

# A STUDY OF DOUBLE CARTILAGE OSSICULOPLASTY IN PATIENTS OF CHRONIC SUPPURATIVE OTITIS MEDIA

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## Abstract

**Introduction:** This retrospective study is based on assessment of hearing in patients of chronic suppurative otitis media by double cartilage ossiculoplasty at MEHROTRA ENT HOSPITAL KANPUR. **Materials and Methods:** 100 patients of CSOM who were operated at MEHROTRA ENT HOSPITAL KANPUR with double cartilage ossiculoplasty were included in the study. Results were analyzed by comparing the air bone gap pre and post operatively after one year.

**Results:** With Double cartilage ossiculoplasty postoperative hearing assessed after 1 year improved significantly.

**Conclusion :** Double cartilage ossiculoplasty represents an excellent alternative to prosthesis for ossicular reconstruction in severe chronic otitis media. Long term hearing outcome improved significantly and remain stable and satisfactory. It is also cost effective.

## Keywords

Double Cartilage, Ossiculoplasty, Otitis Media

## INTRODUCTION

Ossiculoplasty refers to restoration of hearing by reconstruction of middle ear ossicular chain with the use of interposition devices. Its aim is to establish the hearing by regaining the original

mechanics of ossicular chain. Also to provide physical protection for cochlear fluids and to maintain differential pressure between the round and oval window by coupling sound preferentially to only one window of cochlea. 80% of patients of ossicular abnormalities is cholesteatoma present in unsafe chronic suppurative otitis media. Trauma, congenital malformations, surgical manipulations, fixation of ossicles accounts for other causes.

## AUSTIN CLASSIFICATION FOR OSSICULAR CHAIN DEFECT

TYPES		
A	Loss of part of incus or total loss of incus (most common)	M+, S+
B	Loss of incus and stapes superstructure but malleus handle still present	M+, S-
C	Loss of incus and malleus but stapes suprastructure still present	M-, S+
D	Loss of incus, malleus and superstructure of stapes but mobile footplate still present	M-, S-

\*Incus is absent in all cases.

Tympanoplasty the term used for repair of tympanic membrane along with middle ear, is originally described and classified into 5 types by HORST LUDWIG WULLESTEIN IN 1956.

- Type 1 : repair of tympanic membrane alone. Ossicular chain is intact and graft placed directly over malleus. Type 1

tympanoplasty is synonymous with myringoplasty.

- Type 2 : repair of tympanic membrane along with middle ear with reposition of graft directly over incus as malleus is necrosed.
- Type 3 : malleus and incus are necrosed. Graft placed over stapes head
- Type 4 : stapes suprastructure eroded but footplate is mobile and graft placed over stapes head
- Type 5 : reconstruction with a fixed stapes footplate, a graft extending to a horizontal semicircular canal fenestration.

### **MATERIALS USED FOR OSSICULOPLASTY**

Biologic materials include autograft or homograft ossicles, cortical bone, teeth and cartilage.

Synthetic material grafts are metallic and non metallic. The metallic grafts used are made up of titanium, gold, stainless steel, platinum and silver whereas non metallic grafts used are polymeric such as solids (Teflon) and porous (plastipore) and some are ceramic i.e. bioinert (frialit), bioreactive (ceravital/bioglass) and biodegradable (hydroxyl apatite)

### **DOUBLE CARTILAGE OSSICULOPLASTY**

First described by Luetje and Denninghoff in 1987 for partial ossicular reconstruction in presence of intact stapes.

Tragal cartilage of patient was used as a source. A large triangular piece of cartilage was made. A small vertical strut of tragal cartilage was also made. A shallow acetabulum is created on lower or inner surface of large triangular cartilage for small vertical strut cartilage to fit in, the base of which is attached to stapes footplate. The horizontal upper smooth surface of large triangular cartilage is made to be in contact with temporalis fascia graft. Thus a modified T shaped

alignment is made with larger horizontal part and smaller vertical strut. This new technique of ours, we call it as MEHROTRA TECHNIQUE. (FIGURE 1-5).

FIGURES SHOWING COLOURED PICTURES OF CARTILAGE OSSICULOPLASTY (MEHROTRA TECHNIQUE)



Figure 1



Figure 2



Figure 3



Figure 4



Figure 5

This modified Double cartilage ossiculoplasty (MEHROTRA TECHNIQUE) represents an excellent total ossiculoplasty replacement prosthesis. It is easy to perform as tragal cartilage is easily available and is very flexible to be modified to any shape. Hearing results are satisfactory and long lasting.

The purpose of this study is to assess the results of hearing by double cartilage technique in cases of chronic ear disease. We commonly refer it as cartilage ossiculoplasty from stapes to tympanic membrane (COST).

## MATERIAL AND METHODS

Study was carried out in Mehrotra ENT hospital, Kanpur from March 2016 to March 2019 on 100 patients of chronic suppurative otitis media (CSOM).

### INCLUSION CRITERIA

- Patients between 12-60 years of age.
- History of chronic ear discharge with minimum air bone gap of 20 decibells.
- Only those cases of CSOM with ossicular erosion of incus and stapes suprastructure

### EXCLUSION CRITERIA

- Cases with sensory neural hearing loss.

### EVALUATION PROTOCOL AT MEHROTRA ENT HOSPITAL KANPUR

- Informed written consent was taken from the parents for the study and follow-ups required during the study.
- A detailed history and thorough physical

and ENT examination was carried out.

