ENDOSCOPIC SINGLE-HANDED TYMPANOPLASTY: HOW EFFECTIVE ARE THE 'PANETTI'S ENDOSCOPIC EAR SURGERY' INSTRUMENTS!

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Abstract: Endoscopic ear surgeries have always intrigued Otologists. However, the non-availability of the non-dominant hand for a simultaneous suction in the narrow ear canal has sought frequent answers from the established endoscopic ear surgeons. Professor Giuseppe Panetti has designed special endoscopic ear surgery instruments, to provide suction and instrumentation together in one hand. This study has been done to compare technique and results of endoscopic ear surgery done with conventional microscopic ear surgery instruments and Panetti's set of instruments.
Materials & methods: This prospective comparative study was carried out at Department of E.N.T. & Head-Neck Surgery, Medical College, Baroda in duration of May 2022 to January 2023. 32 patients with ear discharge, decreased hearing and central perforation who have been operated endoscopically via Endo-meatal approach using conventional ear surgery instruments VS Panetti's instruments, equally divided in two arms. Postoperative follow up was done at 1week, 4 week & 6 weeks.

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Results: Separate suction canula was not needed as Panetti's instruments has suction channel in these instruments. These instruments have 360 degrees rotatable Luer lock connector, which make these instrument's use comfortable.
Conclusion: In the study comparing Panetti and conventional ear surgery instruments, no significant difference in surgery duration, graft uptake and post-op hearing outcomes was found. Surgical preference, cost, and instrument availability should guide selection.

Key words: Endoscopic ear surgeries, Single handed tympanoplasty, Panetti's instruments, Prof. Guiseppe Panetti, Conventional ear surgery instruments, cartilage, Endo-meatal tympanoplasty

Introduction

Tympanic membrane perforation is a common pathological condition that occurs due to various aetiologies as infection and trauma. Chronic otitis media is one of the most common problems in otology. Tympanoplasty is commonly used procedure for the treatment of mucosal chronic otitis media.

Conventional microscopic tympanoplasty has been the standard method for surgical repair of tympanic membrane. Commonly performed through postauricular routes, it uses graft materials such as temporal fascia, tragal cartilage with perichondrium etc. Microscope has an inherent drawback of providing a straight-line view, which limits the visual field in the deeper recesses of the middle ear.[5]

Endoscopic tympanoplasty is a relatively recent technique for repairing TM perforation. Oto-endoscope provides a panoramic surgical view and avoid postauricular incision hence being minimally invasive. It also provides high-definition video imaging, better quality of images, achieving the desired zoom and exposure by manoeuvring the endoscope. Angled endoscopes provide direct access to the concealed areas, which cannot be visualized

without bone curettage via conventional microscopic approaches. e.g.- epitympanum, retrotympanum and hypotympanum.[5,6,8]

Previously endoscopic ear surgeries (EES) were being done using conventional microscopic ear surgery instruments. Major limiting factor of endoscopic ear surgery was one handed work as another hand holds endoscope during the procedure. The constant change between dissector, suction and forceps made this surgery slow and uncomfortable.[7]

Prof. Giuseppe Panetti, director of the E.N.T. department of San Paolo hospital, Naples, Italy is a renowned otologist and one of forerunners of endoscopic ear surgeries. He has developed a special product series that combines suction and dissection in one instrument (figure 4). This enables simultaneous suction and dissection with just one instrument, sparing the non-dominant hand for handling endoscope (figure 3). This also reduces fogging and blood-soiling around tip of the endoscope. It makes the surgery swift and precise.[9]

We have done this study to compare the efficiency of these Panetti set of instruments as compared to conventional micro-ear surgery instruments, in performing endoscopic tympanoplasty.[11]

AIMs & objectives

The primary aim of our study was to compare surgical technique and post op results of endoscopic ear surgery done with conventional microscopic ear surgery instruments (figure 2) VS Panetti's sets of instruments (figure 3).

OBJECTIVES OF THE STUDY

Comparison of the following parameters between two arms.

1. Duration of surgery.

2. Rate of graft uptake.

3. Post op. A-B gap closure.

Materials & Methodology

Inclusion criteria:

Patients with dry, tympanic membrane central perforation with conductive hearing loss.

Exclusion Criteria:

1. Patients with otitis externa, otomycosis and immunocompromised patients.
2. Any abnormality in Ossicular chain found pre-op or intra-op.
3. Patients with otitis media with any Intra and/or extratemporal complication.
4. Revision surgery of the same ear.

Patients attending E.N.T. department OPD 15, Medical College Baroda and S.S.G. Hospital, Vadodara in duration of May 2022 to January 2023 with history of ear discharge and decreased hearing requiring tympanoplasty and in whom endo-meatal endoscopic surgery was planned were included in the study. Total 32 patients were included in the study. Thorough E.N.T. clinical examination was done. Patients were selected as per the inclusion and exclusion criteria. Pure tone audiometry with MAICO MA 53 audiometer at frequencies of 500, 1000, 2000 and 4000 Hz to determine the air conduction thresholds, bone conduction thresholds and air-bone gap values was done to keep records of preoperative hearing. Preoperative otoendoscopy was done with an attempt made to examine middle ear ossicles.

