

## Original Article

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# Autologous cartilagenous graft in ossiculoplasty

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### Abstract

*CSOM is a most common ENT disease in our country, among them the atticoantral variety is life threatening if not treated earlier. So treatment plan is still radical surgery to eradicate the disease to save life ignoring the hearing conservation. Henceforth post operative hearing loss remains a problem for the patient. Ensuring total clearance of the disease depending on the ossicular status, tragal cartilage graft was used as easily available material for ossiculoplasty to improve the post operative hearing. The study presents 35 ear operation of varied middle ear pathology using tragal cartilage & perichondrium as a choice graft. We have recorded our observation & result & concluded that tragal cartilage & perichondrium is an ideal graft for ossiculoplasty. The objective of study was to assess the efficacy of tragal cartilage, the functional capacity in restoring hearing acuity, its mechanical survival, its extrusion rate & its functional integrity in ossicular reconstruction. The patients those underwent surgery in Sir Salimullah Medical College Mitford Hospital had significant improvement of hearing with no recurrence of disease.*

**Keywords:** Atticoantral; autologous; ossiculoplasty

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### Introduction

One of the most difficult problems in the surgical treatment of chronic otitis media is reconstruction of the ossicular chain. It is the purpose of this paper to describe a technique of ossicular reconstruction using autogenous tragal cartilage. In the past, the main consideration in the surgical treatment of otitis media was the control of disease. With the development of tympanoplasty techniques, equal attention was given to reconstruction of the sound conducting mechanism<sup>1,2</sup>. The goal of tympanoplasty is to control disease, retain anatomy whenever possible, and restore hearing<sup>3</sup>. Hearing restoration depends upon effective transmission of sound through the middle ear. When healthy ossicular remnants are present this may be accomplished by

careful repositioning<sup>4-6</sup>. Many different types of prostheses have been advocated as ossicular substitutes<sup>3,5,7-9</sup>. In the earlier years of tympanoplasty we frequently used a polyethylene or Teflon strut between the handle of the malleus and the mobile footplate when the incus and stapes arch were deficient. When the stapes or its footplate was the only ossicular remnant present, a plastic columella was placed between it and the tympanic membrane. Initial results with these techniques were rewarding, but as time passed, it was frequently noted that the prosthesis slipped or extruded through the drum and often transected the handle of the malleus. Jansen<sup>10, 22</sup> and other European surgeons described cartilage as a prosthesis several years ago. Smyth (personal communication, September 1966) in Ireland has been using homograph septal cartilage with good results. Goodhill and Brockman<sup>11, 12</sup> in this country have recently reported a series of tympanoplasties using cartilage to reconstruct the ossicular chain. Tragal cartilage makes an excellent prosthesis because it is readily obtainable in the operative field and is autogenous. Since cartilage does not require a direct blood supply, but receives its nutrition through tissue fluids, it remains viable after transplantation into the middle ear. It is our opinion that autogenous cartilage is superior to any foreign material presently available for use in middle ear reconstruction. While homograph ossicles seem to be well tolerated. The versatility of tragal cartilage as a prosthesis has much to offer the otologic surgeon.

### Methods

Total 35 patients were studied in 1 year, from January 2010 to December 2011, in Sir Salimullah Medical College & Mitford Hospital, Dhaka. 35 ears have been operated using cartilage prosthesis of different types. Patients were followed up upto 2 years.

This was a cross sectional study.

