

## Research Article

**Middle ear Ossiculoplasty – an experience of a single surgical unit**Jayaweera JMRG<sup>1</sup> <sup>1</sup> Consultant ENT and Head & Neck Surgeon, District General Hospital Matara, Sri Lanka**Abstract:****Background**

Middle ear ossiculoplasty refers to the reconstruction of the middle ear ossicular chain when there is an in continuity or fixation of the ossicular chain due to disease process or trauma. Various materials and techniques have been used to regain the function and continuity of the ossicular chain. But the ideal reconstruction materials and techniques are yet to be developed. The first ossiculoplasty was reported in modern medical literature by Matte in 1901. (1) Since then, various people have used different materials and techniques for ossiculoplasty(2).

In a Sri Lankan setting, only a few centres of the country perform ossiculoplasty though almost all the Ear nose throat departments in the country perform myringoplasty for CSOM (Chronic suppurative otitis media). The main purpose of myringoplasty is to make the ear safe from recurrent ear infection. Improving hearing is not the main aim for myringoplasty in Sri Lanka though some patients get the hearing benefit.

**Material and method**

Gray's total ossicular replacement prosthesis (TORP )and partial ossicular replacement prosthesis (PORP) were used. Retrospective data analysis was carried out from patients who underwent surgery from 1<sup>st</sup> of July 2017 for three-year periods and calculated the success rate using the improvement of hearing in postoperative audiograms.

**Conclusion and recommendations**

Our experience in ossiculoplasty with TORP and PORP showed a reasonable success rate on hearing for traumatic or infective conductive hearing loss. We recommend carrying out it routinely with myringoplasty in the case of damage ossicular chain in the middle ear. We also recommend the ministry of health to make available other types of ossicular prostheses like angular clip prosthesis and malleus replacement prosthesis in addition to TORP and PORP.

**Keywords:** middle ear Ossiculoplasty, Middle ear trauma, Chronic otitis media, Ossicular prosthesis**Copyright:** © 2021 Jayaweera JMRG

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## **Introduction.**

Middle ear ossiculoplasty refers to the reconstruction of the middle ear ossicular chain following disruption of the ossicular chain due to trauma or disease process. It is well known that the commonest bone affected is the incus due to its rich blood supply (16). The goal is to improve the overall hearing of the patient. But ossiculoplasty also improves the aeration of the middle ear cavity which is beneficial to control chronic middle ear disease. The first ossiculoplasty was reported in modern medical literature by Matte in 1901 (1). He reported a case of myringostapediopexy by lowering the tympanic membrane to the stapes head. In 1951 – Wullstein, A German Otologist used Vinyl Acrylic to fill the gap of the Ossicular chain (2) Hall and Ryztner in 1957 reported a series of cases of ossiculoplasty using autograft ossicles. They used the incus to fill the gap between malleus and stapes. (3) Various otologists in the early 1960 s successfully tried Autologous ossicles sculptured from Mastoid cortex, Loop of Henle Etc. (4) House et al. and Wehrs et al in the 1960s have done a series of cases on the ossicular repair with homograft ossicles(4,12,13). In 1966, Jean Marquet published the first clinically successful use of allograft tympanic membranes(5). For both allograft and homograft ossicular repair, it was essential to maintain a tissue bank. To overcome this people all over the world tried various synthetic and non-organic materials for ossicular chain reconstruction, the earliest material was gold prosthesis and In the late1960s and early 1970s gold prosthesis gave reasonably good results(11). Biocompatible materials, such as polyethylene tubing, Teflon, and Proplast came into the picture in the 1960s. ( 6,11). Though the results of hearing gain were not bad short-term, the extrusion rate is high for those synthetic ossicular prostheses, and in Early 1971 – Cartilage grafts became popular among surgeons. (7) But with the invention of more innate materials in the 1970s like a high-density polyethylene sponge (HDPS) and Hydroxyapatite and Titanium, surgeons favoured artificial prosthesis again.(2,11) By the 1980s almost all the prosthesis made with titanium and hydroxyapatite to make them MRI compatible(8). The quest for designing an ideal ossicular prosthesis is still on as the appropriate prosthetic design for optimal sound transmission is yet to be developed.

Aetiology for the damage of the ossicular chain is mostly due to chronic infection in the ear and traumatic ossicular chain discontinuity. (9,10). Incus is found to be the most vulnerable ossicle and the malleus is the most spared (10,16) The Goal is to improve hearing, prevent further infection, and to achieve a well-aerated middle ear. Acute infection of the ear is considered a contraindication as this can result in poor healing, prosthesis extrusion, or both(11). Few relative contraindications are also described as persistent middle ear mucosal disease and repeated unsuccessful use of the same or similar prostheses(11).

