ijlpr 2022; doi http://dx.doi.org/10.22376/ijpbs/lpr.2022.12.5.L18-22

International Journal of Life science and Pharma Research

ISSN 2250-0480

Case Report

Medicine

Cost Effective Ossicular Reconstruction- A Case Report

Sumitha Ramanathan*[1], and Aberna Govarthanaraj[1]

[1] Department of ENT, Sree Balaji Medical College and Hospital, Chrompet, Chennai-600044*

Abstract: Ossicular reconstruction using various materials from autograft to artificial prosthesis have a wide range of success and failure rates due to various reasons. In this article, a newer use of old grommet in ossicular reconstruction is attempted. A 50yr old lady presented with hearing loss in the right ear for one year. She gave a previous history of ear discharge 11 months back. There was no other positive history relevant to the case. On examination, the pars tensa was plastered and immobile on the left side. Her Pure tone audiometry showed conductive hearing loss on the left ear with average 55 db loss. Her CT showed absent incus with obliteration of middle ear-space and sclerosed mastoid. We planned for Tympanotomy. On elevating the flap, the incus and stapes were absent. Here we decided on a newer use for the grommet and used it as prosthesis. The result is good and promising with no complications. The grommet did not get extruded or produce granulation tissue. The ear is dry and the patient is still on follow up. The purpose of publishing this report is to identify a prosthesis that is cost-effective and readily available. The grommet has been used for a more extended period for other indications,but as a prosthesis for reconstruction is a new method and requires further studies.

Keywords: Prosthesis, Grommet, Ossicles, ossicular chain, mastoid air cell system.

***Corresponding Author**

Sumitha Ramanathan , Department of ENT, Sree Balaji Medical College and Hospital, Chrompet, Chennai-600044

Received On 11 May, 2022
Revised On 1 July, 2022
Accepted On 8 July, 2022
Published On 1 September, 2022

Funding This research did not receive any specific grant from any funding agencies in the public, commercial or not for profit sectors.

Citation Sumitha Ramanathan, Govarthanaraj , Cost Effective Ossicular Reconstruction- A Case Report.(2022).Int. J. Life Sci. Pharma Res.12(5), L18-22 http://dx.doi.org/http://dx.doi.org/10.22376/ijpbs/lpr.2022.12.5.L18-22

1. INTRODUCTION

Myringoplasty is a surgical procedure where we close the perforation in the tympanic membrane with Temporalis fascia. Now a days conchal and tragal cartilage are used extensively due to a better success rate. Tympanoplasty is a procedure where the middle ear is cleared of the disease and the perforation is closed. Minimal diseases of the middle ear like polypoid tissue are cleared using an endoscope or microscope.[1] Both of these procedures can beperformed with or without ossiculoplasty. In ossiculoplasty the Ossicular chain is reconstructed along with disease clearance and closure of perforation. In chronic ear infections which is the commonest cause of Ossicular discontinuity, erosion of the long process of incus is the commonest finding due to its precarious blood supply. Fibrous tissue healing and scar formation between remnant incus and stapes are the causes of conductive hearing loss. During ossiculoplasty, the damaged ossicle is removed, sculpted and intrapositioned if possible.[2] In cases where it is not possible, TORP (Total Ossicular Replacement Prosthesis) or PORP (Partial Ossicular Replacement Prosthesis) is used to restore the continuity. In cases of traumatic dislocation , there is discontinuity of Ossicular joints causing hearing loss .Here only ossiculoplasty is done depending on the per operative finding. Ossiculoplasty procedure needs excellent surgical skills and good post-operative care for effective hearing improvement. Here we present a case where the patient had ossicular discontinuity due to chronic infection with plastered eardrum and absent Incus. Since the patient could not afford any prosthesis, we used Grommet as prosthesis and the result was encouraging.

2. CASE REPORT

2.1. Presenting Complaints

A 50-year-old female patient presented with history of progressive hearing loss on right side for one year. She also gave a history of ear discharge 11 months back which was profuse, mucoid, not foul-smelling and not blood stained.The ear has been dry for the past 11months.There was no history of pain, tinnitus, giddinessand recurrent upper respiratory tract infections.

2.2. Medical History

Patient underwent medical treatment for Ear discharge 1 year back. Once the ear became dry, she stopped the treatment. Then once she started developing hearing loss she contacted a general physician. Since there was no improvement, she consulted an ENT surgeon.

2.3. Family History

There was no family history of hearing loss particularly in the women of the reproductive age group.

