

Short Communication

Lobular Hyaline Fat versus Abdominal Globular Fat Graft for Repair of Tympanic Membrane Perforation

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- Ear lobule

Abstract

Myringoplasty is a common surgery in our practice so every Otolaryngologist should do this operation by using different graft materials to gain a comprehensive experience with familiarity about those grafts. In this study fat grafts were used in 80 patients. They were divided into 2 groups. In group A, fat graft was obtained from ear lobule and in group B from abdominal fat. After analysis of clinical and audio logical data we concluded that fat from ear lobule was anatomically and functionally better than those of abdominal fat in repair of tympanic perforations.

INTRODUCTION

Myringoplasty is a common procedure performed by otolaryngologists. Tympanic membrane (TM) perforation is most commonly a result of infection, trauma, or the squeal of tympanostomy tube insertion. Although most of traumatic perforations heal spontaneously, some others not heal and need treatment [1]. Every otolaryngologist should do myringoplasty by different techniques with different materials as fascia, fat, cartilage or combination of more than one material to be more familiar with any circumstances. Temporalis fascia remains until now the gold standard material in this issue. One of the drawbacks of temporal fascia is its shrinkage because it's fibrous content. Another drawback is its thinning makes it to retract with middle ear pressure changes [2]. Ringenberg [3] first reported the use of fat myringoplasty (FM) with success rate of 86%. Deddens and colleagues [4] reported 100% success rate of fat myringoplasty. Adipose tissue has been established to have many angiogenic materials, growth factors as well as stem cells to promote repair of destroyed epithelium [5]. The primary site for harvesting adipose tissue has been the ear lobule [6]. Other sites for fat graft are the post-auricular fat, pre-tragal area and from abdominal wall [7]. The presenting study introduces comparison between the hyaline fat grafts from ear lobule versus globular fat graft from abdominal wall for repair of tympanic membrane perforation.

MATERIAL AND METHODS

This study included 80 patients collected from the outpatient clinic of Ear, Nose and Throat at our tertiary Hospital at the

period from 2012 to 2017. The approval was obtained from the institutional Research Ethics Committee and the consent was obtained from all included patients. Inclusion criteria include: age ranged from 18 to \leq 50 years with acceptable general fitness, unilateral dry central perforation and persistent for at least 6 months from the onset. Exclusion criteria include: perforation of recent onset, large, subtotal or total perforations, and age > 50 years, general unfitness or debilitating conditions and sinonasal obstruction or infection. After history taking and examination the patients were divided into two groups. Group A included cases repaired by fat graft from ear lobule and group B included cases repaired with fat graft from abdominal wall. Consents were taken from all patients. All cases were operated under local anesthesia by injection of xylocaine 2% with adrenaline 1:50000. An otoendoscope 0⁰ connected to camera video monitor system was used in all cases. The edge of the perforation of the tympanic membrane was freshened by a needle or a sickle knife. In group A the fat graft was taken from the lobule of the ear by injection of local anesthesia in the posterior surface and a small incision was done to extract a piece of fat provided that the fat size is more than the size of the perforation. In group B fat graft was harvested from abdominal wall by a small incision just inferior to the umbilicus after local infiltration anesthesia. The lobular fat graft was compressed on a block of teflon and harvested to be 2mm more than the size of the perforation. The abdominal fat was difficult to be compressed so was inserted through perforation without compression. One circular piece of Gel foam was inserted in the middle ear under the graft. Small pieces of gel foam soaked with antibiotic drops were inserted in the external

ear canal. Follow up once every 2 weeks in the first 3 months. After completing follow up of 6 months, audiological evaluations were done for all cases.

Statistical analysis

The data was collected and analyzed by using Graphpad. Quickcalcs software. *P* value and statistical significance were measured by the unpaired *t* test

RESULTS

Interpretation of the results was conducted on 80 patients who fulfilled a regular follow up of at least 6 months postoperatively. They were 34 males and 46 females. The mean age at operation was 26 years in group A and 24 years in group B. Both groups were age matched (Table 1). The mean time of the procedure was 18 ± 5.25 minutes in group A and 16 ± 6.50 minutes in group B (Table 2). There was 100% take rate in group A and 82.5% in group B (Table 3). The mean postoperative air bone gap was nearly equal in both groups but there was significant improvement in comparison to preoperative air bone gap (Table 4). The percentage of air bone gap closure within 10 dB was achieved in 47.5% in group A as compared to 30.3% in group B (Table 5). The mean of air conduction thresholds at 250 - 4000 Hz was analyzed. The postoperative pure tone thresholds were extremely significantly improved in group A at 250, 500, 2000 Hz and very significantly improved at 4000 Hz. In both groups there was extremely significant improvement of postoperative pure tone thresholds (Table 6). Speech reception threshold (SRT) was improved from 38 dB to 22 dB in the first group and from 42 dB to 26 dB in the second group. Tympanometry type A was obtained in all cases with taking graft in both groups.

