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A STUDY OF USE OF AUTOLOGOUS CARTILAGE IN OSSICULAR RECONSTRUCTION IN CHRONIC OTITIS MEDIA CASES

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ABSTRACT :

BACKGROUND:

Chronic otitis media is a common cause of conductive hearing loss in developing countries. Despite advances in public health and medical care, it continues to be prevalent. According to WHO, COM was considered as the most common cause of persistent mild to moderate hearing impairment among children and young people in developing countries. It is even more significant because chronic otitis media is a common cause of preventable deafness.

METHOD:

By Simple random sampling technique 40 Patients selected with chronic otitis media associated with loss of hearing on simple random selection technique, attending to E.N.T. outpatient department VIMS, Ballari and patients referred from other departments to Vijayanagar Institute Of Medical Sciences combined group of Hospitals, Ballari. Study will be conducted for a period of one and half year from November 2019 to May 2021.

RESULTS:

In our study there is significant improvement in PTA post operatively with mean pre operative PTA 46.81db and post operative PTA mean of 38.13db, standard deviation is 7.77 ,7.53 and paired T test P value <0.001 which is highly significant. In our study there is significant improvement in ABG post operatively .The preoperative ABG mean is 37.94db ,standard deviation is 8.01 .The post operative ABG at 6 month ,mean is 29.51db ,standard deviation is 8.36 ,mean difference between two group is 8.42 and paired T test P value <0.001 which is highly significant. Thus, our study was aimed to assess the efficacy of autologous cartilage in ossicular reconstruction.

CONCLUSION :

All the patients who underwent ossicular reconstruction with autologous cartilage in our study had successful graft uptake and significant hearing improvement hence proves the efficacy of the study.

KEY WORDS : CHRONIC OTITIS MEDIA, OSSICULOPLASTY, PURE TONE AUDIOGRAM.

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INTRODUCTION :

Chronic otitis media, is defined as chronic inflammation of middle ear space resulting in long-term or more often permanent changes in tympanic membrane like perforation, atelectasis, retraction pocket or cholesteatoma. It is one of the common causes of conductive deafness, and continues to be widely prevalent in our country. COM(Chronic otitis media) equates with the classic term chronic 'suppurative' otitis media (CSOM) that is no longer advocated as COM is not necessarily a result of 'the gathering of pus'.[1]

Chronic otitis media can be of two types; tubotympanic and atticoantral type. Former is associated with permanent central perforation which can be presented with recurrent bouts of otorrhoea (active COM), dry but permanent tympanic perforation (inactive COM) where this is not the case though there is the potential for the ear to become active at some time. A third clinical entity is (healed COM) where there are permanent abnormalities of the pars tensa, but the ear does not have the propensity to become active because the pars tensa is intact and there are no significant retractions of the pars tensa or flaccida. 'Healed COM' can also be the end result of successful surgery.[1]

The latter, atticoantral type presents either with attic perforation, postrosuperior retraction, cholesteatoma and granulations. Ossicular erosion and complications are more with this and hence considered as dangerous type. Generally patients with tympanic perforations which continue to dischargemucoid material for periods of 6 weeks to 3 months[2] despite medical treatment are recognized as CSOM cases. The WHO definition requires only 2 weeks of otorrhoea, but otolaryngologists tend to adopt a longer duration,more than 3 months of active ear discharge.[3]

Incidence of chronic otitis media is higher in poor socioeconomic class, poor nutrition and in rural population. It affects both sexes and all ages. Prevalance surveys show that the global burden of illness due to chronic suppurative otitis media involves 65-300 million individuals - 60% of whom suffer from significant hearing impairment. In India, the proportion of patients with CSOM having hearing impairment is higher – 77%. The global burden ofhearing impairment can be potentially reduced by 4/5th if CSOM is effectively tackled. Chronic otitis media cases which are not resolved by conservative management with aural toilet, oral and topical antibiotics should be considered for surgery.[3]

MATERIALS AND METHODS:

The patients attending the department of Otorhinolaryngology OPD, VIMS and also patients referred from other departments of VIMS combined group of hospitals of MCH, Ballari.
Method of collection of data:

A written informed consent will be taken from all patients included in this study. A detailed history taking, thorough clinical examination and investigation is done for these patients. The data collected will be entered into a specially designed case record proforma.

