Original Research Article

A study on the outcome of tympanoplasty with various graft materials

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International Archives of Integrated Medicine, Vol. 5, Issue 12, December, 2018.

Available online at http://iaimjournal.com/
ISSN: 2394-0026 (P) **ISSN: 2394-0034 (O)**
Received on: 01-12-2018 **Accepted on:** 05-12-2018
Source of support: Nil **Conflict of interest:** None declared.
How to cite this article: Harinarayana N, Srikanth M. A study on the outcome of tympanoplasty with various graft materials. IAIM, 2018; 5(12): 77-82.

Abstract

Background: Chronic Suppurative Otitis Media (CSOM) is one of the most common causes of preventable hearing loss especially in developing countries. CSOM is a disease condition characterized by persistent perforation of tympanic membrane with recurrent or persistent muco-purulent Otorrhoea.

Aim: This study was undertaken to review the outcomes (hearing improvement) achieved by using various graft materials like temporalis fascia (TF), tragal cartilage (TC), Conchal cartilage (CC), autologous sculpted incus (I), autologous cortical bone (BG) in tympanoplasty surgery.

Material and methods: This study comprised of 14 males and 16 females patients with age ranging from 12 years to 55 years. They were selected for surgery after adequate history taking, clinical, otoscopic and microscopic examination. Type 1 tympanoplasty was done in 19 patients, Type 3 tympanoplasty + Modified Radical Mastoidectomy (MRM) was done in 11 patients by using various graft materials. The results were evaluated in the form of rate of graft success, hearing gain, and the pre and post-operative Air Bone gap.

Results: Out of 30 patients, in 20 TF graft patients AB gap improvement seen in 14 patients, 5 patients did not show any change and 1 patient did not come for follow up. In 2 TC graft patients, both showed improvement in AB gap. In 1 patient where CC graft was used showed improvement in AB gap. In 6 patients I graft was used, 2 patients showed improvement, 2 patients did not show any change, 1 patient did not come for follow up and in 1 patient AB gap worsened. In 1 patient BG was used and no change in AB gap was seen. Out of 30 cases graft uptake was seen in 25 cases and graft rejection was seen in 3 cases and 2 patients did not come for follow up. Graft rejection was documented in one case where TF was used, one case where incus graft was used and in another case where BG was used.

Conclusion: Post-operative hearing gain obtained was found to be better in patients operated upon with tubotympanic disease than those operated upon with atticoantral disease. The post-operative hearing improvement depends not only on the graft material used and the type of tympanoplasty but also on the pre-operative status of the ossicular chain.

Key words

Tympanoplasty, Temporalis fascia graft (TF), Tragal cartilage (TC), Conchal cartilage graft (CC), Autologous sculpted incus graft (I), Autologous cortical bone (BG), Modified Radical Mastoidectomy (MRM).

Introduction

Chronic Suppurative Otitis Media (CSOM) is one of the most common causes of preventable hearing loss especially in developing countries. CSOM is a disease condition characterized by persistent perforation of tympanic membrane with recurrent or persistent muco-purulent Otorrhoea [1]. The duration of the Otorrhoea has been a subject of controversy among otolaryngologist with various definitions ranging from six weeks to three months from various studies [2, 3]. The patients usually present with ear discharge, perforation of tympanic membrane or attic retraction and hard of hearing.

Tympanoplasty is a procedure to eradicate the disease in the middle ear cleft and to reconstruct the hearing mechanism. The first reports about the reconstruction of the sound conduction apparatus by Wullstein and Zöllner [4, 5].

Nowadays temporalis fascia is the most commonly used graft material. Other materials used being tragal perichondrium, tragal cartilage, conchal cartilage, vein graft and fascia lata. Such abundance of materials implies that there is no clear cut favorite and the choice of graft material depends on individual surgeon's preference [6, 7].

The materials used for ossiculoplasty are incus, bone graft, total ossicular replacement prosthese (TORP), partial ossicular replacement prostheses (PORPs).

Aim and objectives

This study was undertaken to review the outcomes (hearing improvement) achieved by using various materials like temporalis fascia, cartilage, incus, bone in tympanoplasty surgery.

Materials and methods

This study comprised of 30 patients of which 14 were males and 16 were females with age of the patients ranging from 12 years to 55 years. Patients were selected for surgery after adequate history taking, clinical examination, otoscopic and microscopic examination.

Study design

This study was a prospective study, carried out from August 2014 to July 2015 at Otorhinolaryngology Department, SVS Medical College and Hospital, Mahabubnagar. Patients with unilateral or bilateral ear discharge and other sign and symptoms suggestive of CSOM (hearing loss, otalgia, perforation and tinnitus) attending Otolaryngology OPD (Out Patient Department) were included in the study.