### Result

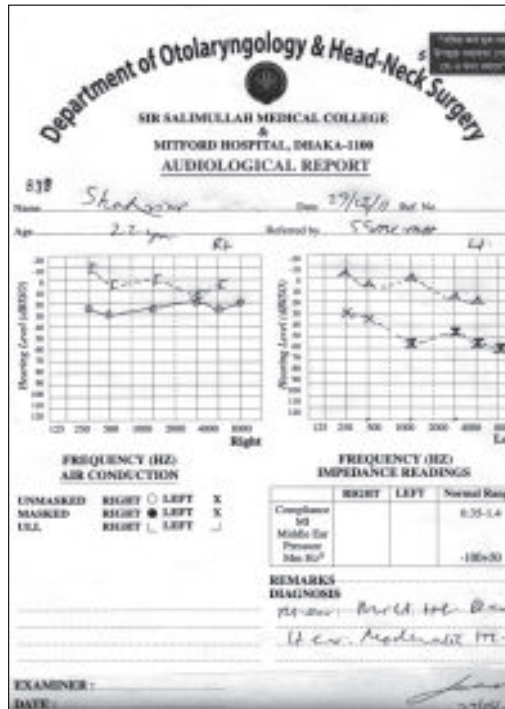
From January 2010 to December 2011, 35 ears have been operated using a cartilage prosthesis of some type. 5 of these have been lost to follow-up. This accounts for the large number of cases in which the columella was used from the tympanic membrane to the footplate. These ears had large air-bone gaps of at least 40 db where average ABG was obtained in 4 frequencies (500,1000, 2000,3000 Hz). Sixty-seven percent (20 cases) of the ears closed the air-bone gap to within 20 db. 33 percent (10 cases) were brought into the range of 25db or better by American Standards Association (ASA) standard. The longest follow-up is 2 year. The shortest follow-up is four weeks. Of those cases that have not had hearing gains, a large percentage had poor aeration of the middle ear post-operatively. No patient had to undergo re-exploration for conductive hearing loss during this short term follow up period. Above calculation was done by manually by calculator.

**Table-I**  
*Pathological Defects*

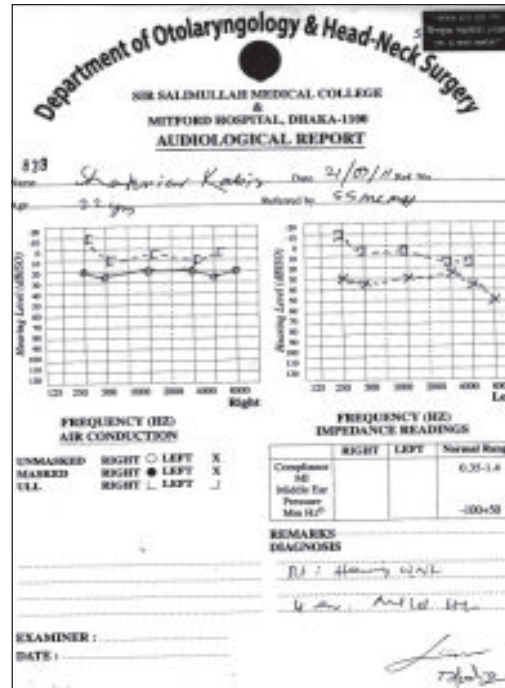
Type of Pathology	No. of Cases	Percent
Attic Perforation	10	28.57
Retraction pocket	5	14.28
Cholesteatoma	20	57.14
Total	35	100

**Table-II**  
*State of Ossicles (n=35)*

Structure	Normal	Eroded	Destroyed
Malleus	30	5	00
Incus	12	15	8
Stapes	25	6	4



**Figure-1:** Pre-operative PTA (ABG-55dB) of a case of CSOM (Lt.) AA variety



**Figure-1:** Post-operative PTA (ABG-32dB) of same patient after limited atticotomy with ossiculoplasty.

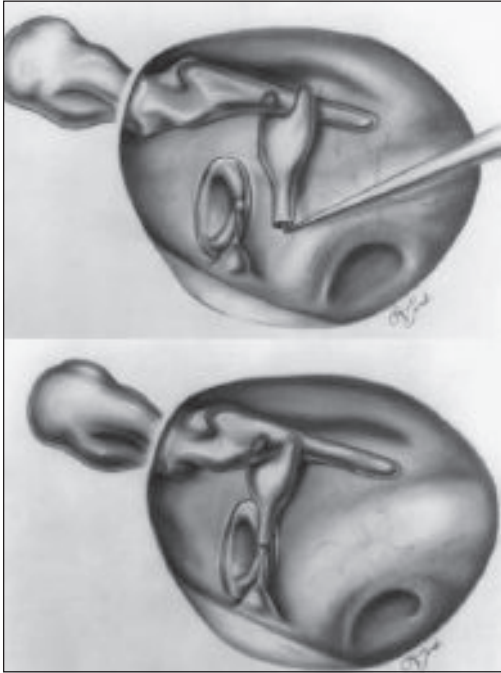
**Discussion**

For many years the so called conservative methods of radical mastoid operations (by Barany, Bondy, Citelli, Heerman and Stacke) were done for the clearance of disease but none of these proved better<sup>15</sup>. At later dates Farrior, House, Lempert and Morrison added some minor variations in the technique of reconstructive tympanoplasty but still could not achieve the good results because the recurrence of the disease was very high<sup>17</sup>. To modify these Victor Goodhill, Heerman and Heerman demonstrated their new techniques which prevented the recurrence of the cholesteatoma and gained the high success rates<sup>18</sup>.