Randomization was done with the help lottery method before enrolling the first case. Pre-decided allocation of patients was done in two arms.

Arm A: Patients were operated using "Conventional microscopic ear surgery instruments".

Arm B: Patients were operated using "Panetti's sets of ear surgery instruments".

According to the numbers allotted patients were operated by endoscopic ear surgery with either conventional microscopic ear surgery instruments or Panetti sets of instruments.

All patients were operated under General Anaesthesia. They were admitted one day prior to the surgery for the preoperative preparations. EAC diameter was measured prior to surgery using silicone material and making Mold (figure 1). A small piece of cotton patty with thread was placed in EAC than silicone impression material was injected manually into the ear canal using 20 cc syringe. Material was left in ear canal for 4-7 minutes, so it got fixed and attained the shape of EAC. After this Mold was removed from EAC by withdrawing thread attached to patty and with index finger and thumb. Diameter of Mold was measured with help of digital Vernier Caliper. Patients were operated next day by via endo-meatal endoscopic approach under general anaesthesia. The decision to harvest temporalis fascia or tragal cartilage, was taken by the senior most operating surgeon intraoperatively. Intra-operative blood pressure (systolic and diastolic) at time of incision and at 30 min was noted. Post op pain was assessed using the Wong Baker's faces pain scale.[4]

Patients were given Cefotaxime antibiotic and Paracetamol analgesic in iv Injection form pre and post operatively. Patients were discharged on either same day or next day after observation. Most of patients Could have been discharged on the same day but discharge was delayed due to formalities

related to health assurance scheme. Patients were given Cefpodoxime + clavulanate antibiotic and Paracetamol analgesic, Chlorpheniramine antihistaminic and Pantoprazole antacid all in tablet form.

Patients were called for regular follow ups postoperatively at 1 week, 4 week and 6 weeks. Suture removal was done on 1 week follow up (if taken). On 4th week otoendoscopy was done to assess graft uptake. After 6th week pure tone audiometry at frequencies of 500, 1000, 2000 and 4000 Hz to determine the air conduction thresholds, bone conduction thresholds and air-bone gap values was be done for records of postoperative hearing.

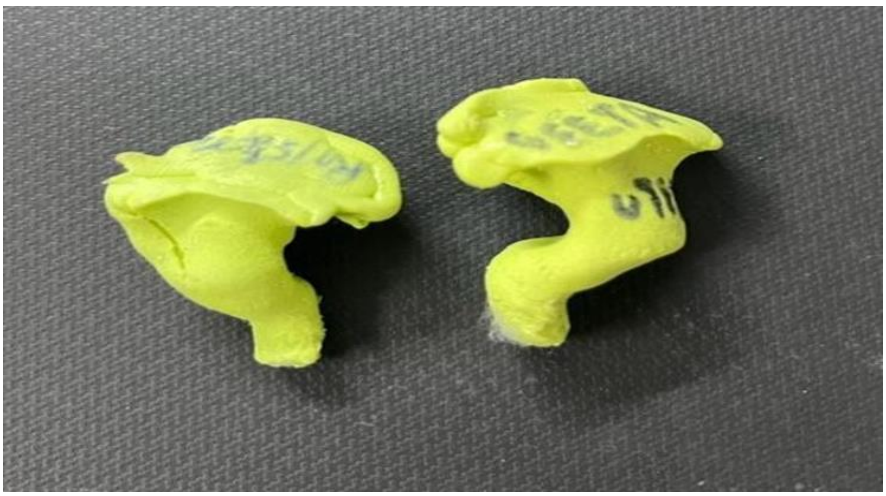

Figure 1- Silicone mold used for EAC diameter measurements.

Instruments & Surgical technique

Endoscopes- Karl Storz Hopkins endoscope of 14 cm working length and 3 mm diameter with angle 0, 30 and 45 degrees.

A Xenon Nova 150 Karl Storz light source and Storz Image 1 was used for these surgeries.

Figure 2- Endoscope Holder in use

Figure 3 – Surgery being performed using Panetti's instruments

Panetti's set of instruments-

Figure No: 4 – Panetti's set of ear surgery instruments.

Figure No: 5 – Panetti's set of ear surgery instruments.

-Suction dissector for acoustic neuroma, left curved

-Ear drum suction dissector single right curve

-Suction curette angled

-Sinus tympani suction dissector double backward left curve

-Atticus suction dissector double forward left curve

-Suction knife oval, suction right

-Suction curette for acoustic neuroma

-Suction dissector for acoustic neuroma, right curved

-Atticus suction dissector double forward right curve

-Sinus tympani suction dissector double backward right curve

-Suction knife oval, suction left

-Ear drum suction dissector single left curve

-Suction separator suction at outside

-Suction separator suction hole in angle

-Suction adaptor Luer-lock, rotatable

For years limiting factors for endoscopic ear surgeries were one handed work, constant change between forceps, dissectors and suction which made EES long and uncomfortable. Panetti set of instruments have suction channel with suction control on the hand piece which enables surgeon to do suction and dissection simultaneously. The instruments have 360 degrees rotatable Luer lock connector.

