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**SNIP value** – 0.77
**SJR** - 0.288
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EVALUATION OF VARIOUS GRAFT MATERIALS IN MYRINGOPLASTY

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ABSTRACT

The objective of this study was to compare the effect of various graft materials influencing the outcome of myringoplasty and other factors like age of the patient, size of the perforation, duration of discharge with that of previous studies. We studied a series of 60 patients of chronic suppurative otitis media tubotympanic disease over a period of 2 years at the department of ENT, Navodaya Medical College Hospital. A detailed proforma was filled for each patient. Audiological evaluation (pure tone audiometry) was done preoperatively, 3 months and 6 months after surgery and the results tabulated. Statistical comparisons were performed using the Students’ t-test, Chi-square test, and Anova test. Out of 60 patients there were 31 males and 29 females with a mean age of 27.4 years. In our study in the age group of 10-40 years the audiological benefit in speech frequency was found to be 11.05 dB and in high frequency it was found to be 7.79 dB. In patients aged over 40 years the audiological benefit was 10.83 dB in the speech frequency and 8.5 dB in the high frequency. Statistically patients with duration of ear discharge more than 11 years and less than 20 years showed more audiological benefit. In our study 10 patients had small perforations of the tympanic membrane, 20 patients had medium perforations and 30 patients had large perforations. The audiological benefit seen in the speech frequency for patients with small perforations was 4.1 whereas in the high frequency no audiological benefit was observed. In patients with medium perforation the audiological benefit in speech frequency was 9.7 and for high frequency it was 7.5. In patients with large perforations the audiological benefit was 14.2 in speech frequency and 11.03 in high frequency. In 34 patients temporalis fascia was used as the graft material, in 13 patients tragal perichondrium was used and in 13 patients composite cartilage was used as the graft material for myringoplasty. In our study, of 93.3% cases showed audiological improvement in the speech frequency range postoperatively. There was no change in the hearing level in 5.1% of cases and worsening of hearing seen in 1.6% of cases in the speech frequencies. Maximum improvement was seen in temporalis fascia group compared to cartilage and tragal perichondrium and out of the three grafts least benefit was seen with cartilage graft. However these differences were not statistically significant. Age of the patient, size of the perforation and the type of graft used were found to have an effect on the final outcome of surgery.

KEY WORDS: CSOM – myringoplasty-temporalis fascia-tragal perichondrium-composite cartilage-
Hearing gain -

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INTRODUCTION

In early centuries ear infection with complication was a life threatening condition. The introduction of antibiotics and use of operative microscope in surgical field was revolutionary advances in the control of disease. Chronic suppurative otitis media is still a major problem in our country. Tympanic membrane (TM) perforations lead to recurrent ear infections and hearing loss. If the perforations are bilateral, hearing handicap becomes more evident. Persistent perforations occur either due to improper treatment of recurrent middle ear infections or infected traumatic perforation. Repair of TM perforation was attempted for many years. Different techniques and different graft materials like temporalis fascia, duramater and tragal perichondrium were used. The tympanosclerosis is a hyaline degeneration of the submucosa layer of TM and it may be a factor for the myringoplasty failure. Ears with tympanosclerosis had worse results than the ones with normal TM. This way, we can observe that the presence of tympanosclerosis may harm the cicatrisation of the TM. Chronic suppurative otitis media is a common condition seen in patients attending the otolaryngology clinic. The discharging ear presents the otologist with the dilemma of operating it or not. This is due to the widespread belief that the success rate while doing tympanoplasty on discharging ears is decided inferior. To evaluate this fact we conducted a study to compare outcomes of type I tympanoplasty in dry and discharging ears. Myringoplasty is an operation in which the reconstructive procedure is limited to repair of the tympanic membrane, or “An operation performed to repair or reconstruct the tympanic membrane, often incorrectly referred to as Type I tympanoplasty (because myringoplasty does not imply removal of disease from the middle ear)”

CLASSIFICATION OF TYMPANOPLASTY

1. **Myringoplasty**
   “An operation wherein the procedure is limited to repair of the tympanic membrane”, or “An operation performed to repair or reconstruct the tympanic membrane, often incorrectly referred to as Type I tympanoplasty (because myringoplasty does not imply removal of disease from the middle ear)”

2. **Tympanoplasty without mastoidectomy**
   An operation to eradicate disease in the middle ear and to reconstruct the hearing mechanism without mastoid surgery, with or without tympanic membrane grafting.

3. **Tympanoplasty with mastoidectomy**
   An operation to eradicate disease in both the mastoid process and middle ear cavity and to reconstruct the middle ear conduction mechanism, with or without tympanic membrane grafting. In this classification, types of tympanoplasty according to the method of ossicular reconstruction are included.

**Wullste in Classification Of tympanoplasty**
Wullstein created a classification scheme in 1956 identifying six basic types of tympanoplasty. This classification was established to predict outcomes. Wullstein’s classification of tympanoplasty is as follows:

**Tympanoplasty type I**
Type I tympanoplasty is performed when all three ossicles are present and mobile and...
involves repair of a TM perforation or retraction without ossicular chain reconstruction.

**Tympanoplasty type II**
Type II tympanoplasty is utilized when the malleus is eroded and involves grafting the tympanic membrane to an intact incus and stapes or remnant of the malleus.

**Tympanoplasty type III**
A type III tympanoplasty is indicated when the lateral ossicles are eroded. The stapes must be intact and mobile. The tympanic membrane/graft or if a partial ossicular chain reconstruction prosthesis is used is placed in contact with the stapes superstructure and is also known as Columella tympanoplasty or Myringostapediopexy.

**Tympanoplasty type IV**
Type IV describes an absent or eroded suprastructure with the graft or tympanic membrane overlying a mobile stapes footplate. The resulting middle ear consists of the hypotympanum and the Eustachian tube orifice only.

**Tympanoplasty type V**
Type V tympanoplasty is used when the stapes footplate is fixed. It involves grafting over a fenestration created in the horizontal semi circular canal.

**Tympanoplasty type VI**
Here the round window is left exposed to the direct impact of sound waves. Mobile footplate is protected by small tympanic air space in continuity with the Eustachian tube also known as ‘Sonoinversion’. This classification though widely used in routine practice, but is not used in reporting results. The Subcommittee’s classification also enumerates a set of rules for describing the gross pathology present at the time of surgery for chronic suppurative otitis media. These rules have to do with the type and location of a perforation of the tympanic membrane, the status of the ossicular chain, the presence of the tympanic membrane, the status of the ossicular chain, the presence of otorrhea, and the status of the mucosa and Eustachian tube. In addition, guidelines have been set forth for reporting results. In the past, most workers described success in terms of hearing improvement only, when in fact, elimination of infection and restoration of anatomy are of equal importance. Therefore, results today are reported in relation to control of pathology, anatomic status, hearing improvement and postoperative complications.