In this study 600 ear operations were performed with tragal perichondrium and cartilage as a composite graft in various types of middle ear reconstructions such as

myringoplasty, ossiculoplasty, osseous reconstructions and mastoid obliterations. This study was done at K.E.M. Hospital E.N.T. department, Pune during period of 1980–2000. We have presented our observations of this reconstructive study of 20 years and found that the tragal cartilage is an ideal graft for the reconstructive middle ear surgery.

In the simple myringoplasty group the tragal perichondrium and cartilage achieved 96% success rate, the small, large and subtotal central perforations healed well in six weeks time<sup>16</sup>. The inlay and onlay methods were used in the neotympanic reconstruction. In the total perforations and missing annulus the perichondrium angle was appropriate fit in forming the new annulus the perichondrium angle was appropriate fit in forming the new annulus. By this technique the blunting and



**Figure-3:** *Repositioning of incus prosthesis between malleus & capitulum of stapes*

lateralisation of the graft was prevented from the various cartilage assemblies in ossicular reconstruction achieved excellent stability and contact to bridge the gap in transformer mechanism. The incudostapedial gap was restored by cartilage sturt and maintained assembly. The malleostapedial, malleofootplate assembly proved good in restoring hearing<sup>19</sup>.

In TORP & PORP ossicular graft the interposed tragal cartilage and drum have increased the ossicular stability and improved hearing to 75 percent<sup>18</sup>. Chronic endotympanic depression is a pathological entity which leads to atelectasis, retraction pockets and cholestestoma formation. The tragal cartilage and perichondrium composite graft intervention has prevented the recurrence of the cholesteatoma pocket adhesions and tympanosclerosis. The postop results were dry healed middle ears with good hearing.

During the study it was observed that middle ear pathology of 40% perforaytions of safe and unsafe types, 4% adhesive otitis media, 6% tympaosclerosis, 30% retraction pockets and 20% cholesteatoma sacs. All these pathologies were corrected by radical removal and tragal cartilage reconstruction.

It was our observation that biological material like tragal cartilage, perichondrium, facia or ossicles etc. are much better than nonbiological materials in reconstructive surgery.

The survival rate of tragal graft material is much better than nonbiological materials.

The extrusion rate of cartilage is very minimal as compared to the other graft materials. The review of literature revealed the different extrusion rates of different materials, such as autologous, 1.19%, isografts 3.06% the synthetics 5.04%, human dentine 7.14%, gold prosthesis 8.7%<sup>20, 21, 22</sup>. Overall the tragal cartilage and perichondrium proved to be the best graft materials in reconstructive tympanoplasty which is universally accepted.

### Conclusion

When usable ossicular remnants are present, repositioning is our method of choice for reconstruction of the sound conduction mechanism of the middle ear. Our results are comparable to those reported by other authors. In our hands, tragal cartilage has proved to be a valuable prosthesis in reconstruction of the ossicular chain. It is autogenous, viable, and easily obtained. When only the handle of the malleus is present, we prefer cartilage rather than wire or plastic as an incus replacement prosthesis. We have found that cartilage makes an excellent connection from the tympanic membrane to the footplate or capitulum of the stapes. As our experience with this technique increases, we expect the results to improve.

### Summary

Ossicular reconstruction is one of the most difficult problems in the surgical treatment of chronic otitis media. By means of ossicular repositioning and tragal cartilage prostheses more patients will obtain long standing hearing improvement from ossiculoplasty; 35 cases of ossiculoplasty with cartilage prostheses are reported. Of these, 67% have closed the air-bone gap to within 20 db or better, and 33% were brought into the range of 25 db or better by ASA standard. In view of the above study we strongly recommend the tragal perichondrium & cartilage graft in ossicular reconstructions. The main reason being the cartilage is easily available at the site of operation, nontoxic, less extrusion, minimum shrinkage & lateralization above all it is very cost effective to patients.

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