



## Research Article

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## A Study on Clinical Outcome of Scutumplasty in Treatment of Attic Cholesteatoma

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### Abstract

**Objective:** To evaluate the clinical outcome of scutumplasty in the treatment of limited attic cholesteatoma. **Materials and Method:** A prospective interventional study was performed in 30 patients with limited attic cholesteatoma who underwent scutumplasty. The status of the reconstructed scutum was assessed at postoperative 1<sup>st</sup>, 3<sup>rd</sup>, 6<sup>th</sup> month. Pre operative and post operative hearing results were recorded by pure tone audiometry and compared at 3<sup>rd</sup> and 6<sup>th</sup> month. **Results:** Out of thirty patients who underwent scutumplasty, two developed retraction pocket and one developed recurrence of cholesteatoma. There was a statistically significant reduction in the Air Bone Gap in the post operative period with  $p < 0.05$ . **Conclusion:** Attic reconstruction with cartilage prevents future retraction and recurrence of cholesteatoma. It could also improve the hearing postoperatively but it depends on the ossicular status and the type of tympanoplasty that was done. Scutumplasty can be used successfully in the treatment of limited attic cholesteatoma cases.

**Keywords:** Scutumplasty, Cholesteatoma, Attic Cholesteatoma.

### INTRODUCTION

Cholesteatoma is a cystic lesion formed from keratinising stratified squamous epithelium, the matrix of which is composed of epithelium that rests on a stroma of varying thickness, the perimatrix. The resulting hyperkeratosis and shedding of keratin debris usually results in a cystic mass with a surrounding inflammatory reaction. Prussac's space is the site of origin of acquired cholesteatoma. It can later spread into mastoid cavity and mesotympanum and destroy the ossicles and induce complications<sup>[1]</sup>. The attic or epitympanum is bounded laterally by the scutum which is the superior wall of bony external auditory canal. Scutum is the first bony structure to be involved in the process of cholesteatoma spread. In initial stages, cholesteatoma will be limited only to attic.

In surgeries for attic cholesteatoma, the main goal is complete removal of cholesteatoma with prevention of residual and recurrent disease followed by restoration of hearing. Canal wall up and canal wall down mastoidectomy are the two main surgical techniques used. In canal wall up procedure the posterior canal wall is maintained whereas in canal wall down it is removed. In canal wall up procedure, relapse rate was found to be high<sup>2</sup>. The canal wall down procedure gives a wide exposure, so the eradication of disease is possible with reduced recurrence rate<sup>[2,3]</sup>. Canal wall down is associated with post operative otorrhea and involved with the need of regular cavity cleaning<sup>[4,5]</sup>. Various factors are used to decide the type of surgery needed in a particular patient. Main factors are extent of disease, status of the opposite ear, Eustachian tube function, hearing status of the ear, complications, possibility for follow up and preference of surgeon.

Scutumplasty is the procedure of removing the outer attic wall and eradicating the disease in the attic region, with reconstruction of the outer attic wall to prevent future retraction pockets<sup>6</sup>. This procedure can be carried out in patients with limited attic cholesteatoma<sup>[7]</sup>. Pre operative CT scan and intra operative findings of the extent of the disease can be meticulously used to select the cases for scutumplasty.

In this study, we assess the clinical outcome of scutumplasty in the treatment of attic cholesteatoma.

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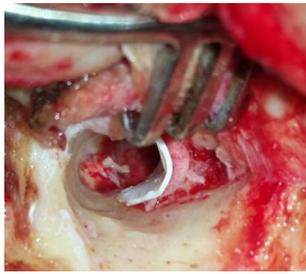
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**MATERIALS AND METHODS**

Thirty patients who underwent scutumplasty for limited attic cholesteatoma were included in this prospective interventional study for a period of one and half years. Pre operative pure tone audiogram was made for all patients. Preoperative CT scan was done in all patients and cases with limited attic cholesteatoma were meticulously selected for the study. Patients with marginal and central perforation of pars tensa were excluded. Patient with previous history of ear surgery, adhesive otitis media were excluded.

Postauricular approach was used for all patients under general/local anaesthesia. Meatotomy was done and tympanomeatal flap was elevated and the mesotympanum was exposed. The ossicular chain was next assessed. Then the extent of cholesteatoma was evaluated. The outer attic wall was drilled to visualize the epitympanum (Figure 1). When needed, the malleus head and/incus body was removed to increase the exposure. The cholesteatoma matrix was dissected and removed in toto.



