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RESEARCH ARTICLE

ENDOSCOPIC FAT MYRINGOPLASTY: GRAFT UPTAKE AND AUDIOLOGICAL OUTCOME IN INACTIVE MUCOSAL CHRONIC OTITIS MEDIA: A PROSPECTIVE STUDY

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ABSTRACT

The objective of this study was to compare the graft uptake and audiological outcome of endoscopic myringoplasty in Inactive Mucosal Chronic Otitis Media with various tympanic membrane perforation sizes using fat graft from ear lobule or abdominal donor sites.This prospective study was conducted at Jawaharlal Nehru Medical College, Aligarh Muslim University, Aligarh, India. 46 patients fulfilling the inclusion criteria who were suffering from inactive mucosal chronic otitis media and attended Otorhinolaryngology outpatient department of this tertiary care centre were considered for this study. Endoscopic myringoplasty using fat graft was performed in all cases. Fat graft was harvested from ear lobule or abdominal donor sites according to tympanic membrane perforation size. They were evaluated for graft uptake and postoperative audiometric status and were followed upto 12 weeks.We found the overall success rate of Endoscopic fat myringoplasty to be 83%. No statistical difference was noted in tympanic membrane closure rates amongst various perforation sizes. The evaluation of fat graft material harvested from either ear lobule or abdominal donor site on closure rates was found to be statistically insignificant. Audiometric gain was statistically significant in successful patients with better gain demonstrated in larger perforations.Thus we conclude that ear lobule or abdominal fat graft can be effectively used in inactive mucosal chronic otitis media for successful closure of small, medium and even large tympanic membrane perforations with comparable graft uptake rates and good audiological outcome with better audiometric gains in larger perforations.

INTRODUCTION

Chronic suppurative otitis media is one of the most common ear diseases in the developing countries. Chronic suppurative otitis media is defined as a persistent disease, insidious in onset, often capable of causing severe destruction of middle ear structure and irreversible sequel, which is clinically manifested with deafness and discharge more than 3 months (Shrestha *et al., 2006*). Poor living conditions, overcrowding, poor hygiene and malnutrition have been suggested as a basis for the wide spread prevalence of chronic otitis media in developing countries (Glasscock, 2010a)

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Tympanic membrane perforations are common in childhood and usually follow episodes of acute otitis media, ventilation tube insertion, or trauma. Perforations that do not heal spontaneously may require surgical repair, particularly when associated with recurrent infections or hearing loss. Closure of uncomplicated tympanic membrane perforation is usually a straight forward procedure with agood success rate. The success rate in adults is higher than that in children (Inwood JL *et al*., 2003). Reasons cited for this finding include poor eustachian tube function, a higher incidence of upper respiratory tract infections, and greater technical difficulty in performing surgery on smaller anatomy (Lancaster *et al*., 1999). Tympanoplasty is the surgical technique for the management of chronic otitis media tubotympanic type (chronic otitis media, mucosal type) (Buckingham, 1992;

Milewski, 1993; Glasscock, 2010b). Perforation of tympanic membrane with intermittent discharge and hearing loss of conductive type are the indication of tympanoplasty (Milewski, 1993; Glasscock, 2010b). The aim of operation includes perforation closure with a dry stable grafted membrane and improvement in hearing levels. Myringoplasty has been used for the reconstruction of tympanic membrane for centuries. Many reconstructive materials have been used for myringoplasty, but the use of autogenous materials became popular at the end of the 19th century (Storrs L, 1961). Since the introduction by Storrs, temporalis fascia is still the favoured technique of many surgeons worldwide (Storrs, 1961). However, there are disadvantages and ongoing controversies regarding the use of temporalis fascia Vartiainen *et al*., 1993).

Fat tissue has been known to have a high capacity of resistance and is used as an autogenous material for different surgeries (Storrs, 1961; Vartiainen *et al*., 1993; Ringenberg, 1978). Ringenberg (1962) was the first surgeon to use fat tissue for the closure of perforations of tympanic membrane. Other studies also confirmed the efficacy of fat grafts for the reconstruction of tympanic membrane (Ringenberg, 1978, Deddens *et al*., 1993, Mitchell *et al*., 1997, Ayache *et al*., 2003, Ozgursoy *et al*., 2005; Fiorino *et al*., 2007; Landsberg *et al*., 2006, Kim *et al*., 2011; Gun *et al*., 2014). Saliba *et al.,* 2011 reported a new technique of combining fat graft myringoplasty with the use of hyaluronic acid solid polyester form and reported better results compared with those of the temporalis fascia technique. In our study, we have compared the grafting and acoustic properties of ear lobule and abdominal fat graft in ears with small, medium or large perforation and with a favourable eustachian tube function.

