



Incudostapedial rebridging ossiculoplasty with bone cement

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Abstract : The goals of surgery for chronic ear disease are eradication of the disease and reconstruction of a sound transformer mechanism. Erosion of the incudostapedial joint with an intact mobile malleus is the most common ossicular defect encountered in chronic middle ear disease. Various techniques are available for reconstruction of ossicular defect. Total (TORP) or partial ossicular replacement prostheses (PORP), otogen bone grafts, homogen bone grafts, or cortical bone grafts are materials that have been used for years. Problems with these materials are high extrusion rates and risk of dislocation, which may result in recurrent conductive hearing loss. ISRO with bone cement has some advantages such as satisfactory hearing results, ease of application, and cost effectiveness. 37 years female came with hard of hearing right ear for past 2 years. On examination bilateral TM intact. PTA and impedance audiometry was done. Right conductive hearing loss with airbone gap 35.6 dB HL identified. Patient underwent exploratory tympanotomy. Incudostapedial joint identified intraoperatively, stabilized with glass ionomer bone cement. Post operative air bone gap evaluated after 6 months. A postoperative air-bone gap less than 20 dB was achieved. Hearing results with bone cement ossiculoplasty are satisfactory.

Keyword : Ossicular discontinuity, bone cement, conductive hearing loss

Case Report.

37 years old female came to OPD with complaints of Hard of Hearing Right side for 2 years. Patient was apparently normal before 2 years. Later she developed hard of hearing, gradual in onset. History of blocking sensation on and off. History of noise heard right ear on and off. No other specific complaints. Patient known case of Diabetic, taking Oral Hypoglycemic Drugs for past 6 months. No history of previous ENT surgeries. General Examination was normal. O/E, Ear – TM intact on both sides, mobile TFT- Rinne negative on right side, positive on left side Weber lateralized to the right ABC not reduced on both side O/E, Nose, Throat – Clear Patient evaluated for right side conductive hearing loss with complete blood and urine investigation, PTA and impedance audiometry



Figure 1 :Preoperative PTA

PTA – Right ear -56.6 dB HL

Left ear - 13.3 dB HL

ABG - 35.6dB HL

Impedence Audiometry

* Right ear- Ad type curve with absent reflex

* Left ear – A type curve with present reflex

CT Temporal Bone

* Mastoid air cells cellular on both sides.

* Ossicles visualized

Patient planned for exploratory tympanotomy for evaluation of conductive hearing loss on the right side.

Procedure:

Under LA, under strict aseptic precaution, patient in semifowler position, using 0 degree Hopkins rod endoscope, local infiltration given in right ear canal. Canal incision made. TM flap elevated. Middle ear exposed. Ossicular discontinuity identified in incudostapedial joint with intact Mucosa. Ossicle mobility is absent in stapes. Mucosa over the joint removed. The bone raw area created over the incudostapedial joint. Bone cement paste prepared in the metal plate. The small gel foam placed over the facial nerve region and the foot plate area. Paste applied over the joint gap. The IS joint stabilized with the bone cement paste. The mobility of the joint is checked after the setting time. A good mobility is obtained in the IS joint. The TM flap is repositioned. Post operative care given in the ward. Patient is discharged on 3rd POD. Patient advised for regular followup for 1 year period for evaluation of pre operative and post operative PTA.

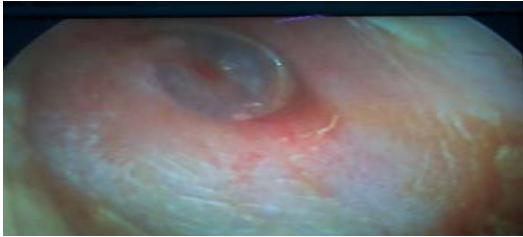


Figure 2 : Right intact TM

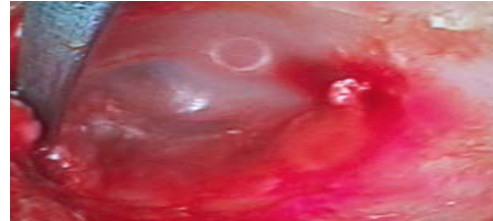


Figure 9 : TM flap repositioned



Figure 4 : IS joint discontinuity with intact mucosa



Figure 5 : Mucosa over the IS joint removed. Joint gap identified. Mucosa removed raw area created.



Figure 6: Preparation of bone cement paste

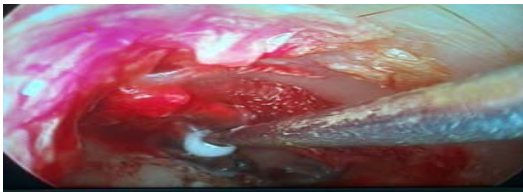


Figure 7 : Application of bone cement placed over the ossicular defect

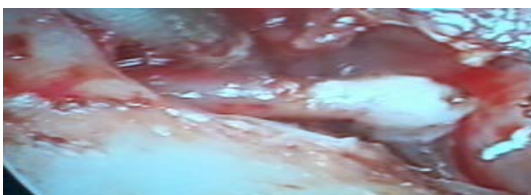


Figure 8 : Stabilised IS joint after bone cement setting time

Frequency (Hz)	Right Ear (dB HL)	Left Ear (dB HL)
250	33.3	13.3
500	33.3	13.3
1000	33.3	13.3
2000	33.3	13.3
4000	33.3	13.3
8000	33.3	13.3