Surgical procedure

Type 1 tympanoplasty was done in 19 patients who presented with central perforation (i.e. Tubotympanic disease). Among these 19 patients, temporalis fascia graft (TF) was used in 17 patients and tragal cartilage (TC) graft was used in 2 patients.

Type 3 tympanoplasty + Modified Radical Mastoidectomy (MRM) was done in 11 patients. Indications for surgery in 5 of them being attic cholesteatoma and in 6 of them being cholesteatoma with granulations (i.e. atticoantral disease).

Among these 11 patients, Temporalis Fascia (TF) graft was used in 3 patients, Conchal cartilage graft (CC) was used in 1 patient, autologous sculpted incus graft (SI) was used in 6 patients and autologous cortical bone graft (CB) was used in 1 patient.

In all the patients inlay technique of graft placement was done.

Audiometric data

Thereafter, all patients were called for regular follow-up once weekly for 1 month and fortnightly for 3 months, then after 6 months and 1 year.

In the present study, hearing improvement in these 30 patients was evaluated by means of Air Bone gap (AB gap) in pure tone audiometry (PTA) at 500Hz, 1000HZ and 2000Hz

The pre-operative AB gap and post-operative AB gap (i.e. 3 months after surgery) was taken into account (**Figure - 1(a) and (b)**).

Figure - (1a): Preoperative PTA with AB Gap.

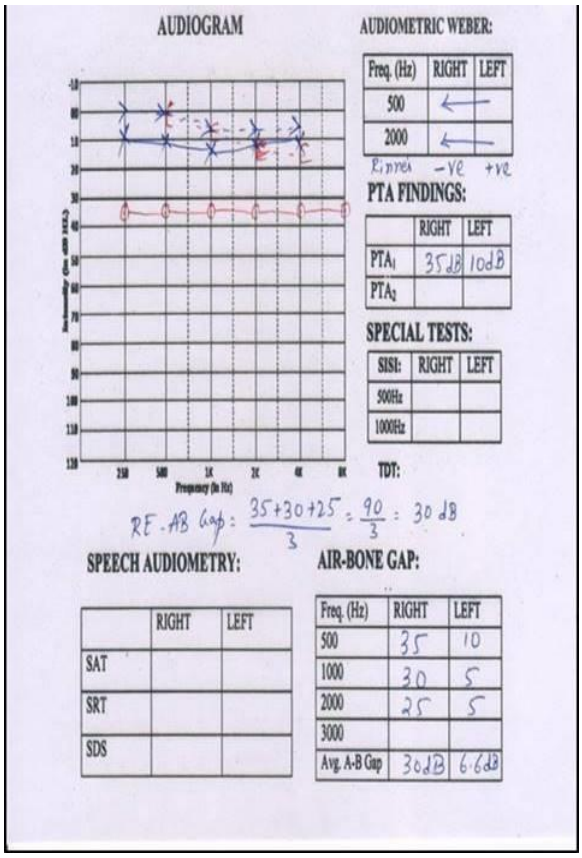
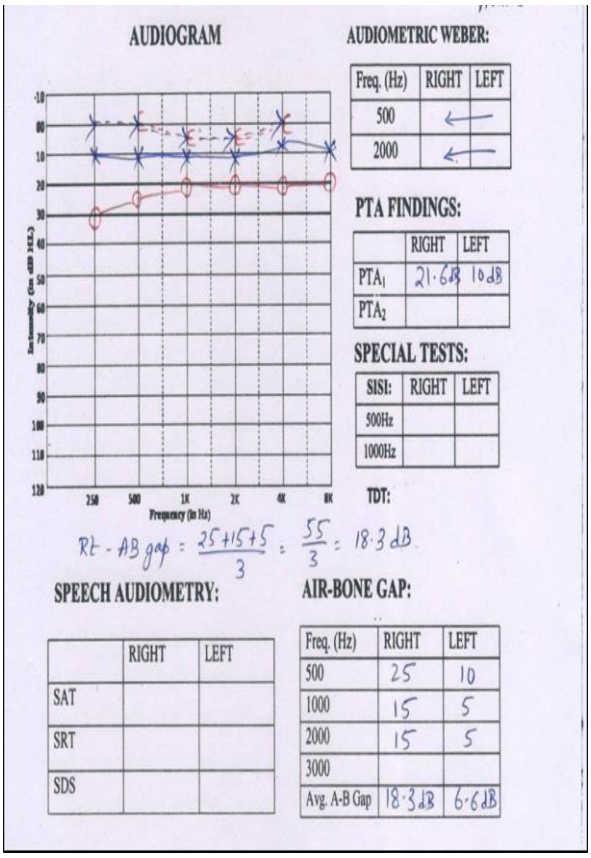


Figure - (1b): Post -operative PTA with AB Gap.