MATERIALS AND METHODS

The study was prospective in nature and was carried out from March 2016 to July 2017. Patients attending Otorhinolaryngology outpatient department of Jawaharlal Nehru Medical College, A.M.U., Aligarh, India were considered for this study. 46 patients of either sex who fulfilled the inclusion criteria were considered for the study.

Inclusion Criteria

1. Age group 12 – 50 years.
2. Chronic otitis media mucosal variety less than 75% tympanic membrane perforation, inactive for atleast 6 weeks.
3. Good cochlear reserve with intact middle ear conducting mechanism.

Exclusion Criteria

1. Age <12 years and >50 years.
2. Patients having chronic otitis media mucosal variety with subtotal (>75%) or total tympanic membrane perforation, sensorineural deafness,ossicular chain discontinuity, tympanosclerosis, eustachian tube dysfunction, presence of cholesteatoma, retraction pocket, complicated chronic otitis media, sinonasal disease like allergic rhinitis, sinonnasal polyposis, chronic sinusitis etc.
3. Patients having any systemic disease like hypertension, diabetes mellitus, tuberculosis, asthmaetc.

All the patients underwent detailed history, general, systemic and local examination which included clinical examination of ear, nose, paranasal sinuses, larynx and pharynx. Pure tone audiometry with or without masking for available four frequency (i.e. 0.5,1,2 and 4 khz) was done and preoperative air bone gap in decibels (db) was recorded for each case.

Data Collection Tools

The patients were classified as per the following criteria:

1. The patients were classified on the basis of age, sex and rural/urban population.
2. The size of the perforation was graded as small (less than 25%), medium (25-50%) and large (50-75%) of the total tympanic membrane area.
3. The patients were also classified on the basis of donor site of the fat graft.

In all patients, ear lobule or abdominal fat was used as graft material. Ear lobule fat was used for majority of small perforations and abdominal fat was used for all medium and large size tympanic membrane perforations. Endoscopic transcanal technique was adopted in every case. All the patients included in the present study were operated by surgeons with same expertise and the surgical technique remained same throughout the period of study. All the patients were operated under local anaesthesia (xylocaine 2% with adrenaline 1:100000) and intravenous sedation. About 1/2 cc local anaesthetic agent is infiltrated at 3 - o clock, 6 - o clock, 9 - o clock, and 12 - o clock positions at the bony cartilaginous junction of the external auditory canal. Fat graft from ear lobule was harvested through a 1.5 cm incision given in the posterior aspect behind margin of the lobule under local anaesthesia. Fat graft from the abdomen was harvested 5 cm lateral to the umbilicus through 2 cm horizontal incision under local anesthesia (Fig. 1).

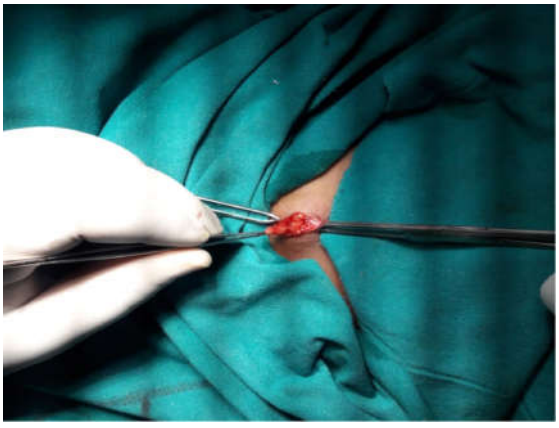

Fig. 1. Harvesting abdominal fat graft

Large Fat swabs at least two times bigger than the perforation were harvested (Fig. 2). The incision of the graft site was closed with 2/0 silk suture. We used 0^o and 30^o angled rigid endoscopes with 2.4-mm outer diameter (TIAN-SONG) together with a high definition video system. Surgery was performed with the endoscope held in one hand and the surgical instruments in the other hand. We primarily used the 0^oangled endoscope with the 30^o angled endoscopes used to more precisely observe the ossicular chain and tympanic cavity through the perforation of the tympanic membrane, taking care to avoid trauma to the ear canal or middle ear structures.

Fig. 2. Abdominal fat graft

Fat graft myringoplasty technique: De-epithelization of perforation margins with a sharp prick was performed to the perforation margins. In majority of patients (15 out of 20 cases) with small tympanic membrane perforation fat was harvested from ear lobule while in remaining patients with small perforation (5 out of 20), medium and large perforations, fat tissue was obtained from the abdomen. It is important that the fat graft should contact all parts of the margins of the perforation, along with some fat bulging over the tympanic membrane remnant. Attempts were made to close the perforation with single large piece of fat tissue in most of the cases (Fig. 3).