Duration of study: The study will be conducted for a period from November 2019 to May 2021

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Design of study: A Prospective Study.

Sampling technique: Simple random sampling technique.

40 Patients selected with chronic otitis media associated with loss of hearing on simple random selection technique, attending to E.N.T. outpatient department VIMS,Ballari and patients referred from other departments to Vijayanagar Institute Of Medical Sciences combined group of Hospitals, Ballari. Study will be conducted for a period of one and half year from November 2019 to May 2021.

Inclusion Criteria:

- All case of chronic otitis media (mucosal and squamosal type) with conductive hearing loss.

Exclusion criteria:

- Cases associated with Sensorineural hearing loss and mixed hearing loss.
- Cases associated with intracranial complications of chronic otitis media.
- Cases associated with Malignancies in ears.
- Revision cases.

Data Analysis:

Data collected will be entered into a specially designed case record proforma and analysed statistically using descriptive statistics namely mean, standard deviation, percentage wherever applicable. Chi-Square test will be used for analysis .
A p value <0.05 will be considered significant.

SAMPLE SIZE ESTIMATION

A total of 40 consecutive patients of chronic otitis media (mucosal and squamosal type) with conductive hearing loss, from the period between November 2019 to May 2020, who were willing to participate in the study were taken as study subjects.

$$n = \frac{z^2 \times \hat{p}(1-\hat{p})}{\varepsilon^2}$$

Where
Z is the Z score
ε is the margin of error
N is population size
p is the population propotion

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Statistical Analysis

Qualitative data represented in the form of frequency and percentage.
Continuous variables were represented as mean & Standard deviation. Comparison of PTA before and after OP was done with paired t Test.
A P value of <0.05 was considered statistically significant.
IBM SPSS Version 28 for windows was used to do statistical analysis.

RESULTS

A prospective study is done on 40 patients who have come to ENT department to VIMS BALLARI. Primarily we have observed the age and sex distribution followed by the side of ear disease, the various ossicular defects, surgeries patients underwent and the postoperative PTA ABG values and mean ABG closure values.

In our study maximum patients are in the 2^{nd} decade 15(37.5%)patients,3^{rd} decade 15(37.5%) patients, and other age distribution were 1^{st} decade 3(7.5%) patients, 4^{th} decade 4(10%)patient ,5^{th} decade 2(5%)patients and 6^{th} decade 1(2.5%) patient.

Table 1: TABLE SHOWING OTOSCOPIC FINDINGS IN COM

Tympanic Membrane	No of cases	Percentage
Attic retraction with perforation	22	55.0
Posterosuperior retraction	3	7.5
Subtotal perforation	9	22.5
Central perforation	1	2.5
Granulation Tissue present over postero superior quadrant	1	2.5
RT Aural Polyp	3	7.5
RT PARS Flaccida perforation	1	2.5
Total	40	100.0