In our surgeries, most commonly used instruments were Ear drum suction dissector (single right curve and left curve), suction knife oval, suction right and suction left, Suction separator suction at outside, Suction separator suction hole in angle, Suction curette angled, Suction adaptor Luer-lock-rotatable (figure 5).

Parts preparation-

-Hairs were managed with clips for the patient in whom Temporalis fascia graft was planned.

Patient position-

The patient was placed in supine position with partial head rotated to the opposite side. Endoscopic ear surgery was done either by single handed or by double handed technique. In double handed technique the endoscope was held in the endoscope holder. This was an individual preference, and no comparison was sought for these techniques.

Infiltration-

The canal and postauricular infiltration with Normal saline with 1:2,00,000 adrenaline. Infiltration was done using a 5 ml syringe with 26-gauge lever lock needle. The canal wall infiltration was done under endoscopic guidance.

Graft harvesting-

Temporalis fascia graft was harvested using horizontal temporal incision along the hairline so that the post op scar due to incision gets hidden in the hair.

Tragal cartilage graft was harvested using incision on medial surface of the tragus so that the post op scar due to incision will not be visible.[10]

Inspection-

The endoscope was introduced into the EAC. The TM was visualized, and the middle ear was examined through the TM perforation for any ossicular erosion or abnormality.

Perforation margins freshening-

Margins of the perforation were freshened using a straight pick in arm A and Panetti's ear drum suction dissector in arm B (figure 6).

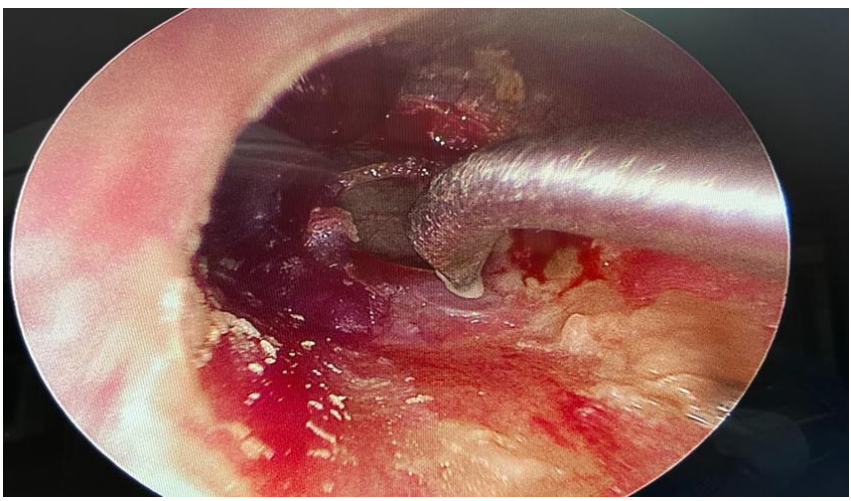

Figure 6- Perforation margins freshening using Panetti's eardrum suction dissector (Case no: - 26)

Incision and tympanomeatal flap elevation-

A 3 O' clock to 9 O' clock incision was given on EAC skin 5-7 mm lateral to the annulus. The tympanomeatal flap was elevated for underlay tympanoplasty.

Incision for the flap was given by Rosen micro ear round knife in arm A and Panetti suction knife in arm B (figure 7).

Flap was elevated with the help of Paperella Duckbill micro ear elevator in arm A and Panetti suction separator in arm B (figure 8).

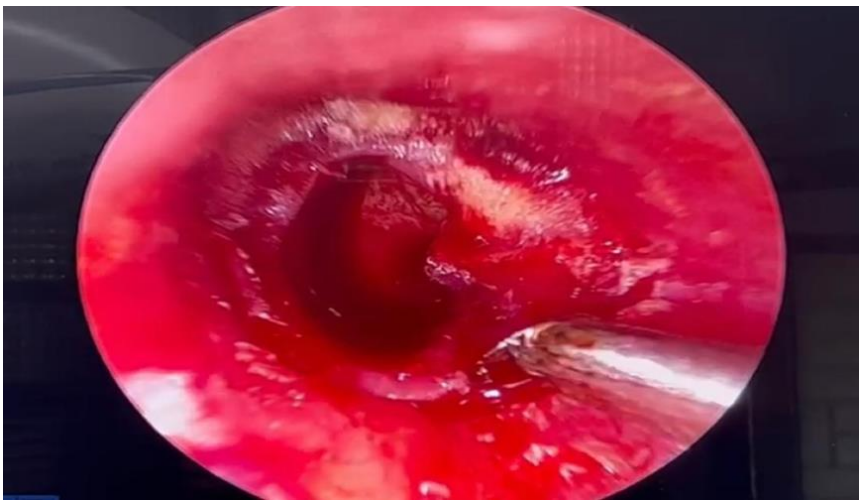

Figure 7- Incision by Panetti suction knife (Case no: -22)

