ORIGINAL ARTICLE

COMPARISON OF GRAFT UPTAKE BY UNDERLAY AND OVERLAY TECHNIQUE IN MYRINGOPLASTY

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Background: About 80% of tympanic membrane tears consequential of middle ear infections or trauma restore spontaneously. Myringoplasty is the procedure to fix the perforation which fails to heal. It is of two types; overlay and underlay techniques. In former technique graft is placed lateral to the fibrous sheet of the tympanic membrane while in underlay technique the graft is placed medial to the tympanic membrane remnant. The published success rates of underlay and overlay myringoplasty varied. This study was conducted to evaluate the effectiveness of graft uptake by underlay and overlay technique in patients undergoing myringoplasty. **Methods:** This randomized control trial including 80 patients was carried out at Otorhinolaryngology department of Combined Military Hospital, Rawalpindi from April 2016 to September 2017. Patients going through myringoplasty for tympanic perforations were randomly allocated into two groups. Group-A underwent underlay while Group-B underwent overlay myringoplasty. **Results:** The age of the patients ranged from 20 to 40 years with a mean of 29.58±5.92 years with a male to female ratio of 1.2:1. Hearing improvement was significantly higher (97.5% vs. 77.5%) in patients undergoing underlay versus overlay myringoplasty. The frequency of effectiveness in terms of graft uptake was significantly higher in patients undergoing underlay (95.0% vs. 57.5%) as compared to overlay myringoplasty. **Conclusion:** The underlay procedure is more effective in terms of graft uptake and lesser complications as compared to overlay myringoplasty.

Keywords: Tympanic Perforation; Underlay Myringoplasty; Overlay Myringoplasty

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INTRODUCTION

The tympanic membrane (TM) is not only important for hearing but also plays a key role in the pathophysiology of chronic infection of middle ear. The ear drum perforation impairs the quality of life.[1] The TM perforation usually results from middle ear infections and trauma but up to 80% restore spontaneously while others may need Myringoplasty; which is the surgical repair of the perforation.[2] This procedure is done via postaural, endaural or endomeatal approach through which grafts from temporalis fascia, vein graft or perichondrium are placed.[2,3]

There are two methods of myringoplasty; overlay technique and underlay technique. In overlay the graft is placed lateral to the fibrous layer of the tympanic membrane while in underlay technique the graft is applied medial to the tympanic membrane remnant. Although overlay method has higher success rate for the repair of anterior large or subtotal perforation but it is challenging and requires expertise and is also known for complications like anterior angle blunting, graft lateralization, epithelial pearls and delayed healing.[4] The restoration of anterior quadrant perforations is difficult compare to the posterior perforations due to graft's viability, bulge of the anterior canal wall and medialization of the graft. For anterior perforations graft is placed medial to the tympanomeatal flap with underlay technique.[5]

Temporalis fascia is most frequently used grafting material because of its locality and resistance to infections. Other sources like skin, homologous TM, dura, tragal cartilage, perichondrium and vein have been used. Success of myringoplasty is evaluated in terms of perforation healing and hearing improvement.[6] Surgical approach, technique (underlay vs. overlay), perforation site and graft material all effect the success.[2]

Variable anatomic and functional results have been noted.[2] Some authors noted same rate of graft uptake in both techniques with underlay technique a better option because of quick graft healing (92.8% vs. 57.1), hearing gain in more patients (92.8% vs. 57.1%) and minimal complications (6.6 vs. 33.3).[7] Gulia *et al*[8] showed best overall success with combined technique. A recent study showed overall closure rate for myringoplasty as 89.5% with average 9.4 db hearing improvement.[9] The rationale of the study was to compare the success of underlay and overlay myringoplasty in terms of graft uptake as

tympanic membrane perforations is a frequent problem in our community.

MATERIAL AND METHODS

After approval from hospital ethical committee this randomized control trial was conducted at the Department of Otorhinolaryngology and Head and Neck surgery Combined Military Hospital Rawalpindi from April 2016 to September 2017.

Total of 80 cases with dry tympanic membrane perforation of various sizes were divided in two groups. Sample was calculated using previous study[7] with graft uptake of 57.1% and 92.8% by WHO sample size calculator. Patients were selected by Non-Probability, Consecutive Sampling.

After taking informed consent detailed otoscopic examination was carried out to select the sample. Patients were assigned into two groups randomly. Those undergoing underlay technique were assigned group A and those undergoing overlay technique group B. The final outcome was measured after 3 months in the form of hearing improvement and absence of complications of both the groups were reviewed in terms of pure tone audiometry and otoscopic examination in OPD.

RESULTS

The age of the total 180 patients ranged from 20 to 40 years with a mean of 29.58±5.92 years. There was slight male predominance with male to female ratio of 1.2:1. The duration of the symptoms varied from 1–16 years with a mean of 7.26±3.60 years. Most of the patients had perforation size ≤25%.

The hearing improvement was significantly higher along with lower complications in patients undergoing underlay as compared to overlay myringoplasty (Table 2 and 3). Complications included epithelial pearls and ear discharge in 1 patient each in underlay group while ear discharge (5 patients), blunting of anterior sulcus (4 patients), epithelial pearls (3 patients) and lateralization of graft (1 patient) in overlay technique.

