MANAGEMENT OF OSSICULAR CHAIN ABNORMALITIES IN CHRONIC SUPPURATIVE OTITIS MEDIA OF TUBOTYMpanic TYPE

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ABSTRACT

BACKGROUND
The aim of the study is to study the commonest ossicular pathology in Chronic Suppurative Otitis Media (CSOM), tubotympanic type and how the results vary with various techniques and graft materials used for ossicular reconstruction.

MATERIALS AND METHODS
A total of 200 patients between 15-60 years of age with CSOM tubotympanic type requiring surgical treatment who underwent treatment at Dr. B. R. Ambedkar Medical College and Hospital, Bangalore, within a period of 36 months from June 2012 to May 2015 were taken into study.

Design- Randomised Prospective study.
Setting- Department of ENT, Dr. B.R. Ambedkar Medical College and Hospital, Bangalore.

RESULTS
The commonest ossicular pathology noticed was necrosis of incus. Ossicular reconstruction performed by short columella and long columella procedure using autogenous/homogenous incus gave the best results, i.e. 21.42% and 20% closure of AB gap within 10dB, respectively and 70% and 66.66% closure of AB gap within 20 dB, respectively.

CONCLUSION
In this era where a large variety of artificial prosthetic materials are being used to replace and to reconstruct the ossicular chain, autograft/homograft still play a significant role.

KEYWORDS
Chronic Suppurative Otitis Media (CSOM), Ossicular Chain Abnormalities, Ossicular Reconstruction.

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BACKGROUND
CSOM, a common condition in otorhinolaryngology characterised by chronic, intermittent or persistent discharge through a perforated tympanic membrane. Poor living conditions, overcrowding, poor hygiene and nutrition have been suggested as the basis for the widespread prevalence of CSOM in developing countries.1,2

Both types of CSOM, tubotympanic, which is considered safe, as well as atticotympanic, which is considered unsafe, may lead to erosion of the ossicular chain. The proposed mechanism for erosion is chronic middle ear inflammation as a result of overproduction of cytokines- TNF alpha, interleukin-2, fibroblast growth factor and platelet derived growth factor, which promote hyponervascularisation, osteoclast activation and bone resorption causing ossicular damage. TNF-alpha also produces neovascularisation and hence granulation tissue formation. CSOM is thus an inflammatory process with a defective wound healing mechanism.3 This inflammatory process in the middle ear is more harmful the longer it stays and the nearer it is to the ossicular chain.4

Management of CSOM has witnessed a profound change over the last 10 decades. Middle ear reconstruction is done after successful removal of the disease. For a successful ossicular reconstruction, an air-filled middle ear and a functioning eustachian tube are important prerequisites. Grafts and biomaterials chosen for use in middle ear reconstruction should not induce a sustained foreign body reaction, neither should extrude or biodegrade.

Aim of the study was to find the age, sex-related distribution, the commonest ossicular pathology, results of ossicular reconstruction by using various techniques, graft materials and to compare pre and postoperative hearing thresholds in patients with CSOM, tubotympanic type of disease.
MATERIALS AND METHODS
200 ossiculoplasties were performed over a period of 36 months from June 2012 to May 2015 at Dr. B.R. Ambedkar Medical College and Hospital, Bangalore.

Inclusion Criteria
1. Age group 15-60 years.
2. Both males and females.
3. Patients with tubotympanic type of CSOM with ossicular chain abnormalities.
4. Patients should have good cochlear reserve and good eustachian tube function.

Exclusion Criteria
1. Age group <15 years and >60 years.
2. Patients with aticoconal type of CSOM.
3. Patients with mixed hearing loss and sensory neural hearing loss.
4. Patients with tubotympanic type of CSOM without ossicular chain abnormalities.
5. Patients with poor eustachian tube function.

Intact canal wall procedures were performed in all these patients and all patients underwent audiometric assessment, pure tone averages 500, 1000, 2000 Hz were compared in the pre and postoperative periods. After clearing the disease from middle ear and mastoid, the status of ossicular chain was assessed. Ossicular reconstructive procedure was planned according to the status of ossicular chain. Temporalis fascia was used to close the perforation. Autogenous/homogenous bone (incus remnant) and synthetic Teflon prosthesis (PORP/TORP) were used for ossicular reconstruction, which was performed by either of the following methods:
1. Stapes head and newly constructed tympanic membrane (short columella).
2. Footplate and newly constructed tympanic membrane (long columella).
3. Partial Ossicular Reconstruction Prosthesis (PORP).
4. Total Ossicular Reconstruction Prosthesis (TORP).