**METHODS OF GRAFTING FOR TYMPANIC MEMBRANE**
Various methods of grafting for the tympanic membrane are available:

1. **Onlay graft** positioned lateral to the tympanic membrane remnant and malleus handle, after removing all squamous epithelium from these structures.

2. **Underlay graft** positioned medial to tympanic membrane remnant and malleus handle or lateral to it.

3. **Tympanomeatal allograft** positioned underneath deep meatal skin cuff, lateral to the handle of malleus.

4. **Pop in technique** for small perforations.

**TYPE I TYMPANOPLASTY**
The technique is as follows

The ear is prepared and draped in the usual manner and then the external canal is injected with lidocaine with 1:100,000 epinephrine. A vascular strip incision is made, and inferior and superior flaps are created. Next the post auricular incision is made about 5 mm behind the fold. By the time the incision is made (10 minutes), the epinephrine has had time to become effective, and there is very little bleeding. A hemostatic self-retaining retractor is inserted, the temporalis fascia is exposed and is taken for the grafting material. Tension is put on the auricle during the incision by pulling away from the head. This tension creates an avascular plane above the actual fascia as well as a layer of areolar tissue. A hemostatic self-retaining retractor is inserted, the temporalis fascia is exposed and is taken for the grafting material. Tension is put on the auricle during the incision by pulling away from the head. This tension creates an avascular plane above the actual fascia as well as a layer of areolar tissue. By injecting through the fascia with anaesthetic solution, it balloons up so that a large piece can be readily removed. This tissue is teased out on a hard surface and placed to air dry. Next a T shaped incision is made in the subcutaneous tissue of the post auricular area, allowing the auricle and vascular strip to be lifted forward, exposing the auditory canal. The self-retaining retractor is inserted to hold the vascular strip and auricle out of the...
surgeon’s way, thus eliminating the need for a speculum holder and allowing the surgeon to see all areas of the middle ear. The undersurface of the annulus is denuded of mucosa. The ear canal flaps are created. If the perforation is limited to the posterosuperior quadrant, the normal ear drum remnant is preserved and the facial graft placed under the remnant, supported by Gelfoam in the middle ear.

**VARIOUS GRAFTS USED**

In the past a number of materials have been used as grafts for the perforated tympanic membrane. The discussion here will be limited to those grafts only which have undergone sufficient trial and research.

**Skin grafts**

Consist of skin containing rete pegs and epithelial elements, obtained from the post auricular region, arm or leg (full thickness or split thickness), as first used by Zollner or can be skin used from the external auditory canal, as preferred by House. Grafts of the former category have a tendency for complications such as perforations (34% with split thickness and 11% with full thickness), dermatitis cysts, cholesteatomas, and have poor healing quality in the presence of otitis media. Canal skin however, shows none of these disadvantages and heals well even after a myringotomy. However, the skin obtained from the medial portion of the external auditory canal, is very thin, has no secreting qualities, is lined by tough periosteum, and takes well, as it is in the same anatomical situation where it is to be grafted. Because of its limitations like insufficient grafting material in cases with a small canal, prolonged period of 6-8 weeks for the canal to re-epithelise, and occurrence of stenosis, it is not a preferred graft today.

**Periosteal grafts**

There is a real continuity between the periosteum of the bony portion of the external canal wall and the middle layers of the tympanum at the level of the annulus tympanicus. Moreover, the connective tissue of this layer is closely similar to periosteum in structure, showing a marked affinity for bone in its firm adherence to the handle of the malleus. These facts explain the great adaptability of the periosteum, used in reconstruction of the tympanic membrane. As soon as the graft is placed over the middle ear, the skin of the adjacent regions of the external canal, tend to cover its surface, and this epithelium, has no tendency to collect debris, form dermoid cysts or suffer dermatitis. The periosteum also tends to become quickly covered on its medial surface, by the mucous membrane of the middle ear. Another important characteristic of periosteum is its amazing vitality. Possibly, the poor vascularization of this tissue may explain its great resistance to necrosis and perforation, since it is accustomed to surviving on relatively poor nutrition.

**Perichondrium grafts**

Brackman began to work with tragal perichondrium as a graft substance in tympanoplasty, after having used it successfully in over 1000 stapedectomies. Tragal perichondrium seems an ideal substance, due to easy accessibility in the operating field, availability in adequate amounts, excellent contour, good survival capacity and freedom from osteogenic or chondrogenic tendencies. It can be placed in a concave position for type II, IV and I and in a convex position for type III tympanoplasties, due to its configuration as part of the tragus.

**Fat grafts**

This tissue is very readily available in the ear lobe and is used exactly as a vein is used. Unfortunately its use is limited to very small
perforations in which cases results are uniformly good.

**Cartilage grafts**
The use of cartilage as a component of the tympanoplasty was first reported in 1973. It has been in more widespread use since the early 1980s and has been gaining in popularity. The cartilage, usually prepared from tragus or concha, can be used in a number of ways. They can be composite perichondrial-chondrial grafts. Alternatively 'thin sheets' or 'pallisades' (multiple small fragments) of cartilage can be prepared. These may be appropriately positioned by being placed underneath a conventional temporalis fascia graft or sandwiched between two temporalis fascia grafts. The use of tissue glues to maintain a stable position is common. The use of these grafts in competent hands is not associated with a reduction in hearing and also the recurrent retraction may be more reliably prevented than with temporalis fascia grafts alone. Cartilage has been shown to be well tolerated by the middle ear. Long term survival is achieved as cartilage grafts are nourished by diffusion. Even in the cases of severe Eustachian tube dysfunction, cartilage maintains its rigid quality and resists resorption and retraction.

**Fascia grafts**
Following early reports by Loyd Storrs in 1961, which claimed 98.5% success, temporalis fascia was extensively used and is the most widely accepted tympanic replacement of the day. Enumerating its advantages, the graft is abundantly and easily available, and of a histological constitution that makes it more resistant to the effects of low oxygen tension and infection during the early post-operative phase. About the 6th week, there is a slight tendency for polypoidal granulations to form, but after removal, the graft heals well. Although at first the graft thickens it gradually thins down, till about the 10th month, it is only slightly thicker than the normal drum.

