

Original Research

Assessment of outcome of autologous incus and titanium ossicular replacement prosthesis in patients with ossicular discontinuity in chronic suppurative otitis media

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ABSTRACT:

Background: Chronic suppurative otitis media (CSOM) is a persistent inflammation and infection of the middle ear and mastoid cavity characterized by the presence of purulent (pus-like) discharge from the ear for at least 6 weeks. The present study was conducted to compare outcome of autologous incus and titanium ossicular replacement prosthesis in patients with ossicular discontinuity in chronic suppurative otitis media. **Materials & Methods:** 78 cases of patients with ossicular discontinuity in chronic suppurative otitis media of both genders were divided into 2 groups of 39 each. In group I patients, autologous incus was used and in group II patients, titanium prosthesis either TORP or PORP was used for ossicular replacement. The postoperative air-bone gap (ABG) was calculated as the difference between postoperative air conduction (AC) and preoperative bone conduction (BC). **Results:** The mean pre-operative air conduction in group I was 42.5 dB and in group II was 42.9 dB. The mean post-operative air conduction in group I was 34.2 dB and in group II was 33.7 dB. The mean pre-operative bone conduction was 8.6 dB in group I and 9.4 dB in group II. The mean post-operative bone conduction was 9.1 dB in group I and 10.2 dB in group II. The mean pre-operative air bone gap was 32.1 dB in group I and 32.7 dB in group II. The mean post-operative air bone gap was 24.7 dB in group I and 22.3 dB in group II. The difference was significant ($P < 0.05$). Pre-operative and post-operative air conduction in PORP patients was 41.5 dB and 32.8 dB respectively and in TORP patients was 52.6 dB and 41.9 dB respectively. The mean pre-operative and post-operative bone conduction in PORP patients was 8.3 dB and 9.6 dB and in TORP patients was 14.2 dB and 15.3 dB respectively. The mean pre-operative and post-operative air bone gap in PORP patients was 32.8 dB and 21.7 dB and in TORP patients was 37.4 and 26.5 dB respectively. The mean pre-operative air bone gap closure in PORP patients was 10.6 dB and in TORP patients was 11.4 dB respectively. The difference was significant ($P < 0.05$). **Conclusion:** The results of titanium ossicular replacement prostheses are superior, and there is no discernible difference between the audiological outcomes of TORP and PORP.

Keywords: Chronic suppurative otitis media, titanium ossicular, bone conduction

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INTRODUCTION

Chronic suppurative otitis media (CSOM) is a persistent inflammation and infection of the middle ear and mastoid cavity characterized by the presence of purulent (pus-like) discharge from the ear for at least 6 weeks. It is a common condition, particularly in low- and middle-income countries, and can lead to hearing loss and other complications if left untreated.¹

CSOM typically occurs as a complication of acute otitis media, an infection of the middle ear. Factors that can predispose individuals to CSOM include inadequate treatment or recurrent episodes of acute otitis media. Eustachian tube dysfunction, which impairs ventilation and drainage of the middle ear.^{2,3} Trauma to the tympanic membrane (eardrum), such as from insertion of foreign objects or repeated mechanical injury. Chronic inflammation due to

allergies, nasal polyps, or underlying conditions such as immune deficiencies or ciliary dyskinesia.⁴Rebuilding the ossicular chain is known as ossiculoplasty. For ossicular restoration, the ideal prosthesis should be biocompatible, stable, safe, simple to install, and able to provide the best possible sound transmission. A number of considerations must go into choosing a prosthesis, including as compatibility and ease of configuration during surgery. Materials utilized in ossiculoplasty include synthetic materials like plastipore, hydroxyapatite, and titanium; homologous grafts like homologous bone; and autografts such autologous ossicles, cartilage, and bone.⁵The present study was conducted to compare outcome of autologous incus and titanium ossicular replacement prosthesis in patients with ossicular discontinuity in chronic suppurative otitis media.

MATERIALS & METHODS

The present study was conducted on 78 cases of patients with ossicular discontinuity in chronic

suppurative otitis media of both genders. All were informed regarding the study and their written consent was obtained.