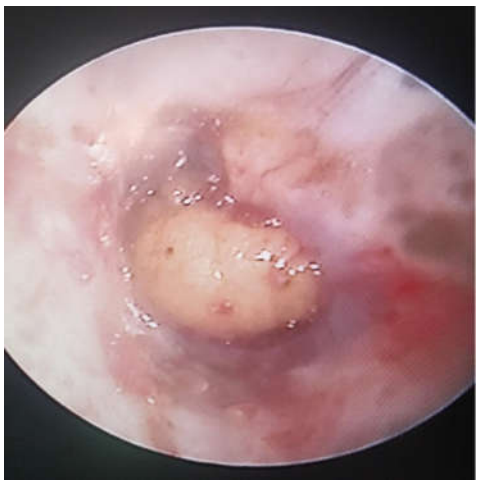

Fig. 3. Single piece fat graft closure in large perforation

Sometimes several pieces of fat tissue were used to close large perforations. The fat tissue was placed through the perforation in an hourglass fashion. Several small fat pieces were supported around the perforation margins to further augment the closure (Fig. 4).

Fig.4: Single piece fat graft closure in large perforation with small pieces of fat placed over the tucked margins for augmentation

Small pieces of sponge gels soaked with antibiotic drops were placed over and around the graft to keep it in position. Systemic antibiotics and decongestants were prescribed for daily use in immediate post operative period for two weeks. Topical antibiotic was also started in second post operative week and was continued for subsequent two weeks. The patients were instructed to keep their ear dry.They were advised to avoid vigorous nose blowing and straining exercises. Follow up were performed by otoscopy or endoscopy at 1 weeks, 6 weeks and 12 weeks. At 6 weeks (Fig. 5) and 12 weeks (Fig. 6), observation on otoscopic examination for graft take up was graded as follows:

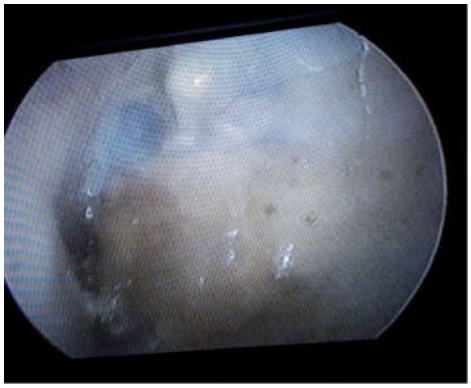

Fig. 5. Graft uptake in large perforation at 6 weeks

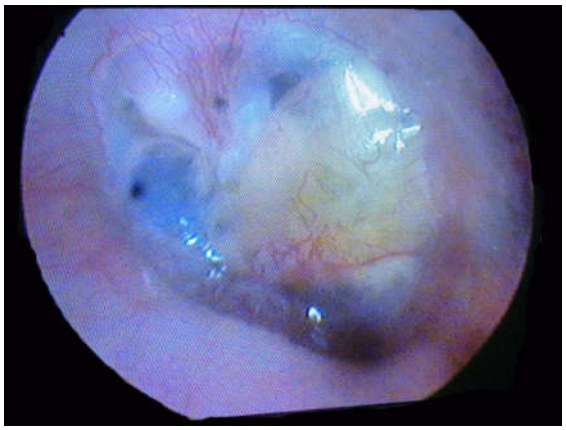

Fig. 6. Graft uptake in large perforation at 12 weeks

Group 1: Successful – If complete graft taken up and no remnant perforation in any quadrant.

Group 2: Unsuccessful – If Graft partially taken up with residual perforation remaining in any quadrant or if perforation remains as such.

Pure tone audiometry of the patients were performed at 6 weeks and 12 week follow up. Hearing gain was designated as the change in the air-bone gap after the operation. Air-bone gap was calculated in decibels (db) as the difference of the average thresholds of air conduction and bone conduction at the frequencies of 0.5, 1, 2 and 4 kHz.

DATA ANALYSIS TOOLS

The statistical package SPSS (version 20.0) was used for statistical evaluation including independent samplest test, $\chi 2$ test, paired t-test, fischer exact tests and AnovaTukey HSD test. A value of $p < 0.05$ was taken to indicate statistical significance.

