 1, 2kHz, and 4 kHz.

Anaesthesia:

most of the tympanoplasty surgeries performed under local anaesthesia except in non-cooperative and anxious patients. A 26 gauge 1.5-inch needle is used to inject a mixture of 2% xylocaine with adrenaline. The following points infiltrated anasthatic solution: Post auricular area, Incisura terminals, tragus, and in the ear canal wall at the bony-cartilaginous junction at four locations - 3'clock, 6'clock, 9'clock, 12'clock positions of EAC.

Equipment:

Endoscopes of 0°, 30°, and 45° rigid endoscopes with diameters of 2.7 mm 3mm and 4 mm and length of 16–18 cm. Video Equipment: High-resolution camera and video monitor, light source, fiberoptic cable. Instruments: Surgical instruments used are the same as conventional otological surgery. The monitor placed in front of the surgeon and a microscope can be made available to enable a switch to microscopic surgery if necessary.

Surgical Technique;

The endoscopic ear surgery indicated in csom with wide external auditory canal except in severe cases of bleeding. All the conventional microscopic tympanoplasties performed via the post-auricular

approach to obtain a broader surgical view.

Steps of operation; Transcanal endoscopic ear surgery involves the following steps,

The temporalis fascia graft collected through a small incision above the postauricular area. (figure1) With sickle knife freshen the edges of the perforation and elevate tympanomeatal flap (figure2).

Elimination of the inflamed, infected tissue, and graft tissue is placed on the under the surface of the tympanomeatal flap to reconstruct the perforated tympanic membrane.

Figure 1 Temporal Fascia Graft- A Small Incision

Figure 2 Freshening Edges of the Perforation

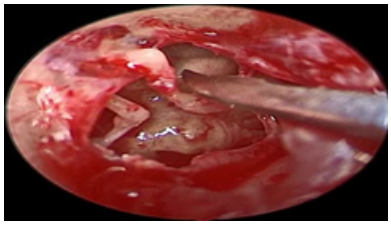

Figure 3 Testing Ossicular Mobility

Figure 4 Medium Size Perforation

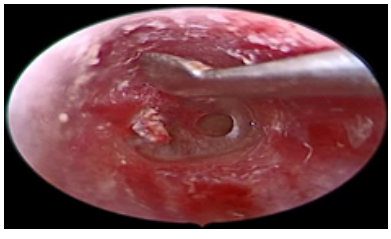

Figure 5 Small Perforation

The defects in the ossicular chain assessed intra operatively, repaired by ossiculoplasty using total or partial ossicular replacement prosthesis TORP or PORP with cartilage. (figure 3)

Postoperative follow-up

All patients asked to return for follow-up 1, 2, 4, and 8 weeks after surgery, ear canal packing removed within two weeks, patients were followed-up for every two weeks until the end of recovery. The integrity of the tympanic membrane and hearing assessed by a pure tone audiogram

MATERIAL AND METHODS

The clinical study of endoscopic and microscopic tympanoplasty for the treatment of csom conducted in selected patients in the Department of Otorhinolaryngology & Head and Neck surgery, NRI Medical College and Hospital, Chinakakani. And it is done during the period from 2017 to 2019. This study was undertaken to compare the advantage and disadvantages of endoscopic and microscopic tympanoplasty surgery. A total of 30 patients with hearing loss selected for the study, with dry central perforation of the tympanic membrane and divided into two groups. Group A patients underwent tympanoplasty by microscopy, and Group B patients underwent endoscopic tympanoplasty.

RESULTS

In our study, males, and females are in equal ratio 1:1. Hearing loss is the most common symptom (100%). All patients with discharge treated by giving medications, only dry ears taken into consideration. All csom patients had TM perforations (100%). Medium-sized perforations (figure 4) were present in 36.67% of patients, 30% had large size perforations, and 33.33% had small perforations (figure 5). Normal middle ear mucosa present in 76.66% of patients remaining 23.33% had inflamed abnormal middle ear mucosa. The average pre-operative conductive hearing loss in Group A was 32.33dB, and in Group B is 30.6dB. Mastoid X-ray revealed that the majority of our patients (76.67%) had sclerotic mastoid. In Group A, patients operated by post aural incisions and Group B patients operated by a 1.5 cm small supra-aural linear skin incision for temporal fascia graft and by transcanal endoscopic ear surgery. The average operation time taken for Surgery in Group A was 90 mins, and Group B is 45 mins.