Data such as name, age, gender etc. was recorded. In all patients otoscopic examination were done. Patients were divided into 2 groups of 39 each. In group I patients, autologous incus was used and in group II patients, titanium prosthesis either TORP or PORP was used for ossicular replacement. Ossiculoplasty was performed in one stage with tympanomastoidectomy with post aural approach. Temporalis fascia was used as the graft material. Hearing level was determined using four-frequency pure tone averages, of 500, 1000, 2000, and 3000 Hz, as recommended before surgery and 6 months after surgery. The postoperative air–bone gap (ABG) was calculated as the difference between postoperative air conduction (AC) and preoperative bone conduction (BC). Data thus obtained were subjected to statistical analysis. P value < 0.05 was considered significant.

RESULTS

Table I Pre-operative and post-operative hearing status

Parameters	Groups	Pre- op (dB)	Pre- op (dB)	P value
Air conduction	Group I	42.5	34.2	0.02
	Group II	42.9	33.7	0.03
Bone conduction	Group I	8.6	9.1	0.82
	Group II	9.4	10.2	0.76
Air bone gap	Group I	32.1	24.7	0.01
	Group II	32.7	22.3	0.01

Table I shows that mean pre- operative air conduction in group I was 42.5 dB and in group II was 42.9 dB. The mean post- operative air conduction in group I was 34.2 dB and in group II was 33.7dB. The mean pre- operative bone conduction was 8.6 dB in group I and 9.4 dB in group II. The mean post- operative bone

conduction was 9.1 dB in group I and 10.2 dB in group II. The mean pre- operative air bone gap was 32.1 dB in group I and 32.7 dB in group II. The mean post- operative bone gap was 24.7 dB in group I and 22.3 dB in group II. The difference was significant (P<0.05).

Graph I Pre-operative and post-operative hearing status

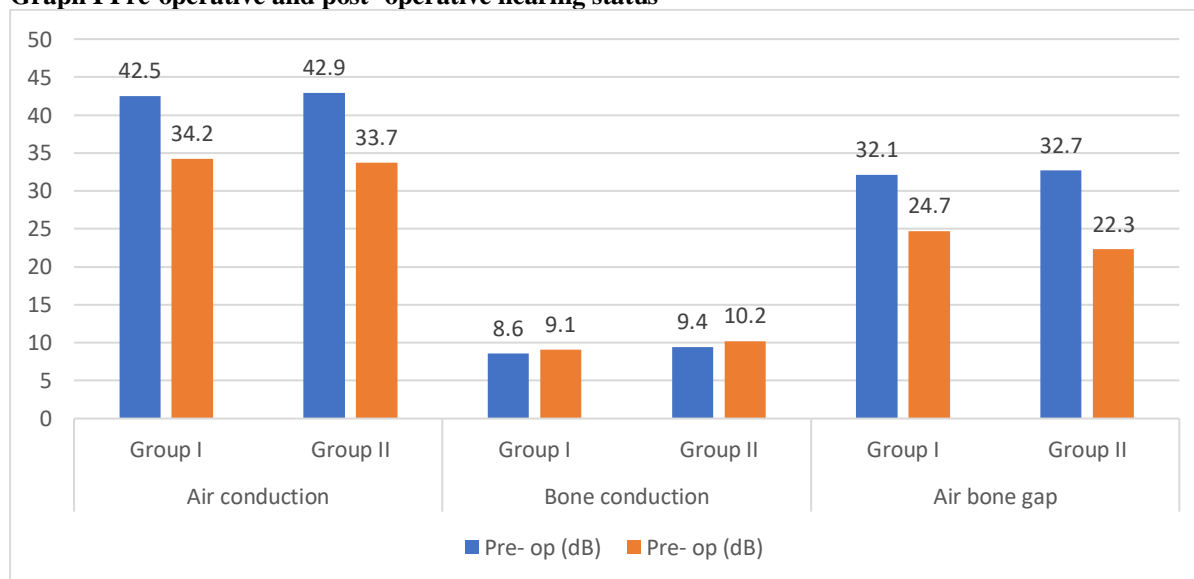


Table II Comparison of hearing results in patients implanted with titanium total and partial ossicular replacement prosthesis in group II

Parameters	Groups	Pre- op (dB)	Pre- op (dB)	P value
Air conduction	PORP (24)	41.5	32.8	0.03
	TORP (15)	52.6	41.9	0.01
Bone conduction	PORP (24)	8.3	9.6	0.82
	TORP (15)	14.2	15.3	0.76
Air bone gap	PORP (24)	32.8	21.7	0.03
	TORP (15)	37.4	26.5	0.02
Air bone gap closure	PORP (24)	10.6	-	0.73
	TORP (15)	11.4	-	

Table II shows that pre- operative and post- operative air conduction in PORP patients was 41.5 dB and 32.8dB respectively and in TORP patients was 52.6dB and 41.9dB respectively.