RESULTS

Fourty-six patients fulfilled the criteria for our study. The demographics and other variables of the patients are demonstrated in Table 1. We assessed the results of our study in different aspects. There were 22 male (48 %) and 24 female (52 %) patients. The highest prevalence was in age group of 12-30 yr. This group had 24 (52%) of total 46 patients. Considering patients' age group, no significant difference between the successful and unsuccessful graft group was detected by paired test (p= 0.88) (Table 1). Of the 46 fat-graft myringoplasty, 38 of them were (83 %) successful. No intraoperative or postoperative complications were recorded. There were 20 males and 18 females in the successful graft group, there were 2 males and 6 females in the unsuccessful graft group. The difference between gender groups was not statistically significant by Fischer exact test (p= 0.24) (Table 1). 61% of the patients (28 out of 46) belonged to rural population. 21 of these had successful outcome with 7 failures.18 patients who belonged to urban population had 17 successful and 1 unsuccessful graft outcome. The difference between the population group was statistically insignificant by Fischer exact test (p=0.12, Table 1).

Table 1. Demographic classification of patients and other variables

Demographic data	Variable	Total	Successful	Unsuccessful	P-value
Age Group	12-30yr	24	20 (83.3%)	4 (16.6%)	0.88
	31-50yr	22	18 (81.8%)	4 (18.2%)	
Sex	Male	22	20 (91.0%)	2 (9.0%)	0.24
	Female	24	18 (75.0%)	6 (25.0%)	
Population	Rural	28	21 (75.0%)	7 (25.0%)	0.12
	Urban	18	17 (94.4%)	1 (5.6%)	

We also classified the cases according to the size of the tympanic membrane perforation as small, medium and large and analyzed its' relationship with the closure rates, In small perforations the closure rate was 85.0%, in medium perforations was 81.3% and finally in large perforations it was 80 %. This difference was analyzed by Fisher's exact test; and there was a no significant difference (p = 0.99) (Table 2).

Table 2. Comparison of success rate with size of perforation (at both 6 & 12 weeks)

Perforation size	Total	Successful	Unsuccessful	P-value
Small	20	17 (85.0%)	3 (15.0%)	0.99
Medium	16	13 (81.3%)	3 (18.7%)	
Large	10	8 (80.0%)	2 (20.0%)	

We also evaluated the effect of fat graft donor sites on the efficiency of tympanic membrane closure. In 15 patients with small perforation, fat from ear lobule was used as graft, whereas in rest of 31 patients, abdominal fat was used as graft material.

Table 3. Comparison of success rate with donor site of fat graft

Donor Site	Total	Successful	Unsuccessful	P-value
Ear lobule	15	12 (80.0%)	3 (20.0%)	1.0
Abdominal	31	26 (83.9%)	5 (16.1%)	

Of the 15 ear lobule fat graft patients, 12 patients (80.0 %) had successful perforation closure, 3 of the patients (20.0 %) were unsuccessful.

Of the 31 abdominal fat graft patients, 26 (84%) of them were successful, 5 of them were unsuccessful. Comparing both the groups by Fisher's exact test, there was no significant difference between graft sources (p= 1.0) (Table 3). We also analyzed the audiometric hearing gains of successful and unsuccessful patients at 6 weeks and 12 weeks. Applying the paired t test hearing gains were found to be statistically highly significant in successful group as expected than the unsuccessful group (For successful group at 6 weeks $p < 0.0001$, $t = 21.94$ and at 12 weeks $p< 0.001$, $t = 28.89$)(Table 4). Finally when we compared the hearing gains between of different perforation sizes group for successful patients with AnovaTukey HSD test, the hearing gain in larger perforation was found to be statistically significant (Table 5)

DISCUSSION

The idea of myringoplasty first emerged in the seventeenth century by the attempts of Banzer (1640), who tried to repair the tympanic membrane perforation by the aid of a small ivory tube in 1640. However, it was Berthold (1878) who successfully achieved first successful tympanic closure by a full thickness skin graft. As the repair of tympanic membrane by Berthold's method caused recurrent perforations and cholesteatoma, different graft materials were tested by various surgeons to overcome the obstacles of this method. First by Hagerman in 1958 and later by Ortegen in 1959, the autologous temporalis muscle fascia had been introduced as the ultimate graft material for tympanoplasty, and since then, this graft is the most popular grafting material in otological surgery (Paparella *et al*., 1991; Alan *et al*., 1987). The present study has been undertaken to compare the perforation closure and audiological outcome of endoscopic myringoplasty using ear lobule or abdominal fat graft in various perforation sizes.