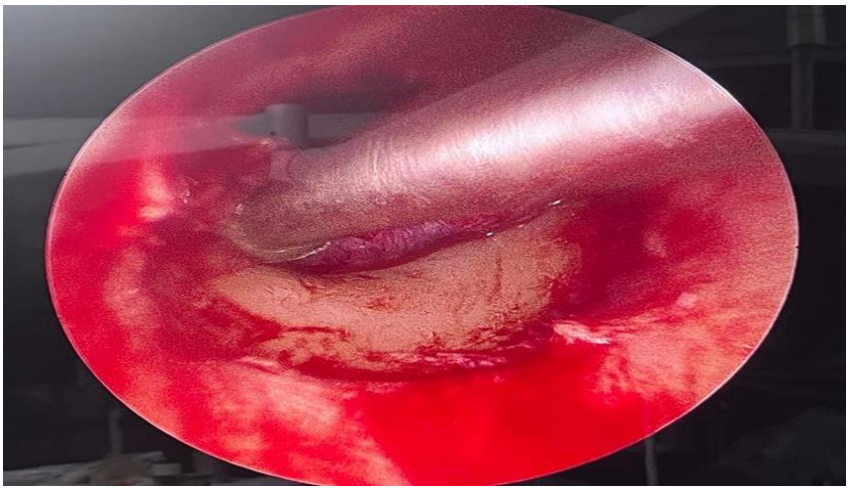

Figure 8- Tympanomeatal flap elevation Panetti suction separator (Case no: - 22)

Inspection of middle ear-

Ossicles, the incudo-malleal and incudostapedial joints examined. Any discontinuity/erosion of any ossicle led to exclusion of the case from current study.

Placement of graft-

The graft was placed under the fibrous annulus and handle of malleus- Underlay technique.

Tympanomeatal flap repositioning-

The flap was repositioned to its original position with margins in approximation circumferentially. Antibiotic-soaked Gel foam pieces placed over the tympanomeatal flap to keep the skin in approximation to graft. Small dressing given to cover sutures in temporal region if temporalis fascia graft

harvested and to cover EAC if tragal cartilage graft harvested. In most of our cases, no sutures were taken at the tragal perichondrium harvest donor site. The patients were given oral antibiotics and analgesics for 10 days postoperatively. The patients were discharged on either same day or next post operative day.

Post-op Follow up

Patients called up for follow up on 7th day for suture removal (if taken). After 4th week graft uptake status was assessed and after 6th week post of PTA was done.

Data analysis

Out of 32 patients equal half of patients underwent endoscopic ear surgery using conventional microscopic and Panetti's instruments. 20 patients had a left ear tympanic perforation and 12 had right tympanic perforation.

Age distribution-

AGE (in years)	Frequency	Percent
≤ 20	6	18.75%
21 to 40	12	37.50%
41 to 60	11	34.38%
≥ 60	3	9.38%
Total	32	100.00%

Table 1: Age distribution

Out of all patients as seen in table 1, most of the patients i.e. 71.8% were aged between 21 to 60 years of age, 6 patients were below 20 years of age, and least were above 60 years of age (n= 3). The mean age of all patients 38.78 years.

Sex distribution

Majority of patients were females (69%) in the study and with only 31% of males.

Types of grafts used in patients-

Two types of grafts were used in the surgery i.e., temporalis fascia and tragal cartilage with perichondrium. Temporalis fascia graft was used in 5 patients and tragal cartilage was used as graft in rest of all patients.

Duration of surgery among both groups- The mean duration of surgery among patients in which conventional microscopic instruments (74.06 ± 32.17 minutes) were used was more than that patients in which Panetti's instruments (58.75 ± 14.66 minutes) were used.

Duration of surgery	Conventional group	Panetti's group	P Value
Mean ± SD	74.06 ± 32.17	58.75 ± 14.66	0.09

Table 2: Duration of surgery among both groups

Unpaired t test was applied between duration of surgery and instruments used among patients. Hence, from table 2, there is no significant difference between two groups regarding duration of surgery.

	Instruments used	
DURATION OF SURGERY (Minutes)	**Conventional**	**Panetti's**
≤ 45	3	4
46 to 50	4	5
51 to 75	4	5
≥ 75	5	2
TOTAL	16	16

Table 3: Mean difference between two groups for duration of surgery

Sutures status among patients at graft harvesting site –

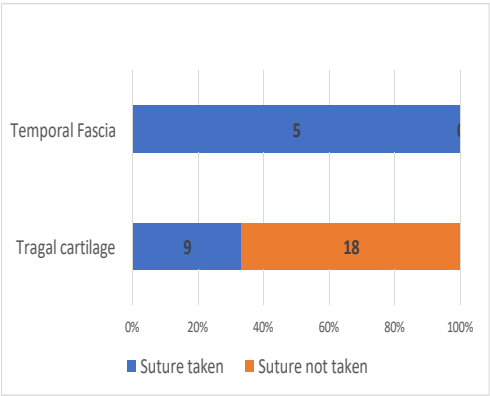

Figure 9- Sutures status among patients at graft harvesting site

It was observed that there was need to close the donor site with sutures in all patients in which temporal fascia was used as graft, but sutures were taken in only 33.3% of patients (n=9) in whom tragal graft was used (figure 9).