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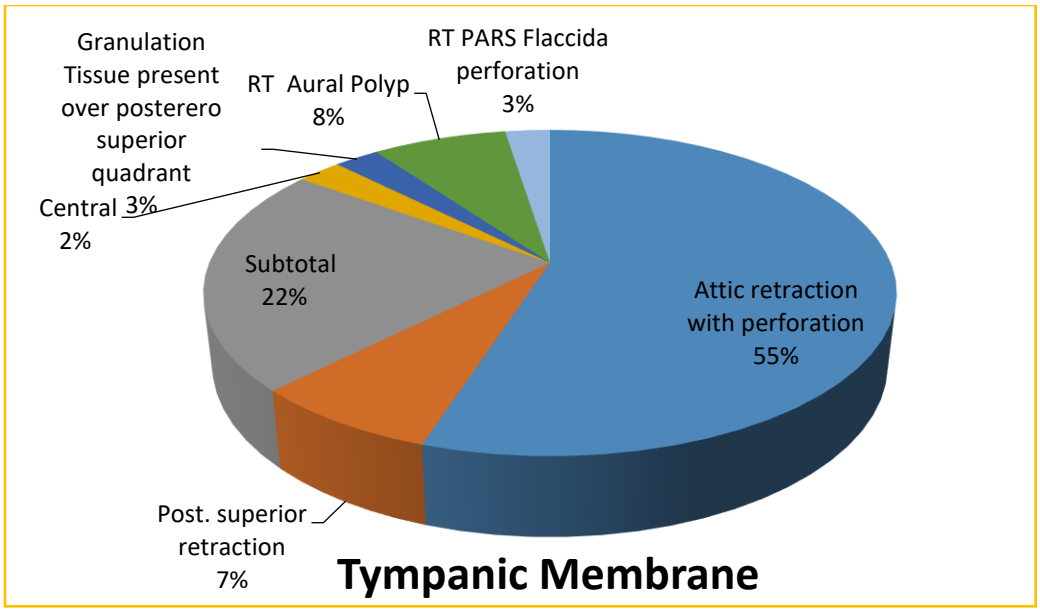

GRAPH 1- PIE DIAGRAM SHOWING OTOSCOPIC FINDINGS IN COM

In our study the otoscopic findings revealed 22(55%)patients with attic retraction with perforation, posterosuperior retraction 3(7.5%)patients, subtotal perforation in 9(22.5%)patients, aural polyp in 3(7.5%)patients, central perforation 1(2.5%)patient, granulation tissue over posterosuperior quadrant 1(2.5%)patient , pars flaccida perforation in 1(2.5%)patient.

Table 2: TABLE SHOWING OSSICLES INVOLVED IN COM

Ossicles involved	No of cases	Percentage
Malleus	31	77.5
Incus	32	80.0
Stapes	40	100.0