**AIMS AND OBJECTIVES**
• To Compare audiological improvements by using different graft materials in myringoplasty

**REVIEW OF LITERATURE**
Ortegren during the period 1957 to 1961 did a comparison study of 87 cases of myringoplasty using temporalis fascia and canal skin graft. The relation of age on hearing and hearing results, importance of tubal function and causes of failures were discussed. Palva et al in 1969 reported that they achieved a practically useful hearing (0 to 40 dB, ISO standard) in 93% of cases postoperatively out of 160 myringoplasties. They used an operative method termed as 'swing door myringoplasty'. In 1973, Glasscock analysed 237 myringoplasty cases using temporalis fascia. He found that the results were better using the underlay technique. James L Sheehy and Anderson reviewed 472 cases of myringoplasties during a 11 year period. They found a statistically significant relationship between the size of the perforation and degree of hearing impairment. 88% cases showed hearing improvement and 3% of patients developed a high frequency sensorinueral impairment. P. Packer et al, in 1982 compared preoperative and postoperative hearing evaluation in 604 patients. He also compared the different techniques and different graft materials used in his series. Alan G Gibb and Sing-Kiat Chang in 1982 analysed 365 myringoplasties. Various factors liable to influence the surgical results were analysed. Yung MW in 1983 studied hearing gain in relation to perforation site in 100 cases of successful myringoplasties. It was shown that the site of perforation affects the degree of hearing loss and degree of subsequent improvement after myringoplasty. G.S. Bawa et al in 1987, studied 50 cases of myringoplasties and showed a postoperative hearing improvement in 74% patients. Vartiainen et al in 1993, did a follow up study 404 cases of myringoplasties. In audiological failures the cause of persistent conductive hearing loss was found to be due to fixation or erosion of ossicles overlooked by the surgeon. Saeed AL-Ghamdi in 1994, reviewed records of 183 patients who had undergone myringoplasty; Various factors liable to influence the success rate and hearing improvement were analysed. Only the status of the middle ear and presence of tympanosclerosis at the time of surgery were found to have a major effect on the final
A success rate of 53% was observed.

Matsuda Y, Kurita T, Ueda Y, Ito S, Nakashima et al in 1995, studied the effects of hearing and its contributing factors in 211 cases of myringoplasties over a 1 year period. A hearing gain was achieved in 77.9% of patients post-operatively. The degree of hearing loss and factors influence the loss such as size of perforation were discussed. Wielinga et al in 1995, in their study showed an average hearing gain of 6dB when tympanosclerotic plaques exceeding one third of tympanic membrane surface area were removed as part of the myringoplasty procedure. Kotecha B et al in 1999, presented a prospective audit study of myringoplasty. 73 surgeons participated in this study and they got data from 1070 individual patients. Where hearing loss was the main indication for surgery, hearing improvement was seen in 67%. Mak D et al in 2000, published a paper on a field assessment of the surgical outcome in middle ear disease in remote aboriginal Australia during the period 1986 to 1995. Success was defined by an intact tympanic membrane and air-bone gap of 25Db at 6 month follow up after operation. A success rate of 53% was observed. Successful outcomes were more likely in adults and children aged more than 10 year Matsuda Y, Kurita T, Ueda Y, Ito S, Nakashima T in 2009 found significant correlation between the degree of sound conduction disturbance and the perforation area; this correlation was greater at low frequencies following a traumatic perforation. Mehta RP, Rosowski JJ, Voss SE, O’Neil E, Merchant SN in 2006 studied Patients with tympanic membrane perforations without other middle-ear disease. They concluded that the conductive hearing loss resulting from a tympanic membrane perforation is frequency-dependent, with the largest losses occurring at the lowest sound frequencies; increases as size of the perforation increases; varies inversely with volume of the middle ear and mastoid air space (losses are larger in ears with small volumes); and does not vary appreciably with location of the perforation. Effects of location, if any, are small. Ibekwe TS, Nwaorgu OG, Ijaduola TG in 2009 studied the relationship between the location of perforation on TM and hearing loss and concluded that The location of perforation on the tympanic membrane (TM) has no effect on the magnitude of hearing loss in acute TM perforations while it is significant in chronic ones. Nepal A, Bhandary S, Mishra SC, Singh I, Kumar P in 2003-04 studied 100 cases with dry, clean central tympanic membrane perforations due to various causes like chronic suppurative otitis media-tubotympanic, post acute suppurative otitis media residual perforations or simple traumatic perforations with conductive hearing loss and without pre-existing hearing loss were clinicoaudiologically evaluated and analyzed. The study concluded that hearing loss was found to be directly proportional to the size of perforation irrespective of their cause. Overall, perforations involving posterioinferior quadrant were found to have maximum hearing loss. Yetiser S, Hidir Y, Karatas E, Karapinar U in 2009 conducted a study on 30 patients who underwent ossicular chain reconstruction between 1990 and 2005, concluded that the success of the surgery was dictated by the location and the extent of tympanosclerotic involvement. Gierek T, Slaska-Kaspera A, Majzel K, Klimczak-Golab L in 2006 published a study that aimed to establish through a systemic review what is the best technique to treat tympanic perforations and concluded that there is no technique considered sure for every perforation neither technique definitive for type of perforation. H. Vijayendra, C. J. Ittop and R. Sangeetha in 2008 found that canaloplasty is an integral part of tympanoplasty and concluded that Canaloplasty gives 9 db gain in hearing compared to without canalplasty. and gives better visualization, better graft placement and better post-operative care. Patrick Sheahan, Tadhg O’Dwyer, Alexander Blayney in 2002 studied about the goals of tympanoplasty in children including improvement in hearing, prevention of ear infections, and elimination of the need for water precautions. The surgical success rate was 72.5 per cent. Fifty per cent of parents reported that their child’s hearing had improved, 78 per cent reported a decrease in ear infections, 45 per cent reported their child to be participating in activities previously refrained from and 79 per cent of parents were satisfied with the overall surgical outcome. Friedman EM, Sprecher RC, Simon S, Dunn JK in 2001 studied the incidence and prevalence of tympanosclerosis (TS) in patients attended pediatric
otolaryngology clinic, and concluded that patients who had bilateral myringotomy and tube placement have a higher incidence of TS than those who have not had the surgery. Alexander Kessler, MD; William P. Potsic, MD; Roger R. Marsh 31 studied patients age less than 18 years who undergone type 1 tympanoplasty from 1985 to 1989, for whom at least 6 months' follow-up was done. Two hundred nine tympanoplasties on 183 patients were included; 22 patients were excluded for insufficient follow-up and found that The overall short-term surgical success rate was 92%, with 87% of ears remaining free of reperforation to the end of follow-up. They concluded that Tympanoplasty may be considered at any age, Even in young children, there is a high likelihood of return to normal function. Warren Y. Adkins, Benjamin White 32 in 2009 studied about Type I tympanoplasties utilizing an underlay technique with temporalis fascia performed at the Medical University associated hospitals over a 5-year period were reviewed. In their study 40 adults and 25 children, were analyzed for influencing factors. The overall success rate was 89% and concluded that The age of the patient, the length of time the ear had been dry, and the presence of infection at the time of surgery had no influence on the success rate. The two factors which adversely influenced the success rate were the presence of a near total or total perforation and the presence of bilateral perforations. Sato H, Nakamura H, Honjo I, Hayashi M 33. In 1990 examined about the Prognostic value of preoperative Eustachian tube function in 77 ears, subjected to type 1 tympanoplasty. Eustachian tube function was evaluated by positive and negative pressure equalization tests, and clearance test and found that positive pressure equalization and clearance tests of the tube were correlated with the outcome of ear surgery, although the negative pressure equalization test had no correlation with it and concluded that the preoperative tubal function test including positive pressure test and clearance test are useful for predicting the prognosis of ear surgery. Goldman NC 34. in 2007 studied about the effectiveness of chemical cautery in the closure of tympanic membrane perforation. Chemical myringoplasty is not only of historical interest. It is an effective means of tympanic membrane closure in selected patients, hereby reducing the surgical waiting list and saving time and money for the patient, surgeon and hospital. Michael P, Raut V 35, in 2007 assessed operative findings of chorda tympani nerve (CTN) trauma correlate with postoperative symptoms. Patients who undergo middle ear surgery should be thoroughly counselled with respect to CTN injury and symptoms regardless of the type of damage to the nerve and high-lighten the high incidence of postoperative alterations in taste after middle ear surgery, especially in non-diseased ears, and that CTN transection results in fewer symptoms than CTN stretching. Elluru RG, Dhanda R, Neely JG, Goebel JA.36 in 2001 studied about the efficacy and safety of anterior subannular tympanostomy in 38 consecutive patients with a diagnosis of Eustachian tube dysfunction, adhesive otitis media, or chronic otitis media with a perforation who underwent a tympanoplasty and concluded that Anterior subannular tympanostomy is a safe and effective method for long-term middle ear ventilation in patients with chronic Eustachian tube dysfunction.