Fat is also an active material containing angiogenic and survival factors e.g. Monobutyrin, prostaglandins, interleukins 1 and 6, cytokines and tumour necrosis factor which, stimulate restoration and repair of the fibrous layer and promote revascularization which are both essential for survival of the free flap (Fiorino *et al*., 2007). Fat graft promotes growth factors including vascular endothelial growth factor, transforming growth factor beta, platelet derived growth factor and fibroblast growth factor which promote the process of the tissue repair (T. Nishimura *et al*., 2000). Fat contains high population of multipotent cells referred as adipose-derived stem cells which are similar in activity to those of the bone marrow derived mesenchymal stem cells in the ability to differentiate into mesenchymal tissues such as endothelial and fibrous types promoting the healing process of the tympanic membrane (Zuk *et al*., 2002). In 1962, Ringerberg JC published his article on the use ear lobule fat graft in tympanic membrane perforations and introduced this method as a simple, reliable and costeffective procedure for small tympanic membrane perforations. However, his operational technique was very different from the one that is used nowadays. He elevated the tympanomeatal flap, explored the middle ear and placed the graft lateral to the perforation, but not through the perforation in the dumbbell fashion as introduced by Althaus SR (1986) as we mostly use today and also used in our study. So RingenbergJCwas the first surgeon to describe fat myringoplasty and the characteristics of fat tissue for otologic procedures in 1962. After RingenbergJC many authors reported good results with the fat graft myringoplastytechnique (Mitchell *et al*., 1997).

Table 4. Comparison of audiological outcome between successful and unsuccessful group at 6 and 12 weeks

	Successful outcome						Unsuccessful outcome					
Follow-up	Pre-op AB gap (dB)	SD	Post-op AB Gap (dB)	SD	Audiological gain (dB)	P-value	Pre-op AB gap(dB)	SD	Post-op AB Gap(dB)	SD	Audiological gain(dB)	P-value
At 6 weeks	31.94	±3.8	18.55	±1.68	13.39	<0.0001	32.36	±3.20	32.01	±3.40	0.35	0.14
At 12 weeks	31.94	±3.8	17.75	±1.73	14.32	<0.0001	32.36	±3.20	31.83	±3.92	0.66	0.12

Table 5. Comparison of audiological outcome between different perforation sizes of successful patients at 12 weeks

Perforation Size	Pre-op AB Gap(dB)	SD	Post-op AB Gap(dB)	SD	Audiological gain(dB)	P-value
Small	28.77	±1.80	16.52	±1.50	12.25	Medium vs small 0.009
Medium	33.22	±2.66	18.17	±0.85	15.05	Large vs Small 0.001
Large	36.60	±2.47	19.75	±1.02	16.90	Large vs Medium 0.22

Ringenberg, (1978) also compared three graft sites, namely the abdomen, buttock, and ear lobe in his study and concluded that the ear lobe showed better epithelial and mucosal tympanic growth because of its high density. In our study, we have usedear lobe fat for repair of majority of small size perforation (15 out of 20 cases) and abdominal fat for repair some small (5 out of 20 cases) and all medium (16 cases) and all large (10 cases) sized perforations, the ear lobule fat volume is not enough to cover the larger perforations completely. In our study which included 46 patients, 22 (48%) are males and 24 patients (52%) are females. Females were thus relatively more affected by the disease. Our result is in accordance with Wasson *et al*., 2009 and Yadav *et al*., 2011 who also found female predominance of the disease. However our study was not in concurrence with the study of Ahmad *et al*., 2010 who reported male preponderance of the disease in their group of 120 patients. Majority of cases (61%) were from rural area belonging to low socio-economic strata. This is in concurrence with Mohammad Shafiqul Islam *et al*., 2010 who also found majority of this disease prevalence in rural areas.

This might be due to ignorance, poverty and inadequate specialized medical facilities in rural areas. In our study, majority of the cases belonged to younger age group (52%) in their second and third decades of the life. This is in concurrence with Srikrishna BH *et al,* 2014 and Bijan Basak *et al*., 2014 who also reported highest disease prevalence in second and third decades of life. This might be due to concern about the hearing loss and ear discharge due to increase in general level of awareness among people of younger age group. In our study, the closure rate of tympanic membrane perforation was 83%. Our finding is in accordance with success rates of 70% - 100% demonstrated in various studies of fat graft myringolasty done by, Gross *et al*, 1989; Mitchell *et al*., 1997; Kwong *et al*., 2012; Konstantinidis*et al*., 2013; Hegazy*et al*., 2013 and Gun *et al*. 2014. On comparing the successful outcome of myringoplasty between the gender groups, no statistical difference was found between them. This is in concurrence with other fat graft myringoplasty studies conducted by Gross *et al*., 1989; Ayache *et al*., 2003 and Kwong *et al*., 2012 who also found no significant difference in success rates between gender groups. We assessed the effect of perforation size on the tympanic membrane closure rate using fat graft. For this we classified the perforations as small, medium and large. We observed the success rate of tympanic membrane perforation closure following fat graft myringoplasty to be 85% for small size perforation (17 out of 20), 82.0% to 81.3% for medium size perforation (13 out of 16) and 80% for large perforation (8 out of 10).