2.4. Observation

Clinical examination of ear revealed thinning of pars tensa on right side and was plastered over promontory. Tympanic membrane on right side lacked mobility on seigalization as compared to left side tympanic membrane which was intact and mobile. Tuning fork test showed conductive hearing loss on the right side. Nose and throat was normal.

2.5. Investigation

Pure tone audiometry showed conductive hearing loss of 60 db [Figure 2] and impedance audiometry showed a flat curve with which the integrity of ossicles could not be evaluated. Examination under the microscope was done and the otoscopic findings were confirmed. HRCT of the temporal bone showed absent incus on the right side. The middle ear space was obliterated with sclerosis of the mastoid.

2.6. Diagnosis

The clinical diagnosis was Adhesive Otitis media with Conductive Hearing loss [R] side.

2.7. Treatment

The patient was scheduled for Exploratory Tympanotomy under GA. The tympano meatal flap was elevated and ossicles were examined under microscope. The flap could not be retained as a whole as it was thin and plastered. The malleus looked foreshortened. Incus was eroded totally and stapes was intact with its suprastructure. Stapes mobility was confirmed by intact round window reflex. Middle ear mucosa was polypoidal with granulation tissue and the same were removed Endoscopically. As the patient could not afford prosthesis and incus was not available for transpositioning, we decided to use grommet as prosthesis. It was placed over the suprastructureupto the posterior canal wall retaining the depth of middle ear [Figure 1]. Round window reflex was checked and thus the integrity of reconstructed ossicles was confirmed. Temporalis fascia graft harvested was placed and the remnant of Tympano Meatal flap was repositioned along with the posterior canal wall skin. Ear canal was filled with gel-foam and mastoid dressing applied.

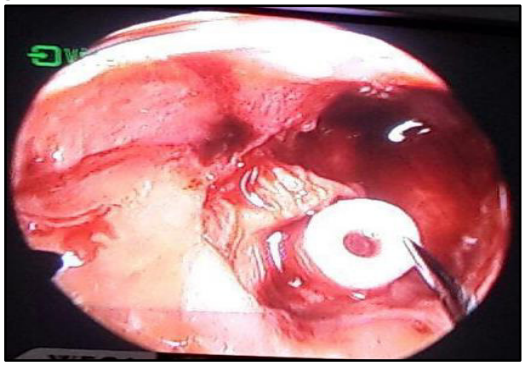

Fig 1: This is the picture showing a grommet which was used for Reconstruction.

The patient was normal post-operatively. Patient was put on oral antibiotics,antihistamines for 1 week. She was reviewed periodically every week for the first 4 weeks. Patient was advised strictly not to allow water inside the ear or use any ear drops.

2.8. Prognosis

Patient had good improvement in hearing from the first postoperative week. Post operative audiometry was done after 4 weeks which showed closure of Air Bone gap from 60db loss to 35 dbloss with improved hearing [Figure 3] .Examination done under microscope after 4 weeks showed intact Eardrum [Figure 4]. The patient is on regular follow up till now.