Results

In the present study 30 patients who underwent surgery for (Chronic suppurative otitis media) CSOM were considered. In 20 patients, TF graft was used and among them 14 patients showed improvement in AB gap, 5 patients did not show any change in AB gap and 1 patient did not come for follow up. In 2 patients, TC was used and both of them showed improvement in AB gap. In 1 patient CC graft was used and improvement in AB gap was seen. In 6 patients, SI graft was used and among them 2 patients showed improvement, 2 patients did not show any change, 1 patient did not come for follow up and in 1 patient AB gap worsened. In 1 patient CB graft was used and no change in AB gap was seen (**Table – 1, 2, Figure - 2**).

Table - 1: Results with various graft materials in terms of improvement in AB gap.

Graft materials	No. of patients	Type of tympanoplasty	No. of patients with improved ABG	No. of patients with same ABG	No. of patients with worsened ABG	No. of patients who had no follow up
TF	17	Type 1	12(70%)	4(28%)	-	1(2%)
	3	Type 3 +MRM	2	1	-	-
TC	2	Type 1	2 (100%)	-	-	-
CC + TF	1	Type 3 +MRM	1 (100%)	-	-	-
I+TF	6	Type 3 +MRM	2 (33.3%)	2 (33.3%)	1 (16.6%)	1 (16.6%)
CB+ TF	1	Type 3 +MRM	-	1 (100%)	-	-
Total	30		19	8	1	2

Figure - 2: Results with various graft materials in terms of improvement in AB gap shown in a bar chart.