Although lower success rates were observed for patients with larger tympanic membrane perforations, statistically no significant difference in surgical success rates between the various perforation size categories was demonstrated (p = 0.99). Our study is in concurrence with (Landsberg *et al*., 2006; Kim *et al*., 2011 and Gun *et al*., 2014) who in their studies also used fat graft to repair small and large tympanic membrane perforations and reported no significant difference. They also concluded that regardless of size of perforation, the fat graft just needs an oval surface to stick to the edges of perforation (Storrs 1961; Buckingham, 1992; Vartiainen *et al*., 1993). However our study is not in concurrence with Deddens *et al*., 1993 and Konstantinidis *et al*., 2013 who considered tympanic membrane perforation size as a crucial factor in successful outcome. They demonstrated better success rates with significant difference for fat graft myringoplasty in small perforations as compared to larger perforation. Our study also evaluated the impact of fat graft material from different donor sites on tympanic membrane closure rate. We preferred to use abdominal fat for medium and large perforations, as the ear lobule fat volume is not enough to cover these perforations completely. We used ear lobule fat mostly for small perforations. In this study we observed no clinical significant difference between the donor sites in regard of success of the procedure.

Our findings are contradictory to Ringenberg (1978) who recommended and favoured ear lobe fat for fat plug myringoplasty. He postulated ear lobe adipocytes being more compact, having more fibrous supporting tissue than buttocks or abdominal fat, and saw this is an advantage for myringoplasty. However our study is in accordance with Kwong *et al*., 2012 who renounced Ringerberg's observations and proposed that the compact and fibrous structure of ear lobe fat may complicate angiogenesis and tissue repair and demonstrated a success rate of 100% using umbilical fat in his study. Our study is also in accordance to Mustafa Acar *et al*., 2015 who also did not observe a statistically significant difference between fat grafts of different donor sites. We also assessed the audiological gain following successful closure of tympanic membrane perforation. 38 out of 46 patients who had successful operative closure were evaluated for audiometric improvement at 6 and 12 weeks. According to the size tympanic membrane perforation was classified preoperatively as small, medium and large perforation. The mean preoperative air bone gap for small perforation was 28.77±1.80 dB& postoperative AB gap at 12 weeks was 16.52 ± 1.50dB with audiological improvement of 12.25 ± 2.09 dB at 12 weeks. For medium size perforation the mean preoperative air bone gap was 33.22 ± 2.67 dB & mean postoperative AB gap was 18.17

±0.85 dB at 12 weeks with audiological improvement of 15.05 ± 2.96 dB at 12 weeks. For large perforation the mean preoperative air bone gap was 36.60 ± 2.47dB & mean postoperative AB gap was 19.75 ±1.02dB at 12 weeks with audiological improvement of 16.90 ± 2.11 dB at 12 weeks. The postoperative audiological improvement was highly significant in small,medium and large perforations at 6 and 12 weeks ($p < 0.0001$). This improvement was due to graft integration and better conditions in the middle ear and ossicular chain as a result of surgery. Significant subjective improvement in hearing was also found during clinical examination. The restoration of normality of the drum with restoration transformation mechanism and phase difference might be the cause of this improvement. Such achievement of an audiometric gain in hearing thresholds following successful fat myringoplasty has been widely demonstrated in various studies. Our study is in concurrence with study conducted by (Landsberg *et al*., 2006; Koc *et al*., 2013, Hegazy *et al*., 2013 and Mustafa Acar *et al*., 2015), who obtained significant audiological improvement following successful fat graft myringoplasty. However our study was contradictory to Konstantinidis *et al*., 2013 who could not detect statistically significant hearing improvement after fat graft myringoplasty. On comparing the audiological improvement following successful closure of large perforations with small perforation and medium sized perforation with small perforation they were found to be statistically significant ($p=0.001$ & $p=0.009$ respectively). This showed that the improvement in audiological gain following fat graft myringoplasty was more for larger sized tympanic membrane perforation.

Our study is in accordance with Koc *et al*., 2013 who also demonstrated significant audiometric gain following fat graft myringoplasty and the hearing gain was more prominent for larger perforations group. Our study is in contradictory with Kim *et al*., 2011 who observed poorer audiological gain post fat graft myringoplasty in large perforation group.They implicated this due to large volume of fat graft required which resulted in bulky appearance of neotympanum and also hampered its vibration. They also mentioned that it was difficult to create a flat tympanic membrane after fat graft myringoplasty (Kim DK *et al*., 2011). Our study is also not in concurrence with Gun *et al*., 2014 who also confirmed the finding of a bulky appearance and poorer audiological results in large perforation group. The problem of bulky fat graft can be solved by using precise size of a single flat piece of fat tissue large enough to tuck under the perforation margins thus avoiding too much of fat tissue. Further several small fat pieces were supported around the tucked margins to further augment the closure. Since long Temporalis fascia is the most widely used autogenous material for myringoplasty. However this time tested technique requires large incision, preparation of a tympanomeatal flap, and disconnection of the tympanic membrane and malleus. In our opinion in view of these technical difficulties endoscopic fat myringoplasty can make temporalis fascia technique a secondary choice. Since there is no disturbance to middle ear structures and there is also negligible risk of any iatrogenic otological trauma making this procedure very safe for tympanic membrane repairs. Our study demonstrates acceptable rates of successful perforation closures and audiological gain for all three grades of perforations with fat graft. These finding indicates that fat graft myringoplasty technique can also be performed successfully for medium and larger perforations hence can avoid the obstacles of the temporalis fascia technique mentioned above.

