

## TYMPANOPLASTY WITH SEPTAL CARTILAGE AND CORTICAL MASTOID BONE IN CHOLESTEATOMA PATIENTS

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### ABSTRACT

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#### OBJECTIVE

This study was conducted to find out the ideal graft between septal cartilage and cortical mastoid bone in Farrior's type 3 tympanoplasty in cholesteatoma patients in terms of hearing improvement, graft status and recurrence rate of the disease after canal wall down mastoidectomy.

#### METHODS

This randomized controlled trial was conducted in a tertiary care centre and the procedure and data collections were carried out for one and a half calendar year with effect from September 2007 and each case was followed up for 6 months. The data were entered and calculated statistically using SPSS16 for windows.

#### RESULTS

The study shows significant hearing improvement in both the groups. The tympanoplasty type 3 with cortical mastoid bone had air bone gap less than 20dB in 40% of patients. In septal cartilage, tympanoplasty group air bone gap less than 20dB was observed in 36.4%. Retraction of graft developed in 1(2.4%) out of 20 patients among cortical mastoid bone tympanoplasty group. Among 22 patients of septal cartilage tympanoplasty type 3, 2(4.8%) patients had cartilage resorption and 3(7.1%) had graft displacement. Of the total 42 patients, 2(4.8%) developed recurrence of the disease.

#### CONCLUSION

Cholesteatoma management is controversial. Canal wall down mastoidectomy can reduce the recurrence of disease. The cortical mastoid bone and septal cartilage grafts can provide hearing improvement after tympanoplasty type 3. There is no significant difference in hearing improvement between the two grafts.

#### KEYWORDS

Tympanoplasty, Cholesteatoma, Decibel (dB), Airbone Gap (ABG).

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#### INTRODUCTION

Tympanoplasty is an operation performed to eradicate disease from the middle ear and to reconstruct, if possible the hearing mechanism.<sup>1</sup> The modern concepts and techniques of tympanoplasty came into being due to pioneering works of Wullstein, Zollner and Heerrman.<sup>2</sup>

Different types of autologous, homologous and synthetic grafts can be used for tympanoplasty. Homologous grafts, though once popular are abandoned due to risk of transmission of HIV, Creutzfeldt Jacob disease.<sup>3</sup> Autogenous ossicles are frequently used for tympanoplasty. However, they were found to be associated with increased risk for postoperative infection and residual cholesteatoma.<sup>4</sup> The use of mastoid cortical bone and nasal septal cartilage in the reconstructive surgery of the middle ear was introduced by Hugh and Jensen respectively.<sup>5</sup> Septal cartilage has less chance of cartilage reabsorption compared to conchal cartilage.<sup>6</sup> However, conchal cartilage has the advantage of avoiding another incision.

The synthetic PORP and TORP are costly and not all the patients can afford it.

It is in the light of above controversy to find the ideal graft material for tympanoplasty that this study intends to find out better graft between the use of nasal septal cartilage and cortical mastoid bone in Farrior's type 3 tympanoplasty after canal wall down mastoidectomy in terms of hearing improvements and graft status.

#### MATERIAL AND METHODS

This randomized controlled trial was conducted on patients older than 15 years and younger than 65 years with cholesteatoma at a Tertiary Care Centre. Patients after canal wall down mastoidectomy surgery for cholesteatoma were reconstructed using septal cartilage and cortical mastoid bone grafts as strut in between temporalis fascia graft and stapes suprastructure. Cavity obliteration technique was used with pedicled flap and meatoplasty was done in all the patients.

The pre-operative audiometry were compared with audiometric outcome after 6 months of surgery. The status of the graft and recurrence of the disease are noted.

Patients with extensive cholesteatoma with moderate to profound sensorineural hearing loss, labyrinthitis and intracranial complications are excluded. Patients with systemic diseases are also excluded.

#### RESULTS

Of the 47 patients studied, 5 patients were lost to followup and 42(89.4%) patients were available for analysis; 20 patients are

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male. Maximum cases of cholesteatoma were seen in the age group of 21-30 years, which constitutes 38.1% of the cases; 22 patients underwent cartilage tympanoplasty with septal

cartilage and 20 patients had tympanoplasty with cortical mastoid bone.

| Mean Audiogram                         | Number of Patients | Mean (decibel) | Standard Deviation (decibel) |
|--|--------------------|----------------|------------------------------|
| Pre-operative Air-Bone Gap             | 20                 | 39.04          | 8.06                         |
| Post-operative Air Bone Gap (6 months) | 20                 | 22.47          | 10.07                        |

**Table 1: Pre-operative and post-operative audiogram of tympanoplasty with cortical mastoid bone (n=20)**

After tympanoplasty with cortical mastoid bone, the mean pre-operative air bone gap was 39.04±8.06dB and post-operative mean air bone gap was 22.47±10.07dB suggesting significant improvement of hearing (p<0.001).

| Mean Audiogram                         | Number of Patients | Mean (decibel) | Standard deviation (decibel) |
|--|--------------------|----------------|------------------------------|
| Pre-operative Air Bone Gap             | 22                 | 39.87          | 7.4                          |
| Post-operative Air Bone Gap (6 months) | 22                 | 22.18          | 7.9                          |

**Table 2: Pre-operative and post-operative audiogram of Tympanoplasty with Septal cartilage (n=22)**

After tympanoplasty using nasal septal cartilage, the mean pre-operative air bone gap of 22 patients are 39.87±7.4dB and post-operative mean air bone gap was 22.18±7.9dB suggesting significant improvement (p<0.001).