Haruo Takahashia 37, Hiroaki Satob, Hajime Nakamurac, Yasushi Naitod, Hiroshi Umekia. In 2007 examined the correlation between the middle-ear pressure-regulation functions including active eustachian tube (ET) functions and transmucosal gas exchange function, and outcome of tympanoplasty and concluded that impairment of all the middle-ear pressure-regulation functions was likely to cause poor outcome of tympanoplasty, and also allowed us reconfirm that ears with mechanically obstructed ETs were contraindicated for tympanoplasty. Therefore, assessment of mastoid condition is important as well as the ET function before tympanoplasty.

MATERIALS AND METHODS

A total of 60 patients with CSOM tubo tympanic disease who underwent myringoplasty in the Department of ENT, Navodaya Medical College Hospital and Research Centre, were studied in the period of two years.
**INCLUSION CRITERIA**
1. The patients with CSOM tubotympanic type with conductive hearing loss
2. Dry ear for a minimum period of 6 months.
3. Age more than 14 years and less than 60 years.
4. Graft is taken up completely and remain intact for 3 months after surgery.

**EXCLUSION CRITERIA**
1. CSOM atticoantral disease or retraction pocket
2. CSOM tubotympanic disease active stage
3. Age below 14 years and above 60 years
4. Severe mixed hearing loss- poor cochlear reserve on audiogram
5. Eustachian tube dysfunction
6. Focus of infection in the ear, nose and throat
7. Patients who do not turn up for post operative audiological evaluation
8. Patients having discontinuity of ossicular chain

**Graft materials used for the procedure were**
1. Autologous temporalis fascia
2. Autologous tragal perichondrium
3. Autologous cartilage

**Temporalis fascia**
Temporalis fascia was obtained during the surgical procedure in cases using post-auricular incision as shown in the fig. 1. The same incision was extended to harvest the temporalis fascia. After obtaining the graft, it was spread on to a graft spreader and teased to remove excessive muscle fibres, fat and fibrous tissue so that it appears like parchment when dry as shown in the figure 2. The periosteum over the mastoid was incised parallel to the post aural groove, about 2 mm behind it. It was elevated and reflected forward, using a periosteal elevator till the posterior meatal wall. Posterior meotomy incision was made about 5 mm away from the annulus and from 12 to 6 o'clock position. The skin of the posterior meatal wall was elevated upto this incision and then reflected forward using a mastoid retractor to clearly visualise the tympanic membrane and the perforation. The edges of the perforation were freshened by removing a 1mm rim of perforation with the sickle knife. The medial surface of the tympanic membrane around the perforation was then scarified. The tympanomeatal flap was elevated, in order to clearly visualize and examine the details of the posterior mesotympanum. The temporalis fascia graft is seen after three months and six months of tympanoplasty.

**FIGURE 1**
POST AURICULAR INCISION
Autologous Composite cartilage
The Palisade technique was used. Cartilage graft was harvested from either the tragus or the concha cymba as shown in figure 3. The cymba concha was used when a postauricular incision was planned, as in the case of mastoidectomy. For conchal cartilage graft, perichondrium was removed from the postauricular side. Cartilage graft is cut into several slices or strips, which are then subsequently pieced together medial to the malleus to reconstruct the tympanic membrane as shown in figure 4.
Autologous tragal perichondrium

In patients who received the tragal perichondrial graft the incision was placed in the medial aspect of the most prominent part of the tragus, 1 mm below the lateral edge, care was taken not to incise the perichondrium. Skin and tissues over the tip of tragus were undermined to expose the other side of the cartilage. The cartilage was freed on the medial aspect from skin and tissue on the medial side using a scissors and side knife, creating a pocket upto the base of the cartilage. The cartilage was incised across at its base and removed in toto with the perichondrium was then stripped from the cartilage using a tympanic or freer’s elevator. The cartilage was then put back into the pocket and the incision sutured with 4/0 vicryl sutures placed subcutaneously. An end aural incision was taken separately and not communicating with the incision taken to harvest the tragal perichondrium and cartilage. This was done in the cases where end aural with permeatal approach were combined. This was found necessary in some cases where exposure was not adequate due to a narrow ear canal. The perforation was visualised and the edges of the perforation were freshened by removing a 1mm rim of the perforation with the sickle knife. The medial surface of the tympanic membrane around the perforation was then scarified using a circular knife. A posterior canal wall skin incision was made about 5mm away from the annulus, from 12 to 6 o’clock position using a circular knife. The posterior tympanomeatal flap was then elevated to clearly visualise the mesotympanum.

FIGURE 5
THE TECHNIQUE OF PERICHONDRIUM MYRINGOPLASTY.

A perichondrium graft is obtained from tragal cartilage. The middle ear is filled with gelfoam to support the perichondrium graft. A perichondrium is placed under the tympanic membrane perforation.