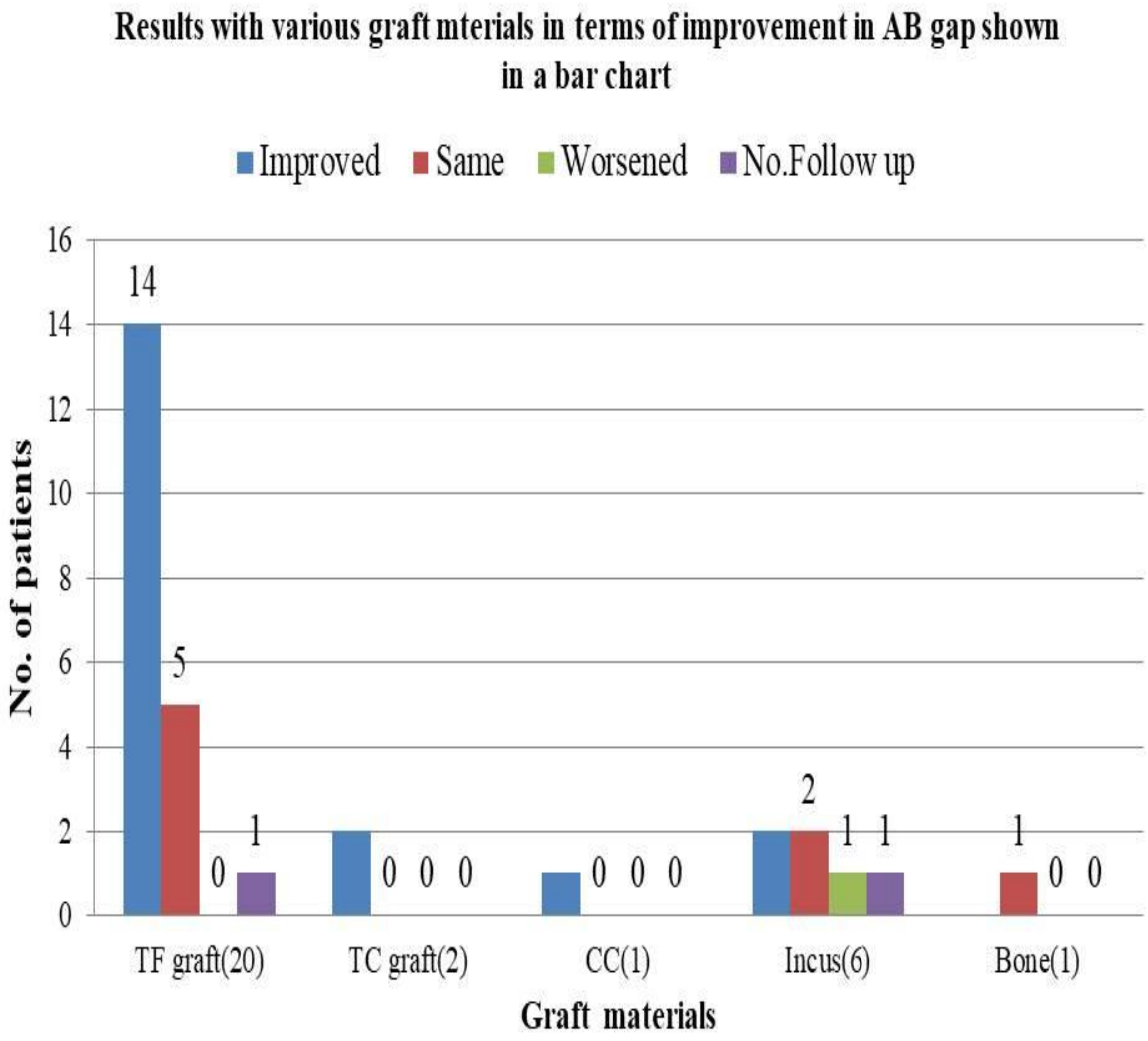


Table - 2: Results with various graft materials in terms of Pre and post-operative ABG (in dB).

Pre op ABG (in dB)	No. of pts, with various graft materials	Post-Operative ABG (in dB)				Results			
		11-20	21-30	31-40	41-50	Improved	Same	worsened	No follow up
21 -30	9 (TF)	3	5		-	3	5	-	1
	1 (TC)	1	-		-	1	-	-	-
	3 (I)	1	1		-	1	1	-	1
	1 (CB)	-	1		-	-	1	-	-
31- 40	7 (TF)	1	6		-	7	-	-	-
	1 (TC)	1	-		-	1	-	-	-
	2 (I)	-	1		1	1	-	1	-
41 -50	4 (TF)	-	1		-	4	-	-	-
	1 (CC)	1	-		-	1	-	-	-
	1 (I)	-	-		1	-	1	-	-
Total	30	-	-		-	19	8	1	2

Table - 3: Results with various graft materials in terms of Graft rejection.

Graft materials	No. of patients	No. of pts with improved ABG	No. of pts with same ABG	No. of pts with worsened ABG	No. of pts who had no follow up
TF	20	14(70%)	5(25%)	0	1(5%)
TC	2	2(100%)	0	0	0
CC + TF	1	1(100%)	0	0	0
Incus+TF	6	2(33.3%)	2(33.3%)	1(16.6%)	1(16.6%)
Bone+ TF	1	0	1(100%)	0	0
Total	30	19(63.3%)	8(26.6%)	1(3.33%)	2(6.6%)

Out of 30 cases graft uptake was seen in 25 cases and graft rejection was seen in 3 cases and 2 patients did not come for follow up. Graft rejection was documented in one case where temporalis fascia was used, one case where incus graft was used and in another case where bone graft was used (**Table - 3**).

Discussion

Surgical repair of the tympanic membrane and tympanic membrane grafting has come to a long way after initial reports of the tympanic membrane grafting from Germany in 1950s. There have been numerous technical advances that have improved surgery for tympanic membrane repair to high level of accuracy and success. A critical problem in the early days was of tympanoplasty was finding a suitable graft material for tympanic membrane grafting. This evolution of the tympanic membrane grafting has been based on the biological tissues of mesodermal origin which contain collagen matrix [8]. Temporalis fascia and perichondrium remains the commonly employed material till today.

Hearing Improvement

AB gap closure was taken as a guide to study the hearing improvement. Analysis of hearing improvement was done for cases with successful graft uptake**.**

- Hearing improvement was documented in 74% patients who underwent type 1 tympanoplasty with temporalis fascia or tragal cartilage. Hearing improvement in

tragal cartilage group is almost comparable with that of temporalis fascia group.

- Hearing improvement in ossiculoplasty group (i.e type 3 tympanoplasty +MRM in our study) where conchal cartilage or Autologous incus or Autologous bone or temporalis fascia showed varied results.

The hearing loss is found to be improved 46% of patients, 36% of patients conditioned remained same, 9% of patient condition worsened and 9% patients did not come for follow up.

Conclusion

From the present study we may conclude that:

- Post-operative hearing gain obtained was found to be better in patients operated upon with tubotympanic disease than those operated upon with atticoantral disease.
- Post-operative hearing improvement depends not only on the graft material used and the type of tympanoplasty but also on the pre-operative status of the ossicular chain.

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