- Apart from routine blood investigations and other blood investigations required for preanaesthetic checkup and fitness, patients also underwent specialized investigations like tuning fork tests, pure tone audiometry (PTA) and impedance audiometry.
- HRCT temporal bone bilateral is mandatory for all patients.
- The general physical condition was evaluated by anaesthetist and if declared fit, patient was scheduled for surgery on a given date.

Modified radical Mastoidectomy along with double cartilage ossiculoplasty (as described earlier) was done in all 100 patients. Patients were discharged the next day with mastoid bandage and followed up after 7 days. After 7 days mastoid bandage removed, ear cleaned and a PTA (pure tone audiometry) done. PTA was again done after 1 month, 6 months and at 1 year follow up and results were compared with pre-operative PTA.

Follow up done initially at weekly interval for one month and then at 3, 6 and 12 months postoperatively.

## OBSERVATION AND RESULTS

Out of 100 patients operated 58 (58%) were males and 42 (42%) females.

### AGE WISE DISTRIBUTION

AGE GROUPS IN YEARS	NUMBER OF PATIENTS
10-20	36(36%)
21-30	34(34%)
31-40	21(21%)
41-50	07(07%)
51-60	02(02%)

55 were operated in right ear and 45 in left ear.

## RESULTS AND COMPARISON WITH PRE OPERATIVE FINDINGS

### OTORRHEA

Preoperatively 68 patients presented with otorrhea. Postoperatively only 7 patients were having otorrhea which later were dry after couple of weeks.

### ATTIC CHOLESTEATOMA

53 patients had cholesteatoma preoperatively. Postoperatively, in 3 patients recurrence was seen. All 3 patients underwent revision surgery following which no patient showed any recurrence in follow up.

### RETRACTED/ADHESIVE TYMPANIC MEMBRANE

18 patients presented with retraction pocket in attic region preoperatively. Postoperative no patients showed recurrence of retraction pocket after 1 year of follow up.

### LARGE CENTRAL PERFORATION

23 patients had large central tympanic membrane perforation preoperatively. Postoperatively 3 had small residual anterior perforation after 2 weeks of follow up which gradually closed by itself. By the end of 1 year follow up no residual perforation seen in any of the patients.

### POLYP AND GRANULATION IN EXTERNAL AUDITORY CANAL

6 patients preoperatively presented with polyp and granulations in external auditory canal. Postoperatively no recurrence seen in any of 6 patients after 1 year of follow up

### POST AURICULAR FISTULA/DISCHARGE

5 patients showed post auricular discharge with fistula preoperatively. Postoperatively no patient showed any recurrence.

### TINNITUS

Preoperatively 19 patients were having tinnitus. Postoperatively 4 of them reported tinnitus, which was managed conservatively.

### HEARING LOSS

Preoperatively 38 patients (38%) were having air bone (AB) gap between 30-40 decibels and 62 patients (62%) had AB gap of greater than 40 decibels.

#### PREOPERATIVE HEARING RESULTS

AB GAP IN DECIBELS	PERCENTAGE OF PATIENTS
30-40	38%
>40	62%

#### POSTOPERATIVE HEARING RESULTS

AB GAP IN DECIBELS	PERCENTAGE OF PATIENTS
0-10	26%
10-20	62%
20-30	04%
30-40	06%
>40	02%

## DISCUSSION

Similar study was also conducted by Harvey SA<sup>[1]</sup> et al in 1999 in which 23 patients aged between 6-85 years underwent canal wall down tympanomastoidectomy with double cartilage ossiculoplasty. Mean air bone gap was 23.8 decibels after surgery achieved in almost 50 % of his patients.

Another study in 2008 by Malafronte G<sup>[2]</sup> et al in which inner perichondrium layer was intact and in contact with tympanic membrane. 65 cases performed out of which in 25 cases original double cartilage ossiculoplasty performed as



described by Luetje and Denninghoff 48% of these showed improved hearing. 2<sup>nd</sup> group of 32 patients with modified double cartilage ossiculoplasty showed 81 % improvement.

Another study conducted by Denis Ayache<sup>[3]</sup> et al of 81 patients with cartilage interposition ossiculoplasty in one stage intact canal wall tympanoplasty . Preoperatively mean air conduction(AC), air bone gap and speech response threshold (SRT) were 35.3, 20.14 and 35.6 decibels. Postoperatively the parameters were 27.8, 13.34 and 28.8 decibel respectively.

In our study done at MEHROTRA ENT HOSPITAL KANPUR, of 100 patients of CSOM, postoperative hearing improved significantly after 1 year follow up. The MEHROTRA technique of cartilage ossiculoplasty, as we name it showed excellent hearing results as 88% of patients achieved AB gap of less than 20 db which is exceptional compared to other studies done earlier. Moreover, hearing results we achieved remained stable for long..

## CONCLUSION

- The MEHROTRA technique of cartilage ossiculoplasty in patients of chronic suppurative otitis media with ossicular erosion of incus with stapes suprastructure is an excellent technique for disease eradication and more importantly for hearing restoration.
- The technique is very cost effective for patients as there is no extra charge for prosthesis.
- Cartilage is easily accessible through a very small tragal incision. Tragal cartilage is very flexible and can be easily modified to fit in the middle ear space available and is long lasting.
- No foreign body reaction problems.
- As hearing outcome is excellent, stable and long lasting, we conclude that MEHROTRA technique for cartilage

ossiculoplasty is excellent choice for ossicular reconstruction in chronic suppurative otitis media and thereby improving quality of life.

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### **Declarations**

Compliance with Ethical Standards

Disclosure of potential conflicts of interest : **None**

Research involving human participants and/or animals: **No**

Informed consent: **Yes**

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