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Original Research Paper

ENT

A STUDY ON OSSICULOPLASTY

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ABSTRACT

The diagnosis of **chronic otitis media** (COM) implies a permanent abnormality of the pars tensa or flacida, most likely a result of earlier acute otitis media, negative middle ear pressure or otitis media with effusion [1]. Ossiculoplasty is a micro surgical operative procedure, performed to repair or reconstruct the ossicular chain [2]. Present study was done to find out the epidemiology and hearing result after ossiculoplasty.

Materials and methods

Study design – Retrospective study

Study setting – Tertiary care hospitals in south India.

Study period - Over a period of 3 years (from July 2017 to June 2020)

Sample size – 55

Methodology -

All the patient with COM and ossicular chain damage were considered for study. Data was collected from the medical record department and analyzed.

Results - Study was to be done to find out the natural behavior of the disease, COM with ossicular damage and how it can be managed effectively. In our study of 55 cases of ossiculoplasty, followings are finding-

1. 52.72% are male and 47.27% are female. And the male to female ratio is 1.11:1.
2. Mean age of the patient is 27.63.
3. Most common ossicle involved was incus.
4. Mean improvement in ABG is 15.49 and in 87.2% of patients ABG closure was with in 20dB.

KEYWORDS : Ossiculoplasty, Ossicular chain, Ossicular erosion, atticoantral

INTRODUCTION

The diagnosis of **chronic otitis media** (COM) implies a permanent abnormality of the pars tensa or flaccida, most likely a result of earlier acute otitis media, negative middle ear pressure or otitis media with effusion [1]. This is of three types; **active COM, inactive COM and healed COM.** Earlier it was classified as **tubotympanic** and **atticoantral** disease. Tubotympanic type is called safe type and the atticoantral type is called unsafe type, because of more chance of complication. Now it is considered as the term, safe and unsafe type are incorrect and misleading as complications can occur from any ear with active COM irrespective of its pathology [1].

Ossicular chain involvement is found in all types of COM i.e. active inactive and healed. But it is more common in active otitis media and cholesteatoma disease.

Ossicular chain damage causes conductive type of hearing loss. So to improve the hearing we need to go for either tympanoplasty or ossiculoplasty.

By definition ossiculoplasty is a micro surgical operative procedure, performed to repair or reconstruct the ossicular chain [2]. Ossicular chain repair or ossiculoplasty can be done alone or along with mastoidectomy depending upon the associated disease condition.

Commonest ossicle to be eroded in COM is the long process of the incus, followed by superstructure of the stapes. But any ossicle and any parts may be involved and in some cases total ossicular chain is completely absent. The most widely used classification system is the Austin - Kartush system [3].First Austin proposed the classification of ossicular chain defect depending up on the presence or absence of malleus handle and superstructure of stapes (Incus absent in all the cases) in 1971. Later Kartush has modified the classification in 1994. Austin and Kartush classification system is the combination of both (Table 1).

Table - 1: Austin- Kartush classification of ossicular chain defects with absent incus 3 (M - Malleus handle, S - Stapes superstructure)

Group	Ossicular status
A	M+, S+
B	M+, S -
C	M -, S+
D	M -, S -
O	Intact ossicular chain
E	Ossicular head fixation
F	Stapes fixation

Autologous bone (ossicles, cortical bone) and cartilage (conchal, tragal) are the excellent material for ossiculoplasty and commonly used for the reconstruction of the ossicular chain. Some cases some biomaterials are used like bioglass, ceravital and hydroxylapatite. Titanium and Teflon prosthesis are more commonly used now a days with good result.

Objectives of our study are

- Epidemiology of the ossiculoplasty
- Hearing improvement after ossiculoplasty

MATERIALS AND METHODS

Study design – It is a retrospective study

Study setting – Study has been conducted in a tertiary care hospitals in south India.

Study period - Over a period of 3 years (from July 2017 to June 2020)

Target population – Patients were selected from the department of otolaryngology and head and neck surgery.

Sample size – 55

SAMPLING CRITERIA – All the patients of COM with ossicular chain damage who have undergone reconstructive surgeries i.e. ossiculoplasty in our hospital by a single surgeon, during above period were taken for study.

NCLUSION CRITERIA –

- Patients of COM with ossicular chain damage
- All the relevant datas are available in the medical record

department
- Patient coming for regular follow up and taken proper post operative care.
- Post operative tympanic membrane graft has taken up well.