Post-operative pain score among both the groups

	Instruments used		
POST OP PAIN Score	**Conventional**	**Panetti's**	
2	9	8	Chi-square value = 0.39
4	6	6	
6	1	2	p-value = 0.82
TOTAL	16	16	

Table 4: Post-operative pain score among both the groups.

Pain score was assessed post-operatively in all patients after surgery. In table 4, majority of patients in both the groups showed pain score less than 4. While only few (n=3) were having pain score 6 with 2 patients in Panetti's instrument surgery.

Graft after 4 weeks of surgery in each group

	INSTRUMENTS USED	
GRAFT AT 4 WEEK	**Conventional**	**Panetti's**
Graft Displaced/ Defect present	4	0
Defect absent	12	16
TOTAL	16	16

Table 5: Graft after 4 weeks of surgery

We planned to study the correct placement of graft using this criteria. However multiple other parameters which also decide displacement of graft in the immediate post-op period (like middle ear ventilation etc.) have not been studied.

As seen in table 5, no defect was found in all the patients after 4 weeks of surgery in which Panetti's instruments were used for surgery. However, in contrast to it, out of 16, defect was found in 4 patients in which conventional microscopic instruments were used.

So, the graft success rate was 100% by using Panetti's instruments and 75% by conventional microscopic instruments.

Reduction in AB gap post-operatively in both groups

	Instruments used		
DECREASE IN A-B GAP (in dB)	**Conventional**	**Panetti's**	
0 to 5	4	3	Chi-square value = 3.10
6 to 10	3	5	
11 to 15	4	1	
16 to 20	2	4	p- value = 0.53
21 to 25	3	3	
TOTAL	16	16	

Table 6: Reduction in AB gap post-operatively

As seen in table 6, 5 to 15 DB decrease in air-bone gap was seen in majority of patients in both the groups i.e., 11 and 9 respectively. In addition to it, only 3 patients in both the groups had reduction AB gap up to 21 to 25 DB post-operatively.

Association between AB gap closure and type of grafts used

	Graft used		
CLOSURE OF A-B GAP	**Temporalis fascia**	**Tragal cartilage**	
Less than 15 DB	3	17	Chi-square value = 0.14
More than 15 DB	2	10	p- value = 0.7
TOTAL	5	27	

Table 7: Association between AB gap and grafts used.

Further to observe association of decrease in AB gap among types of grafts used. It was seen that there is no significant difference among two groups. Thus, there is no significant difference of decrease in AB gap among grafts used i.e., tragal cartilage and temporalis fascia as seen in table 7. Graft materials in both the arms has not compared.

Correlation of BP, External ear canal with duration of surgery-

Intraoperative BP (in mmHg)	Conventional group (Mean ± SD)	Panetti's group (Mean ± SD)
At the time of incison (systolic BP)	106.43 ± 9.66	111.25 ± 10.22
At the time of incison (diastolic BP)	69.81 ± 7.23	69.91 ± 8.06
After 30 minutes (systolic BP)	98.37 ± 10.67	105.75 ± 11.63
After 30 minutes (diastolic BP)	66.31 ± 9.25	67.40 ± 7.67

Table 8- SYSTOLIC AND DIASTOLIC BP AT TIME OF INCISION AND 30 MIN (mean)

Karl Pearson coefficient correlation test was applied to duration of surgery with other variables like intraoperative systolic and diastolic blood pressure at the time of incision & at 30 minutes (figure 9-12) and with canal diameter (figure 14). This parameter was considered important, as availability of suction in the dissecting instrument was likely to allow anaesthetist to keep a provide a normo-tensive field.

Variables	**Duration of Surgery**		
	Correlation Coefficient (r)	**p-value**	**Confidence interval;**
Intraoperative systolic blood pressure at incision	0.2821	0.1178	-0.073 to 0.574
Intraoperative diastolic blood pressure at	0.2479	0.2033	-0.137 to 0.568
Intraoperative systolic blood pressure at 30 minutes	0.74	< **0.001**	0.52 to 0.86
Intraoperative diastolic blood pressure at 30 minutes	0.73	< **0.001**	0.51 to 0.88
Canal diameter	0.1046	0.56	-0.437 to 0.253

Table 9: - Correlation between duration of surgery and various variables (blood pressure, canal wall diameter).

As seen in table 9, it can be interpreted that there was positive correlation intraoperative blood pressure with duration of surgery. With increase both systolic and diastolic blood pressure duration of surgery also increased.

However, no correlation was observed for canal diameter with duration of surgery. This probably mean that, when planning endoscopic ear surgeries in similar settings, external auditory canal diameter may not be considered important.

