Research Article

Success Rate of Revision Myringoplasty Using Temporalis Fascia Graft

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Highlights

- Temporalis fascia is considered the best choice as a graft for myringoplasty
- The improvement of the air bone gap between 10-20 dB was 76.66%
- We showed the influence of some factors on the results

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ABSTRACT

Background and Aim: To evaluate the success rate of revision myringoplasty using temporalis fascia graft and to assess the effect of potential influencing factors on closure of tympanic membrane (TM) and hearing outcome such as size and site of perforation, whether the patient is smoking or not and condition of contralateral ear.

Methods: Thirty patients were included in this prospective study, who underwent revision myringoplasty for chronic otitis media without cholesteatoma in the period between 2017-2019 in the Department of Ear, Nose, and Throat-Head and Neck Surgery in Almowasat University Hospital. Data of all patients: perforation size and site, middle ear status, surgical approach, graft material, pre and postoperative morphological and functional results were assessed. The temporal fascia was used for the reconstruction of TM. The interrelation between multiple preoperative parameters and postoperative morphological (closure of the perforation) and functional (hearing level) outcomes were assessed.

Results: Successful closure rate of the TM perforation was 86.66% and failure rate was 13.34% in revision myringoplasty. The improvement of the air bone gap between 10-20 dB was 76.66% while the air bone gap between 20-30 dB was unchanged 23.33%.

Conclusion: Revision myringoplasty can offer reasonably good chances for postoperative graft healing and hearing improvement with a high success rate. This gives the patient a good benefit in protecting the ear from developing complications that may have poor structural changes in the middle ear (ossicular necrosis and tympanosclerosis) which in turn leads to hearing loss.

Keywords: Revision myringoplasty; temporalis fascia; tympanic membrane perforation

Introduction

Myringoplasty is performed as a single procedure or as a part of another ear operation such as a tympanoplasty or a tympanomastoid surgery. However, the operation success rate has been reported to be 75-100% [1, 2]. The primary outcome measure for success is the perforation closure. The other outcomes are hearing change and reduction in frequency of ear infections. Although morphological results for primary and revision myringoplasty are similar, the success rate of revision tympanoplasty for tympanic membrane perforation with chronic otitis media without cholesteatoma is not consistently reported in literature [3, 4]. Graft failure and poor hearing outcome have been reported by numerous authors after revision myringoplasty [5].

Temporalis fascia is still considered the best choice as a graft material for tympanic membrane TM closure and it remains the most commonly used graft in primary tympanoplasties [6-8]. However, a sceptical view exists regarding the use of fascia for residual defects after primary surgery although the number of studies comparing the success rates of fascia and other grafts for revision tympanoplasty is few [9, 10]. In fact, there are no studies available in which the same author reports the results of primary and revision tympanoplasty in one study using the same technique. Due to its excellent healing potential and satisfactory hearing outcomes, the cartilage has been advocated as a first choice substrate for tympanic membrane repair in revision tympanoplasty [11, 12].

The limited available literature that reports the results of revision myringoplasty is sometimes used to support the contention that revision myringoplasty is less successful than primary surgery [12, 13]. Poor graft take during revision tympanoplasty has been attributed to existence of certain conditions such as atelectatic ear, Eustachian tube dysfunction, active suppuration, tympanosclerosis and revision myringoplasty among others, where these results have not been as gratifying. These cases are defined as high-risk perforations. Candidates for revision tympanoplasty have experienced at least one failed attempt at repair of the tympanic membrane and are therefore, at higher risk for subsequent repair failure [13-16]. Revision tympanoplasty cases are a delicate situation for otologists and the success rate decreases in such operations [17, 18].

The aim of the present study was to evaluate the success rate of revision myringoplasty using temporalis fascia after a previously unsuccessful tympanoplasty and to assess the effect of factors such as size of perforation (less or greater than 50% of tympanic membrane), site (anteriorly or posteriorly located) of perforation, side of perforation, smoking status and condition of the contralateral ear that might influence 1) the closure of TM and 2) hearing outcome.

Methods

Study design

This prospective study was conducted in Almowasat University Hospital during the period between 2017-2019. This study included all patients who underwent revision tympanoplasty for chronic otitis media without cholesteatoma. All patients were followed up clinically at one and three weeks postoperatively, clinically and audiologically at 6-9 months postoperatively.