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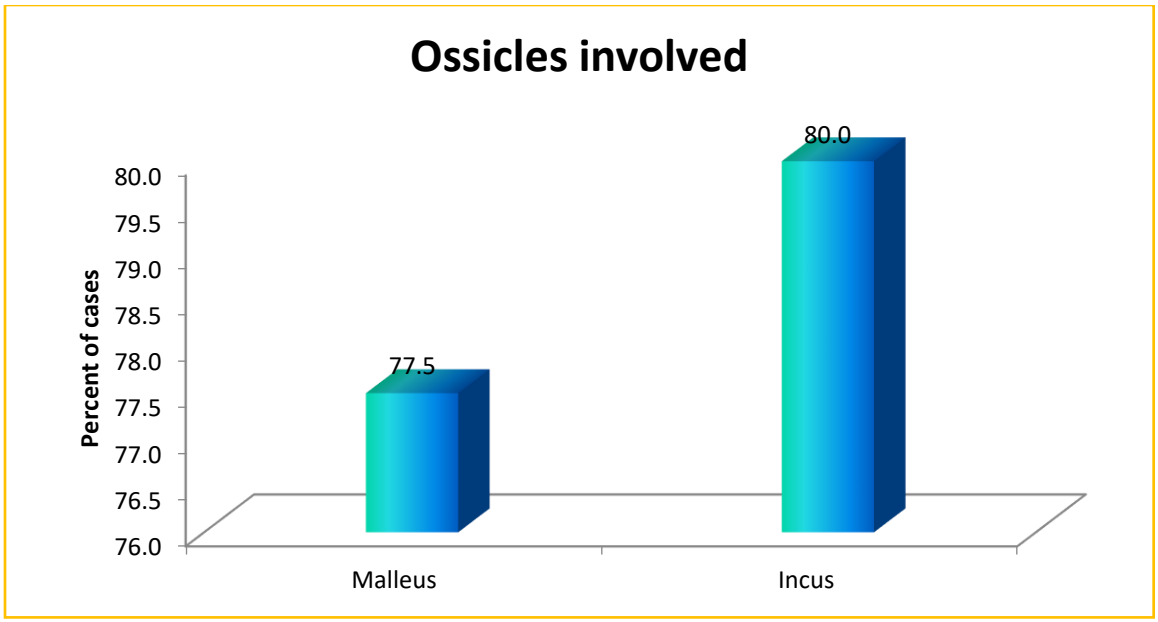
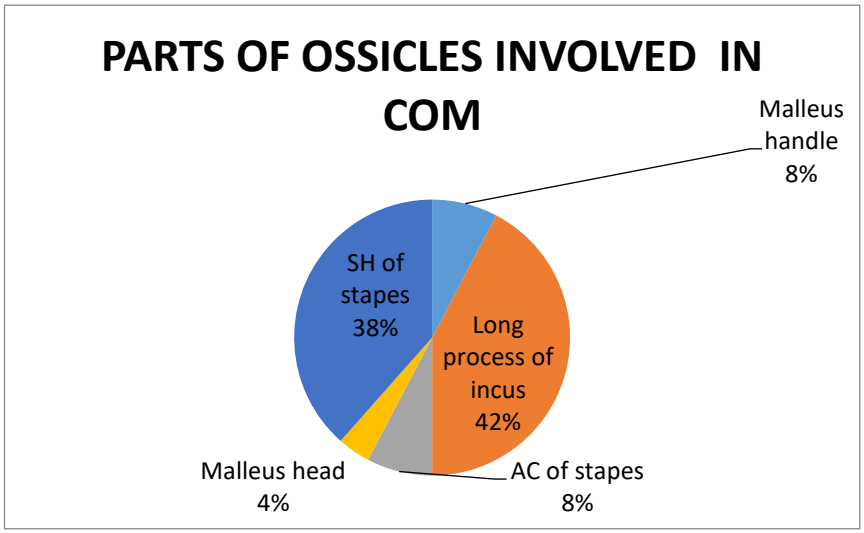


GRAPH 2 – PIE CHART SHOWING OSSICLES INVOLVED IN COM

In our study stapes is involved in 40 (100%) patients, incus 32(80%) patients, and malleus in 31(77.5%) patients.

Table 3: TABLE SHOWING PARTS OF OSSICLES INVOLVED IN COM

	No of cases	Percentage
Malleus handle	2	2
Long process of incus	11	27.5
AC of stapes	2	5
Malleus head	1	2.5
SH of stapes	10	25



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GRAPH 3 – PIE CHART SHOWING PARTS OF OSSICLES INVOLVED IN COM

TABLE 4– TABLE SHOWING THE TYPE OF TYMPANOPLASTY DONE IN COM PATIENTS

Procedure	No of cases	Percent
Cortical mastoidectomy/Intact canal wall with type 3b tympanoplasty using autologous conchal cartilage	15	37.5
Cortical mastoidectomy/Intact canal wall with type 3a tympanoplasty using autologous conchal cartilage	19	47.5
Canal wall down with type 3b tympanoplasty using autologous conchal cartilage	2	5.0
Canal wall down with type 4 tympanoplasty using autologous conchal cartilage	1	2.5
Intact canal wall with type 3a tympanoplasty using homologous conchal cartilage	1	2.5
Intact canal wall with type 3a tympanoplasty using autologous conchal cartilage	1	2.5
Canal wall down with type 3A tympanoplasty using autologous conchal cartilage	1	2.5
TOTAL	40	100.0

In our study most of the patients under went cortical mastoidectomy intact canal wall with type 3a tympsnoplasty using autologous conchal cartilage in 19(47.5%) patients , type 3b tympanoplasty in 15(37.5%)patients ,Canal wall down mastoidectomy with type 3b tympanoplasty using autologous conchal cartilage in 2(5%) patients, canal wall down mastoidectomy with type 4 tympanoplasty using autologous conchal cartilage in 1 (2.5%)patient, Intact canal wall with type 3a tympanoplasty using autologous conchal cartilage in 1(2.5%)patient, and Canal wall down with type 3A tympanoplasty using autologous conchal cartilage in 1(2.5%) patient.