DISCUSSION

First reported in 1962 by Ringenberge [3], fat graft myringoplasty has been used and described as an effective and safe procedure for repairing small TM perforations. Fat grafts have abundant angiogenicities that promote restoration of fibrous tissues with revascularization as monobutyryl, prostaglandins, interleukins 1 and 6, cytokines and tumour necrosis factor [8]. 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 [9]. Fat contains high population of multipotent cells referred as adipose-

Variables	Group A	Group B
No. of patients	40	40
Mean age/year	26	24
Gender		
Male	18	16
Female	22	24
Side of operation		
Right	28	22
left	12	18
Anesthesia		
Local	40	40
General	0	0

Group A	18 ± 5.25 minutes
Group B	16 ± 6.50 minutes

Taken graft	Group A 40/40 (100%)	Group B 33/40 (82.5%)
Failed graft	0	7 (17.5%)

ABG	Group A	Group B	p
Preoperative	28.2 ± 11.6	24.6 ± 06.4	0.0897 (NS)
Postoperative	14.0 ± 08.5	15.8 ± 06.4	
P value	< 0.0001 (ES)	< 0.0001 (ES)	0.2879 (NS)

Abbreviations: ES: Extremely Significant; NS: N on Significant

Postoperative ABG closure	Group A	Group B
Within 10 dB	19/40 47.5 %	10/33 30.3 %
Within 20 dB	14/40 35 %	16/33 48.5 %
> 20 dB	7/40 17.5 %	7/33 21.2 %

	Preoperative	Postoperative	P value
(250 Hz)			
Group A	40.5 ± 05.6	18.5 ± 03.3	< 0.0001 (ES)
Group B	38.6 ± 7.4	22.4 ± 06.4	
P value	P= 0.2013 (NS)	P= 0.0010 (ES)	< 0.0001 (ES)
(500 Hz)			
Group A	40.6 ± 4.5	18.3 ± 3.5	< 0.0001 (ES)
Group B	39.5 ± 5.6	23.2 ± 4.5	
P value	P= 0.3358 (NS)	P= < 0.0001 (ES)	< 0.0001 (ES)
(1000 Hz)			
Group A	42.7 ± 06.7	26.7 ± 10.5	< 0.0001 (ES)
Group B	40.5 ± 05.5	29.5 ± 7.5	
P value	P= 0.1125 (NS)	P= 0.1739 (NS)	< 0.0001 (ES)
(2000 Hz)			
Group A	39.5 ± 5.5	26.5 ± 3.5	< 0.0001 (ES)
Group B	41.4 ± 4.5	30.6 ± 4.6	
P value	P= 0.0948 (NS)	P= < 0.0001 (ES)	< 0.0001 (ES)
(4000 Hz)			
Group A	43.6 ± 04.5	25.5 ± 11.6	< 0.0001 (ES)
Group B	41.7 ± 08.7	32.7 ± 12.5	
P value	P= 0.2236 (NS)	P= 0.0092 (VS)	< 0.0001 (ES)

ES: Extremely significant; VS: Very significant; NS: Non significant

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 [10]. Success rates of fat grafts have been reported from 76% to 92% [11,12]. Fat myringoplasty is not preferred in pediatric patients due to frequent upper airway infections and Eustachian dysfunctions [13,14]. The abdomen is an abundant source of fat but the nature of fat is different which is globular

Table 7: Advantages and disadvantages of fat from different donor sites.

	Advantages	Disadvantages
Lobule fat	Same organ of operation Compact hyaline Easy compression Easy Use in underlay, overlay and plug techniques	Limited fat obtained Scar can be visible
Abdomen fat	Abundant fat obtained Scar is not visible	Away from operation site Loose globular fat so Difficult compression Used only in plug technique not underlay or overlay

and loose making difficult shaping in a disc like to adapt the perforation. Some authors mentioned that abdominal fat is more vascular and can be successfully performed in small perforations [15,16]. Hyaluronic acid fat myringoplasty was used by Saliba [17] with success of 81%. Fiorino [8] reported fat success rate of up to 87%, even in cases of revisional cases. Ringen-berg [3] preferred ear lobe fat due to it is compact with enough fibers to support the graft and can be compressed to desired shape. Acar et al. [18], demonstrated equal effectiveness of abdominal fat graft and ear lobe fat graft on tympanic membrane healing. In our study, there was extremely significant improvement in pure tone thresholds at most frequencies in the group of ear lobe fat more than that obtained by abdominal fat. In summary, fat myringoplasty with ear lobule fat was highly effective for myringoplasty in properly selected patients. Ear lobule fat is compact, more stable, and could be compressed into a shield like, so it could be effectively used to repair tympanic membrane perforation by the same techniques of Temporalis fascia. The lobular fat was tough enough to be easily and conveniently handled by instruments, could be successfully compressed into discoid manner to adapt small to medium perforation size. Compressed ear lobule fat can be used as underlay or overlay graft, as well as the non compressed lobular fat can be used for inlay technique. Conversely umbilical fat was loose and globular not compact so was difficult to be compressed into disc manner so that could not be used under the perforation but inserted by an inlay technique (plug in the perforation). In my opinion the only advantage of abdominal fat is the donor site which have abundant amount of fat together with its hidden scar. The advantage and disadvantages of ear lobule fat from fat of abdominal wall in Table 7.

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