FIGURE 6
HARVESTING TRAGAL PERICHONDRIUM
**Statistical Analysis**

Descriptive statistics such as mean, SD and percentage was used to present data. Comparison between two groups were done by unpaired t test. Comparison between the anatomical and audiological outcomes of myringoplasty performed with perichondrial graft and temporalis fascia, cartilage composite graft was done by ANOVA test followed by post hoc Tukey’s multiple comparison tests. A p-value less than 0.05 were considered as significant. Data analysis was done by using software SPSS v16.0

**RESULTS AND OBSERVATIONS**

In our series we studied 60 patients of myringoplasty. The age and sex incidence and various factors influencing the audiological benefit in a successful myringoplasty were analysed after 3 months and 6 months and the results were analysed based on the observations of the second follow up audiogram(after 6 months).

**AGE INCIDENCE**

**TABLE 1**

**AGE DISTRIBUTION OF PATIENTS**

<table>
<thead>
<tr>
<th>Age</th>
<th>Frequency</th>
<th>Percentage</th>
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<tr>
<td>10-19</td>
<td>13</td>
<td>21.7</td>
</tr>
<tr>
<td>20-29</td>
<td>23</td>
<td>38.3</td>
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<tr>
<td>30-39</td>
<td>17</td>
<td>28.3</td>
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<tr>
<td>40-49</td>
<td>3</td>
<td>5.0</td>
</tr>
<tr>
<td>&gt;= 50</td>
<td>4</td>
<td>6.7</td>
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<tr>
<td>Total</td>
<td>60</td>
<td>100.0</td>
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</table>

Mean (SD) age 27.4 ± 9.9
Pts under 14 years of age were not included in this study. Upper age limit was 60 years. In this study 21.7% patients were in the age group of 10-19 years. In this study maximum number of patients were seen in the age group of 20-29 years (38.3%), 21.7% patients were in the age group of 10-19 years, 28.3% patients were in the age group of 30-39, 5% patients were in the age group of 40-49 and 6.7% patients were more than 50 years old.

### TABLE 2

**AGE AND AUDIOLOGICAL BENEFIT**

<table>
<thead>
<tr>
<th>Age</th>
<th>Frequency</th>
<th>Speech frequency</th>
<th>High frequency</th>
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<tbody>
<tr>
<td>10-40</td>
<td>54</td>
<td>11.05</td>
<td>7.79</td>
</tr>
<tr>
<td>&gt;40</td>
<td>6</td>
<td>10.83</td>
<td>8.5</td>
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<td>Total</td>
<td>60</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>p&gt;0.05</td>
<td>p&gt;0.05</td>
</tr>
</tbody>
</table>
In our study 54 myringoplasties were performed on patients between the age group of 10-40 years and only 6 myringoplasties were performed in patients aged over 40 years. In the age group of 10-40 years the audiological benefit in speech frequency was found to be 11.05 dB and in high frequency it was found to be 7.79 dB. In patients aged over 40 years the audiological benefit was 10.83 dB in the speech frequency and 8.5 dB in the high frequency.

SEX INCIDENCE AND AUDIOLOGICAL BENEFIT

<table>
<thead>
<tr>
<th>Sex</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>31</td>
<td>51.7</td>
</tr>
<tr>
<td>Female</td>
<td>29</td>
<td>48.3</td>
</tr>
<tr>
<td>Total</td>
<td>60</td>
<td>100.0</td>
</tr>
</tbody>
</table>
In our study, 31 out of 60 patients i.e 51.7% of the patients were male and 29 out of 60 i.e 48.3% of the patients were female.

### TABLE 4
**SEX INCIDENCE AND AUDIOLOGICAL BENEFIT**

<table>
<thead>
<tr>
<th>Sex</th>
<th>Frequency</th>
<th>Audiological benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Speech frequency</td>
</tr>
<tr>
<td>Male</td>
<td>31</td>
<td>11.6</td>
</tr>
<tr>
<td>Female</td>
<td>29</td>
<td>10.4</td>
</tr>
<tr>
<td>Total</td>
<td>60</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>High frequency</td>
</tr>
<tr>
<td>Male</td>
<td></td>
<td>8.3</td>
</tr>
<tr>
<td>Female</td>
<td></td>
<td>7.4</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>p &gt; 0.05</strong></td>
</tr>
</tbody>
</table>

In our study the audiological benefit for male patients in the speech frequency was 11.6 dB and in the high frequency was 8.3 dB. The audiological benefit for female patients in the speech frequency was 10.4 dB and in the high frequency was 7.4 dB.
DURATION OF EAR DISCHARGE AND AUDIOLOGICAL BENEFIT

TABLE 5
DURATION OF EAR DISCHARGE AND AUDIOLOGICAL BENEFIT

<table>
<thead>
<tr>
<th>Duration(years)</th>
<th>Frequency</th>
<th>Speech frequency</th>
<th>High frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 10</td>
<td>35</td>
<td>10.3</td>
<td>6.8</td>
</tr>
<tr>
<td>11 – 20</td>
<td>13</td>
<td>11.5</td>
<td>8.9</td>
</tr>
<tr>
<td>&gt; 20</td>
<td>2</td>
<td>5.5</td>
<td>11.5</td>
</tr>
<tr>
<td>Total</td>
<td>60</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Mean (SD) duration 8.7 ± 5.6

<10

GRAPH 5
DURATION OF EAR DISCHARGE AND AUDIOLOGICAL BENEFIT

In our study 35 patients had ear discharge for less than ten years duration, 13 patients had ear discharge for less than 20 years duration and 2 patients had ear discharge for more than twenty years. The audiological benefit in patients with ear discharge of less than ten years was 10.3 dB in the speech frequency and the audiological benefit was 6.8 in the high frequency. The audiological benefit in patients with ear discharge between 11 to 20 years was 11.5 dB for speech frequency and 8.9 for high frequency. The audiological benefit in patients with ear discharge of more than twenty years duration was 5.5 dB for speech frequency and 7.5 dB for high frequency.

TABLE 6
SIZE OF PERFORATION AND AUDIOLOGICAL BENEFIT

<table>
<thead>
<tr>
<th>Size</th>
<th>Frequency</th>
<th>Speech frequency</th>
<th>High frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small</td>
<td>10</td>
<td>4.1</td>
<td>-1</td>
</tr>
<tr>
<td>Medium</td>
<td>20</td>
<td>9.7</td>
<td>7.5</td>
</tr>
<tr>
<td>Large</td>
<td>30</td>
<td>14.2</td>
<td>11.03</td>
</tr>
<tr>
<td>Total</td>
<td>60</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

P<0.007 P<0.05

GRAPH 6 SIZE OF PERFORATION AND AUDIOLOGICAL BENEFIT
In our study ten patients had small perforations of the tympanic membrane, twenty patients had medium perforations of the tympanic membrane and thirty patients had large perforations of the tympanic membrane. The audiological benefit seen in the speech frequency for patients with small perforations was 4.1 whereas in the high frequency no audiological benefit was observed. In patients with medium perforation the audiological benefit in speech frequency was 9.7 and for high frequency it was 7.5. In patients with large perforations the audiological benefit was 14.2 in speech frequency and 11.03 in high frequency.