Figure 10 : Postoperative PTA

Post operative PTA:
 Right Ear - 33.3 dB HL
 Left ear - 13.3 dB HL
 Air bone gap- Reduced

DISCUSSION

In this case a postoperative air-bone gap less than 20 dB was achieved.. Based on the American Academy of Otolaryngology—Head and Neck Surgery Committee on Hearing and Equilibrium guidelines⁷ a closure of the air-bone gap to within 20 dB was considered successful. Bone cements are cost effective because they are cheaper than other ossiculoplasty materials.³ Bone cements are substances that formulated powder mixed with the dissolving liquid results in a mixture that hardens within minutes through an exothermic reaction. The glass ionomer bone cement powder composed of glass powder, polycarboxylic acid, and pigments, as well as a liquid composed of water, tartaric acid, and conservation agents. After a quick mixing of the two components the material hardens to a bonelike consistency in five to 10 minutes. The cement can be shaped within a few minutes before hardening.

The cement bonds directly to bone, and once the cement has set, it is no longer sensitive to surrounding fluids. These features make this material potentially useful in ossiculoplasty procedures.³ The application of bone cement is easy. some important points that should be considered during cement application. It should be performed within minutes before the mixture becomes hard. Any hemorrhage should be controlled before application of bone cement because it may interfere with hardening of the cement. Mucosal covering over ossicles should be removed and bone cement should be applied directly over denuded bone since bone cement does not adhere to soft tissue.^{6,8} Ionomeric bone cement should not come into contact with neural structures, perilymph, or dura because of its potential neurotoxicity.^{4,8,9} To prevent contamination, bone cement should be applied in its most suitable consistency. Also, small pieces of gelfoam can be placed over facial nerve and stapes footplate during application.⁵ There have been no reported cases of toxicity secondary to glass ionomer cement ossiculoplasty. Bone cement does not interfere with graft take rate.⁵ Patient selection in bone cement ossiculoplasty is essential to obtain satisfactory postoperative

hearing results Bone cement ossiculoplasty is not advocated in canal wall down surgeries, atelectatic ears, the presence of a cholesteatoma.⁵ The distance between the remnant of necrotic incus and the stapes head is also important when selecting patients. Cases that have gaps less than one-third of incus long arm are ideal candidates for this technique. Larger defects up to two-thirds of incus long arm may be treated with this technique by repeated application of the cement. Defects larger than two-thirds of incus long arm should be treated by other techniques such as incus interposition or PORP ossiculoplasty. Incudostapedial rebridging ossiculoplasty is the most common indication of bone cement ossiculoplasty, bone cements also can be used in different situations such as between malleus and stapes in the absence of incus,⁵ in case of incus long arm necrosis in stapedotomy cases,³ to secure ossiculoplasty prostheses like TORP or PORP,¹⁰ and in incus subluxations.⁶ one-year follow-up is enough to obtain hearing results, we continue to follow up these patients in order to assess longer-term results.

CONCLUSION

Ionometric bone cement is a reliable material for use in ossicular reconstruction because of its ease of application, cost effectiveness, tissue tolerance, and satisfactory hearing results. Patient selection is mandatory to obtain good hearing results.

REFERENCES

1. Bayazit Y, Goksu N, Beder L. Functional results of plastipore ossiculoplasty prostheses for middle ear ossicular chain reconstruction. *Laryngoscope* 1999;109:709–11.
2. McGee M, Hough JVD. Ossiculoplasty. *Otolaryngol Clin North Am* 1999;32:471–88.
3. Feghali JG, Barrs DM, Beatty CW, et al. Bone cement reconstruction of the ossicular chain: A preliminary report. *Laryngoscope* 1998;108:829–36.
4. Ozer E, Bayazit YA, Kanlikama M, et al. Incudostapedial rebridging ossiculoplasty with bone cement. *Otol Neurotol* 2002;23:643–6.
5. Bayazit YA, Ozer E, Kanlikama M, et al. Bone cement ossiculoplasty: incus to stapes versus malleus to stapes cement bridge. *Otol Neurotol* 2005;26:364–7.
6. Brask T. Reconstruction of the ossicular chain in the middle ear with glass ionomer cement. *Laryngoscope* 1999;109:573–6.
7. American Academy of Otolaryngology—Head and Neck Surgery Foundation. Inc. Committee on Hearing and Equilibrium guidelines for the evaluation of treatment of conductive hearing loss. *Otolaryngol Head Neck Surg* 1995;113:186–7.
8. Chen DA, Arriaga MA. Technical refinements and precautions during ionometric cement reconstruction of incus erosion during revision stapedectomy. *Laryngoscope* 2003;113:848–52.
9. Brook IM, Hatton PV. Glass ionomers: Bioactive implant materials. *Biomaterials* 1998;19:565–71.
10. Goebel AJ, Jacob A. Use of Mimix hydroxyapatite bone cement for difficult ossicular reconstruction. *Otolaryngol Head Neck Surg* 2005;132:727–34.