Patients

Patients were 18-65 years of age, 12-male and 18-female with residual or recurrent tympanic central perforation after previous unsuccessful reconstruction of TM and no active infection for at least three months before the revision procedure. Patients had an average of 25-40 dB air-bone gap on audiogram. patients below 18 years and above 65 years of age, those with active ear infection, attic perforation and/or retraction and audiometric loss not consistent with sole involvement of tympanic membrane were excluded from our study. The gender of the patient, site, size and side of perforation, smoking status and condition of contralateral ear (whether it is normal or there is something wrong like retracted TM or perforation) were assessed in final results outcomes. Audiometric values were calculated using threshold at frequencies 500, 1000, 2000 and 4000 Hz at 6-9 months postoperatively.

Surgical techniques

The surgery was performed under general anesthesia. The incision area behind the pinna and the auditory canal were injected by a solution of lidocaine/adrenaline 1.100.000. An incision was made 0.5-1 cm behind the postauricular crease with harvesting of the deep temporalis fascia graft. Thereafter, the external auditory meatus was entered, trimming the edges of tympanic membrane remnants, raising the tympanomeatal flap and annulus to reach the middle ear cavity (ossicular chain was normal in all patients), the graft was fixed using the underlay technique and a gel foam was used to cover the graft. Repositioning of the flap was performed followed by closure of the wound.

Statistical analysis

All of the data was collected and arranged on Excel 2016 to draw tables and illustrations. SPSS 16 was used to perform the necessary statistical tests for this work, as a t-test, Chi-Square test and p value.

1) closing of the perforation of the TM and 2) improvement of the air-bone gap to between 10-20 dB after 6-9 months were considered the success of this surgery.

Results

A total of 30 patients were participated in the study undergone revision myringoplasty and completed the follow-up program. The interval time from the primary operation to revision ranged from 18 months to 24 months. During that time status of the perforation and contralateral ear were monitored. Type c tympanogram and varying degree of TM retraction without cholesteatoma were observed in eight patients. Fourteen patients (46.66%) underwent right myringoplasty and sixteen patients (53.34%) underwent left myringoplasty. Perforation closure with temporalis fascia was observed in 26 out of 30 (86.66%) ears. The graft take results in relation to various factors are shown in tables below. Patients who smoked were 22 out of 28. Site of perforation and smoking status were not found to be significant determining factor for successful revision myringoplasty (p=0.513, p=0.447 respectively). Graft take was higher in cases with small perforation (<50% of TM) 91.30% than in cases with large perforation (>50% of TM) 71.42% (p=0.002). Graft take was higher in patients with normal contralateral ear (n=22, 90.90%) compared to the patients with contralateral ear retraction (n=8, 75%) (p=0.001). All 30 patients had normal ossicular chain. The average preoperative bone conduction threshold was 16.75 decibels and the average postoperative bone conduction threshold improved to 13.50 decibels which was not statistically significant (p=0.332). The average preoperative air conduction threshold was 38.5 decibels and the average postoperative air conduction threshold improved to 27.25 decibels which was statistically significant (p=0.001). The average preoperative air bone gap was 21.5 decibels and the postoperative air bone gap was 13.25 decibels which was statistically significant (p=0.004) (Tables 1 and 2).

Table 1. Factors affecting significantly and insignificantly the outcome of surgery

	Factors	No. (%)			p
		Total patient (%)	Success (%)	Fail (%)	
Site of perforation	Anterior	19 (63.33)	16 (84.21)	3 (15.78)	0.513
	Posterior	11 (36.66)	1 (90.90)	1 (9.09)	
Size of perforation	>50%	7 (23.33)	5 (71.42%)	2 (28.57)	0.002
	<50%	23 (76.66)	21 (87.5)	2 (8.69)	
Contralateral ear (Retraction/perforation)	Yes	8 (26.66)	6 (75)	2 (25)	0.001
	No	22 (73.33)	20 (90.90)	2 (9.09)	
Smoking	Yes	6 (20)	5 (83.33)	1 (16.66)	0.447
	No	24 (80)	21 (87.5)	3 (12.5)	

Table 2. Hearing level before and after surgery

	Mean±SD		p
	Preoperative	Postoperative	
Bone conduction threshold	16.75±5.08	13.50±6.02	0.332
Air conduction threshold	38.5±15.05	27.25±13.81	0.001
Air bone gap	21.5±11.20	13.25±7.03	0.004

Discussion

Myringoplasty is the most common middle ear surgery performed in our center with cases referred from all regions of the country. Repair of a recurrent tympanic membrane perforation is a challenge for the ear surgeon. Although primary tympanoplasty has high successful rates 90% or higher [7, 8, 19], successful outcome in revision cases can be more difficult to achieve.

