COMPARATIVE STUDY BETWEEN UNDERLAY AND OVERLAY TECHNIQUE IN TYPE 1 TYMpanoplasty IN CSOM MUCOSAL INACTIVE TYPE

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ABSTRACT

Otitis Media (OM) is an inflammatory condition which usually involves muco-periosteal covering of middle ear cleft (partial or full) comprising of eustachian tube (ET), hypo-tympanum, meso-tympanum, epi-tympanum, additus and the mastoid air cells.

Myringoplasty was introduced by Berthold⁵ long back in 1878 and included the surgical closure of tympanic membrane perforation including removal of epithelium and grafting with skin. This period witnessed an improvement in surgical techniques with improved optics and emergence of microsurgery, thus making the Myringoplasty safer and lowered the rate of graft rejection. In this study we have compared the the grafting technique in type-1 tympanoplasty of in CSOM mucosal inactive type.

KEYWORDS

Underlay, Overlay, Tympanoplasty

INTRODUCTION

Otitis Media (OM) is an inflammatory condition which usually involves muco-periosteal covering of middle ear cleft (partial or full) comprising of eustachian tube (ET), hypo-tympanum, meso-tympanum, epi-tympanum, additus and the mastoid air cells.¹

All age groups are affected and there are multiple factors contributing to it. The most common being infections, ET dysfunction, allergy in the nose and trauma. OM is classified pathologically into following types²:

- Mucosal (active or inactive)
- Squamosal (active or inactive)
- Chronic (healed)

ET dysfunction when chronic and accompanied by secondary negative middle ear pressure is a frequent cause of perforation as well as recurrent atelectasis. Cholesteatoma may or may not be present. Reconstruction is done using fascia or perichondrium to reserve the anatomy and functional status of tympanic membrane.³ The process is known as Tympanoplasty. It is a surgery performed not only for reconstructing Tympanic membrane but also the ossicles of the middle ear.

Wullestein⁴ was the person who first coined the term Tympanoplasty and used split thickness graft for the same.

The aim of repairing the perforation is:-

- Normal/ non restricted social life of patient which also includes any issue related to water entry.
- To correct the hearing loss occurred due to perforation.

Types of tympanoplasty as described by Wullstein⁴:

- Type I:** Also called myringoplasty and only involves the examination of tympanic cavity and restoration of the perforated eardrum by grafting.
- Type II:** Ossicular chain partially destroyed but preserved and continuity restored. Graft lay against the ossicles after removal of the bridge.
- Type III:** Myringostapediopexy producing a shallow middle ear and a columella effect.
- Type IV:** Round window protection with a small middle ear mobile footplate left exposed.
- Type V:** Closed middle ear with round window protection; fenestra in the horizontal semicircular canal covered by a graft.

Myringoplasty was introduced by Berthold⁵ long back in 1878 and included the surgical closure of tympanic membrane perforation including removal of epithelium and grafting with skin. This period witnessed an improvement in surgical techniques with improved optics and emergence of microsurgery, thus making the Myringoplasty

safer and lowered the rate of graft rejection.

The grafting technique which have been compared in this study are as follow:

- Overlay technique: the graft is placed lateral to the annulus or the remnant of tympanic membrane and only the epithelial layer is elevated. In this technique anterior meatal recess is better visualized so can be used for anterior perforations extending into anterior annulus.
- Underlay technique graft is placed medial to annulus or manubrium of malleus, ideal for small or posterior perforation and is relatively easier to perform.
The concept of placing the graft medial to annulus was given by Shea and Tabb in 1960⁶.

METHOD AND MATERIAL:

The study was conducted in 82 patients. The study cohort included patients who had a central perforation with no discharge for 6 weeks or more and were followed up for at least till 6 months after the surgery.

Patients in which the procedure was contraindicated, for example, those having cholesteatoma, ossicular chain dysfunction, sensorineural hearing loss, patients less than 10 years of age or those not medically fit for the operation due to chronic systemic diseases were not included.