All patients in whom ossicular reconstruction was done using synthetic Teflon prosthesis (PORP/TORP), a piece of conchal cartilage was placed between the reconstructed tympanic membrane and prosthesis.

RESULTS
1. Majority of patients (95%) were more than 20 years of age with a male preponderance (male:female 2.3:1) and left ear (52.5%) was involved more frequently compared to right ear.
2. Commonest complaints were otorrhoea (100%) and hearing loss (92.5%) with average duration of otorrhoea and hearing impairment being 7.25 years and 2.8 years, respectively.
3. We also observed that 67% patients had hearing threshold between 41-60 dB and 33% of patients had a hearing threshold between 21-40 dB.
4. Commonest ossicular pathology noticed was necrosis of incus (95%).
5. Ossicular reconstruction performed by short columella and long columella using autogenous/homogenous incus gave the best results, i.e. 21.42% and 20% closure of AB gap within 10 dB respectively and 70% and 66.66% closure of AB gap within 20 dB respectively in comparison to ossicular reconstruction done by using PORP and TORP prosthesis where 10% and 13.33% of patients achieved closure of air bone gap within 10 dB respectively and 58.57% and 56.66% closure of AB gap within 20 dB, respectively.

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Ossicular Status</th>
<th>Number of Patients</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Necrosed incus</td>
<td>140</td>
<td>70</td>
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<tr>
<td>2.</td>
<td>Necrosed incus + stapes super structure</td>
<td>50</td>
<td>25</td>
</tr>
<tr>
<td>3.</td>
<td>Necrosed malleus</td>
<td>10</td>
<td>5</td>
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</table>

Table 1. Intraoperative Ossicular Status (n=200)

<table>
<thead>
<tr>
<th>AB Gap (dB)</th>
<th>Number of Patients</th>
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<tbody>
<tr>
<td>0-10</td>
<td>0</td>
</tr>
<tr>
<td>11-20</td>
<td>0</td>
</tr>
<tr>
<td>21-40</td>
<td>66</td>
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<td>41-60</td>
<td>134</td>
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</tbody>
</table>

Table 2. Preoperative Air Bone Gap Findings (Intact Canal Wall Technique, n=200)

<table>
<thead>
<tr>
<th>Reconstruction Technique</th>
<th>Postoperative Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Closure within 10 dB (Number of Patients)</td>
</tr>
<tr>
<td>Short columella</td>
<td>15</td>
</tr>
<tr>
<td>Long columella</td>
<td>6</td>
</tr>
<tr>
<td>PORP</td>
<td>7</td>
</tr>
<tr>
<td>TORP</td>
<td>4</td>
</tr>
</tbody>
</table>

Table 3. Postoperative Air Bone Gap Findings (Intact Canal Wall Technique, n=200)

DISCUSSION
The commonest type of ossicular chain erosion encountered in CSOM is necrosis of long process of incus because of its anatomical position and the course of its blood supply. Zollnhner described the benefits of sculpturing the autologous incus in order to obtain a better assembly. Wehrs and others refined this technique and advocated the use of homograft ossicles. Austin (1972), Fisch (1994) and Pennington (1983) in their extended period of study reported good stability of hearing results with autografts. Bauer (2000) analysed his 34 years of experience with autogenous incus and cortical bone to form a columella between stapes and tympanic membrane. In their study,
85% showed an AB gap closure $\leq 20$ dB and 43% showed closure $\leq 10$ dB when TM was normal.\textsuperscript{10} Naragund Al (2011) concluded that results after ossiculoplasty with autologous incus were significantly better compared with those after other prostheses.\textsuperscript{11} Kartush (1999) found that the results of incus remnant and cortical bone were similar. They also found that the autogenous bone provides better sound transmission than cartilage.\textsuperscript{12} In our study also, we achieved better results with autogenous/homogenous bone.

**CONCLUSION**

In this era, where a large variety of artificial prosthetic materials are being used to replace and to reconstruct the ossicular chain, autograft still play a significant role. Moreover, they are stable and easily accepted by the body and not extruded, thereby providing good hearing to the patient, as it is one of the vital senses of human beings.

**Summary**

- CSOM, a common condition in otorhinolaryngology, both types of CSOM can lead to erosion of ossicular chain.
- In our study, on tubotympanic type of CSOM, commonest ossicular pathology noticed was necrosis of incus.
- Ossicular reconstruction performed by short columella and long columella using autogenous/homogenous incus gave the best results, i.e. 21.42% and 20% closure of AB gap within 10 dB respectively and 70% and 66.66% closure of AB gap within 20 dB, respectively.

**REFERENCES**