TABLE 5 – TABLE SHOWING THE COMPARISION OF PRE OP AND POST OP PTA IN COM PATIENTS

PTA	Mean	Std. Deviation	Mean difference	Paired t Test	
Pre OP	46.81	7.77	8.68	P<0.001	Highly Sig
Post OP after 6 moths	38.13	7.53			

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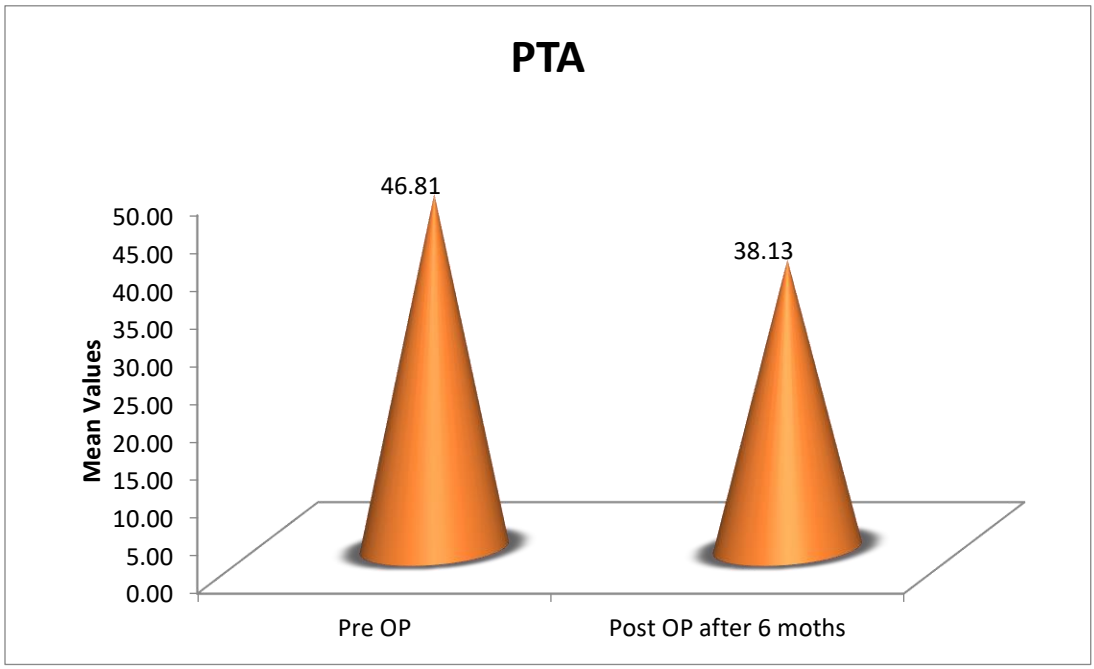

GRAPH 4 – GRAPH SHOWING THE COMPARISION OF PRE OP AND POST OP PTA IN COM PATIENTS

In our study there is significant improvement in PTA post operatively with mean pre operative PTA 46.81db and post operative PTA mean of 38.13db, standard deviation is 7.77 ,7.53 and paired T test P value <0.001 which is highly significant.