The mean pre- operative and post- operative bone conduction in PORP patients was 8.3dB and 9.6dB and in TORP patients was 14.2dB and 15.3dB respectively. The mean pre- operative and post- operative air bone gap in PORP patients was 32.8dB and 21.7dB and in TORP patients was 37.4 and 26.5 dB respectively. The mean pre- operative air bone gap closure in PORP patients was 10.6dB and in TORP patients was 11.4 respectively. The difference was significant ($P < 0.05$).

DISCUSSION

Materials utilized in ossiculoplasty include synthetic materials like plastipore, hydroxyapatite, and titanium; homologous grafts like homologous bone; and autografts such autologous ossicles, cartilage, and bone.^{6,7} Improving hearing is the aim of ossiculoplasty in patients with conductive hearing loss. Numerous factors, such as the condition of the ossicles and middle ear mucosa, surgical technique, and Eustachian tube function, affect the outcome of ossiculoplasty.⁸ A patient's age, the duration of the prosthesis, revision surgery, otorrhea, tympanic membrane perforation, and cholesteatoma are other factors that can impact the outcome of their postoperative hearing.^{9,10} The present study was conducted to compare outcome of autologous incus and titanium ossicular replacement prosthesis in patients with ossicular discontinuity in chronic suppurative otitis media.

We found that the mean pre- operative air conduction in group I was 42.5 dB and in group II was 42.9 dB. The mean post- operative air conduction in group I was 34.2 dB and in group II was 33.7 dB. The mean pre- operative bone conduction was 8.6 dB in group I and 9.4 dB in group II. The mean post- operative bone conduction was 9.1 dB in group I and 10.2 dB in group II. The mean pre- operative air bone gap was 32.1 dB in group I and 32.7 dB in group II. The mean post- operative bone gap was 24.7 dB in group I and 22.3 dB in group II. Kruger et al¹¹ in their study 31 patients undergoing ossiculoplasty, with 16 partial ossicular chain reconstructions using the Bell prosthesis and 15 total reconstructions using the

Aerial prosthesis were studied and air-bone gap for pure tone average and 3,000 and 4,000 Hz, assessed preoperatively and 3 months, 6 months, and 12 months postoperatively; percent of patients obtaining an air-bone gap of ≤ 20 dB; high-frequency average (1,000, 2,000, and 4,000 Hz) to evaluate sensorineural hearing loss; and extrusion rate. A postoperative air-bone gap of ≤ 20 dB was obtained in 81% of Bell prosthesis patients and 67% of Aerial prosthesis patients at 3 months. The results were stable to improved for later time intervals. High-frequency gaps were similar to the pure tone average gap.

We observed that pre- operative and post- operative air conduction in PORP patients was 41.5 dB and 32.8 dB respectively and in TORP patients was 52.6 dB and 41.9 dB respectively. The mean pre- operative and post- operative bone conduction in PORP patients was 8.3 dB and 9.6 dB and in TORP patients was 14.2 dB and 15.3 dB respectively. The mean pre- operative and post- operative air bone gap in PORP patients was 32.8 dB and 21.7 dB and in TORP patients was 37.4 and 26.5 dB respectively. The mean pre- operative air bone gap closure in PORP patients was 10.6 dB and in TORP patients was 11.4 respectively. Stupp et al¹² studied a wide variety of patients aged 5 to 82 years received a tympanoplasty type III. Those patients whose ossicular chain had been reconstructed with titanium implants since 1994 were evaluated. As implants from one company are fixed in length; implants of a second company are trimmable in length. All prostheses are lightweight and made of pure titanium, fitting most anatomical situations. Earlier results already showed a very low complication rate. Extrusions occurred only in cases of middle ear atelectasis with resorption of interposed cartilage ($< 1\%$). No adverse reaction to the prostheses could be seen, even in histologic reviews. An average air-bone gap less than 20 dB(A) for all calculated frequencies of 0.5, 1, 2, and 4 kHz was achieved for 76% of cases; 43% of cases showed a calculated air-bone gap of less than 10 dB(A), only 10% higher than 30 dB(A).

The shortcoming of the study is small sample size.

CONCLUSION

Authors found that the results of titanium ossicular replacement prostheses are superior, and there is no

discernible difference between the audiological outcomes of TORP and PORP.

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