EXCLUSION CRITERIA –
- Patients with postoperative remnant or reperforation in the tympanic membrane.
- Patient with extensive disease, where ossiculoplasty was not done.
- All the relevant datas are not available in the medical record department.
- Patient with lost follow up

Methodology -
As per inclusion criteria, all the patient's data were collected from the medical record department. Those patients where all the relevant data available were taken in to study.

Data from the medical record department shows that, all patients with CSOM coming to the out patient department (OPD) otolaryngology and head and neck surgery were evaluated properly.

CT- scan was done in all the cases to find out the extension of the disease and complications, mainly to identify cholesteatoma, assess the ossicular chain status, status of the facial canal and semicircular canals.

Depending upon the ossicular chain status we offered different types of ossiculoplasty for hearing improvement. And for the tympanic membrane defect we did grafting using temporalis fascia. All the reconstructive surgeries we did in the same sitting. In case of dry central perforation where the ear was dry for minimum of 4weeks period without any antibiotics, only ossiculoplasty and tympanic membrane grafting was done.

We have assessed the ossicular chain status of all the patients intraoperatively, because none of the investigation including CT scan of temporal bone can give the exact status of ossicular chain. Then appropriate ossiculoplasty was done. All the patients were reviewed in 1st month, 3rd month and 6th month both for graft take up and hearing status. All graft taken up cases were included on the study.

RESULTS

From the medical record department all the datas were collected and analyzed. It was found that, during July 2017 to June 2020 (3 years) total micro ear surgery done in our institute by a single surgeon was 253. Out of which the ossiculoplasty was done in 55 cases. So the percentage of ossiculoplasty in respect to total micro ear surgery is 21.73%. These 55 patients were selected for study. Out of these 55 patients, 29 were male (52.72%) and 26 were female(47.27%). The youngest patient in our series was 6 years female child, where modified radical mastoidectomy (MRM) with ossiculoplasty was done. The oldest patient in our series was a 70 year old male patient with malignant otitis externa, where MRM with ossiculoplasty was done. Table - 2 shows the age and sex distribution of all the patients under study. Male to female ratio in our study is 29:26 i.e. 1.11:1, indicates slight male predominance. Maximum number of patients were in the age group of 21 - 40 years i.e. 41.82% followed by the age group of less than 20 years i.e. 38.18%. Least common age group is more tan 60 years i.e. 3.64%. So it showed that the ossiculoplasty was commonly performed in the age group of 21 - 40 years in our series. The mean age of the patients in our study is 27.63.

Table - 2: Age and Sex distribution

Age	Male	Female	Total	Percentage (%)
< 20 years	10	11	21	38.18%
21 - 40 years	12	11	23	41.82%
41 - 60 years	5	4	9	16.36%
> 60 years	2	0	2	3.64%
Total	29(52.72%)	26(47.27%)	55	100%

Most common presenting symptom was hearing loss in all 55 cases (100%), followed by ear discharge in 46 cases (83.63%).The least common presenting symptom were ear pain and vertigo, each 5 cases (0.09%).

41 out of 55 cases (74.54%) were having atticoantral type of disease presenting with cholesteatoma or granulation or both and 14 cases (25.45%) were tubotympanic disease. Cholesteatoma was found in 36 cases (65%).

Ossiculoplasty was done by using ossicle (incus), cortical bone, autologous cartilage, heterologous preserved septal cartilage and biomaterials like teflon and titanium. Out of 55 cases 22 cases incus, 15 cases cartilage (both homologous and heterologous), 4 cases cortical bone were used. Teflon total ossicular replacement prosthesis (TORP) was used in 8 cases and titanium TORP in 6 cases. Partial ossicular replacement prosthesis (PORP) was not used in any cases.

In our series only involvement of incus was found in 31 cases, incus and stapes in 15 cases, incus and malleus in 3 cases and all the ossicles are involved in 6 cases.

Table - 3 shows, different type of ossiculoplasty done in these patients. Malleus-Stapes assembly (MSA) was done in majority of the cases. Other procedures include membrane to stapes head interposition (MmSI), membrane to footplate of stapes interposition (MmFI) and use of the TORP.