### TABLE 7
**AUDIOLOGICAL ASSESSMENT IN TYMPANOPLASTY**

<table>
<thead>
<tr>
<th>Hearing results</th>
<th>Audiological benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Speech frequency</td>
</tr>
<tr>
<td>Improvement</td>
<td>56 (93.3%)</td>
</tr>
<tr>
<td>No change</td>
<td>3 (5%)</td>
</tr>
<tr>
<td>Worsened</td>
<td>1 (1.6%)</td>
</tr>
<tr>
<td>Total cases</td>
<td>60</td>
</tr>
</tbody>
</table>

In our study 60 cases, 56 (93.3%) cases showed improvement in speech frequency and 49 (81.6%) in high frequency by the end of 6 months; hearing decreased in 1 case (1.6%) in speech frequency and in 7 cases (11.6%) in high frequency. The rest remained unchanged audiologically at the end of 6 months.

### TABLE 8
**EFFECT OF DIFFERENT GRAFTS ON AUDIOLOGICAL IMPROVEMENT:**

<table>
<thead>
<tr>
<th>Type of graft</th>
<th>Frequency</th>
<th>Audiological benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Speech frequency</td>
<td>High frequency</td>
</tr>
<tr>
<td>Composite cartilage</td>
<td>13</td>
<td>11.2</td>
</tr>
<tr>
<td>Temporal fascia</td>
<td>34</td>
<td>14.3</td>
</tr>
<tr>
<td>Tragal perichondrium</td>
<td>13</td>
<td>11.7</td>
</tr>
<tr>
<td>Total</td>
<td>60</td>
<td></td>
</tr>
</tbody>
</table>

P>0.05  p>0.05

### GRAPH 7
**TYPES OF GRAFT AND AUDIOLOGICAL BENEFIT**

In our study, in thirty four patients temporalis fascia was used as the graft material, in thirteen patients tragal perichondrium was used as the graft material and in thirteen patients cartilage was used as the graft material. The audiological benefit seen with temporalis fascia was 14.3 dB for speech frequency and 8.5 dB for high frequency. The audiological benefit seen with tragal perichondrium was 11.7 dB for speech frequency and 7.3 dB for high frequency. The audiological benefit seen with cartilage graft was 11.2 dB for speech frequency and 7.1 dB for high frequency.
In our study forty-one patients had unilateral involvement and nineteen patients had bilateral involvement. In patients with unilateral disease the audiological benefit was 11.2 dB for speech frequency and 7.7 dB for high frequency. In patients with bilateral disease the audiological benefit was 10.6 dB for speech frequency and 8.3 dB for high frequency.

### TABLE 9

**LATERALITY AND AUDIOLOGICAL OUTCOME**

<table>
<thead>
<tr>
<th>U/B</th>
<th>Frequency</th>
<th>Audiological benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Speech frequency</td>
</tr>
<tr>
<td></td>
<td></td>
<td>High frequency</td>
</tr>
<tr>
<td>U</td>
<td>41</td>
<td>11.2</td>
</tr>
<tr>
<td>B</td>
<td>19</td>
<td>10.6</td>
</tr>
<tr>
<td>Total</td>
<td>60</td>
<td></td>
</tr>
</tbody>
</table>

P>0.05 p>0.05

### TABLE 10

**SIDE INVOLVEMENT AND AUDIOLOGICAL OUTCOME**

<table>
<thead>
<tr>
<th>EAR</th>
<th>Frequency</th>
<th>Audiological benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Speech frequency</td>
</tr>
<tr>
<td></td>
<td></td>
<td>High frequency</td>
</tr>
<tr>
<td>L</td>
<td>33</td>
<td>12.4</td>
</tr>
<tr>
<td>R</td>
<td>27</td>
<td>9.4</td>
</tr>
<tr>
<td>Total</td>
<td>60</td>
<td>p&gt;0.05</td>
</tr>
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</table>

p>0.05
DISCUSSION

Myringoplasty is an operation in which the reconstruction procedure is limited to the repair of tympanic membrane perforation alone. Implicit in the definition is that the ossicular chain is intact and mobile, and that there is no middle ear disease such as infected mucosa or in growth of skin. The present study describes various parameters in assessing the hearing improvement after myringoplasty and the advantage of using different graft materials. Post-operative audiological evaluations were done after 3 months and 6 months following myringoplasty.

AGE BENEFIT

In our study 54 myringoplasties were performed on patients between the age group of 10-40 years and only 6 myringoplasties were performed in patients aged over 40 years. In the age group of 10-40 years the audiological benefit in speech frequency was found to be 11.05 dB and in high frequency it was found to be 7.79 dB. In patients aged over 40 years the audiological benefit was 10.83 dB in the speech frequency and 8.5 dB in the high frequency. This is in contrast to the study conducted by Ortergren, where the maximum number of the patients were in the age group of >40 years (42.5%). The audiological benefit in speech frequency was found to be lower in these patients (10.83 dB) compared to that of the younger age group (11.05 dB). But in high frequency, the older age group patient showed more hearing improvement (8.5 dB) compared to the younger age group (7.79 dB) which is not statistically significant. Ortegren has reported that there is a limit at 40 years beyond which hearing results are markedly worse than in younger cases. In a study conducted by Quraishi et al., in 1995 the average age of patients were 33.1 and 33.3 years in the study group and the control group. According to a few studies, (Lee & Schunknecht, 1971; Booth, 1974; Sade et al., 1981) age has no role to play in successful graft uptake in tympanoplasty. While some authors (Raine & Singh 1983) state that the graft is more likely to fail in children. Some other studies have reported that the failure rates are higher below 10 years and above 50 years of age (Russel & Kleid 1991) which is however not supported by similar studies (Schuknecht and Lee, 1971;
Lau and Tos, 1988). In Ortegren’s study, the hearing improvement in the various groups below 40 years were obviously very much alike. Hearing results were worse in the above 40 years age group, compared to young age group. Vartiainen et al in 1985 found that results in elderly patients were found to be as good as in younger patients.

**SEX INCIDENCE AND AUDIOLOGICAL BENEFIT**

In our study the audiological benefit for male patients in the speech frequency was 11.6 dB and in the high frequency was 8.3 dB. The audiological benefit for female patients in the speech frequency was 10.4 dB and in the high frequency was 7.4 dB. The audiological benefit was more in males for both speech frequency and high frequency compared to females. There are no definite reports in literature relating the sex of the patient with the audiological benefit in tympanoplasty. However Booth (1974) reported that there are more failures in women than men with regard to graft take up rates. The better result observed in males could be due to better graft uptake in them. However according to other literature (Scott Brown, Vol3, ch 10), sex has no role in the success of myringoplasty surgeries. The differences in the ratios in various other studies could be due to random assignment of the patients to study and control groups.