TABLE 6– TABLE SHOWING THE COMPARISION OF PRE OP AND POST OP ABG IN COM PATIENTS

ABG	Mean	Std. Deviation	Mean difference	Paired t Test	
Pre OP	37.94	8.01	8.42	P<0.001	Highly Sig
Post OP after 6 moths	29.51	8.36			

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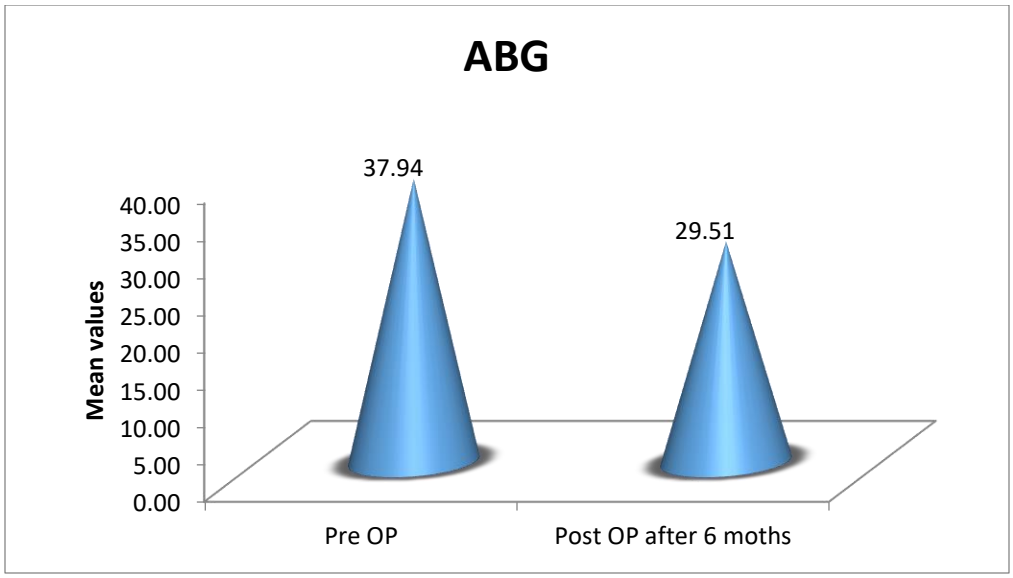

GRAPH 5 - GRAPH SHOWING THE COMPARISION OF PRE OP AND POST OP ABG IN COM PATIENTS

In our study there is significant improvement in ABG post operatively .The preoperative ABG mean is 37.94db ,standard deviation is 8.01 .The post operative ABG at 6 month ,mean is 29.51db ,standard deviation is 8.36 ,mean difference between two group is 8.42 and paired T test P value <0.001 which is highly significant.

DISCUSSION:

This study is an attempt at evaluating the hearing improvement following ossicular reconstruction using autograft conchal cartilage.

A total number of 40 cases were studied in the study. Types of tympanoplasty using autologous cartilage in these cases were analysed from the view point of hearing improvement. The cases selected have tympanic membrane perforation and both active and inactive middle ear disease and pre operative hearing loss >40 dB. The operation performed was mastoidectomy with tympanoplasty. The graft used was temporalis fascia.

OSSICLE INVOLVEMENT:
In our study the within the osssicles most common ossicle involved is long process of incus 11(69%) patients, anterior crus of stapes in 2(13%),malleus handle 2 (12%) and malleus head in 1(6%) patients.

Austin reported that most common ossicular defect to be erosion of incus with intact malleus and stapes in 29.5% of cases.[4]

Kartush found erosion of long process of incus with intact malleus and stape (Type A) as most common ossicular defect.[5]

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Shrestha et al[6] and Mathur et al[7] reported erosion of incus as most common ossicular defect in their study.[6,7] Austin reported that stapedial erosion was seen in 15.5% of his cases. Sade et al[8] reported that 36% stapedial erosion was seen in unsafe type of CSOM.[8]

Shrestha et al[6] reported 15% stapedial erosion was seen in unsafe type of chronic suppurative otitis media.[6]

Udaipurwala et al had 21% of stapedial erosion in their study on ossicular defects.[9]
In our study stapes is involved in 40 (100%) patients, incus 32(80%) patients, and malleus in 31(77.5%)patients.