Table - 3: Different type of ossiculoplasty done

Ossiculoplasty	No of cases	Percentage(%)
MSA	20	36.36%
MmSI	11	20%
MmFI	10	18.18%
TORP	14	25.45%
Total	55	100%

Preoperative hearing evaluation shows that, 20 patients (36.36%) were having mild hearing loss, 26 patients (47.27%) were having moderate hearing loss and 9 patients (16.36%) were having moderately severe hearing loss. Post operative hearing result data was taken after 6 month of surgery. It shows that out of 55 patients, in 36 cases (65.45%) hearing became normal and 19 cases (34.54%) hearing loss was mild.

- Mean preoperative ABG (Air Bone Gap) - 27.91dB
- Mean postoperative ABG - 12.42 dB
- Mean improvement in ABG - 15.49 dB
- ABG closure within 10dB - 22 (40%)
- ABG closure within 20dB - 48 (87.2%)

DISCUSSION

In the present study, out of 55 patients, 29 were male (52.72%) and 26 were female(47.27%). So male to female ratio in our study is 29:26 i.e. 1.11:1, indicates slight male predominance. This is comparable to study by other authors. O' reilly et al (2005) in a study of 137 cases, 72 were male and 65 were female (Male: female ratio is 1.10:1) [4]. Reshma P Chavan et al in a study of 50 cases of ossculoplasty found that 29 were male and 21 were female (male:female ratio is 1.38:1) [5]. A study by Salvatore lurato et al (2001), out of 181 patients 90 were male and 91 were female (1:0.98) [4].

The mean age in our study is 27.63. O' Reilly et al (2005) [4] showed in their series, that mean age is 40 years. According to Salvatore lurato et al [6](2001), mean age is 39.5. Mean age was 32.7 according to the study by Masoud Naderpour [7] (2007). According to Resma P Chavan [5] (2017), the mean age is 36.44.

A study by Srinivas S Chavan [8] (2014), in a series of 80 cases, the mean age was 34.3. In our series more younger age group is involved.

Maximum number of patients in our series, were in the age group of 21 - 40 years i.e. 41.82%, followed by the age group of less than 20 years i.e. 38.18%. Next common age group is 41 - 60 years i.e. 16.36%. Least common age group is more tan 60 years i.e. 3.64%. This is consistent with the study by Resma P Chavan et al (2017) [5]. In their series of 50 cases, the most common age group is 21 - 40 years (48%), followed by above 40 age group (36%) and least common age group is up to 20 years (16%).

Regarding ossicular involvement in all the cases, in our series, out of 55 cases incus was found to be involved in all cases (100%). Only incus was involved in 31 cases (56.37%), incus and stapes involved in 15 cases (27.28%), incus and malleus in 3 cases (5.45%) and all the ossicles were involved in 6 cases (10.9%). In the series by Reshma P Chavan et al [5] (2017), only incus was found to be involved in 66% cases, incus and stapes was involved in 26% cases, incus and malleus was found in 6% cases. All the ossicles in their series were involved in 2% cases. So in there series also incus was involved in all cases (100%).

41 out of 55 cases (74.54%) were having atticoantral type of disease presenting with cholesteatoma or granulation or both and 14 cases (25.45%) were having tubotympanic type of disease. Cholesteatoma was found in 36 cases (65%). Cholesteatoma was found in 45% of cases in the series of Srinivas S Chavan et al [8].

In our study, out of 55 cases 22 cases we used incus for ossiculoplasty, 15 cases cartilage (both homologous and heterologous) and 4 cases cortical bone were used. Teflon TORP was used in 8 cases and titanium TORP in 6 cases. PORP was not used in any cases. Chavan SS at al[10] used teflon TORP in 36.25% cases, incus in 33.75% cases and teflon PORP in 30% cases.

In our study, mean pre-operative ABG was 27.91. O'Reilly et al [4] in their study, shown that mean pre-operative ABG was 26.8 and mean post-operative ABG was 18.6. Study by S B Ceccato et al [9] the mean pre-operative ABG was 42.8 and mean post-operative ABG was 25.5.

In our study, out of 55 cases closure of ABG to within 10dB was found in 22 cases (40%) and closure within 20 dB was found in 48 cases (87.2%). In the study by Chavan RP et al [5] it was 44% and 84%. In the study of O'Reilly et al [4] it was 25.5% and 66.4%. In the study of S B Ceccato et al [9] with in 20 dB closure was found in 62% cases.

CONCLUSION

Ossiculoplasty is a very effective technique for improvement of hearing in case of chronic suppurative otitis media with ossicular damage. In our study it was found to be effective in 87.2% cases.

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