Underlay Versus Onlay Myringoplasty and its Outcome: Experience at Tertiary Care Hospitals

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ABSTRACT: OBJECTIVE: To determine the outcome of different types of myringoplasty regarding hearing improvement and closure of perforation. PLACE & DURATION OF STUDY: This study was conducted in the departments of E.N.T - Head & Neck Surgery, Liaquat University Hospital Hyderabad and Dow University of Health Sciences & Civil Hospital Karachi from January 2008 to December 2011. STUDY TYPE: Descriptive study. SUBJECTS & METHOD: Fifty cases of tubo-tympanic type of CSOM with dry central perforation for last 8-12 weeks, having good cochlear reserves and air bone gap not more than 40dB were included in this study. Patients of either sex with age ranged from 12-40 years were included. Detailed history was acquired and thorough clinical examination was performed with main consideration that ear should be dry for around 8-12 weeks with no primary infection and no pathology in nose, nasopharynx and oropharynx. Patients with active ear discharge, mastoiditis or any other impending complication, history of recent infection within last 8 weeks, with sensori-neural deafness or air bone gap more than 40db, patients having eustachian tube insufficiency or having gross abnormality in nearby anatomical structures were excluded from the study. The data was analysed by SPSS version 21 using Pearson Chi-Square test for statistical significance. RESULTS: A total of 50 cases were included in this study, among which 34 were males and 16 were female patients (ratio 2.1:1). The mean age was 26.4 years. Majority of the patients (78%) had past history of discharging ear with central perforation while 10% of patients had subtotal perforation. In this study 25 patients were operated by underlay technique among them graft uptake was successful in 22 patients and failed in 3 patients. In 25 patients myringoplasty was performed by onlay technique, graft uptake was successful in 23 patients and failed in 2 patients. The result shows that graft uptake was successful in 45 (90%) out of 50 patients and failure was encountered only in 05 (10%) patients. Complete closure of perforation was achieved in 33 cases (66%). The reduction in the size of perforation or partial uptake of the graft was achieved in 12 cases (24%). In 5 cases, graft was rejected resulting in reperforation as before. In our study 30 patients (60%) showed 20db to 30db improvement in hearing after surgery whereas 15 patients (30%) showed betterment between 10db to 20db in their hearing while 5 patients (10%) had less than 10db improvement in hearing after surgery. CONCLUSION: The ultimate goal of myringoplasty is to have a new reconstructed healed tympanic membrane with restoration of hearing as much as possible. In our study, there was no significant difference in achieving these goals by using two different techniques of myringoplasty. Key Words: Myringoplasty, Underlay graft, Onlay graft, Hearing improvement, Closure of perforation.

INTRODUCTION: The problem of ear drum perforation is almost as old as the human history, but its incidence in general population is still debatable. Tympanic membrane perforation is mainly caused by acute or chronic supplicative otitis media (ASOM or CSOM) and trauma, either accidental or iatrogenic. Around 70-80% of perforations healed naturally while rest of 20-30% needs surgical repair. In a survey it was discovered that 4% of native American children had perforated tympanic membrane. Perforation caused after placing gromets in children having otitis media with effusion is estimated around 3%. An increased incidence is noted during childhood and in young adults mainly due to higher incidence of CSOM in this group of population. A dry central perforation in a tympanic membrane (TM) chiefly has two effects. One is otorrhea and other is hearing impairment. In such perforations a Myringoplasty operation is usually performed. Two classical techniques have been described as underlay and onlay procedures. Underlay technique is very popular and is widely used as it is relatively simple to perform. In this the graft is placed medial to the tympanic membrane remnant and malleus. Smaller central perforations are ideal for such technique avoiding the complications of anterior blunting and lateralization, although the reduction in middle ear space and adhesion formation are among its disadvantages. Poor vascular supply to the graft due to limited bed size is also a potential threat for failure. On the other hand onlay myringoplasty is more challenging and mainly used for total perforations or anterior perforations. Although the rate of success is higher but it takes longer time to heal. However the rate of success by either technique is very much debatable as there are studies with variable results of both procedures in terms of achieving an intact ear drum. This study is carried out to compare the results of underlay and only techniques of myringoplasty in terms of achieving post operative closure of tympanic membrane perforation and improvement in hearing.

SUBJECTS & METHOD: This study was conducted in the Departments of E.N.T – Head & Neck Surgery, Liaquat University Hospital Hyderabad and Dow University of Health Sciences & Civil Hospital, Karachi, Pakistan.
University of Health Sciences, Civil Hospital Karachi between January 2008 and December 2011. Fifty cases were included in this study where myringoplasty was done. In this study two main surgical techniques were used i.e. underlay and onlay. In 25 cases underlay technique of myringoplasty was done while in 25 cases onlay technique was used. Detailed history acquired and thorough clinical examination was done in all cases.

