

# Hearing Status After Cartilage Augmented Type III Tympanoplasty: In Chronic Otitis Media Squamous Type

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## ABSTRACT

**Introduction:** Tympanoplasty is typically performed in conjunction with a canal wall down mastoidectomy in patient with Chronic Otitis Media Squamous. The results from experimental and clinical studies of the type III stapes columellar reconstruction have shown that interposing a disk of cartilage between the graft and the stapes head improves hearing in the lower frequencies by 5 to 10 dB. They hypothesize that the cartilage acts to increase the “effective” area of the graft that is coupled to the stapes, which leads to an increase in the middle ear gain of the reconstructed ear. **Aims:** To assess the hearing improvement after cartilage augmented Type III Tympanoplasty in chronic otitis media squamous disease **Methods:** This study was conducted in 44 patients with Chronic Otitis Media squamous in the patients attending the department of Otorhinolaryngology in NGMC teaching hospital from November 2018 to March 2020. Canal Wall Down mastoidectomy with cartilage augmented type III Tympanoplasty and was done. Augmentation was done with thin 3-4 mm conchal cartilage interposed between stapes and Temporalis fascia graft. **Results:** There were 11(25%) male and 33(75%) female, with mean age of 29.48 years, ranging from minimum of 15 years to maximum 56 years. The preoperative mean A–B gap was 21.82 and postoperatively means AB gap was 12.20 dB with overall AB gap gain was 9.64 dB. **Conclusion:** Significant hearing improvement is seen in Canal Wall Down mastoidectomy Chronic Otitis Media squamous after cartilage augmented type III tympanoplasty.

**Keywords:** Chronic Otitis Media (COM), CWD Mastoidectomy ABG, Squamous, Tympanoplasty

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## INTRODUCTION

Chronic suppurative otitis media is characterized by intermittent or persistent, chronic purulent drainage through a perforated tympanic membrane and can be associated with cholesteatoma. On occasion, a permanent, central perforation of the tympanic membrane can remain dry, with only rare intermittent drainage, that is, inactive chronic otitis media.<sup>1</sup> According to survey done by BRINOS, and IOM Teaching Hospital, 2.7 million out of the population of 19 million were significantly deaf.

The term tympanoplasty was used in 1953 by Wullstein to describe surgical techniques for reconstruction of the middle ear hearing mechanism that had been impaired or destroyed by chronic ear disease.<sup>2</sup> The goal of tympanoplasty is to restore sound pressure transformation at the oval window by coupling an intact tympanic membrane with a mobile stapes footplate via an intact or reconstructed ossicular chain and to provide

sound protection for the round window membrane by means of a closed, air-containing, mucosa-lined middle ear.<sup>3</sup>

The hearing results after a classic type III tympanoplasty is vary widely, with airborne gaps ranging from 10 to 60 dB. The results from experimental and clinical studies of the type III stapes columellar reconstruction have shown that interposing a disk of cartilage between the graft and the stapes head improves hearing in the lower frequencies by 5 to 10 dB. They hypothesize that the cartilage increase the “effective” area of the graft that is coupled to the stapes, which leads to an increase in the middle ear gain of the reconstructed ear.<sup>1</sup>

## METHODS

The present prospective study was conducted in the Department of Otorhinolaryngology, Nepalgunj Medical College & Teaching Hospital Nepalgunj, Banke from November 2018 to March 2020. The total number of cases included in

the study was 44 with COM Squamous type with both genders. Patients with complication and poor hearing result are not included on study. A detailed history followed by general physical and detailed ENT examination was done in all patients and diagnosis recorded. Pre-operative Pure Tone Audiometry (PTA) was done by ALPS Advanced Digital Audiometer AD 2100 in a sound proof room. Otomicroscopy was done to reconfirm the otoscopic finding, middle ear mucosal and ossicular status, middle ear epithelization and status of attic region.

Written and informed consent was taken before surgery. Ethical clearance was obtained from Institutional Review Committee, Nepalgunj Medical College and Teaching Hospital. Canal Wall Down mastoidectomy with cartilage augmented type III Tympanoplasty was done. Augmentation was done with thin 3-4 mm conchal cartilage interposed between stapes and Temporalis fascia graft. Patient was watched for soakage of dressing, vertigo, facial nerve status, otalgia, headache etc and discharged on 2<sup>nd</sup> day after re-dressing. First visit was at 7 post-op days for removal of dressing, cotton/ribbon plug and stitches. Patients were advised to start a topical antibiotic ear drops for two weeks. Second visit was done at 21 post-op days for, subjective evaluation (hearing, tinnitus, and any other complaints) and status of post aural wound. Third visit was done at one and half month post-operative day for subjective evaluation (hearing, tinnitus, and any other complaints) and post aural wound and status of graft by otoscopy. Fourth visit was at 3 months post op for subjective evaluation and PTA was repeated. These findings were then evaluated and compared with preoperative findings.

