

Evaluating the results in Endoscopic technology of tympanoplasty v/s tympanoplasty using microscope

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Abstract

Results of endoscopic and conventional microscopic tympanoplasty were compared. Evaluation and comparison of graft uptake was done in both methods. Tympanoplasty was performed on 50 patients, 25 patients by endoscope (group A) and 25 patients by conventional microscope (group B). Post operation of surgery the results were compared at the end of three months and six months. The success rate of graft uptake was 88% with endoscopic tympanoplasty and 84% with microscopic tympanoplasty. Tympanoplasty was conventionally performed using a microscope for decades. Literature shows that we get improved results in selected cases by using endoscope in tympanoplasty. More over the cost of endoscope is much less than that microscope. However, the endoscope cannot be employed in every case as one hand is blocked.

Keywords: Tympanoplasty, Endoscope, Microscope.

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Introduction

Chronic suppurative otitis media is a disease with worldwide prevalence having potentially serious long-term effects. It is a disease well known for its recurrence and persistent despite treatment. Chronic suppurative otitis media is a disease of mucoperiosteal lining of the middle ear cleft. The history of the middle ear cleft infection can be traced back to as early as 460 BC, when Hippocrates noted that acute pain in the ear with continued strong fever is to be dreaded, for the patient may become delirious and die. This disease remains an important global public health problem leading to hearing impairment, which may have serious effects on language, auditory and cognitive development[1].

Tympanic membrane is a unique structure vital to sound transmission, a key in impedance matching for sound travelling from air to fluid and true closing membrane which remains in fully developed in human foetus[2].

In chronic otitis media, perforated tympanic membrane does not heal automatically which causes anatomical and functional defect that needs surgical correction in most of the cases. Chronic suppurative otitis media should be diagnosed in the presence of a chronic membrane perforation, even if there are no active signs of mucosal inflammation[3].

Although 88% of traumatic perforations of any size heal without intervention. Myringoplasty under local anesthesia is a short, simple, cost-effective and minimally invasive technique compared with traditional myringoplasty[4].

Rebuilding the tympanic membrane allows the patient to have a normal social life without restrictions including water entry into the ear and repair the hearing loss as a result of perforation[5].

Tympanoplasty is a surgical technique to repair a defect in tympanic membrane of ear drum with the placement of graft, either medial or lateral to the tympanic membrane annulus.

The first known attempt to repair the tympanic membrane perforation is attributed to *Benzer (1640)* who used Pig's bladder membrane as prosthesis to close the perforation. *Blake* in 1867 introduced the paper patch technique for closure of tympanic membrane perforation [6,7]. *Berthold* first performed the myringoplasty operation with thick skin graft introducing the concept of surgical repair of tympanic membrane and coined the term[8]. Myringoplasty is performed to seal the perforation of pars tensa of the tympanic membrane. When myringoplasty combined with removal of scar tissue, it is called tympanoplasty. Anterior marginal tympanic membrane perforations are frequently repaired using a postauricular approach to maximize exposure. The visualization of far anterior perforations may be especially difficult, and the anterior margin may be completely hidden from direct view behind a prominent anterior canal bony overhang. Anterior perforations may be managed through a transcanal approach, using the endoscope to visualize the anterior margin [9,10]. Keeping all this in view the study was undertaken to compare the methods of tympanoplasty i.e., using fiberoptic rigid endoscope or other conventional methods. The study aimed to evaluate the graft uptake and postoperative hearing as well.

Methods

The study was carried out on 50 patients admitted for tympanoplasty as per selection criteria. The selection criteria were COSM with central perforation, dry ear is necessary for at least 3 weeks. Mild to moderate conductive hearing loss. Age should be in between 12 to 50 years. Nose and throat should be in no disease condition which could affect the result of study. Presence of the good Eustachian tube is must.

Procedure

Selected patients had signed a written consent. Patients submitted their detailed clinical history as per performa. To assess the hearing loss tuning fork test and PTA (Pure Tone Audiometry) were done. To assess the condition of mastoids X-ray of both mastoids lateral oblique view was done. Complete haemogram including Hemoglobin, Bleeding time, clotting time, TLC, DLC and urine complete examination for each patient was done. To assess the patency of Eustachian tube function tests were done which includes Valsalva maneuver and Miller Botnique. Local anaesthesia was

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administered during surgery. 2% xylocaine with 1:100000 adrenaline was used. Patients were divided in two different groups. Group A consists of 25 patients who underwent endoscope assisted tympanoplasty. Group B consists 25 patients who underwent conventional tympanoplasty. The tympanoplasty was performed by inlay or outlay technique and it was performed through postaural or permeal approach. Temporalis fascia or tragal perichondrium graft was used.