| Hearing Loss (decibel) | Frequency | Percent | Valid Percent | Cumulative Percent |
|------------------------|-----------|---------|---------------|--------------------|
| 10-20                  | 8         | 40      | 40            | 40                 |
| 21-30                  | 5         | 25      | 25            | 65                 |
| 31-40                  | 7         | 35      | 35            | 100.0              |
| Total                  | 20        | 100     | 100           |                    |

**Table 3: Post-operative Air Bone gap range of Tympanoplasty with Cortical mastoid bone (n=20)**

After tympanoplasty using cortical mastoid bone, 40% of patients had air bone gap less than 20dB and 65% of patients have air bone gap less than 30dB and all the patients have air bone gap less than 40dB.

| Hearing Loss (decibel) | Frequency | Percent | Valid Percent | Cumulative Percent |
|------------------------|-----------|---------|---------------|--------------------|
| 10-20                  | 8         | 36.4    | 36.4          | 36.5               |
| 21-30                  | 11        | 50      | 50            | 86.4               |
| 31-40                  | 1         | 4.5     | 4.5           | 90.9               |
| 40-50                  | 2         | 9.1     | 9.1           | 100                |

**Table 4: Post-operative air bone gap range of Tympanoplasty with Nasal Septal Cartilage (n=22)**

Out of 22 patients who had tympanoplasty with septal cartilage, 36.4% of the patients had air bone gap less than 20dB and 86.4% of patients had air bone gap less than 30dB; 90.9% of patients had air bone gap less than 50dB; 2 patients however have air bone gap more than 40dB.

| Complications               | Tympanoplasty with cortical bone | Tympanoplasty with cartilage | Total | Percent |
|-----------------------------|----------------------------------|------------------------------|-------|---------|
| Graft displacement          | 0                                | 3                            | 3     | 7.1     |
| Graft resorption            | 0                                | 2                            | 2     | 4.8     |
| Postero-superior retraction | 1                                | 0                            | 1     | 2.4     |
| Recurrence                  | 1                                | 1                            | 2     | 4.8     |

**Table 5: Graft status and recurrence after surgery (n=42)**

Of the 42 patients, who had undergone tympanoplasty, 3(7.1%) patients had graft displacement. Graft resorption was seen in 2(4.8%) patients and 1(2.4%) patient with cortical mastoid bone tympanoplasty had postero-superior retraction; 2(4.8%) patients had recurrence of Cholesteatoma.

**DISCUSSION**

Much controversy exists on the choice of grafts for reconstruction after Cholesteatoma surgery. Septal cartilage and cortical mastoid bone are easily available autologous graft, which can be modified and used in tympanoplasty with high graft uptake rate.<sup>7</sup>

There was significant hearing improvement from pre-operative air bone gap of 39.8±7.7dB to 22.18±7.9dB after 6 months of septal cartilage tympanoplasty type 3. Our results are comparable to Harvey et al.<sup>8</sup> which reported a similar improvement in mean air bone gap of 23.8dB after double cartilage tympanoplasty. Eleftherios A et al.<sup>1</sup> also reported the mean air bone gap reducing from 40dB to 19dB in 6 months, follow up after type 3 chondrotympanoplasty.

Out of 20 patients who had undergone tympanoplasty with cortical mastoid bone after canal wall down mastoidectomy, the mean pre-operative air-bone gap was 39.04±8.06dB and post-operative mean air-bone gap was 22.47±10.07, suggesting significant improvement of hearing gain (p<0.001). Among these patients, 40% had air-bone gap less than 20dB and 65% had air-bone gap less than 30dB. The results of hearing improvement after canal wall down mastoidectomy is unpredictable. According to Lesinkas E and Vainutiene V.<sup>9</sup> none of the patients had hearing improvement after canal wall mastoidectomy. Moustafa HM and Khalifa MA.<sup>10</sup> reported air bone gap less than 30dB in less than 10% of the patients. In another study by Shrestha BL et al.<sup>11</sup> 73.7% of patients had air-bone gap closure within 30dB and 60.5% had ABG closure within 20dB.

In our study, only 2(4.8%) patients had recurrence at 6 months followup. Ajaluoueyan.<sup>12</sup> had reported recurrence rate of 7% after 10 years. The most common cause of recurrence is incomplete lowering of facial ridge. The recurrence rate of canal wall up technique ranges from 12% to 45%.<sup>1,13</sup> Our study also agrees with the fact that canal wall down mastoidectomy has less chance of recurrence.

Atticoantral retraction of graft after tympanoplasty occurred in 1(2.4%) patient who had undergone tympanoplasty with cortical mastoid bone. Our results are better than Kim JH et al.<sup>14</sup> where retraction rate was 18%.

Graft resorption was seen in 2 patients who underwent septal cartilage tympanoplasty. This is almost similar to study by Rafael A and Ramfrez C.<sup>7</sup> where 1 patient out of 32 cases had graft resorption. Cartilage could lose bulk over time with subsequent retraction. Our study showed that septal cartilage too can undergo resorption over time.

Three (7.1%) patients had graft displacement, Sayed RH.<sup>15</sup> also reported displacement in 2 patients out of 31 patients. Graft extrusion was not reported in our study. This is clearly the result of using non-infected autologous graft.

### CONCLUSIONS

Canal wall down mastoidectomy has better disease clearance than canal wall up mastoidectomy surgery. There is significant improvement in hearing after the tympanoplasty using both septal cartilage and cortical mastoid bone grafts. However, cartilage graft has more chance of resorption. There is no significant difference between the septal cartilage and cortical mastoid bone in terms of hearing improvement. The present study shows cortical mastoid bone and septal cartilage are good autografts for tympanoplasty type 3 and they are good alternatives of synthetic grafts in terms of affordability and availability.

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