**RESULTS**

The study was conducted in the department of ENT in Nepalgunj Medical College and Teaching Hospital of 44 patients with established chronic otitis media inactive .11(25%) were males and 33(75%) females. Their ages ranged from 15 year to 56 years with mean age was 29.48± 11.28 years. Patients in the age group of <20 years were 11 (25%), followed by 21-30 were 15(34.1%), 31-40 were 10(22.7%), 41-50 were 5(11.4%) and >50 were 3(6.8%).

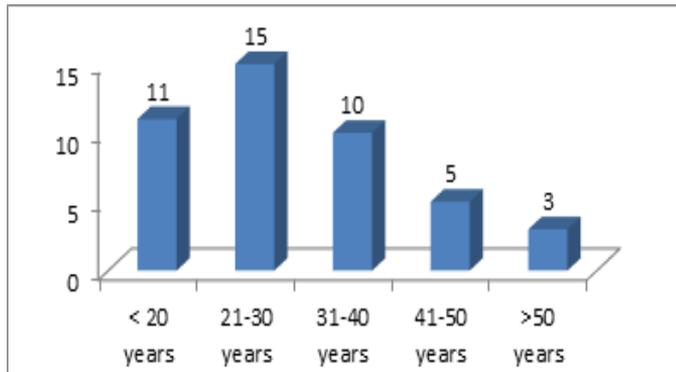


Figure 1: Age Distribution.

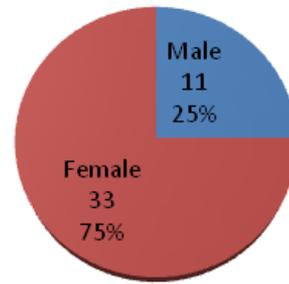


Figure 2: Sex Distribution.

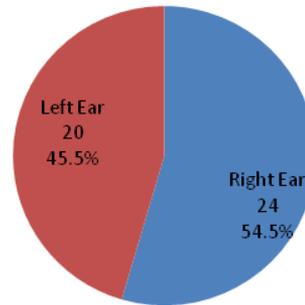


Figure 3: Laterality.

Figure 3 show that right ear involvement was seen in 24(54.5%) cases. The left ear was seen to be involved in 20(45.5%) of the cases. Out of the 44 cases, the disease was unilateral in 33(75%) patients and bilateral in 11(25%) patients.

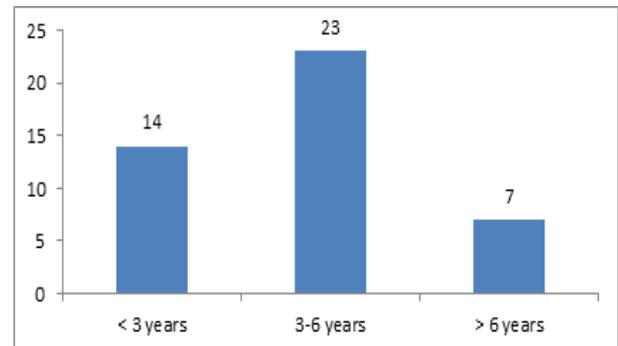


Figure 4: Duration of Ear Discharge.

In maximum number of patients, 23(52.3 %), the duration of ear discharge was 3–6 years, followed by 14(31.8%) and 7(15.9 %) of the patients where the duration was seen to be <3 and >6 years respectively (Figure 4).

The preoperative AC threshold was (39.93±6.37dB) for patients undergone surgery. In present study preoperative mean A–B gap was (21.82 ±3.68dB). Postoperatively AC hearing threshold was (26.93 ±1.89dB) and average gain in air conduction threshold was (13.07 ±6.79dB) in patients who had undergone augmented type III tympanoplasty. In this study preoperative mean A–B gap was (21.82 ±3.68 dB). Postoperatively mean AB gap was (12.20±2.29dB). Overall AB gap gain was (9.64 ± 3.96dB). These differences were statistically significant when applied paired-samples t test.