There was a significant difference in graft take with the size of perforation in this study, similar results have been shown in some international studies. In this study the researcher achieved a success rate of 91.30% for small perforations (size less than 50%) and 71.42% for large perforations (size greater than 50%). However, in the case of larger TM defects, perforation closure has less chance. It has been attributed to increase technical difficulties and poor vascularization and epithelialization with larger perforations. The absence of an adequate residual TM in subtotal or total TM perforations remains a challenge to otolaryngologists. Study by Kotecha et al. [19] and Onal et al. [20]. have shown better graft take in a small size perforation as compared with a large perforation.

In this study, we found the status of the contralateral ear to be an important prognostic factor surgical success. Same as our report study by Sevil and Doblan. [21]. Graft take was significantly poor when the contralateral ear had a retraction of TM (p=0.001). This finding might indicate an Eustachian tube dysfunction and the tendency of chronic otitis media to present as a bilateral disease [22]. The status of contralateral ear is important in two aspects: first, in its contribution for understanding the pathogenesis of otitis media and second, in its implications in treatment and counselling. The researcher found similar results in the studies by Calyan et al. [23] and Ophir et al [24].

There was no significant difference in graft take with the site of perforation in this study although the success rate in posterior perforations was slightly higher than anterior perforations 90.90% vs 84.21% respectively. This has been attributed to technical challenges such as poor visibility of anterior margin of perforation, more difficult access, inadequate graft support and relatively poorer perfusion in anterior portion of tympanic membrane [25]. However, most of the recent studies have found that the site of perforation is not a determining factor for successful myringoplasty [26, 27].

In this study graft take in non-smoking group was 87.5% and that in the smoking group was 83.33%. This difference was not statistically significant possibly due to unknown number of cigarettes per day and duration of smoking. It has been demonstrated that smoking changes the amount and viscosity of mucous and destroys the ciliated epithelium of the Eustachian tube and middle ear mucosa [26]. Nicotine causes cutaneous vasoconstriction, promotes thrombosis and carbon monoxide inhaled in cigarette smoke also reduces the oxygen-carrying capacity of the blood which in turn causes inadequate oxygenation of the graft. These factors may impair the graft vascularization. The systemic effects of smoking are the chemo-allergic and immunosuppressive properties that may cause increase susceptibility to the infectious agents and thereby lead to graft failure [27]. Same as our report, study by Wasson et al. [28]. did not find smoking to be a significant factor for successful myringoplasty.

The authors also found a statistically significant result when studying closure of the air-bone gap with most being between 10-20 decibels. Hearing improvement after myringoplasty is statistically significant if the ossicles are normal.

Four patients in this study had completely lost the graft due to infection with graft necrosis and poor anterior adaptation of the graft.

Conclusion

Revision myringoplasty can offer reasonably good chances for 1) postoperative graft healing and 2) hearing improvement with a high success rate. This gives the patient a good benefit in protecting the ear from developing complications that may have poor structural changes in the middle ear (ossicular necrosis and tympanosclerosis) which in turn leads to hearing loss. Despite the recommendation of many studies that the use of a cartilage graft in the revision myringoplasty is more preferred, the researchers found that using a fascial graft gives good surgical results, both in terms of graft take or improving hearing after surgery. In this study, we were not able to adopt a control group for comparison and the sample was relatively small.

Ethical Considerations

Compliance with ethical guidelines

The research was conducted under the criteria of the Ethics of Damascus University which is compatible with Helsinki standards. All patients agreed to participate in the study and were well informed about the study, stages and the operation risks, so they fulfilled a consent.

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Conflict of interest

No conflicts of interest are declared by the authors.

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