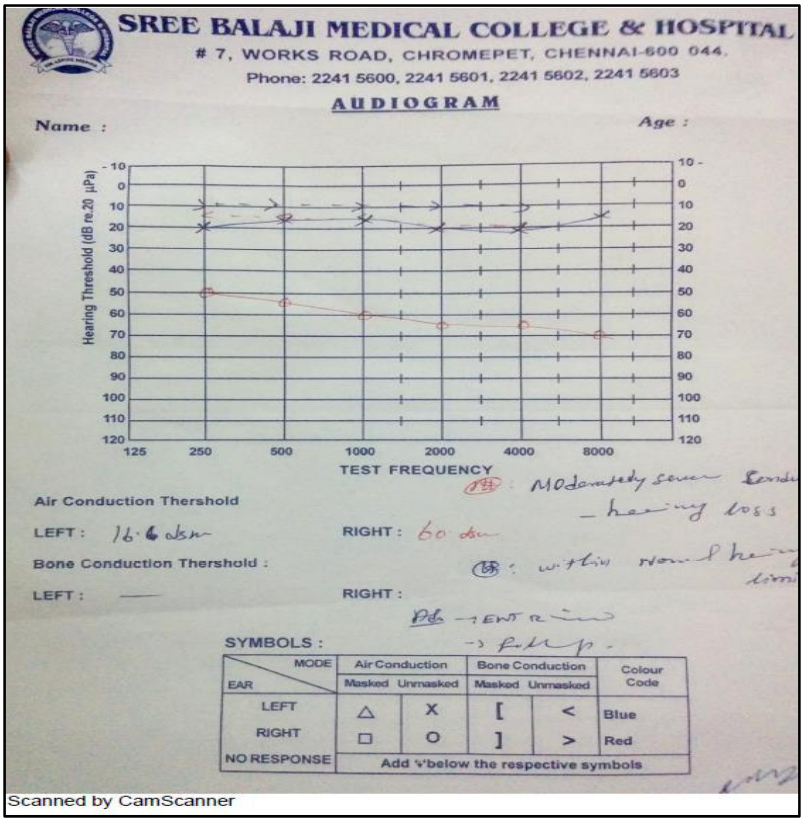

Fig 2: This is the audiometry showing a conductive hearing loss of 60 dbPre –Operatively

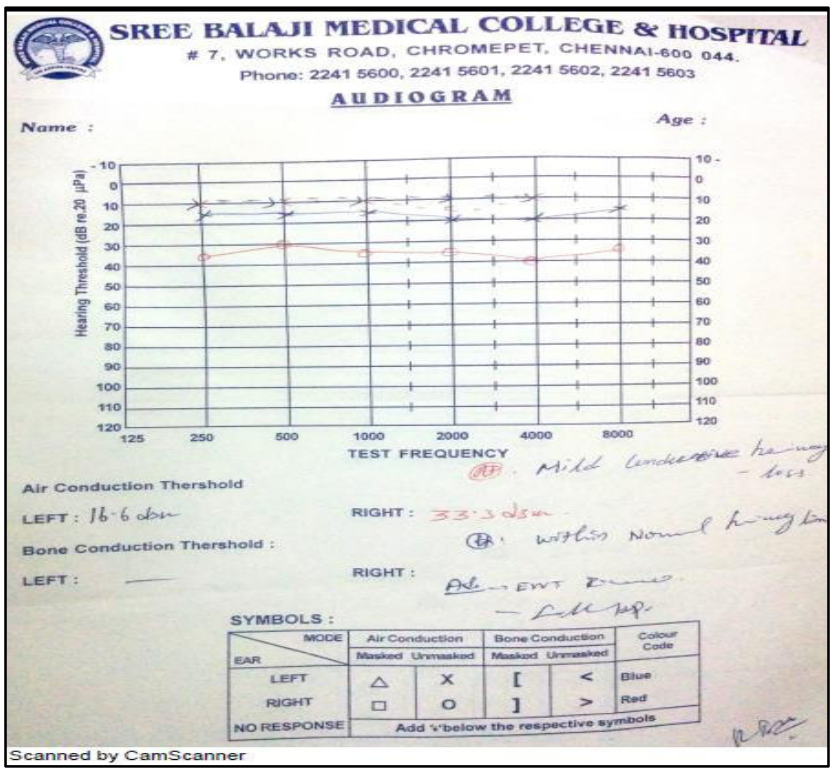

Fig 3: This is the audiometry showing an improvement of hearing loss to 33.3dbPost –Operatively

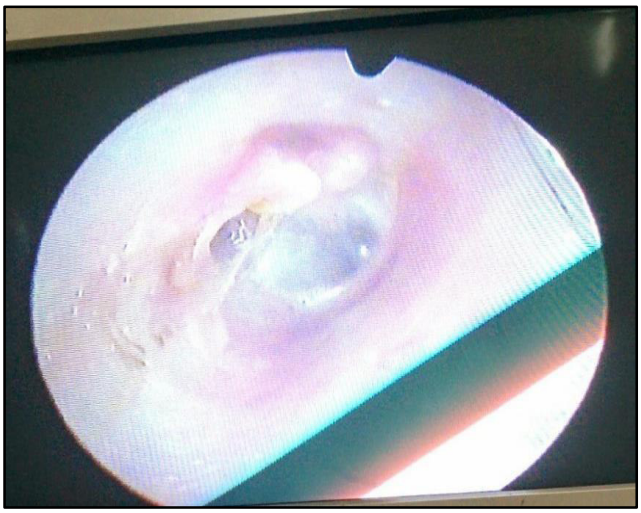

Fig 4: Post operative picture showing intact TM.