## **Material and methods**

The author started to perform ossiculoplasty using Grays Total and Partial ossicular prosthesis after they made available for the patients of the hospital under the ministry of health from 2017 onwards. A single surgeon's experiences of using those ossicular prostheses for three year period starting from 1st of July 2016 were analysed retrospectively. Initially, patients were registered in the outpatient department. Prior to the surgery patients were carefully examined with otoscopic and on some occasions with microscopy or otoendoscopy and assessed the state of the middle ear and the tympanic membrane. Special attention was made to look at clues of past surgical procedures by taking history and examining for preauricular skin and auricle. (preauricular pits or tags or auricular deformities may suggest a congenital abnormality.). It is important to examine the external auditory canal for size, shape, and defects which can give the surgeon an idea of the surgical approach. It is necessary to assess the status of the tympanic membrane and, as much as possible, the middle ear.

After making the decision the patient is explained of possible Complications. The complications highlighted here are ipsilateral taste disturbance, dizziness, residual tympanic membrane perforation, Infection, extrusion of the prosthesis, tinnitus, and rarely sensory Neural Hearing loss.

Results typically are classified based on the postoperative air-bone gap. (excellent (< 10 dB), good (11-20 dB), Fair (21-30 dB). Initial hearing results may diminish with time; therefore, results should be reported at 1, 3, and 5 years. We considered it a success when the air-bone gap in the postoperative audiogram diminished to at least 30 dB after three months postoperatively. The prognosis of the procedure mainly depends on anatomical and technical factors. Technical factors are mainly surgical and prosthetic. (11,14) The status of the tympanic membrane and the middle ear aeration is the most important middle ear anatomical factors. Extrusions due to abnormal middle ear pathology (atelectasis, middle ear fibrosis, recurrent cholesteatoma, tympanic membrane perforation, and otitis media) are the main cause of failure. (11). The success rate of the ossiculoplasty is very variable and different studies show 30% to 80% overall success rate(11,14,15)

Per meatal or end aural approach was used and tympanomeatal flap elevated to expose the middle ear cavity. Both microscopic and endoscopic or hybrid techniques were used to assess the ossicular chain. Depending on the type of discontinuity partial or total ossicular prostheses were inserted. It was experienced the natural placing of the total ossicular prosthesis is difficult and the stability of the prosthesis is poor in an instance where the malleus is eroded. Gray's Titanium prostheses were used because they are freely provided by the medical supplies' division. The package comes with dummy Prostheses and an adjustable proper prosthesis. The dummy prosthesis is used to measure the gap between the remaining ossicles.

## **Results**

All the patients underwent ossiculoplasty during the study period 01/07/2017 to 30/06/2020 by the author were included in the study. Titanium TORP and PORP were the commonest used ossicular prosthesis. fluoroplastic pistons were used to repair the gap between fractured stapes. Patients with Cholesteatoma and Otosclerosis were excluded from the study due to their ongoing pathology. During the period forty-six patients underwent ossiculoplasty with a mean age of 37.05 years. There were twenty-one males (46.65%) and 25 females (54.35%). The commonest indications are CSOM related conductive hearing loss (43 patients – 93.47%) followed by trauma (3 patients – 6.5 %). All the patients have had more than 50 dB conductive hearing in the selected ear preoperatively. Fifty-four percent of the (25 patients) had PORP and forty-one percent (19 patients) had TORP while the remaining two patients (4%) had fluoroplastic stapes piston. The two patients who had stapes prosthesis had fractured stapes following trauma.

## **Discussion**

If the audiogram done three months after surgery shows less than 30dB conductive hearing impairment outcome is considered a success. All the patients of this category were satisfied with their perceived post-operative hearing compared to preoperative hearing. It was noted that some patients were happy about the outcome despite no hearing improvement, but for making their ears free of recurrent infection. The overall success rate of our group after three months of surgery is 70 percent (32 patients. All the patients ) with traumatic hearing loss (6.5%) had improved hearing postoperatively. But this was a small fraction of the group. The success rate of PORP is around 75% (20) while it is about 53 percent (10) in TORP. The commonest complications of our series were post-operative Infection 7 (15%). prosthesis extrusion - 3 (7%) and Sensory neural hearing impairment -1 (2%)

## **Conclusion**

Ossiculoplasty is a good option to improve hearing in patients with conductive hearing loss due to CSOM with safe middle ear disease. All the patients who underwent type one myringoplasty with a severe air-

bone gap in the audiogram (More than 50 DB) should be given the option of ossiculoplasty. All the traumatic conductive hearing loss should be explored with the view of ossiculoplasty. We recommend to make available different and wide variety of ossicular prostheses in hospitals as selection of suitable prosthesis is an on-table decision and it is impossible to have tailor-made prostheses for individual patients. Infection and extrusion are the commonest complications and the failure rate of the TORP is higher than the PORP.

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