Harvesting Temporalis fascia: After shaving and draping the surgical area, temporalis fascia graft was harvested under local anesthesia by giving supra-auricular horizontal incision.

Harvesting tragal perichondrium: After anesthetizing the tragal area, a skin incision was made on the tip of tragus and a cleavage was made between skin and perichondrium.

Microsurgical procedure: Before 24 hours of surgery the hair was shaved in the surgical field and betadine solution was applied. Sterile drapes are placed and 2% xylocaine with adrenaline was injected into the postauricular area at a dose of 4 mg/kg. A postauricular incision was made on the skin, along the natural fold of the ear. Then a bone deep incision was given through the soft tissue upto the mastoid part of temporal bone. The periosteum was cut and elevated anteriorly towards the posterior rim of the external auditory canal. The spine of Henle was identified and the osteomeatal flap was raised anteriorly. A horizontal oblique cut was given in this flap at the junction of the bone and cartilage. The self-retaining Morrison’s mastoid retractor was applied and the external auditory canal and tympanic membrane exposed and visualized. The tympanomeatal flap was elevated further and the cartilaginous ring was removed from the bony annulus. The middle ear cavity was inspected after incising the mucosa along the medial wall of the middle ear cavity. Finally, tympanoplasty was performed depending upon the middle ear condition. Graft was placed by underlay technique and the tympanomeatal flap was reposed back. Gelfoam was placed over the

graft. Closure was by planes and mersilk 3-0 was used for the skin using separate stitches. The surgical procedure was performed with surgical microscope with 10X magnifications.

Endoscopic procedure: Rigid otoendoscope (0 degree/30 degree) was used to do tympanoplasty in patients forming group A. Preferably a transcanal approach was used in group A patients. The EAC was cleaned of any debris. The tympanic membrane perforation was visualized using the endoscope. The portion of the middle ear cavity visible through the perforation was examined. Margins of perforation are made raw. Semicircular incision from 2 o’clock to 8 o’clock positioned 3-4mm lateral to the annulus was made. Tympanomeatal flap was elevated and retracted anteriorly. The middle ear cavity was examined endoscopically and reconstruction was done accordingly. Graft was placed by underlay technique. Tympanomeatal flap was reposed back. Gelfoam placed over the graft. Ear pack was put in EAC. Patients were Broad spectrum antibiotics, Analgesics and Antihistaminics post operatively. Any postoperative complication was noted. Stitches were removed after 7 days and EAC pack was removed after 10-14 days. Patients were observed for graft uptake and any complications after 4wks and 12wks of operation. PTA was repeated 3 months after surgery to assess the hearing and was compared with that of preoperative audiogram.

Results

The present study was carried out in 50 patients upto the age of 50 years. They were divided into 2 groups comprising of 25 patients each in which different methods of tympanoplasty were used, endoscopic and conventional methods respectively. Tympanoplasty was performed under general anesthesia/ local anesthesia by underlay technique using permeal or postaural approach using endoscope or microscope. Patients were followed upto three months after surgery and the following observations were made.

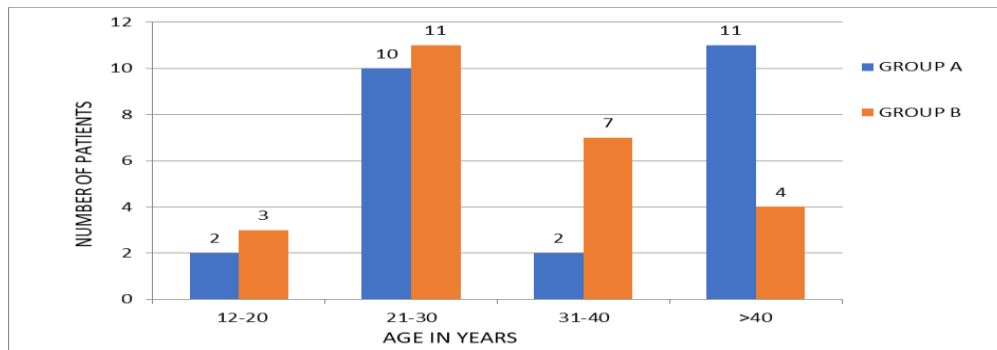


Fig 1: Age incidence

Figure-1 show age incidence of patients in series covered from 12 to 50 years. Between 12-20 years, group A had 2(8%) and group B had 3(12%). In 21-30 years, group A had 10(40%) and group B had 11(44%). In 31-40-year, group A had 2(8%) and group B had 7(28%). In age group above 40 years there were 15 patients i.e., 44%

in group A and 16% in group B. The minimum age was 15 years and maximum age was 50 years. The mean age in years was (31.65±10.94). So maximum number of patients 21(42%) were in the age group of 21-30 years.