Group		P-value
Pre-op AC Threshold	39.93 ±6.37	0.000
Post-op AC Threshold	26.93 ±1.89	
AC Threshold gain	13.07 ±6.79	

**Table I: Post-op Audiological Assessment (AC Threshold).**

Group		P-value
Pre-op A-B Gap	21.82 ±3.68	0.000
Post-op A-B Gap	12.20 ±2.29	
A-B Gap gain	9.64 ± 3.96	

**Table II. Post-op Audiological Assessment (A-B Gap).**

## DISCUSSION

In the present study, 44 patients in the age group of 15–56 years with mean age 29.48 years of either sex were selected. Pure tone audiometry was done to assess hearing loss before and 3 month after surgery. The mean age was 29.48 years with maximum number of patients 15 being between the age group of 21–30 years followed by 11 patients between age group <20 years, 10 patients between age group 31-40 years, 5 patients between agroup 41-50 years and 3 patients in >50 years. Similar studies done by Kyrodimos et al and Shrestha et al, the mean age of presentation was also 32.4 and 24.8 years respectively.<sup>4,5</sup> In present study there was female preponderance as compared to male patients. Overall 33(75%) were females while rest 11(25%) patients was males. The right ear involvement was seen in 24(54.5%) cases. The left ear was seen to be involved in 20(45.5%) of the cases. Out of the 44 cases, the disease was unilateral in 33(75 %) patients and bilateral only in 11(25 %) patients.

### Duration of Ear Discharge

The duration of ear discharge ranged from 2 years to 9 years. Maximum number of patients, that were 23(52.3 %) cases, had duration of ear discharge of 3-6 years followed by 14(31.8%) patients gave history of ear discharge for a duration of < 3 year and 7(15.9 %) had a history of ear discharge of >6 years. In a study conducted by goyal et al. 100 % of the patients presented with a history of ear discharge.<sup>6</sup> Longer duration of ear discharge shows lack of awareness about the disease and its complications.

### Hearing Improvement

The preoperative AC threshold was (39.93±6.37dB) and mean A–B gap was (21.82 ±3.68dB). Postoperatively AC hearing threshold was (26.93 ±1.89dB) with average gain in AC threshold was (13.07 ±6.79dB) in patients who had undergone augmented type III tympanoplasty. The preoperative mean A–B gap was (21.82 ±3.68 dB) and postoperatively means AB gap was (12.20±2.29dB) with overall AB gap gain was (9.64 ± 3.96dB). This was seen to be statistically significant up to a level of 5%. This result is consistent with the study done by

kyrodimos et al<sup>4</sup> where pre and post-operative PTA-ABG were 35.41 and 24.33 respectively. Merchant et al<sup>7</sup> was found mean ABG of 10-25 db in aerated middle ear with variable ABG in non-aerated ear. In the study, conducted by Shrestha et al<sup>5</sup> the hearing gain in patients underwent cartilage augmented type II Tympanoplasty was 7.7 dB. A comparative study, conducted by Cheang et al.<sup>8</sup> In his between myringolenticulopexy and myringostapediopex, the mean post-operative air-bone gaps in the two groups were 17.5 and 24.7 dB, respectively. Similarly Moustafa and Khalifa<sup>9</sup> in their tympano-cartilago-stapediopexy were performed in the other 95 cases, achieved ABG of less than 20 dB. Malafronte G et al<sup>10</sup> in cases of double-cartilage block ossiculoplasty, One year after surgery, a postoperative ABG of 20 dB or less occurred in 80% (n = 20) of patients of Group 1 and in 84.3% (n = 27) of patients of Group 2. After a mean follow-up of 7 years, a postoperative ABG of 20 dB or less occurred in 48% (n = 12) of patients in the first group and in 81% (n = 26) of patients in the second group the ABG of 20 dB or less achieved. In our study the overall AB gap gain was 9.64dB.

Study	Pre op A-B gap	Post op A-B gap	Net gain
Present study	21.82 dB	12.20 dB	09.64 dB
Kyrodimos et al	35.41 dB	24.33 dB	11.09 dB
Shrestha et al	37.4 dB	29.7 dB	07.7 dB

**Table 3: Hearing improvement.**

## LIMITATIONS

To establish strong indication and statistical significance about role of the hearing improvement after cartilage augmented Type III Tympanoplasty in management of mastoidectomy, it requires large sample size and multicenter study.

## CONCLUSION

Depending on our observation we concluded that hearing improvement is seen in Canal Wall Down mastoidectomy COM squamous after cartilage augmented type III tympanoplasty. However it needs to be compared with conventional type III tympanoplasty with Temporalis fascia alone, with cartilage augmented type III tympanoplasty. To establish strong indication and statistical significance about role of mastoidectomy, it requires large sample size and multicenter study.

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