In a study done by Puls.T[10] ,161 cases of conchal cartilage tympanoplasty ,when tympanoplasty combined with ossiculoplasty when the stapes was intact, 72% was within 20 dB and when the stapes was absent, 54.5% was within 20 dB. [10]

In a study done by chloe [11] et al on 188 patients with ossicular reconstruction using costochondral cartilage, the postoperative hearing results as determined by the air-bone gap were comparable with those obtained with synthetic alloplastic materials (mean gap, 16.9 dB).However, unlike synthetic materials, no extrusions occurred.[11]

In our study most of the patients under went cortical mastoidectomy intact canal wall with type 3a tympsnoplasty using autologous conchal cartilage in 19(47.5%)patients , type 3b tympanoplasty in 15(37.5%)patients ,Canal wall down mastoidectomy with type 3b tympanoplasty using autologous conchal cartilage in 2(5%)patients, canal wall down mastoidectomy with type 4 tympanoplasty using autologous conchal cartilage in 1 (2.5%)patient, Intact canal wall with type 3a tympanoplasty using autologous conchal cartilage in 1(2.5%)patient, and Canal wall down with type 3A tympanoplasty using autologous conchal cartilage in 1(2.5%) patient. In all patients autologous conchal cartilage is used for ossiculoplasties.

HEARING IMPROVEMENT:
In a study done by mundada et al[12] in which ossicular reconstruction done by tragal cartilage, in 115 operated ears, an air-bone gap closure within 10 dB was found in 14.8%, within 15 dB in 34.8%, and within 20 dB in 24.4% of ears.[12]
Salter, Ritzer *et al*.[13] also described higher rate of extrusion and failure when prosthesis was used, to reduce the extrusion rate, the tragal cartilage is interposed between prosthesis and eardrum.[13]
In our study there is significant improvement in PTA post operatively with mean pre operative PTA 46.81db and post operative PTA mean of 38.13db, standard deviation is 7.77 ,7.53 and paired T test P value <0.001 which is highly significant.

In our study there is significant improvement in ABG post operatively .The preoperative ABG mean is 37.94db ,standard deviation is 8.01 .The post operative ABG at 6 month ,mean is 29.51db ,standard deviation is 8.36 ,mean difference between two group is 8.42 and paired T test P value <0.001 which is highly significant.

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In our study the within the osssicles most common ossicle involved is long process of incus 11(69%) patients, anterior crus of stapes in 2(13%),malleus handle 2 (12%) and malleus head in 1(6%) patients.
We used reshaped conchal and tragal cartilage and the results are encouraging. There are no extrusion of autologous cartilage used. The disadvantage is requirement of extra time for harvesting and sculpturing of tragal/conchal cartilage. The main advantages of tragal and conchal cartilage are
Well tolerated by the middle ear
Long term survival is achieved since cartilage grafts are nourished largely by diffusion.
Easy bioavailability and nil chances for transmission of diseases
The greatest advantage is that there is very little fibrotic fixation of the prosthesis to the surroundings, and in contrast to bony prosthesis or incus prostheses ,there is no bony fixation with a cartilagenous prostheses.

Post operative hearing improvement in our tragal /conchal cartilage ossicular reconstruction is seen in all patients . The mean PTA improvement of 7.53 dB is seen with a p value < 0.0001 , hence considered significant statistically. The mean ABG improvement of 8.42db is seen with a p value <0.001, hence considered highly significant.

CONCLUSION

There still exists a considerable difference of opinion in using either type of graft in terms of selection of graft material, graft remodeling intra-operatively, extrusion rates and postoperative hearing outcome. Thus, our study was aimed to assess the efficacy of autologous cartilage in ossicular reconstruction. All the patients who underwent ossicular reconstruction in our study had successful graft uptake and significant hearing improvement hence proves the efficacy of the study. In our study there is significant improvement in ABG post operatively .

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