Table 1: Sex incidence

		Group		Total	
		A	B		
Sex	M	No	8	9	17
		%	32.00%	36.00%	34%
	F	No	17	16	33
		%	68.00%	64.00%	66%
Total		No	25	25	50
		%	100.00%	100.00%	100.00%

Table 1 shows sex distribution in the two groups. It shows in group A 17(68%) and in group B 16(64%) patients were females which

suggest that female patients outnumber the male patients. The male female ratio was 1:2.

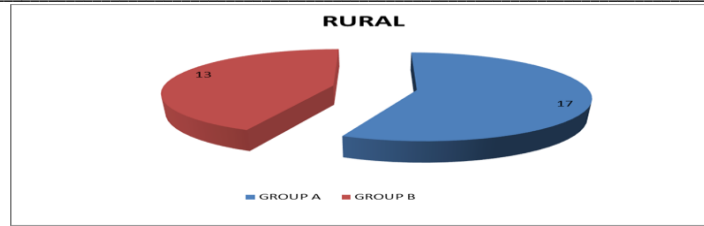


Fig 2:Rural/Urban distribution

Figure 2 show rural versus urban distribution. It shows that in group A 17(68%) and in group B 13(52%) belonged to rural background. This shows more of rural population as compared to urban in our study groups.

Table 2: Ear involved

		Group		Total	
		A	B		
Ear involved	L/E	No	13	15	28
		%	52.00%	60.00%	56.00%
	R/E	No	12	10	22
		%	48.00%	40.00%	44.00%
Total		No	25	25	50
		%	100.00%	100.00%	100.00%

Table 2 shows that left ear involvement was in group A 13(52%) and in group B 15(60%). This shows that left ear was more involved in both the groups.

Table 3:Duration of dry ear (before surgery)

Duration of dry ear	Group A		Group B		Total	
	No	%	No	%	No	%
<3 Months	14	56%	15	60%	29	58%
3-6 Months	9	36%	8	32%	17	34%
6-12 Months	2	8%	2	8%	4	16%
Total	25	100%	25	100%	50	100%

Table 3 shows duration of dry ear before surgery divided into 3 subgroups as shown in above table. In group A 14(56%) and in group B 15(60%) of patients had dry ear of <3 months of duration.

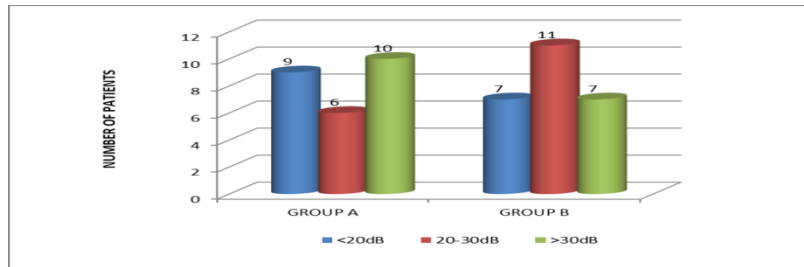


Fig 3:Pre-Op AB gap

Figure 3 shows AB gap of >30db in 40% patients of group A and 44% of group B. Less than 20db AB gap was seen in 15% of group B patients. 20-30 dB, AB gap was seen in 24% of group A and 28% of group B patients.

Table 4:Surgical Approach

		Group		Total	
		A	B		
Surgical Approach	Permeatal	No	21	9	30
		%	84.00%	36.00%	60.00%
	Postaural	No	4	16	20
		%	16.00%	64.00%	40.00%
Total		No	25	25	50
		%	100.00%	100.00%	100.00%

Patients were divided into two subgroups where permeatal and postaural approach was used as shown in table 4. Majority of the patients of group A 21(84%) were operated by permeatal route and 4(16%) by postaural route. 9(36%) cases of group B were operated by permeatal route and 16(64%) by post aural route. So permeatal route was used in 60% of all cases.

