TOTAL ENDOSCOPIC STAPES SURGERY. OUR TECHNIQUE AND EXPERIENCE OF 45 CASES

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ABSTRACT

Objective: To assess the hearing results of transcanal endoscopic stapedotomy

Study Design: Descriptive study.

Place and Duration of Study: Pakistan Naval Ship Hafeez Islamabad Pakistan, from Jun 2016 to Jun 2020.

Methodology: All patients with surgically confirmed otosclerosis were included in the study. All patients were operated with 0-degree 3mm, 14cm rigid endoscope under general anesthesia. Preoperative and post operative air bone gap was noted along with demographic data, middle ear anomalies (persistent stapedial artery, dehiscent facial nerve, anteriorly placed facial nerve, floating foot plate) and injury to chorda tympani. Postoperative air bone gap (A-B Gap) was documented 12 weeks after surgery. All patients were followed up for 6-12 months

Results: Mean age of patients was, 37 years and standard deviation was 12.34 (range 27-52 years). Out of total 45 cases 13 were males (29%) and 32 females (71.%). Four (8.8%) patients had dehiscent facial canal and 1 (2.2%) patient had persistent stapedial artery. Average preoperative A-B gap was 35 db and Average Postoperative A-B Gap was 7 db. Chorda tympani was preserved in all cases. One patient (2.2%) complained of altered taste which resolved after 3 months. Four patients had Postoperative vertigo that lasted 2 days on average.

Conclusion: Endoscopic trans canal Stapes surgery is scarless safe effective procedure demonstrable hearing benefits in all patients with minimum complications. The Technique is single handed and has steep learning curve.

Keywords: Endoscopic ear surgery, hearing loss, otosclerosis, Stapedotomy.

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INTRODUCTION

Otosclerosis was first described in the writings of Antonio Maria Valsalva.From 1704. It is one of the commonest causes of conductive hearing loss in young adults.[1]The patients with otosclerosis may present with tinnitus and vertigo in addition to hearing loss. The disease is bilateral in about 80% cases and has a female predisposition of 2;1. Stapes stapes surgery (stapedotomy and stapedectomy is commonly performed at all major otological and hearing restorative centers in the world.[2] Most centers under take this procedure with a microscope.[3] Endoscopes have evolved as a tool of safe and effective surgery in otological practice and surpass the microscope in middle ear procedures owing to better visualization of anatomy in the middle ear.[4] Stapes surgery is no different and is increasingly being performed with endoscopes. We share our experience if 45 cases of total endoscopic stapes surgery. This is first series of endoscopic stapes surgery in Pakistan.

METHODOLOGY

This descriptive study was carried out at Pakistan Naval Ship Hafeez Islamabad Pakistan, from June 2016 to June 2020.

Inclusion Criteria: A total of 45 cases of surgically confirmed otosclerosis (Fixed foot plate of stapes on anterior tympanotomy) and Bone conduction thrash hold better than 40 and air conduction thrash holds better than 60 were included in the study.

Exclusion Criteria: Patients with malleoincudal fixation ossicular discontinuity, A-B (Air bone gap) <10 decibel, bone conduction >40 decibel and patients with only hearing ear were excluded from the study. Informed consent was obtained from all patients before including them in the study and Approval of Hospital Ethics Committee taken. The objective of the study was to document the results of total endoscopic stapes surgery. This is the first series on this topic in the country. Pure Tone Audiograms of all patients were done preoperatively and 12 weeks postoperatively. CT Scan of Temporal Bone were conducted in all patients to visualize sclerosis of stapedial foot plate. Endoscopic stapedotomy was performed using a 0-degree 3mm 14 cm rigid endoscope with 3 chip Camera. Fat from ear lobule was harvested from a small posterior incision

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for sealing the stapedotomy and wound was closed with 5/0 prolene sutures. Trans-canal approach was used for all cases. Canal incisions were made at 12-6^{O} clock and tympanomeatal flap was elevated chorda tympani was identified middle ear entry was made. Posterior bone removal was done with a curette or micro drill. Pyramidal process, Stapedius tendon, facial nerve stapes supra structure and foot plate were exposed. Stapedius tendon was divided with micro scissors (Figure-1). Incudostapedial joint was divided with joint knife. Crurotomy and stapedotomy was done with 0.8mm foot plate perforator/0.7mm diamond burr using a stapes drill (Figur-2). Footplate distance from the incus was measured and appropriate size Teflon piston 0.6 mm diameter was placed in the stapedotomy (Figure-3). Piston position and mobility was confirmed with bending sign (Figure-4) and round window reflex. Fat graft was placed around the piston to seal stapedotomy (Figure-5). Tympanomeatal flap was repositioned and spongeston was filled in the external auditory canal. Operative time was noted from start of transcanal incision's to repositioning of tympanomeatal flap. and Postoperative facial nerve function and nystagmus was documented. All data was entered in SPSS and mean was calculated for age, gender, A-B Gap, injury to chorda tympani, vertigo and anatomical variations like dehiscent facial canal and persistent stapedial artery.