Closure of large perforations of tympanic membrane using fat plugging technique has been long debated. Recently studiesconducted by (Landsberg *et al*., 2006, Kim *et al*., 2011; and Gun *et al*., 2014), havesuggested that large tympanic membraneperforations can be effectively repaired by fat graft myringoplasty. Our study also demonstrated the efficacy and safety of Endoscopic fat myringoplasty techniques in small, medium and largetympanic membrane perforations with good success rates of perforation closure and improved audiological outcome.

Conclusion

Both ear lobule and abdominal fat can be easily harvested. This combined with endoscopic transcanal myringoplasty technique causes minimal morbidity to the patient undergoing tympanic membrane repair. The ease and simplicity makes endoscopic fat graft myringoplasty a safe procedure with minimal risk of iatrogenic ontological trauma. In our study as perforation size was not found predictive or determinant of successful myringoplasty using abdominal fat graft we propose fat graft from ear lobule and abdominal donor sites as a viable alternative for closing small and medium/large tympanic membrane perforations respectively in inactive mucosal disease.Patients who fail to respond with this procedure can undergo proper tympanoplasty at later date.

REFERENCES

Ahmed M. Alabbasi, Ihsan E. Alsaimary, Jassim M Najim 2010. Prevalence and patterns of chronic suppurative otitis media and hearing impairment in Basrah city *Journal of Medicine and Medical Sciences* Vol. 1(4) pp. 129-133.

Alan GK, Groves J. 1987. Scott-Brown's otolaryngology, 50thedn. Butterworth I˙nternational Edition, London, pp 14–15.

Althaus SR. 1986. Fat plug myringoplasty: a technique for repairing small tympanic membrane perforations. Same-Day Surg 10:88–89.

Ayache S, Braccini F, Facon F, Thomassin JM. 2003. Adipose graft: an original option in myringoplasty. *Otol Neurotol*., 24: 158-64.

Banzer, M. 1640. Disputatio de auditionelaesa (Dissertation on deafness).

Berthold, E. 1879. UberMyringoplastik. Med-chirCentralb 14:195–207.

BijanBasak, Ganesh Chandra Gayen, Munmun Das (Sarkar), GautamDhar, Ritam Ray, Atanu Kumar Das 2014. Demographic profile of CSOM in a rural tertiary care hospital. *IOSR Journal of Pharmacy*; 4(6): 43-46.

Buckingham RA. 1992. Fascia and perichondrium atrophy in tympanoplasty and recurrent middle ear atelectasis. *Ann Otol Rhinol Laryngol;* 101: 755–758.

Deddens AE, Muntz HR, Lusk RP. 1993. Adipose myringoplasty in children. Laryngoscope; 103: 216-9.

Fiorino, F., F. Barbieri. 2007. Fat graft myringoplasty after unsuccessful tympanic membrane repair. Eur Arch Otolaryngol, 264, pp. 1125-1128.

Glasscock ME, Shambaugh GE. 2010a. Surgery of the ear 6th edition pathology and clinical course of inflammatory disease of the middle ear. 25, pp 427–433.

Glasscock ME, Shambaugh GE. 2010b. Surgery of the ear 6th edition: Tympanoplasty: Tympanic membrane repair.pp 465-486.

Gross CW, Bassila M, Lazar RH, Long TE, Stagner S. 1989. Adipose plug myringoplasty: an alternative to formal myringoplasty techniques in children. Otolaryngol Head Neck Surg. 101(6):617–620.

Gun T, Sozen T, Boztepe OF, Gur OE, Muluk NB, Cingi C. 2014. Influence of size and site of perforation on fat graft myringoplasty. AurisNasus Larynx; 41: 507-12.

Hassan MoustafaHegazy 2013. Fat graft myringoplasty – A prospective clinical study: Egyptian Journal of Ear, Nose, Throat and Allied Sciences; 14, 91–95.