**DURATION OF EAR DISCHARGE AND AUDIOLOGICAL BENEFIT**

The duration of the disease process and outcome of the surgery was evaluated in terms of audiological improvement on speech and high frequency range. In this series we did not find any comparable relation between the duration of ear discharge and audiological benefit at speech frequencies as well as high frequencies. Statistically patients with duration of ear discharge more than 11 years and less than 20 years showed more audiological benefit, contrary to the common thinking that a longer disease process reduces the audiological benefit due to more pathological changes. Patients with shorter duration of ear discharge must have probably continuous discharge or more number of attacks of acute exacerbations, when compared to the patients with longer duration of ear discharge. However, audiological improvement is independent of the duration of the disease and depends on the extent of the middle ear damage due to the disease. In another study carried out by Lee P, Kelly G, hearing improvement was seen in patients with shorter duration of disease and smaller size of perforation. This may be due to lesser pathological changes in the middle ear.

**SIZE OF PERFORATION AND AUDIOLOGICAL BENEFIT**

In a prospective audit study of 1070 myringoplasties done by 73 surgeons (Kotecha et al 1999), the size of the tympanic membrane perforations was classified as those <50% and those >50% of the tympanic membrane. In the same study, it was noted that the take rate for perforations <50% of the tympanic membrane was higher 84.7% (710/1018 cases) than take rate for perforations larger than 50% of the tympanic membrane, where take rate was 76.5% (308/1018 cases). In a retrospective analysis of 130 case notes by Wasson JD et al in which they investigated the impact of perforation size and other variables on the success of myringoplasty, and also determined the audiological gain following successful closure of tympanic membrane perforations of various sizes. The collective myringoplasty success rate was 80.8 per cent (105/130); for successful patients, the mean air conduction audiometric gain was -6.8 dB. Neither perforation size nor any other assessed variable was a statistically significant determinant factor for successful myringoplasty. Air conduction audiometric gains following successful myringoplasty were directly correlated with pre-operative perforation size (-4.0 dB for 0-20 per cent perforations, -5.0 dB for 21-40 per cent, -9.1 dB for 41-60 per cent, -10.8 dB for 61-80 per cent and -13.3 dB for 81-100 per cent). In our study ten patients had small perforations of the tympanic membrane, twenty patients had medium perforations of the tympanic membrane and thirty patients had large perforations of the tympanic membrane. The audiological benefit seen in the speech frequency for patients with small perforations was 4.1 whereas in the high frequency no audiological benefit was observed. In patients with medium perforation the audiological
benefit in speech frequency was 9.7 and for high frequency it was 7.5. In patients with large perforations the audiological benefit was 14.2 in speech frequency and 11.03 in high frequency. In our study, the audiological benefit was found to correlate with the size of the perforation. As the size of the perforation increases, the hearing gain was found to improve post operatively. This study supports Packer’s findings in which it was found that in those with a larger hearing deficit pre operatively, obviously benefited more than those with a minimal pre operative hearing loss.

AUDILOGICAL ASSESSMENT IN MYRINGOPLASTY

In our study 60 cases, 56 (93.3%) cases showed improvement in speech frequency and 49 (81.6%) in high frequency by the end of 6 months; hearing decreased in 1 case (1.6%) in speech frequency and in 7 cases (11.6%) in high frequency. The rest remained unchanged audiologically at the end of 6 months. The most likely explanation for lack of complete success from a hearing stand point is that in most cases of CSOM, even though ossicular chain may appear normal, there is some factor of scar tissue that prevents total restoration of hearing (SHEEHY et al 1980). Saeed Ghamdi et al 1994 reported a permanent hearing loss in 3% of the patients. Vartiainen and Nautilinene (1993) in their series had 11 audiological failures. The cause of persistent hearing loss was found to be due to fixation or erosion of ossicles overlooked by the surgeon. The unchanged audiological status in tympanoplasty can be explained by disorders that can interfere with the ventilatory or conducting function of the middle ear viz. tympanosclerosis, stiffness of ossicles that have not been dealt during the surgery (Rance. W. Rancy in 1995). Gibb & Klat (1982) have also found that a persistent conductive hearing loss can result from underlay technique if the handle of malleus is severely retracted especially if it is touching or adherent to the promontory, difficulties arise due to possible reduction in the depth of the tympanic cavity when the graft is placed medial to the malleus handle to overcome this problem, they suggested that one could leave the malleus in its original retracted position and a split graft be pulled upon each size of malleus handle and tucked behind its upper part or amputate 2-3mm from the tip of handle. Sheehy (1980) has reported a loss of BC of 10dB or more at 2K or 4K in 3% of cases probably due to trauma to the ossicular chain while drilling. Saeed Ghamdi et al (1994) reported that one patient developed a profound SN hearing loss in the operated ear in his study. Alan G Gibb & Sing Kait Chang proposed the following reasons for worsening of hearing loss. They stated that a conductive loss can result from damage to the ossicular chain. Sensorineural hearing loss appearing for the first time post operatively generally iatrogenic and the result of some technical error at operation. Thus it is essential to exercise extreme care throughout the operation and avoid undue commotion of ossicular chain which might cause cochlear damage. If underlay grafting is employed, special care should be taken to avoid touching the incus or stapes when scarifying the posterosuperior are of the tympanic membrane remnant. If due care is not taken in this procedure it is possible to hook up the ossicles or incudo-stapedial joint with a scraper. It is also important to exercise extreme care when taking the graft into position in this area, as at this stage of operation, the ossicles are often obscured by the graft itself. In either event the stapes may be shaken and if the trauma is severe, the foot plate may even be cracked. Severe or even total SN deafness may result. The introduction of toxic solutions in the middle ear at the time of operation is another possible cause of SN deafness as previously reported (Alan G. Gibb et al).