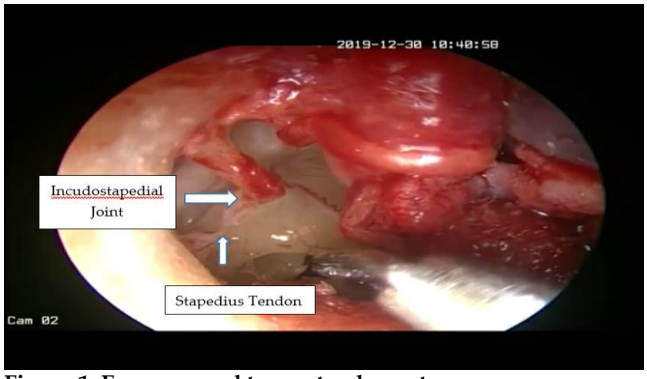

Figure-1: Exposure and tensor tendon cut.

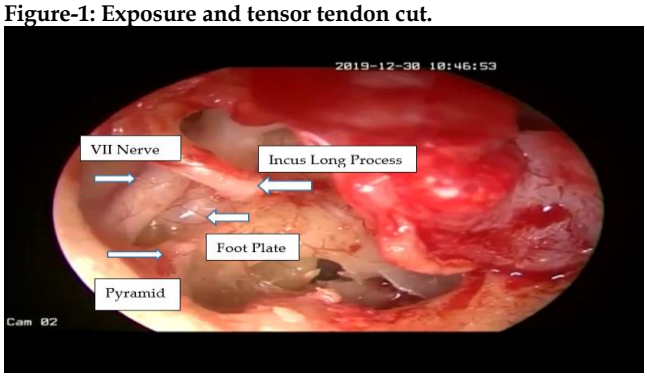

Figure-2: Stapes surprastructure removed.

Figure-3: Stapedotomy.

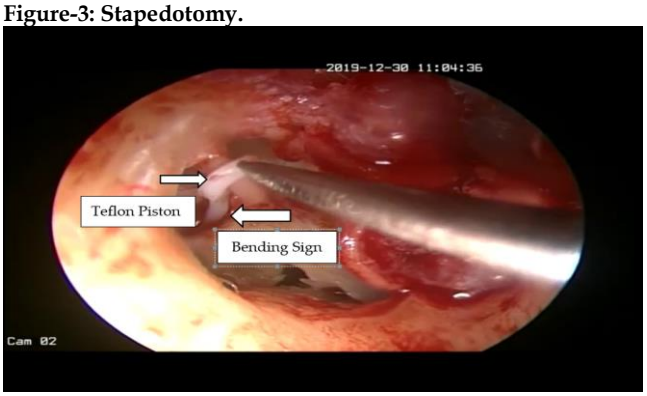

Figure-4: Piston in place with bending sign.

Figure-5: Fat in place to seal stapedomy.

RESULTS

Mean age of patients was 34 years and standard deviation was 12.34 (range 21 to 52years).Out of total 45 cases 13 were males (28.8%) and 32 females (71.1%). Preoperative Average Air Conduction thrash hold on PTA was 50dB, A-B gap was 30 db. Postoperative average air conduction thrash hold was 15db. A-B gap was reduced to <than 10 db in 39 (86.6%) patients whereas A-B gap was brought to <20db in 100% patients. Average postoperative A-B gap was 9 db. Four (8.8%) patients had dehiscent facial canal and 1 (2.2%) patient had persistent stapedial artery (Figure-6 & 7). One patient (2.2%) patient had floating foot plate, stapedotomy was converted into stapedectomy. Mild postoperative vertigo was present and Air Bone Gap was reduced to less than 10 db in this patient. One (2.2%) patient com-

plained of altered taste lasting 3 months and (4.4%) patients had postoperative vertigo lasting for up to 72 hours. Mean operative time was 62 minutes.

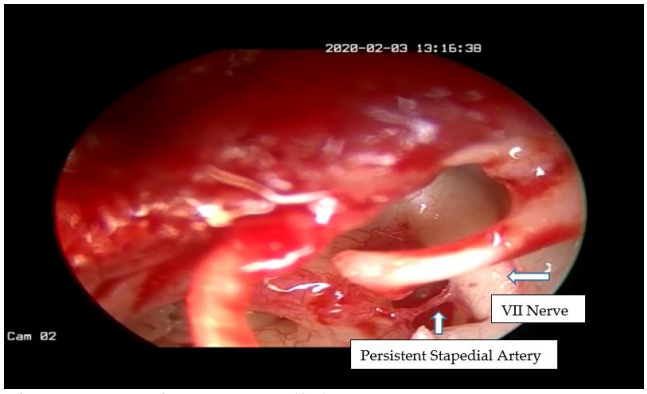

Figure-6 : Persistent stapedial artery.