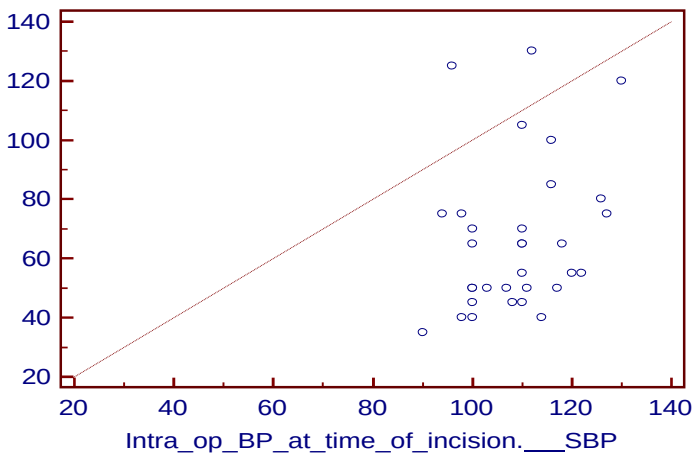

Figure 10- Correlation of systolic BP with duration of surgery at time of incision

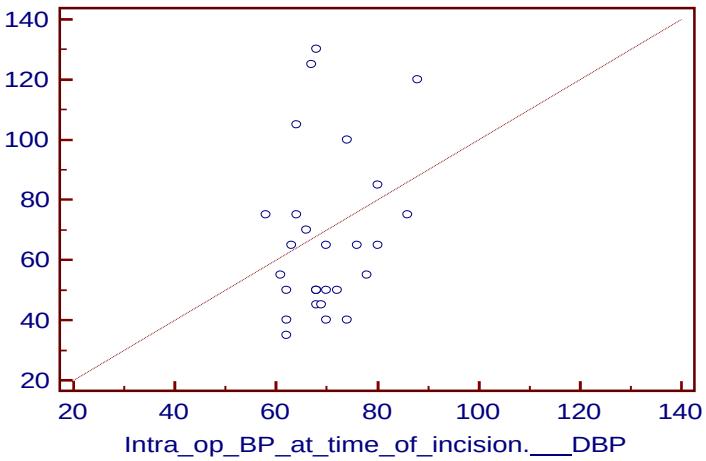

Figure 11- Correlation of diastolic BP with duration of surgery at time of incision

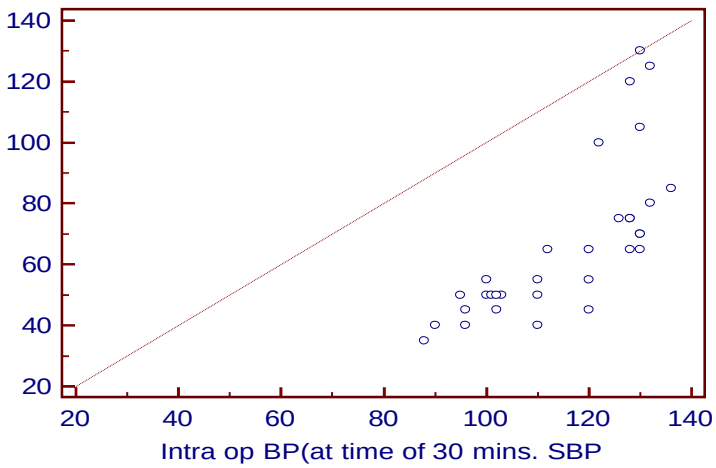

Figure 12- Correlation of systolic BP with duration of surgery at 30 minutes

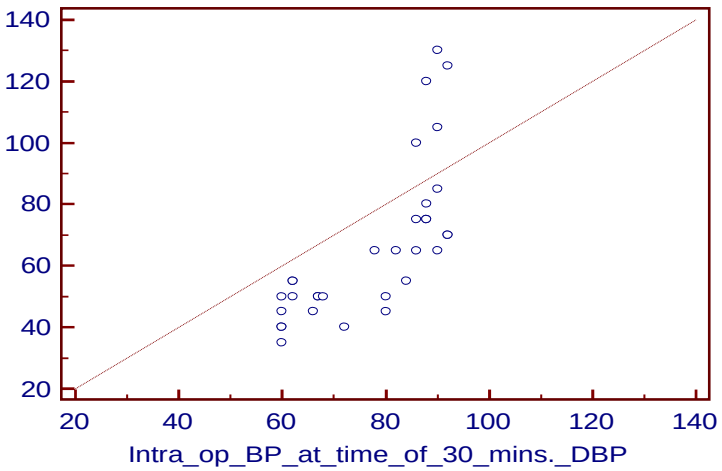

Figure 13- Correlation of diastolic BP with duration of surgery at 30 minutes

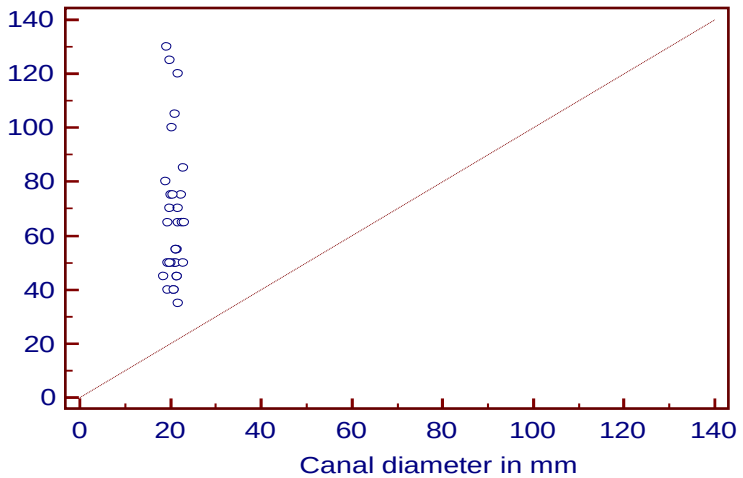

Figure 14- Correlation of canal diameter with duration of surgery

Discussion

Age & Sex-

More than 70 % patients were aged between 20- 60 years of age in our study.