Patients were selected from both genders and from different age groups, between 12-40 years, with dry tympanic membrane perforation for more than 12 weeks and air bone gap not more than 40 dB. It was made sure that there should be no primary infection in nose, throat or other adjacent areas in selected subjects. Patients with active ear disease, mastoiditis, any impending complication, sensori-neural deafness, age above 40 years or below 12 years (extremes of ages), eustachian tube insufficiency, diabetics, hypertensive, patients suffering from any other metabolic disorder or chronic illness like tuberculosis or hepatitis were excluded from the study. Thorough clinical examination of ear, nose and throat, examination under microscope beside routine investigations, audiological assessment by pure tone audiometry, radiological assessment of nasopharynx, paranasal sinuses and mastoid were carried out pre-operatively. The audiometry was performed in all selected patients in a sound proof chamber with no ambient noise by qualified audiologist at standard frequencies. Masking was applied in all cases. The techniques which were used in these patients were underlay and onlay. Transcanal approach was considered in small pinhole perforation. Endaural approach provided better surgical exposure than transcanal approach whereas post auricular approach provided maximum exposure during surgical procedures. The grafting material used was temporalis fascia, as it is freely available, having better flexibility and minimal BMR. All the surgeries were performed under general anaesthesia using operating microscope. The data collected was analysed by mean for quantitative variable and frequency and percentages were calculated for qualitative variables. Statistical analysis was carried out by SPSS version 19 using Pearson Chi-Square test for statistically significant difference in results of underlay and onlay techniques of myringoplasty regarding closure of perforation and hearing improvement. P-value of < 0.05 was established as significant.

**RESULTS:** A total of 50 patients were included in this study out of which 34 were males and 16 were females with male to female ratio of 2.1:1. The age group distribution showing majority of patients (44%) were between the age of 21-30 years. The mean age was found to be 26.4 years (Fig: 1). In selected patients, 45 (90%) had history of discharging ear but after conservative treatment a dry central perforation was obtained while 5(10%) patients had dry traumatic perforation. In our study 4 (8%) patients had small perforation occupyingupto 1/4th of ear drum while 20(40%) patients had medium sized perforation occupying upto ½ of the size of TM, 21(42%) patients had large perforation occupying upto 2/3rd of TM area, while 5(10%) patients had subtotal perforation. This study shows that majority (82%) of the patients had either medium or large size perforations. In our study of 50 patients, 6 (12%) patients had antero-inferior perforation, 4 patients (8%) had antero-superior perforation, only one patient (2%) had postero-inferior perforation, 16 patients (32%) had large anterior perforation, while majority of the cases i.e. 18 patients (36%) had central perforation, and only 5 patients (10%) had subtotal perforation. The study shows that...
majority of the patients (68%) had either anterior or central tympanic membrane perforation (Table: 1). In our study 45 patients (90%) had moderate degree of conductive hearing loss (21-40 dB loss) while 5 patients (10%) had mild deafness (10-20 dB loss). Table: 2

In our study autologous temporalis fascia graft was used in all cases. The patients were operated with different techniques of myringoplasty. Underlay technique was used in 25 patients (50%) while onlay technique was adopted in 25 patients (50%) (Table: 3). In 25 patients out of 50 in which underlay technique was used, graft uptake was successful in 22 patients and failed in 3 patients while in 25 patients in whom myringoplasty was performed by onlay technique, graft uptake was successful in 23 patients and failed in 2 patients. Complete closure of perforation was achieved in 33 cases (66%). The reduction in the size of perforation or partial uptake of the graft was achieved in 12 cases (24%). In 5 (10%) patients graft was rejected resulting in re-perforation as before (Table: 3). 60% of the patients in present study showed 20-30 db improvement in hearing after surgery. In 15(30%) patients 10-20 db improvement in hearing was achieved, while 5(10%) patients had less than 10 db improvement in hearing after surgery. PTA repeated 12 weeks after surgery and the results were compared with the pre-operative pure tone audiogram. Results are shown in Table: 4. Statistical analysis expressed that there was no significant difference in results of both underlay and onlay techniques in terms of graft uptake and hearing improvement.