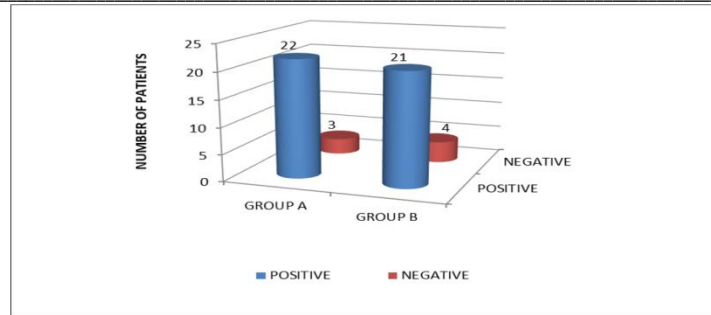


Fig 4: Graft uptake

Figure 4 shows the status of graft at 3 months follow up. Results were taken as positive if graft was taken up and negative if it was not taken up. Above table 10 shows graft uptake at 3 months

postoperatively. It shows that in group A graft take up rate was 88%; in group B it was 84%.

Table 5: Type of Tympanoplasty

		Group			Total
		A	B		
Type of Tympanoplasty	Type I	No.	22	19	41
		%	88.00%	76.00%	82.00%
	Type II	No.	2	3	5
		%	8.00%	12.00%	10.00%
	Type III	No.	1	3	4
		%	4.00%	12.00%	8.00%
Total	No.	25	25	50	
	%	100.00%	100.00%	100.00%	

The table 5 shows the type of tympanoplasty done. In 22 (88%) patients of Group A and 19 (76%) patients of Group B, type I tympanoplasty was done. Type II tympanoplasty was done in 2 (8%)

patients of Group A and 3 (12%) patients of Group B. 3 (12%) patients in Group B and single patient in Group A underwent type III tympanoplasty.

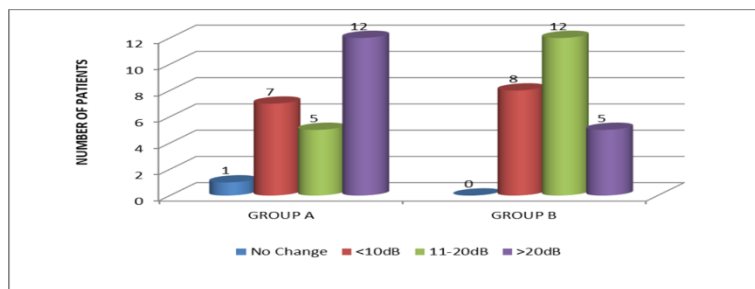


Fig 5: Improvement in hearing

Figure 5 shows improvement in hearing at 3 months postoperatively. One patient in group A showed no hearing improvement. 30% of

total patients had <10dB, 34% had 11-20 dB and 34% of patients had >20 dB of hearing improvement.

Table 6: Combined results of Graft uptake and Improvement in hearing loss

Groups	Graft Uptake	No. of patients (%)	Improvement in hearing loss	No. of patients (%)
Group A	Graft not taken	3 (12.0%)	-	-
	Graft taken	22(88.0%)	No change	1 (4.0%)
			<10dB	7 (28.0%)
			>20dB	12 (48.0%)
Group B	Graft not taken	4 (16.0%)	-	-
	Graft taken	21 (84%)	No change	0 (0.0%)
			<10dB	8 (32.0%)
			>20dB	5 (20.0%)

Table 6 shows the combined results of graft uptake and improvement in hearing loss at 3 months postoperatively. In group A, of 25 patients, the graft was successfully taken up in 22 patients (88.0%) and graft failed to take up in 3 patients. Out of these 3 patients one

patient did not show any improvement in hearing loss but 2 patients showed improvement. The improvement in hearing in these patients was less than 10dB. It concludes that graft uptake even not complete means a small remnant perforation may be associated with an

improvement of hearing. Same case in group B, of 25 patients, the graft was successfully taken up in 21 patients (84.0%) and graft failed to take up in 4 patients. All the patients in group B showed the improvement in hearing including the 4 patients that failed in graft uptake. Of total patients, 30% of total patients had <10dB, 34% had 11-20 dB and 34% of patients had >20dB of hearing improvement.