Also, patients in which infection stemmed from extra aural sites like that in sinusitis, recurrent tonsillitis, nasal obstruction. From the patients undergoing the surgery, a written informed consent was taken.

A detailed history was taken and clinical examination was performed. All patients were subjected to pure tone audiometry, within 3 months of the procedure.

Besides these, tuning fork test, microscopic examination of ear, X-ray of mastoid and CT of temporal bones were done, along with regular preoperative laboratory investigations.

For the purpose of this study, in all the patients, the surgery was done under GA by a post auricular approach and for the graft, temporalis fascia was used.

Techniques used for the purpose of this study include underlay and overlay techniques

The patient may be discharged in a day or two. They are advised to keep the ear dry and to avoid blowing their nose vigorously and sneezing with mouth open to minimise straining. Patients are called for regular follow-up every two weeks initially and then monthly, for six months. Mero-cel is removed in the first post op visit, that is, after 1 week of surgery. A pure tone audiometry is performed 3 months after surgery.

The data was assimilated considering various variables like gender of the patient, age, type and size of perforation, surgical method used, and complications if any.

RESULTS

The study was conducted between time duration of December 2017 to December 2018 total of 82 patients were included in the study. Group A (underlay) comprised of 40 cases (48.78%) and on the other side group B (overlay) consist of 42 cases (51.22%). Patients age ranged from 16 and 51 years in group A whereas in Group B age ranged between 17 and 48 years. The mean age in Group A being 32.22 years (standard deviation 9.22) whereas in group B mean age ranged between 31.78 years (standard deviation 8.64). By means of ANOVA the p value between the mean age of patients in both groups came to be 0.824 which was statistically insignificant.

47.5% (19 cases) left ear was involved and 52.5% (21 cases) right ear was involved in group A.

38.09% (16 cases) left ear was involved and 61.9% (26 cases) right ear was involved in group B.

Unilateral ear involved 77.5% (31 cases) whereas bilateral ear was involved in 22.5% (9 cases) in group A.

Whereas in group B unilateral ear involvement was in 83.3% (35 cases) and 16.7% (7 cases) in group B.

The preoperative AB gap in Group A was 11-20 db in 8 cases, 21-30 db in 17 cases, 31-40 db in 15 cases. The preoperative AB gap in Group B was 11-20 db in 7 cases, 21-30 db in 16 cases, 31-40 db in 19 cases. (Table-1)

The mean AB gap in group A was 25.57 db (SD 6.68) and in Group B the mean AB gap was 28.96 db (SD 6.45) p value being 0.34 on comparing the mean preoperative AB gap which was statistically insignificant.

The success rate of graft intake in group A was 92.5% (37 cases) and 85.72% (36 cases) in group A. The failure rate was 7.5% (3 cases) in group A and 14.28% (6 cases) in group B. On comparing the graft uptake rate in both the groups the p value came out to be 0.52 which was statistically insignificant (Table-2)

Postoperative AB gap <10 db was observed in 5 patients, 11-20 db in 19 patients, 21-30 db in 16 patients and no case was seen between 31-40 db in group A. On the other hand in group B <10 db was found in 6 cases, 11-20 db in 17 cases, 21-30 db in 18 cases and 31-40 db was observed in 1 case. The mean postoperative AB gap improved to 17.58 db (SD 5.79) in group A, whereas in group B postoperative AB gap improved to 19.17 db (SD 7.01). p value between two groups being 0.26 which was statistically insignificant. (Table-3)

Table-1: Pre-op audiological assessment ABG

Decibel	Pre-Op Audiological Assessment ABg (db)					
	Group A			Group B		
	Number	Percentage %	Group Total	Number	Percentage %	Group Total
11-20	8	20.00	40	7	16.67	42
21-30	17	42.5		16	38.09	
31-40	15	37.5		19	45.24	
>40	0	0		0	0	

Table-2: Graft uptake (follow up-3 months)

	GRAFT UPTAKE					
	Group A			Group B		
	Positive	Negative	Total Cases	Positive	Negative	Total Cases
Numbers	37	3	40	36	6	42
Percentage	92.5	7.5	100%	85.72	14.28	100%

Table 3: Post-operative audiological assessment ABG gain.