EFFECT OF DIFFERENT GRAFTS ON AUDIOLOGICAL IMPROVEMENT IN MYRINGOPLASTY

In our study, in thirty four patients temporalis fascia was used as the graft material, in thirteen patients tragal perichondrium was used as the graft material and in thirteen patients cartilage was used as the graft material. The audiological benefit seen with temporalis fascia was 14.3 dB for speech frequency and 8.5 dB for high frequency. The audiological benefit seen with tragal perichondrium was 11.7 dB for speech frequency and 7.3 dB for high frequency. The audiological benefit seen with cartilage graft
was 11.2 dB for speech frequency and 7.1 dB for high frequency. The audiological improvement in both speech and high frequency is more with temporalis fascia (14.3 and 8.5 dB respectively). GierekT, Slaska-Kaspera A et al compared the audiological results with temporalis fascia and tragal perichondrium and they concluded no statistically significant difference between the two Hermann described the use of temporalis fascia as a graft in 1960. Storrs performed the first fascia graft in the United States in 1960. The superior qualities of fascia, its ready availability in the operative field, low BMR, and its ideal handling qualities made it the standard for tympanic membrane grafting as it is today. Goodhill used perichondrium for grafting the tympanic membrane in the 1960s. His results were similar to those of others using fascia. While generally regarded as an acceptable material, it was not as easily harvested as fascia and was available in very limited quantities. Thus, although acceptable, it has not been widely used. In our study the maximum hearing improvement is seen in temporalis fascia graft group which is similar to results seen by various studies. In a comparative study done by B. J. Singh et al 220 cases of unilateral chronic suppurative otitis media (CSOM) with dry central perforation were chosen and myringoplasty was done. Age group ranged from 13 to 48 years. Grafting was done by underlay technique when temporalis fascia, tragal perichondrium, areolar tissue were used as graft material and when fat graft was used the ear lobule fat was placed directly into perforation through transcanal route. In this study, it was found that best hearing improvement occurred using temporalis fascia. Failure occurred may be due to postoperative infection, respiratory tract infection, neglected post-operative advice etc. It has been shown in both experimental and clinical studies that cartilage is well tolerated by middle ear, and long term survival is the norm. The greatest advantage of cartilage graft has been thought to be its very low metabolic rate. However, in addition, it can receive its nutrients by diffusion; it is very easy to work with because it is pliable and resists deformation from pressure variations and becomes well incorporated in the tympanic membrane. Studies have found that although some softening occurs with time, the matrix of the cartilage remains intact, but with empty lacunae, showing degeneration of the chondrocytes. In a retrospective review of myringoplasty cases done by Zhang ZG et al a total of 117 patients with an average age of 25.6 years (range, 12-51 yr) were examined. Forty-two cases exhibited large perforations, and 75 exhibited small perforations. Myringoplasty with temporal fascia, tragus perichondrium, or tragus cartilage-perichondrium composite grafts were randomly used in this comparative study. Recurrent defects were not observed in the small perforation group repaired with autologous substitutes. The graft acceptance rate in this group was 100%. For the large perforation group, the graft acceptance rate was highest with the cartilage-perichondrium composite grafts group 1 year after the operation. Tympoan membrane repaired with temporalis fascia or perichondrium eventually perforated again or seemed invaginated and adherent. Early hearing improvements in the temporalis fascia and perichondrium groups were better than that of cartilage-perichondrium composite grafts, but there was no significant difference 1 year after surgery. They concluded that temporal fascia, tragus perichondrium, and tragus cartilage-perichondrium composite grafts are all suitable for myringoplasty after a minor tympanic membrane perforation. However, cartilage-perichondrium composite graft material for myringoplasty has superior long-term benefits in regard to both hearing improvements and tympanic membrane morphology, which are especially evident in cases with large perforations. In another randomized study by Yung M et al comparing fascia and cartilage grafts in myringoplasty, patients with chronic otitis media with perforations larger than 50% of the size of the tympanic membrane were repaired with either temporalis fascia (20 ears) or cartilage (18 ears) grafts selected randomly. The graft take rates of fascia and cartilage grafts at 24 months were 84.2% and 80%, respectively. The postoperative air-bone gaps and hearing gains at 24 months were 16.97 dB and 13.63 dB, respectively, in the fascia group and 20.63 dB and 12.60 dB, respectively, in the cartilage group. There was no significant difference in the graft take rates.
or postoperative hearing between the two groups. The current difficulty with homografts is similar to other areas of human tissue transplantation. There is a shortage of adequate material, and the general population is concerned with the transmission of viable viral particles such as those which transmit human immunodeficiency virus (HIV) or slow-onset viruses such as the Jakob-Creutzfeldt virus. Thus, although excellent results have been obtained with this material and technique, its use remains infrequent.

**LATERALITY AND AUDIOLOGICAL OUTCOME**

In a study by Quraishi et al., 1995, 32 left ears and 32 right ears were operated. Both ears were found to be equally affected. As given in Scott Brown, 6th edn, vol 3, side of perforation has no bearing on the outcome of tympanoplasty surgery done for disease of the ear. In our study forty one patients had unilateral involvement and nineteen patients had bilateral involvement. In patients with unilateral disease the audiological benefit was 11.2 dB for speech frequency and 7.7 dB for high frequency. In patients with bilateral disease the audiological benefit was 10.6 dB for speech frequency and 8.3 dB for high frequency.

**CONCLUSION**

Tympanoplasty provides the patient with chronic suppurative otitis media tubotympanic type with a dry ear as well as improvement in hearing. To achieve these dual purposes, a proper selection of cases is essential. The anticipated audiological benefit can be hampered by a number of factors, namely middle ear pathologies which can interfere with ossicular function and middle ear ventilation. However it is to be noted that careful evaluation of middle ear in all cases during surgery may give better hearing results, because any ossicular pathology or fibrous adhesions or Tympanosclerotic patches can be corrected during surgery. In this series, we have achieved considerable improvement in hearing in majority of cases. The maximum improvement in hearing was seen in patients in whom temporalis fascia was used as graft material compared to tragal perichondrium and cartilage.

**SUMMARY**

This study was done to evaluate the audiological findings using various grafts materials. We studied a series of 60 patients of chronic suppurative otitis media tubotympanic disease over period of 2 years at the department of ENT, Navodaya Medical College Hospital. Out of 60 patients there were 31 males and 29 females with a mean age of 27.4 years. In 34 patients temporalis fascia was used as the graft material, in 13 patients tragal perichondrium was used and in 13 patients composite cartilage was used as the graft material for myringoplasty. Audiological evaluation was done preoperatively and postoperatively after 3 months and 6 months of myringoplasty and various parameters analysed based on the observations of the second follow-up audiogram. In our study older age group showed less audiological benefit in speech frequency as well as in high frequencies as compared to younger age group. We found that as the size of perforation increases the hearing gain was found to improve more, post operatively. In our study, of 93.3% cases showed audiological improvement in the speech frequency range postoperatively. There was no change in the hearing level in 5.1% of cases and worsening of hearing seen in 1.6% of cases in the speech frequencies. Maximum improvement was seen in temporalis fascia group compared to cartilage and tragal perichondrium and out of the three grafts least benefit was seen with cartilage graft. However these differences were not statistically significant.

**REFERENCES**


29. Patrick Sheahan MB, AFRCS, Tadhg O'Dwyer MB, FRCSI, FRCS(Eng) Alexander Blayney MCh, FRCSI, FRCS(Eng). Results of type I