**DISCUSSION:** Many persons live their lives with out knowing that they have tympanic membrane perforations usually because they are entirely asymptomatic. Patient do not approach consultants for repair of such perforation until the perforation is associated with recurrent infection or causing significant hearing loss. Presence of pain alerts the physician to a concurrent disease process. Problem is often more intense with bilateral perforated ear drum. Discharging ears are usually treated conservatively to acquire a dry perforation as the yield of grafting is much better in dry ears. Discharging ears refractory to conservative treatment might need mastoid exploration. In bilaterally dry perforated tympanic membrane, it is better to choose worse ear for exploration. In bilaterally dry perforated tympanic membrane, it is better to choose worse ear for exploration. In bilateral dry perforated tympanic membrane, it is better to choose worse ear for myringoplasty first in order to save the better ear from iatrogenic complications. If tympanic membrane perforation is present in a patient’s single hearing-capable ear than only incipient life-threatening complications justify repair attempts. Medical therapy for perforations is for controlling otorrhea. Ototoxicity may develop with the use of known topical ototoxic ear drops with perforated tympanic membrane and several types of ossicular defects may also be encountered. Frequency and type of ossicular defects varies among ears with presence or absence of cholesteatoma. Resorption of the ossicular chain is most pronounced in the former which are mainly due to more extensive contact with keratinized epithelium in cholesteatoma. An intact ossicular chain is more frequently found in chronic granulating otitis media and as sequelae to tubo-tympanic CSOM. Anterior & inferior perforation usually associated with intact ossicular chain. Patient with total perforation might have a defective handle of malleus & may also have erosion of the long process of the incus. Treatment of tympanic membrane perforation falls into 3 categories. No treatment is usually required in minimal hearing loss patients having no history of recurrent ear infection. The second option when perforation is small and involves neither the umbo nor the annulus. Down the history several methods had been applied to achieve a healed perforation. Once the simplest but now obsolete method was to cautereze the edges of the tympanic membrane perforation with trichloroacetic acid (10% solution), and then apply a small patch of cigarette paper applied over mechanically stripped perforated margin. A fat-plug myringoplasty can be performed. Other recently reported forms of office treatment use fibrin glue or a patch composed of a hyaluronic acid ester and a dressing component. The use of basic fibroblast growth factor with a patch that consists of a silicone layer and atelo-collagen has been tried in very small number of patients with excellent success. The third option is to perform tympanoplasty with the patient under local or general anesthesia. Approach in this surgery may be post aurale, endaural or transcanal depending on the location and size of the tympanic membrane perforation. The most commonly used grafting material is temporalis fascia. Grafts may be placed either medially (underlay) or laterally (onlay) to the tympanic membrane remanant and handle of malleus. In our series underlay technique was used in 25 cases and onlay in 25 cases. Onlay technique is indicated in cases where meatus is narrow and bony protrusion is present anteriorly. Graft material commonly used in myringoplasty is autologous temporalis fascia because of excellent take rate. In our study all the patients were grafted with temporalis fascia (n=50). A new office technique of conservative myringoplasty using lypholyzed homograft dura and fibrin glue has been described and was carried out on 1305 ears to close central perforation of the tympanic membrane with 90% success rate. If it fails a conventional myringoplasty can always be performed. Cartilage as a graft material has also been used in perforated ear drum successfully in certain centres. Myringoplasty in young children is generally avoided due to recurrent upper respiratory tract infections. But it has been advocated in some cases to restore child’s auditory function, to prevent ossicular damage and also to prevent migration of squamous epithelium. One study of 189 cases, reports 90% success rate with central perforations and 70% in marginal perforations. In another series of 83 patients 100% success rate was claimed. Complications may be avoided with regular follow ups. Perforations in the pars tensa rarely lead to complications, as compare to perforations in the pars flaccida. Every operation carries a risk of exacerbating hearing loss. Exact incidence of such hearing loss is unclear, and rate of reported cases vary widely in the medical literature. One series showed approximately 1 per 500 operations resulted in much worse hearing, while another series showed that nearly 2% of patients had some degree of increase hearing loss. In a small group of patients, persistent eustachian tube dysfunction leads to late complications, such as cholesteatoma, re-perforation, or middle ear effusion. Repaired drums re-perforate in as many as 10% of patients. Potential for late perforation and cholesteatoma...
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formation require regular follow-up for many years after apparently successful surgery.

**CONCLUSION:** The ultimate aim of tympanic membrane grafting procedure is to have new reconstructed tympanic membrane with functions as close as possible to original tympanic membrane. In our study myringoplasty was done by two different techniques. A satisfactory rate of graft uptake was achieved by both techniques and most of the patients had completely dry ear and improved hearing. The difference in graft uptake was insignificant when both methods were analysed statistically. The two techniques can be used alternative to each other as per choice of surgeon. The experience of surgeon, facilities available and regular follow ups are much more important to achieve good success than to the technique alone. The age also affects the myringoplasty success rate and in our study the adults show better results. Results also depend upon the functioning of the eustachian tube and presence of infections in surrounding areas such as nose and nasopharynx.

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