Inwood JL, Wallace HC, Clarke SE 2003. Endaural or postaural incision for myringoplasty: does it make a difference to the patient? ClinOtolaryngol Allied Science; 28(5):396-398.

J D Wasson, C E Papadimitriou, H Pau 2009. Myringoplasty: impact of perforation size on closure and audiological improvement. The Journal of Laryngology & Otology; 123, 973–977.

Kim DK, Park SN, Yeo SW, Kim EH, Kim JE, Kim BY. 2011. Clinical efficacy of fat-graft myringoplasty for perforations of different sizes and locations.ActaOtolaryngol; 131: 22-6.

Koc S, Akyuz S, Gurbuzler L, Aksakal C. 2013. Fat graft myringoplasty with the newly developed surgical technique for chronic tympanic membrane perforation. Eur Arch Otorhinolaryngol 270(5):1629–1633.

Konstantinidis, Iordanis; Malliari, Hariklia; Tsakiropoulou, Evangelia; Constantinidis, Jannis 2013. Fat Myringoplasty Outcome Analysis With Otoendoscopy: Who is the Suitable Patient?, Otology &Neurotology; Volume 34 - Issue 1 - p 95-99.

Kwong KM, Smith MM, Coticchia JM. 2012. Fat graft myringoplasty using umbilical fat. *Int J Pediatr Otorhinolaryngol* 76(8):1098–1101.

L.K. Yadav, J. Pradhananga (2011).A study of graft uptake rate of myringoplasties in Bir Hospital. Journal of College of Medical Sciences-Nepal; Vol-7, No-1, 24-27.

Lancaster JL, Makura ZG, Porter G, McCormick M. 1999. Paediatric tympanoplasty. *J Laryngol Otol*, 113(7):628-632.

Landsberg R, Fishman G, DeRowe A, Berco E, Berger G. 2006. Fat graft myringoplasty: results of a long-term follow-up. *J Otolaryngol*; 35: 44-7.

Milewski C. 1993. Composite graft tympanoplasty in the treatment of ears with advanced middle ear pathology. *Laryngoscope*; 103: 1352–1356.

Mitchell RB, Pereira KD, Lazar RH. 1997. Fat graft myringoplasty in children – a safe and successful day-stay procedure. *J Laryngo lOtol*., 111: 106-8.

Mohammed Shafiqul Islam, Md. Rafiqul Islam, Mohammad Ashequr Rahman Bhuiyan, Md. Shazibur Rashid, Pran Gopal Datta 2010. Pattern and degree of hearing loss in chronic suppurative otitis media: Bangladesh J Otorhinolaryngol; 16(2): 96-105.

Mustafa Acar, Demet Yazıcı, Turhan San, Nuray Bayar Muluk, CemalCingi, 2015. Fat‐plug myringoplasty of ear lobule vs abdominal donor sites.Eur Arch Otorhinolaryngol; 272:861–866.

Nishimura, T., Hashimoto, H., Nakanishi, I., Furukawa, M. 2000. Microvascular angiogenesis and apoptosis in the survival of free fat grafts Laryngoscope; 110: 1333-1338.

Ozgursoy OB, Yorulmaz I. (2005). Fat graft myringoplasty: a cost–effective but underused procedure. J LaryngolOtol; 119: 277-9.

Paparella MM, Schumrick DA, Gluckman JL, Meyerhoff WL 1991. Otolaryngology. 3rd edn. W.B. Saunders, Philadelphia.

Ringenberg JC 1962. Fat graft tympanoplasty. Laryngoscope 72:188–192.

Ringenberg JC. 1978. Closure of tympanic membrane perforations by the use of fat. Laryngoscope; 88: 982-93.

Saliba, Issam, and Owen Woods. 2011. "Hyaluronic acid fat graft myringoplasty: a minimally invasive technique." The Laryngoscope; 121.2: 375-380.

Shrestha S, Sinha BK. 2006. Hearing results after myringoplasty. *Kathmandu Univ* Med J;4:455-9.

Shrikrishna BH, Jyothi AC, Sanjay G and Samson SG. 2014. Age and Gender Differences in the Incidence of Non-Cholesteatomatous Chronic Suppurative Otitis Media. *International Journal of Research in Pharmaceutical and Biomedical Sciences*; 4(4): 1172-74.

Storrs L. 1961. Myringoplasty with the use of fascia grafts. Arch Otolaryngol Head Neck Surg; 74: 45-9.

Vartiainen E, *Nuutinen J.* 1993. Success and pitfalls in myringoplasty: follow-up study of 404 cases. *Am J Otol.,* 14: 301-5.

Zuk, P.A., Zhu, M., Ashjian, P.V. 2002. Human adipose tissue is a source of multipotent stem cells MolBiol Cell; 13: 4279-4295.

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