Decibel	Post-op audiological assessment abg gain (db)					
	Group A			Group B		
	Number	Percentage %	Group Total	Number	Percentage %	Group Total
<10	5	12.5	40	6	14.28	42
11-20	19	47.5		17	40.48	
21-30	16	40		18	42.86	
31-40	0	0		1	2.38	

DISCUSSION

In our study, 82 cases in the age group varying from 15-50 years and both gender with normal functioning ET, dry ear for last 4 weeks with single large central perforation were taken from Otorhinolaryngology Department of MMIMSR, Ambala. Complete detailed history, clinical assessment of the patients and all routine investigations were performed. Pre-operatively Pure Tone Audiometry was done to determine the type and degree of deafness. In the follow-up period of 3 months again post operatively audiometry was performed to access the degree of hearing gain.

Glasscock⁷ (1976) said that young age was a relative contraindication for the surgical intervention since children less than 3 to 4 years of age are most susceptible to recurrent upper respiratory tract infection and frequent episodes of OM.

Wullstein⁸ was the first who used the term tympanoplasty. It included all the procedures undertaken for reconstruction of hearing mechanism impaired by chronic ear disease.

In 1952, Wullstein was the first to use split thickness skin graft so as to close the perforation. One year later Zollner⁹ also used the similar graft material.

In 1963, Zollner⁹ used fascia lata as graft material to close perforation.

Parmod Kalsotra et al¹⁰ in 2017 a study between overlay and underlay stated that underlay technique was slightly better with the graft uptake rate of 91.43% and mean postoperative AB gap of 11.11 db as compared to the overlay technique in which the graft uptake rate was 89.18% and mean post-operative AB gap of 11.72 db.

In a study conducted by Shahpou Kouhpaei¹¹ he concluded hearing improvement was 83.8% with overlay technique and 64.5% with underlay technique he also stated that hearing improvement was better with overlay technique.

In a study by Ashfaq¹² et al in 2004, reported a success rate of graft uptake of 73% in 105 cases by underlay technique of tympanoplasty.

In 1995 Khan and Khan¹³ in study of 94 cases reported 77.5% of successful graft uptake by underlay technique.

In a study conducted by Fadl¹⁴ in 2003 his results were 85.4% success with underlay technique of tympanoplasty and 66.7% successful graft uptake by overlay technique.

Ortgren¹⁵ in 1964 presented a paper on the result of myringoplasty which was carried out since 1957 by various otologists like Zollner, Wright, Heerman et al etc. based on the extensive study he concluded that connective tissue grafts are superior to skin graft material and the results of myringoplasty done on patient above 40 years were not so good as those below this limit. Also noticed that re-perforations occurred before 6 months in most cases at follow up. He introduced the term myringoplasty.

Wehrs¹⁶ and others observed that an aerated middle ear space is a pre-condition to achieve a positive post-operative outcome from tympanoplasty. Poor ET function is the most common cause of inadequate aeration of middle ear post tympanoplasty. Other contributing factors include middle ear adhesions, loss of support of the posterior canal wall and inadvertent blockage of the ET orifice by graft material. Aeration of the mastoidectomy cavity is also important to prevent collapse of the posterior canal wall, retraction pockets and ensure an adequate air reserve.

In our present study successful intake of graft with underlay technique 92.5% was slightly better than overlay technique of myringoplasty which was 85.72% but it was statistically insignificant p value 0.52.

complication rate was slightly lower in group A as compared to group B 1 case of graft lateralization was seen in group A whereas 2 cases of graft medialization was seen in group B.

CONCLUSION

Evaluating our study in the light of present literature we emphasize that both the techniques of underlay and overlay showed good results in terms of hearing improvement but graft uptake rate was slightly higher

with underlay technique as the graft is well supported medially by the mucosal layer and is relatively simple and less time consuming.

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