Male: Female ratio was 1:2

The main objectives of the surgeries for mucosal CSOM, are to ensure proper middle ear ventilation and to provide integrity and mobility of middle ear ossicles. Ossiculoplasty and/or prosthesis are occasionally used. However, in all cases a good repair of the drum perforation, is profoundly important. Various surgical approaches, grafts, grafting techniques and instruments have been used for this purpose. Endoscopic transcanal ear surgeries have been a recent advancement. As most of the E.N.T. surgeons have started investing in good H.D. camera systems for FESS & Endo-Laryngeal surgeries, the same system being used for ear surgeries has been a favourable fallout. Endoscopes offer very high-quality images and magnification when displayed on a medical grade monitor. Endoscopes offers improved visualization of eustachian tube area, epitympanum, hypotympanum, sinus tympani and facial recess areas of middle ear without drilling, without manipulating patients head and surgeon's position as is commonly needed in microscopic ear surgeries. In Endoscopic Ear Surgery the surgeon operates while seeing on the monitor and repeated patient's head manipulation is usually not needed, improving surgeon's concentration. In endoscopic ear surgeries assistant can see steps of the surgery on the monitor continuously (without the need for an additional camera system as attached in surgical microscopes), procedure can be recorded with better high-resolution images and seen later for better understanding of endoscopic anatomy of the middle ear which can be a good teaching tool in teaching tertiary care hospitals.

In our study there was no statistically significant difference was noted in of duration of surgery, rate of graft uptake, post op hearing improvement, A-B gap closure, post operative pain among both the arms.

Duration of surgery was comparatively less in the arm B. As being a teaching institute, it was not possible for a single senior surgeon to operate all the cases. Duration of surgery was less when operating surgeon was more experienced. However, this confounding factor has not been matched, in two arms. As individual surgeons experience increased by operating greater number of case and surgeons became comfortable with instruments and technique duration of surgery of the individual surgeon has decreased over the time.

We have observed that absence of post aural scar, endoscopic surgery was preferred by the patients especially younger females.

In our study patients tragal cartilage graft was used in most of patients. For harvesting tragal cartilage graft separate part preparations were not needed. We have used temporalis fascia graft in 5 patients. For temporalis fascia graft harvesting separate incision was needed and sutures needs to be taken. After harvesting tragal cartilage graft sutures was taken in 9 patients out of which 3 patients has developed tragal deformity (retraction) and all of these patients has prominent scar post operatively. In 18 patients after harvesting tragal cartilage skin was approximated and inner flap was supported with gel foam, sutures was not taken. All these patients had better post operative scar and tragal deformity was not seen in any of these patients.

There was no significant difference was noted between both the grafts in terms of hearing improvement in our study.

In our study, majority of patients showed less post-operative pain in both the groups of endoscopic tympanoplasty.

Discharging the patient was delayed in some of our patients due to formalities related to health assurance scheme. Most of our patients were discharge within 24 hours of their surgery after completing all the necessary formalities for the scheme.

In our study we have observed that there was no significant correlation between canal wall diameter and duration of surgery.

In our study while operating arm A patients we have used endoscope holder in most of patients specially if surgeon was less experienced to keep both the hands free, one hand for holding instrument and another for holding suction canula (two handed technique). Senior surgeons used endoscope holder in some case and did not used in few according to their comfort. As frequent readjustment of the holder by assistant was needed to adjust field of vision in these cases and holder restricts surgeon's hand movements too while operating.

While operating arm B patients we haven't used endoscope holder. One hand was holding endoscope and another hand was holding instruments. Separate suction canula was not needed as these instruments has suction channel in these instruments. These instruments have 360 degrees rotatable Luer lock connector, which make these instrument's use comfortable.

We have observed that with increase in blood pressure duration of surgery have been increased too. When Blood pressure increases blood loss also increases and anatomic details of view of operative field not seen properly that is why repeated suctioning is needed. More blood in operative field also causes more frequent blood staining of the endoscope tip for which repeated cleaning of the endoscope tip is needed. In such cases use of Panetti's ear surgery instruments was more helpful as they have suction channel on their tip. Repeated removal and insertion of endoscope in endoscope holder and frequent changing of instruments was not needed with these instruments.

Results

• In our study, no statistically significant difference was noted in of duration of surgery, between the two instrument groups.

• Similar rates of graft uptake, post op hearing A-B gap closure and post operative pain were noted in both groups. Implying that these parameters are not affected by the choice of instruments being used in the surgery.