The graft uptake was notably higher in patients undergoing underlay (Table-2) with some differences considering age, gender, duration of symptoms and size of perforation groups.

Table-1: Baseline characteristics of study groups

Characteristics	Underlay Myringoplasty n=40	Overlay Myringoplasty n=40	*p*-value
Age (years)	29.48±6.35	29.68±5.54	0.881
● 20-30 years	24 (60.0%)	22 (55.0%)	0.651
● 31-40 years	16 (40.0%)	18 (45.0%)	
Gender			
● Male	22 (55.0%)	22 (55.0%)	1.000
● Female	18 (45.0%)	18 (45.0%)	
Duration of Symptoms	7.45±3.67	7.08±3.56	0.644
● 1-5 years	13 (32.5%)	16 (40.0%)	0.745
● 6-10 years	18 (45.0%)	17 (42.5%)	
● 11-16 years	9 (22.5%)	7 (17.5%)	
Size (% of total)			
● ≤25%	21 (52.5%)	22 (55.0%)	0.963
● 25-50%	10 (25.0%)	9 (22.5%)	
● >50%	9 (22.5%)	9 (22.5%)	

Chi-square test and independent sample t-test, observed difference was statistically insignificant.

Table-2: Comparison of hearing improvement and graft uptake between the two study groups

	Study Group		Total	*p*-value
	Overlay Myringoplasty (n=40)	Underlay Myringoplasty (n=40)		
Hearing Improved	31	39	70	0.007*
	77.5%	97.5%	87.5%	
Hearing not Improved	9	1	10	
	22.5%	2.5%	12.5%	
Total	40	40	80	
	100.0%	100.0%	100.0%	
Graft Uptake	23	38	61	<0.001*
	57.5%	95.0%	76.3%	
Graft Rejected	17	2	19	
	42.5%	5.0%	23.8%	
Total	40	40	80	
	100.0%	100.0%	100.0%	

Table-3: Comparison of frequency of complications between the two study groups (n=80)

Complications	Study Group		Total	*p*-value
	Overlay Myringoplasty (n=40)	Underlay Myringoplasty (n=40)		
Yes	13	2	15	0.002
	32.5%	5.0%	18.8%	
No	27	38	65	
	67.5%	95.0%	81.3%	
Total	40	40	80	
	100.0%	100.0%	100.0%	

Chi-square test, * observed difference was statistically significant.

DISCUSSION

Most of the TM perforations heal without any sequele.[2] failure to heal may need a surgical intervention via a procedure called Type I Tympanoplasty or Myringoplasty.[2] There are two commonly used surgical methods for myringoplasty which are underlay and overlay.[4] This study aimed to compare the two types of myringoplasty.

The mean age of the patients of this study was 29.58±5.92 years which was comparable to a study by Onel *et al*.[10] while Yurttas *et al*.[11] reported mean age of 27.3±11.2 years among Turkish patients while a similar mean age of 27.8±.8 years has been reported by Chouhan *et al*.[12] in Indian patients with tympanic membrane perforation. Shishegar *et al*.[13] reported similar mean age of 30±4.8 years in Iranian such patients.

In the present study, there were 44 (55.0%) male and 36 (45.0%) female patients with a male to female ratio of 1.2:1. A parallel male predominance with ratio of 1.2:1 was reported by Chouhan *et al*.[12] Övet *et al*.[14] observed 1.1:1, Khalilullah *et al*.[15] 1.5:1 and Shishegar *et al*.[13] 1.3:1 male predominance.

The mean duration of symptoms was 7.26±3.60 years in the present study. Abdelghany *et al*.[16] reported similar mean duration of symptoms 7.09±4.3 years among Egyptian patients undergoing myringoplasty.

Complications were significantly lower (5.0% vs. 32.5%; p=0.002) in patients undergoing underlay compare to overlay myringoplasty. Similar rate of complications was shown by Singh et al.[7] who reported 6.6% with underlay compared to 33.3% in overlay technique.

In this present study we also observed significantly higher frequency of effectiveness in terms of graft uptake in patients undergoing underlay of 95.0% compared to 57.5% by overlay myringoplasty with statistically significance p-value of <0.001. These results are similar to the results published by Singh *et al*.[7] where they also observed similar significant difference in the effectiveness of two techniques (92.8% vs. 57.1%; p<0.05). Our results are also in line with those of Arumugam *et al*.[17] and Glasscock *et al*.[18] of 91.5% and 96.0% respectively for effectiveness of underlay technique.

A very strong limitation to the present study was that we didn't follow the patients beyond 3 months so long term efficacy of this approach is not established. Further studies with long term follow-up are required and recommended in future research.

CONCLUSION

The rate of graft uptake was significantly higher in patients undergoing underlay both in terms of graft uptake and hearing improvement as compared to overlay myringoplasty regardless of patient's age, gender, and duration of symptoms and size of perforation.

AUTHORS' CONTRIBUTION

MK: Conceptualization, data collection, interpretation, write-up. TS: Literature search, data analysis, write-up. TA: Literature search, proof reading. UA: Data collection, write-up. AK: Data collection, proof reading.

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