Table 1 Age distribution

Age Group	Group A	Group B	Total
21-30	6	8	14(46.66%)
31-40	6	4	10(33.33%)
41-50	2	2	4(13.33%)
51-60	1	1	2(6.66%)
Total	15	15	30(100%)

In our study, age range from 20 to 60 years Incidence is more in the age group of 2nd and 3rd decade. In the present study, 50% of our patients were male, and 50% of our patients were female

Table 2 Size of perforation

Size	Group A	Group B	Total
Medium	6	5	11(36.67)%
Large	5	4	9(30)%
Small	4	6	10(33.33)%
Total	15	15	30(100)%

All patients had TM perforations due to CSOM (100%). Medium-sized perforations were present in 36.67% of patients, 30% had large size perforations, and 33.33% had small perforations (figure5)

Table 3 Laterality

Laterality	Group A	Group B	Total
Right	6	7	13(43.33%)
Left	5	6	11(36.67%)
Bilateral	4	2	6 (20%)
Total	15	15	30(100%)

In our study, 13 patients (43.33%) had right ear disease, 11 patients (36.67%) had left ear disease, and six patients (20%) had bilateral disease.

Table 4 Pre-Operative audiometry

Average CHL	Group A	Group B	Total
21-30db	6	8	14(46.67%)
31-40db	7	6	13(43.33%)
41-50db	2	1	3(10%)
Total	15	15	30(100%)

In our study, the average conductive hearing loss in group A was 32.33 (range 25-40dB), and in the group, B was 30.6 dB (range 25-40dB).

Table 5 Post Operative Audiometry

A-B Gap	Group A	Group B	Total
0-10db	4	6	10(33.4%)
11-20db	9	7	16(53.33%)
21-30db	2	2	4(13.33%)
Total	15	15	30(100%)

In the present study 10 patients(33.4%) had closure of A-B gap to less than 10dB,16 patients(53.33%) had closure between 11-20 dB and 4 patients (13.33%) had closure between 21-30dB.

No statistically significant differences observed between the two groups regarding the surgical outcome.

Table 6 Complications

Complications	Group A	Group B	Total
Skin Infections	2	2	4(13.33%)
Graft Infection	2	1	3(10%)
Perichondritis	1	0	1(3.33%)
Canal Stenosis	1	0	1(3.33%)

In the present study, four patients (13.33%) had skin infections, three patients (10%) had graft infections, one patient (3.33%) had perichondritis, and one patient (3.33%) had canal stenosis.

Endoscopic ear surgery resulted in the successful healing of 96.2% of eardrums, where microscopic ear surgery led to successful healing in 92% of cases. The average hearing gain in Group A, the Microscopic Surgery 12.4 ± 7.5 dB, and Group B, the Endoscopic Surgery, is 10.3 ± 6.4 dB. No statistically significant difference present between the two groups with respect average pre- and postoperative air-bone gap, average hearing gain, or percentage of patients with an improved hearing with graft take up (figure9)

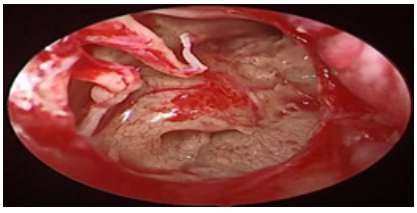

Figure 6 Ossicular Chain, Sinus Tympani

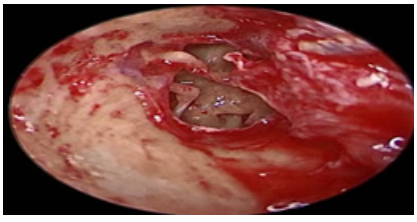

Figure 7 Promontory, Round Window

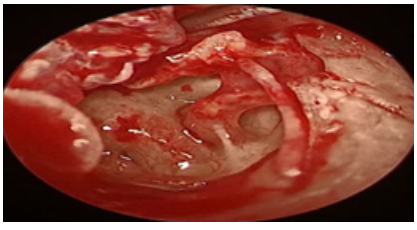

Figure 8 Chord Tympani

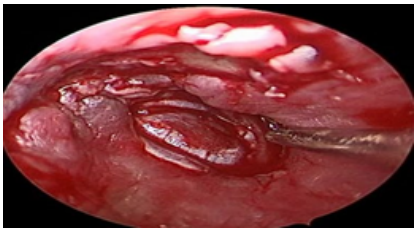

Figure 9 Graft Inlay Technique

DISCUSSION:

The main aim of a tympanoplasty surgery for CSOM is to eradicate the infection, repair of the perforated tympanic membrane, and improvement of the hearing [9]. For decades, MES was the primary modality of treatment for middle ear disease. It enables two-handed manipulation, binocular vision with an excellent stereoscopic surgical view. The vision of a microscope is limited for the transcanal approach to visualize anterior tympanic rim, and the surgeon forced to use the post-auricular method and necessitates a canaloplasty [5]. TEES provides an excellent surgical view, a smaller surgical incision for graft Kozin et al. reported [2]. Transcanal endoscopic ear surgery enables surgeons to prevents unnecessary mastoidectomy. Endoscopic surgery avoids the widening of the external auditory canal (canaloplasty). And injury to soft-tissue during ear surgery in the treatment of COM without cholesteatoma [5, 6, 7, 10, 11]. TEES has some disadvantages, such as one-handed manipulation, reduced endoscopic vision, in cases of severe bleeding. It causes the potential thermal injury to the middle or inner ear by the endoscopic light source [12, 13].

Advantages

Endoscopes provide a wider and angled view of the delicate structures in the middle ear (Kojima et al., 2014). Do not require large surgical incisions postauricular, endaural incisions. Do not require canaloplasty of the external ear canal. Operation time is shorter. Provide less postoperative pain and sooner recovery. Provide better cosmetic outcomes (Badr-El-Dine et al., 2013; Pothier, 2013). The monitor used during endoscopic surgery provides visual content for training purposes (Kojima et al., 2014). Hidden deep regions, such as the anterior tympanic perforation, facial recess, sinus tympani, and hypotympanum, can be directly visualized (figure 6, 7, 8). Contrary to microscopy views can be obtained from more than one angle, High-resolution and relatively clear images can obtain.

Disadvantages: Surgical manipulations must be performed using a single hand (Kojima et al., 2014). Mist may frequently accumulate over the endoscope and require a frequent dip in savlon. Another disadvantage of the endoscope is that even a small amount of blood can obscure the view of the operating field by soiling the scope. Good haemostasis of the external ear canal required. Potential harm to surrounding structures caused by heat produced from the endoscope's light source is also a matter of concern (Badr-El-Dine et al., 2013; Furukawa et al., 2014). Require training for beginners and use of an endoscope and not for experts. It is challenging to operate directly off the endoscope. Neck strain and backache are common and at all the time, require using the monitor. For this, the camera has to fix to scope, and it increases the weight of the endoscope, thereby common to produce left arm fatigue. This disadvantage solved by developing a stand for the endoscope. Savlon used as a defogging agent in endoscopic ear surgeries. The safety of savlon in the middle ear has not yet established. More studies should be invited to evaluate the absorption of savlon through the round window niche and its subsequent effect.

CONCLUSION:

The endoscopic transcanal surgical approach has introduced a new perspective to ear surgery. When compared, endoscopy provides larger and better images of the middle ear. And smaller incisions for taking the graft are preferred over conventional large postauricular incisions. The endoscopy method improves both cosmetic outcomes and reduced postoperative morbidity. It resulted in the successful healing of 96.2% of eardrums. It has the advantage of shorter surgical anesthesia time in comparison to the microscopic method. Need further prospective study and should be conducted in the future to reinforce the conclusion

Abbreviations ABG: Air-Bone gap **CSOM:** Chronic Suppurative Otitis Media **PTA:** Pure Tone Audiometry **TEES:** Transcanal Endoscopic Ear Surgery **MES:** Microscopic Ear Surgery **TORP:** Total Ossicular Replacement Prosthesis **PORP:** Partial Ossicular Replacement Prosthesis

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