**Figure 1:** Atticotomy

Next step of scutumplasty is to reconstruct the scutum. The conchal cartilage was harvested and designed according to the size needed. Ossiculoplasty was conducted in the same setting with cartilage depending on the status of the healthy ossicles that were remaining.

Pre and post operative hearing results were recorded and compared according to the ossiculoplasty done at 3<sup>rd</sup> and 6<sup>th</sup> month using unpaired T test. A p value <0.05 is considered statistically significant. IBM SPSS version 15.0 was used for statistical analysis. Status of the reconstructed scutum was assessed at 1<sup>st</sup>, 3<sup>rd</sup>, 6<sup>th</sup> month.

**RESULTS**

30 patients were included in the study from 2013 – 2015. There were 21 patients in the age group of 12 – 30 and 9 patients in >30. 19 patients were female. Incus is the most commonly eroded ossicle. In this study 80% of the patients had erosion of incus (Table 1). Local anaesthesia was used in 10 patients. All the 30 patients had disease in attic and 13 patients had disease extending to antrum (Table 2). Seven patients had type I tympanoplasty, 16 patients had type IIIB and 7 had type IIIC tympanoplasty (Table 3).

**Table 1:** Ossicular status

Ossicular status	Frequency	%
<b>Malleus</b>		
E	6	20.0%
N	24	80.0%
<b>Incus</b>		
E	24	80.0%
N	6	20.0%
<b>Stapes</b>		
E	7	23.3%
N	23	76.7%

**Table 2:** Operative procedure

Operative Procedure	Frequency	%
Atticoantrostomy	13	43.3%
Atticotomy	17	56.7%
Total	30	100%

**Table 3:** Tympanoplasty types

Tympanoplasty type	No. of patients	Percentage
I	7	23.3%
IIb	16	53.3%
IIc	7	23.3%

One patient (3.3%) had residual graft defect in 1<sup>st</sup>, 3<sup>rd</sup> and 6<sup>th</sup> month post surgery, 2 patients (6.6%) had post op ear discharge in 1<sup>st</sup> month which got dry in 3<sup>rd</sup> and 6<sup>th</sup> month. None of the patients had granulation, surgical site infection, facial paralysis in the post operative period (Figure 2).



**Figure 2:** Cartilage used for reconstructing scutum is seen with no retraction pocket or recurrence.

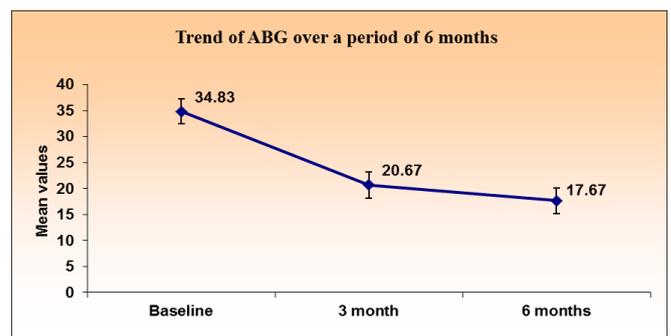


**Figure 3:** Postoperative retraction of reconstructed scutum

Only one patient (3.3%) developed recurrence of cholesteatoma (Table 4). Two patients (6.7%) developed retraction pocket (Figure 3). One patient had it in first month of followup and one more patient developed in third month follow up. There was a statistically significant improvement in hearing 3<sup>rd</sup> and 6<sup>th</sup> postoperative month (Figure 4 And Table 5).

**Table 4:** Postoperative status of reconstructed scutum

Status of the reconstructed Attic	R recurrence	r retraction	H healthy
	n(%)	n(%)	n(%)
1st month	1 (3.3%)	1 (3.3%)	28 (93.4%)
3rd month	1 (3.3%)	2 (6.7%)	27 (90%)
6th month	1 (3.3%)	2 (6.7%)	27 (90%)



**Figure 4:** Comparison of the air bone gap (ABG) pre OP and post OP

**Table 5:** Comparison of preoperative and postoperative abg in various tympanoplasties

Tympanoplasty Type		Mean ABG ± SD	p value	Baseline - 3 months	Baseline - 6 months
1	Baseline	38.57 ± 5.56	<0.001	<0.001	<0.001
	3 month	19.29 ± 6.08			
	6 months	16.43 ± 3.78			
3b	Baseline	34.06 ± 6.12	<0.001	<0.001	<0.001
	3 month	20.31 ± 5.31			
	6 months	16.56 ± 5.39			
3c	Baseline	38.26 ± 4.88	0.001	0.002	0.001
	3 month	19.29 ± 5.35			
	6 months	17.14 ± 5.67			