3. DISCUSSION

Austin in 1971 Classified ossicular defects into group A with malleus and stapes intact, but erosion of long process of incus being the most common defect[1], Group B with only malleus and absent Incus and stapes, Group C with only stapes but absent malleus, Group D with absent malleus and stapes suprastructure. Ossiculoplasty is a surgical procedure where the continuity of the ossicular chain is restored with interpositioning material which can range from patients' own incus to artificial Prosthesis .The aim is to give better hearing for conversational speech. Patients with bilateral disease appreciate hearing improvement better. Usually the worst ear is selected trying to give symmetrical hearing. The aim is not to completely close the air-bone gap but to reduce the gap and give a serviceable hearing. The ossicular reconstruction was first done by Hall and Ryztnerusing Autograft ossicles.[2,3] House et al. in 1966 did ossicular repair with homograft ossicles by sculpting patients' own ossicles . This was overcome by synthetic biomaterials, gold and titanium claiming to have equally good results. In the late 1950s biocompatible materials like polyethylene tubing, Teflon and Proplast were used. In the late 1970s, a high-density polyethylene sponge (HDPS) with nonreactive properties came into use. Wehrs in 1972 used homograft ossicles for reconstruction[4]. Later in 1989, he designed hydroxyapatite prosthesis which reduced preparation time and disease transmission. He claimed that this prosthesis surpassed the advantages and effective outcome of homograft ossicles[5].Though the tissue integration properties of hydroxyapatite prostheses eliminated the necessity for cartilage protection, the extrusion problems remained[6]. Smith & Nephew ENT introduced HAPEX (Hydroxyapatite Polyethylene Composite) a homogeneous composite of particulate hydroxyapatite and high-density polyethylene blended in a 40:60 ratio, by volume [7]. Subsequently, they incorporated porous coralline (from sea coral) hydroxyapatite as a head on a HAPEX shaft for PORP and TORP.[8,9] Early versions of Plastic - Pore Partial Ossicular Replacement Prostheses (PORP) and Total Ossicular Replacement Prostheses (TORP) resulted in extrusion rates. The use of cartilage interposed over the prosthesis platform reduced the extrusion rate.Titanium prostheses are under investigation.[10] In 1987 a method of reconstruction from stapes to graft or drum using Autogenous cartilage remaining attached by its perichondrium was introduced.[11] This was called the perichondrial double cartilage block (DCB) and it replaced the PORP. No extrusions were demonstrated using this technique in more than 20 years despite occasional cases of severe atelectasis. Although new materials are to improve PORP reconstruction, the DCB technique is popular due to its excellent hearing results and long-term stability. It is simple, safe and autogenous. Robert Vincent et al. in 2004.[12] introduced new techniques in ossiculoplasty. The malleus relocation technique of Robert displaces anteriorly placed handle of malleus causing difficulty while doing the procedure. Anteriorly placed handle of malleus, results in placing the prosthesis onto the tympanic membrane which causes loss of the cantilever action of the tympanic membrane malleus complex.[13] Robert Vincent et al. in 2005 achieved 10 db gains in 61.5% patients of 99 cases in his Total Ossicular Replacement Prosthesis with silastic rubber band, in which prosthesis is attached to the stapes superstructure by means of a silastic band which was claimed to solve the problems of instability and displacement.[14] In our case, we used grommet tubes which were plastic tubes used for ventilating the middle ear in cases of serous otitis media or atelectasis and early post superior retraction pockets. It was inert and patient very rarely react to it forming adhesions and extrusion. Usually it is extruded in 6 to 9 months when inserted through the tympanic membrane. In our case where the grommet was placed in middle ear and tympano meatal flap repositioned, the grommet remained in situ for the past 3 years now. Autografts have a lot of limitations like non-availability in diseased ears, lengthy operative time to remove and shape the material, resorption and loss of rigidity of the cartilage and ossicle. Osteitis can exist within the ossicles, and the risk of residual cholesteatoma is more in patients with cholesteatoma. Apart from prosthetic complications there can be fractured and dislocation of the stapes superstructure and tear of the annular ligament causing perilymphatic gush. Contraindication for ossicular reconstruction were includes active discharge due to persistent middle ear mucosal disease, and repeated unsuccessful attempts with same prostheses.[15] In the world of advanced technology and expertise hands, there are varieties of ossiculoplasty techniques and materials available. Ossiculoplasty technique varies from case to case depending on the disease, per operative finding, availability of prosthesis and affordability of the patient. The auto-grafts were preferred for reconstruction because of their high acceptance rate and cost effectiveness. The newer bioactive synthetic mouldable materials would become more popular due to their low extrusion rates, With all these grafts and

prostheses, the final outcome depends on the experience of the surgeon, instrumentation and patient healing[16,17].

4. CONCLUSION

In essence, this case report shows the immense potential to leverage the cost-effective tools such as grommets in place of a prosthesis to treat patients falling in lower social economic status successfully. We believe this is an innovative method and definitely needs further studies.