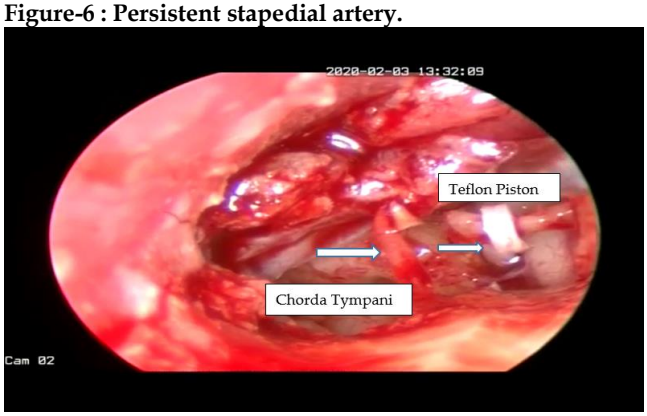

Figure-7: Teflon piston in place in a case with persistent stapedial artery.

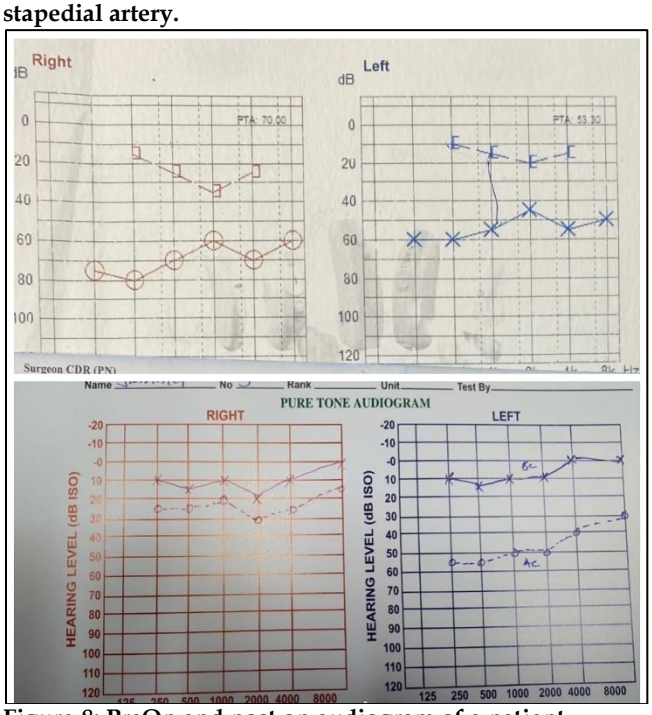

Figure-8: PreOp and post op audiogram of a patient.

DISCUSSION

Otosclerosis is a one of the commonest diseases causes conductive hearing loss in young adults.[1] Etiology if the disease is unknown but researchers attribute measles virus for initiating the disease process.[5] It thought to be an autosomal dominant disorder with a potential genetic transposition.[6] Stapedotomy is a safe effective procedure with 95% hearing restoration results reported.[2,4,7] Traditionally stapes surgery has been done using a microscope. Endoscopes were introduced in middle ear surgery in 1990's by Dr Muaaz Tarabichi, reported that endoscopic stapes surgery in 12 cases with 87% patients reporting audiological improvement.[4,7] Endoscopic stapedotomy required minimal bone removal as compared to microscopic stapedotomy. Marchioni *et al*,reported 100% A-B gap closure to <20 db and 83% and Noguira *et al,* reported 93% A-B gap closure of <25 db.[8,9] Hunter *etal*, reported 50 cases of endoscopic stapedotomies with 87% A-B Gap closure to <20db.[10] Sarkar *et al*, reported A-B Gap closure of <10 dB in 57% patients and <20 db in 100% patients.[11] Our series of 45 cases of total endoscopic stapedotomy is first in Pakistan and we report similar results as documented by Marchioni, Tarabichi and Hunter *et al*, Migirov *et al,* and Daneshi *et al,* reported 100% chorda tympani preservation, whereas Hunter *et al*, reported 88% preservation of chordatympani.[12-13-18] We also report 100% preservation of chordatympani and stretch paresis in one case that recovered over 12 weeks. Floating foot plate is a difficult situation in stapes surgery and its incidence has been reported between 2-5.5% similar to 2.2% of our study. Numerous options have been described to successfully complete surgery in a case of floating foot plate including partial stapedectomy, complete stapedectomy and making a stapedotomy in a floating foot plate. In our case we converted the stapedotomy into stapedectomy and used a vein graft to coverthe footplate before placing the piston.[14,17]Average operating time in our series is 62 minutes but has been reported between 37-77 minutes.[15-18]

LIMITATION OF STUDY

The study is first local publication on endoscopic tympanoplasty and has no local references for comparison.

CONCLUSION

Endoscopic stapedotomy is a safe and affective procedure with better visualization of middle ear structures. Endoscopes are increasingly being used for performing stapes surgery and advantages include minimal bone work and handling of chorda tympani. Limitation of single hand use and lack stereoscopic vision add to steep learning curve.

Conflict of Interest: None.

Authors' Contribution

MAN: Lead Author, Oprating surgeon, data collection, US: Data assemilation and result compilation, MR: Data collection, discusion writing, KAK: Statistical analysis, HS: Discussion writing, NSN: Data collection, MR: Discusion and statistocal analysis, NR: Discusion and statistocal analysis.

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