**Table 6:** Rate of recurrence and retraction

STUDY	RECURRENCE	RETRACTION
Current	3.0%	6.0%
Sakai <sup>10</sup> et al	5.1%	3.8%
Uyar <sup>11</sup> et al	4.8%	6.3%
Andrea Bacciu <sup>12</sup> et al	5.2%	.4%

## DISCUSSION

The purpose of this study is to assess the anatomical and audiological outcome of scutumplasty in limited attic cholesteatoma cases. Scutumplasty is the procedure involving drilling of bony outer attic wall and eradicating the attic cholesteatoma with reconstruction of outer attic wall by cartilage. Tympanoplasty can be done in the same setting to improve hearing result.

Removal of outer attic wall is called atticotomy. It allows the surgeon to have a better visualization of middle ear and attic. It does not result in a wide mastoid cavity as the posterior canal wall is preserved except for its superior part. If disease extends to antrum atticotomy can be widened to complete atticostomy. The resulting scutal defect can result in retraction pocket later on. This can be prevented by using cartilage reconstruction. In a study conducted by Peter C. Weber<sup>[8]</sup> et al. it was concluded that use of cartilage for reconstruction of scutal defect can have some benefit in prevention of future retraction pocket and hence recurrence of cholesteatoma. Abramson et al. found that the recurrence rate was lower in atticotomy than intact canal wall technique<sup>[9]</sup>. Sakai et al. reported 5.1% recurrence of cholesteatoma in patients with scutumplasty. Sakai<sup>[10]</sup> et al. used autologous cortical bone grafts and Uyar<sup>[11]</sup> et al. used cartilage grafts.

In this study, retraction was found in 6% of patients and recurrence was seen in 3% of cases (Table 6). One patient had perforation in pars tensa region which was repaired later. Various factors decide the formation of postoperative retraction pockets. Complete removal of hypertrophied mucosa and granulation tissue is needed to bring back the ventilation of middle ear cavity. Other important factor is the poor Eustachian tube function. Hearing results were compared with the baseline value. Out of 30 patients in this study, 7 patients (23.3%) had type I Tympanoplasty while 16 patients (53.3%) had type IIIb Tympanoplasty and 7 patients (23.3%) had type IIIc Tympanoplasty. Conchal cartilage was used for reconstruction of ossicular chain. In case of patients with intact stapes superstructure, the mobility of the stapes superstructure was checked, Cholesteatoma or diseased mucosa over the stapes superstructure was carefully removed parallel to the stapedius tendon taking care not to damage the stapedius tendon or the superstructure. Among 7 patients who underwent type I Tympanoplasty, 4 patients had ABG<20 in 3<sup>rd</sup> and 6<sup>th</sup> month and two patients had ABG>20 in 3<sup>rd</sup> month but had ABG <20 in 6<sup>th</sup> month and

one had ABG> 20 in both 3<sup>rd</sup> and 6<sup>th</sup> month. 12 out of 16 patients who underwent type IIIb Tympanoplasty had ABG<20 in 3<sup>rd</sup> and 6<sup>th</sup> month. 4 out of 7 patients under type IIIc Tympanoplasty had ABG <20 in 3<sup>rd</sup> and 6<sup>th</sup> month. Baseline ABG in type 1 tympanoplasty patients was 38.57 and it got reduced to 19.29 in 3<sup>rd</sup> month and 16.43 in 6<sup>th</sup> month. In type IIIb tympanoplasty patients baseline was 34.06 and it got reduced to 20.31 in 3<sup>rd</sup> month and 16.56 in 6<sup>th</sup> month. In type IIIc patients baseline was 38.26 and it got reduced to 19.29 in 3<sup>rd</sup> month and 17.14 in 6<sup>th</sup> month which are statistically significant. There was a statistically significant improvement in the Air Bone Gap Closure Ratio. There was no deterioration of bone conduction threshold in any of the patient. The audiological success of the surgery was significantly dependent on several factors like extension of disease, the presence or absence of the stapes superstructure and the type of Tympanoplasty done.

## CONCLUSION

In this interventional study we found that scutumplasty can be used in cases of limited attic cholesteatoma with minimal rates of recurrence. Attic reconstruction with cartilage could improve the hearing postoperatively.

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