5. AUTHORS CONTRIBUTION STATEMENT

I Dr Sumitha Ramanathan contributed mainly to this article. I wrote the article and summarized the clinical method. I collected all the records and formulated them. Dr. Aberna was on regular follow up with the patient and collected references. We both finalized the manuscript with all details for submission.

6. CONFLICT OF INTEREST

Conflict of interest declared none

7. REFERENCES

1. Aristides sismanis A. Tympanoplasty. In: Glasscock-Shambaugh surgery of the ear. 5th ed. p. 463-85.
2. O'Reilly RC, Cass SP, Hirsch BE, Kamerer DB, Bernat RA, Poznanovic SP. Ossiculoplasty using incus interposition: hearing results and analysis of the middle ear risk index. Otol Neurotol. 2005;26(5):853-8. doi: 10.1097/01.mao.0000185054.92265.b7, PMID 16151328.
3. Hall A, Rytzner C. Stapedectomy and autotransplantation of ossicles. Acta Otolaryngol. 1957;47(4):318-24. doi: 10.3109/00016485709130348, PMID 13424240.
4. Wehrs RE. Results of homografts in middle ear surgery. Laryngoscope. 1978;88(5):808-15. doi: 10.1002/lary.1978.88.5.808, PMID 642674.
5. Wehrs RE. Incus replacement prostheses of hydroxylapatite in middle ear reconstruction. Am J Otol. 1989;10(3):181-2. doi: 10.1016/0196-0709(89)90060-4, PMID 2546430.
6. Macias JD, Glasscock ME, Widick MH, Schall DG, Haynes DS, Josey AF. Ossiculoplasty using the black hydroxylapatite hybrid ossicular replacement prostheses. Am J Otol. 1995;16(6):718-21. PMID 8572132.
7. Swain RE. Beale B. HAPEX: a bioactive hydroxylapatite/polyethylene composite suitable for otologic applications Bartlett, TN: Smith & Nephew ENT, 1995. P. 2123.
8. Swain RE, Beale B. HyCor 200: a coralline hydroxylapatite biomaterial used in ossicular replacement surgery Bartlett, TN: Smith & Nephew ENT; 1996.
9. Jahn AF. Experimental applications of porous (coralline) hydroxylapatite in middle ear and mastoid reconstruction. Laryngoscope. 1992;102(3):289-99. doi: 10.1288/00005537-199203000-00011, PMID 1312190.
10. Martin AD, Harner SG. Ossicular reconstruction with titanium prosthesis. Laryngoscope. 2004;114(1):61-4. doi: 10.1097/00005537-200401000-00010, PMID 14709996.
11. Gardner EK, Jackson CG, Kaylie DM. Results with titanium ossicular reconstruction prostheses. Laryngoscope. 2004;114(1):65-70. doi: 10.1097/00005537-200401000-00011, PMID 14709997.
12. Luetje CM, Denninghoff JS. Perichondrial attached double cartilage block: a better alternative to the PORP. Laryngoscope. 1987;97(9):1106-8. doi: 10.1288/00005537-198709000-00020, PMID 3626739.
13. Vincent R, Oates J, Sperling NM, Annamalai S. Malleus relocation in ossicular reconstruction: managing the anteriorly positioned malleus: results in a series of 268 cases. Otol Neurotol. 2004;25(3):223-30. doi: 10.1097/00129492-200405000-00004, PMID 15129096.
14. Vincent R, Sperling NM, Oates J, Osborne J. Ossiculoplasty with intact stapes and absent malleus: the silastic banding technique. Otol Neurotol. 2005;26(5):846-52. doi: 10.1097/01.mao.0000185068.50575.92, PMID 16151327.
15. Yung M. Long-term results of ossiculoplasty: reasons for surgical failure. Otol Neurotol. 2006;27(1):20-6. doi: 10.1097/01.mao.0000176173.94764.f5, PMID 16371842.
16. Sara N, Neelathahalli Kasturirangan M. Prevalence of Off-label Drug Use in Neonatal Intensive Care Unit of a Tertiary Care Teaching Hospital in India. Int J Pharma Bio Sci;11(3). doi: 10.22376/ijpbs.2020.11.3.p18-23.
17. Yadav K, Lokhande S, pitale s. janwadkar,p.s. navarkar and p.k. rana. IJBPS; 3. Solvent extraction and spectrophotometric determination of mo (vi) by using acetophenone 2',4'-dihydroxy semicarbazone as an analytical reagent d;4 :309-14.