Discussion

In the present study, 50 patients in the age group of 12-50 years of either sex were selected. All the patients were with dry and safe perforation and mild to moderate hearing loss. All of them had good eustachian tube function. Detailed history, clinical examination and investigations were done as per Performa attached. Pure tone audiometry was done to assess hearing loss. The tympanoplasty was performed through postaural or permeal approach using endoscope or microscope; inlay or outlay technique was used. Graft used was temporalis fascia or tragal perichondrium under general or local anesthesia. In our study, the age group covered from 12 to 50 years. Patients below 12 years were kept out from this study because of the considerable involvement of upper respiratory tract infection. Glasscock in 1976 found that tympanoplasty is in contraindication with young age[11]. The mean age of patients in Group A was 34.84±11.65 and in Group B was 30.16±10.75 with the range, 12-50 years. All the patients were above 12 years of age with maximum number of patients above 40 years in Group A (44%) and in the age group of 21-30 years in Group B. In this study female dominance was found. In group A 17(68%) and in group B 16(64%) patients were females. Overall 66.0% were females while rest of patients were males. Graft uptake was seen in 22 cases (88%) of Group A and in 21 cases (84%) of Group B. No relation was seen between the age of the patient and graft uptake. In our study majority of patients belonged to rural areas. Altogether 30(60.0%) were from rural areas and 20(40.0%) were from urban areas. There was slightly more involvement of left ear in our study. In group A left ear was pathological in 13(52.0%) patients and in group B 15(60.0%). Altogether there was left ear problem in 28(56.0%) and in 22(44.0%) right ears was involved. In our study, permeal and postaural approaches were used. Post-aural approach was used in 20 cases (40.0%) and permeal approach was used in 30 cases (60.0%). Permeal approach was used in most of the cases (84%) under group A where the endoscope was also used. Only 4 patients in Group A were operated by postaural approach to overcome the problem of narrow EAC or anterior prominent bulge. In our study, these approaches had almost equal success in terms of graft uptake. In our study, type of tympanoplasty procedure was chosen depending upon the degree of hearing loss and intraoperative status of middle ear ossicles. In group A, 22 patients underwent tympanoplasty type I and 2 patients underwent tympanoplasty type II and 1 patient underwent tympanoplasty type III. In group B, 19 patients underwent tympanoplasty type I, 3 patients underwent tympanoplasty type II and type III each. Tympanoplasty was done by underlay technique in all patients. In tympanoplasty II PORP was used in 2 patients, incus interposition in 1 patient and TORP in 2 patients. Ossicular prosthesis extrusion rate at 3 months in our study was 0%. In our study preoperative mean A-B gap in group A and B was (31.84 ± 12.54 dB) and (25.91 ± 10.23 dB) respectively. Overall total pre-op AB gap was (28.88 ± 11.72 dB). Postoperatively mean AB gap was (13.9 ± 13.16 dB) in group A and (10.96 ± 5.63 dB) in group B. Overall total post-operative AB gap was (12.43 ± 10.12 dB). Mean improvement in hearing was (17.92 ± 10.68 dB) and (14.66 ± 7.35 dB) in group A and B respectively. In the present study, the success was defined as intact graft at least 3 months postoperatively. The success rate was in terms of graft uptake rate is 87.5% with temporalis fascia, and 80% with tragal perichondrium. The overall success rate was 88% in group A and 84% in group B. In our study

Conflict of Interest: Nil Source of support: Nil

we achieved satisfactory anatomical and hearing gain results which are comparable to other reported studies in the literature. Kakehata et al (2006)[12] quoted that endoscopic procedure does not require much surgical exposure and avoids the substantial risk of unnecessary injury to the chorda tympani in comparison to conventional microscopic method. Karhuketo et al have found that endoscopic myringoplasty accomplishes the criteria of minimally invasive surgery, with the least trauma to normal tissue and that almost excludes pre- and postoperative complications[13].

Conclusion

Tympanoplasty was conventionally performed using a microscope for decades. Since the endoscope began to be used in middle ear surgery in the 1970s, endoscopic tympanoplasty has gained more attention. Literature shows that we get improved results in selected cases by using endoscope in tympanoplasty. Moreover, endoscope is more cost-effective as the cost of the endoscope is much less (by about 10%) than the operating microscope, especially in developing countries. However, there is a limitation that is when surgeon holds the endoscope his one hand gets blocked, and because of the endoscope and the instrument being used the meatal space seems compact. Repeated withdrawal and cleaning of endoscope is required due to fogging and soiling. The magnification of endoscope is less than the microscope; however, this drawback can be overcome by using a monitor or taking the endoscope nearer to the structures being visualized. Difficulty in patients with narrow external auditory canal was overcome using a wide bore dull colored ear speculum and giving an endaural incision within the incisuraterminalis. In addition, an expertise is required for this technique.

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