• Duration of surgery is not affected by minor variations in the external auditory canal size. Hence the conventional thinking of an endo-meatal surgery being only feasible for wide canal patients can be re-thought over, when using EES.

• Conventional microscopic ear surgery instruments can be used comfortably with endoscope holder in two handed technique and in single handed technique use of Panetti's instruments is better.

• Duration of surgery increases when blood pressure increases. Hence a hypotensive surgical field should be sought and maintained during the surgical procedure. This allows the surgeon to clearly and swiftly visualize anatomic details of the middle ear by preventing repeated blood staining of the endoscope tip. This was found to be equally important in both the arms. Advantage of inbuilt suction of Panetti's instruments was balanced by two-hand technique available with endoscope holder when used for conventional set of instruments.

•Endoscope Holder was not found to be very user friendly and modifications have to be suggested to manufacturers. Especially while operating on the right ear, the endoscope holder blocks the dominant hand of a right-handed surgeon. Moving the holder on the opposite lateral side of patient is restricted by the length of the available holder.

• Surgical preference could not be matched as being a multi-surgeon study. However, in this rapidly expanding surgical technique this factor is considered paramount.

• As the Panetti set of instruments have been very recently introduced, the cost is exorbitant. The quality of these instruments in terms of corrosion have found issues and need to be continuously updated to manufacturers.

• Similar set of instruments are being developed by Indian manufacturers, hence making it cost-efficient and widely available.

• Specialist's choice according to learning curve, instruments availability and financial viability of the instruments have to be taken into account before deciding on one's surgical instrument selection.

Conclusion-

There was no significant difference in surgical duration between the two instrument groups, and key surgical outcomes remained comparable. Endoscopic ear surgery is feasible even in patients with narrower ear canals. While conventional instruments work well with an endoscope holder, Panetti's instruments are better for single-handed use. Maintaining a hypotensive field is crucial for clear visualization. The endoscope holder needs design improvements, and the high cost and corrosion issues of Panetti's instruments require updates. Indian alternatives offer cost-effective options, and instrument selection should consider surgeon preference, availability, and financial feasibility.

References

1. Watkinson JC, Clarke RW, editors. Scott-Brown's Otorhinolaryngology and Head and Neck Surgery. 8th ed. Vol. 2. Boca Raton: CRC Press; 2018.

2. Glasscock ME, Gulya AJ, editors. Glasscock-Shambaugh Surgery of the Ear. 6th ed. Part 1. Shelton: People's Medical Publishing House; 2010.

3. Presutti L, Marchioni D. Endoscopic ear surgery: Principles, Indications, and Techniques. In: Presutti L, Marchioni D, editors. Endoscopic Ear Surgery: Principles, Indications, and Techniques. New York: Thieme; 2015. Chapter 5, p. 66-85.

4. Aziato L, Dedey F, Marfo K, Asamani Avoka J, Clegg-Lamptey NAA. Validation of three pain scales among adult postoperative patients in Ghana. BMC Nurs. 2015;14:42. doi: 10.1186/s12912-015-0094-6

5. Kapadiya M, Tarabichi M. An overview of endoscopic ear surgery in 2018. Laryngoscope Investig Otolaryngol. 2019 May 24;4(3):365-373. doi: 10.1002/lio2.276.

6. El-Guindy A. Endoscopic transcanal myringoplasty. J Laryngol Otol. 1992 Jun;106(6):493-5. doi: 10.1017/s0022215100119966. PMID: 1624881.

7. Cohen MS, Basonbul RA, Barber SR, Kozin ED, Rivas AC, Lee DJ. Development and validation of an endoscopic ear surgery classification system. Laryngoscope. 2018 Apr;128(4):967-970. doi: 10.1002/lary.26802.

8. Anzola JF, Nogueira JF. Endoscopic techniques in tympanoplasty. Otolaryngol Clin North Am. 2016 Oct;49(5):1253-1264. doi: 10.1016/j.otc.2016.05.016.

9. Badr-El-Dine M, James AL, Panetti G, Marchioni D, Presutti L, Nogueira JF. Instrumentation and technologies in endoscopic ear surgery. Otolaryngol Clin North Am. 2013 Apr;46(2):211-25. doi: 10.1016/j.otc.2012.10.005.

10. Parelkar K, Thorawade V, Marfatia H, Shere D. Endoscopic cartilage tympanoplasty: full thickness and partial thickness tragal graft. Braz J Otorhinolaryngol. 2020 May-Jun;86(3):308-314. doi: 10.1016/j.bjorl.2018.12.006.

11. Gulsen S, Baltacı A. Comparison of endoscopic transcanal and microscopic approach in Type 1 tympanoplasty. Braz J Otorhinolaryngol. 2021 Mar-Apr;87(2):157-163. doi: 10.1016/j.bjorl.2019.07.005.

Declaration of patient consent-

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given his consent for his images and other

clinical information to be reported in the journal. The patient understand that name and initials will not be published and due efforts will be made to conceal identity, but anonymity cannot be guaranteed.

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