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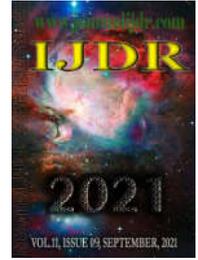
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RESEARCH ARTICLE

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COMPARATIVE STUDY OF CONVENTIONAL TYMPANOPLASTY VERSUS ENDOSCOPIC TYMPANOPLASTY

¹Dr. Pravin Misal, ^{2,*}Dr. Nilam U. Sathe, ³Dr. Muniram Pawara and ⁴Dr. Anjali Taku

¹Senior Resident, ENT Dept. MS ENT, Seth G. S. Medical College and KEM Hospital. Parel. Mumbai - 400 012

²Associate Professor, ENT Dept. Seth G. S. Medical College and KEM Hospital. Parel. Mumbai - 400 012

^{3,4}Senior Resident, ENT Dept. MS ENT, Seth G. S. Medical College and KEM Hospital. Parel. Mumbai - 400 012

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*Corresponding author:

Dr. Nilam U. Sathe

ABSTRACT

Introduction: Conventional microscopic Tympanoplasty with a Postauricular incision is a procedure for patients with chronic otitis media safe type. In our study unsafe chronic otitis media in not included. Minimally invasive otologic surgery has recently been developed along with endoscopic techniques. Endoscopic ear surgery, first tried in the 1990s³ has become popular with anatomic and physiologic concepts⁴. Endoscopically, the typical transcanal approach. This avoids other unnecessary incisions and soft tissue dissections. The endoscopic approach also provides better visualization of hidden areas in the middle ear cavity including the anterior and posterior epitympanic spaces, sinus tympani, facial recess, and hypotympanum. **Material and Method:** Total 80 cases satisfying the inclusion criteria were enrolled in study. Detailed history was taken in every case including ear discharge decreased hearing, tinnitus, giddiness, trauma, nasal complaints. Detailed clinical and systemic examination was done in each case. Each patient was investigated as per proforma clinical, audiometric, radiological examination. After pre Anaesthetic check-up, patient is admitted and posted for tympanoplasty surgery. In our study, we have done comparative study of conventional (microscopic) and endoscopic tympanoplasty. Selection of patients for particular treatment modality is done with randomized method. We have used preoperative antibiotics, antihistaminic, antacid, antiemetics, and nasal decongestant drop. Regarding the anaesthesia most of cases are done in local anaesthesia with sedation, few cases are done in general anaesthesia. **Conclusion:** After a detailed discussion and comparison with literature, we conclude that Endoscopic tympanoplasty as a technique has a long learning curve. Endoscopic technique is as efficacious as and less invasive than microscope surgery. Endoscopic technique of tympanoplasty can yield similar result as microscopic technique with better cosmetics and less pain. Post-operative hearing also shows almost similar result. Surgical time is less for endoscopic than conventional tympanoplasty. Graft uptake rate is more for endoscopic than conventional tympanoplasty

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INTRODUCTION

Tympanoplasty –is most common ear surgery done in ENT. It is surgery performed to remove middle ear pathology with or without ossicular reconstruction with reconstruction of a perforated tympanic membrane. 1640 Banzer⁵¹ first attempt at repair of a TM by using bladder as a lateral graft. 1853 Toynbee placed a rubber disk attached to a silver wire over the TM. 1863 Yearsley placed a cotton ball over a perforation. 1877 Blake used paper patch. 1876 Roosa treated TM

Perforation with chemical cautery. 1878 Berthold coined the term myringoplasty. Closure of TM (TM) perforations is originally Wrest described by Berthold in the year of 1878 as myringoplasty⁴. 1956 Wullstein described five types of tympanoplasty¹. 1957 first medial graft performed by Shea with vein graft. 1961 Storrs introduced the use of temporalis fascia grafting to repair Eardrum. Temporalis fascia grafts commonly used for tympanic membrane repair with 90 % success rate^{2, 3, 6}.

Tympanic membrane is a three layer structure outer epithelium, middle ear fibrous layer, inner endothelium. Earperforation occurs as result of defects in middle fibrous layer. Small perforations heal spontaneously. Poor blood supply, infection during the healing process, spontaneous repair may be hindered. For tympanic membrane grafting, usually graft taken from vein, fascia, dura, synthetic material⁵² may be used in patients with limited graft availability, with previous history of surgery. Perforation may result from chronic infection, trauma, disorders of Eustachian tube, Tonsilloadenoid enlargement, and foreign body insertion⁷⁰ Conventional microscopic Tympanoplasty with a Postauricular incision is a procedure for patients with chronic otitis media safe type. In our study unsafe chronic otitis media is not included. Minimally invasive otologic surgery has recently been developed along with endoscopic techniques. Endoscopic ear surgery, first tried in the 1990s³ has become popular with anatomic and physiologic concepts⁴. Endoscopically, the typical transcanal approach. This avoids other unnecessary incisions and soft tissue dissections. The endoscopic approach also provides better visualization of hidden areas in the middle ear cavity including the anterior and posterior epitympanic spaces, sinus tympani, facial recess, and hypotympanum.

Various approaches to tympanoplasty

- William's Wilde Postaural
- Lempert's Endaural
- Rosen's Endomeatal

In Conventional tympanoplasty with microscope advantages are depth of perception, magnification, two handed technique, continuous head movement to get full view. In endoscopic Tympanoplasty¹¹⁻¹⁴, no magnification, no depth of vision, new technique, and learning curve, single handed. Better understanding of anatomy and ventilation pathways, better optics, and two handed in case of endoscopic holders. Our study is prospective comparative of conventional versus endoscopic tympanoplasty. It compares the efficacy and outcomes of both.

MATERIAL AND METHOD

The present study was conducted at our institute in the Department of ENT during period of June 2017 to December 2019. Total 80 cases studied. Design of the study was prospective comparative study.

Case population: The study population included 80 cases, 40 cases of conventional tympanoplasty and 40 cases of endoscopic tympanoplasty attending indoor department at our institute.

Inclusion Criteria: Patients of age group above 18 years, presenting to ENT Outpatient department with inactive chronic otitis media, giving consent for surgery.

Exclusion Criteria

- Acute suppurative otitis media.
- Cases of unsafe chronic otitis media.

Plan of study: Total 80 cases satisfying the inclusion criteria were enrolled in study. Detailed history was taken in every case including ear discharge decreased hearing, tinnitus, giddiness, trauma, nasal complaints. Detailed clinical and systemic examination was done in each case. Each patient was investigated as per proforma clinical, audiometric, radiological examination. After pre Anaesthetic check-up, patient is admitted in ENT ward and posted for tympanoplasty surgery. In our study, we have done comparative study of conventional (microscopic) and endoscopic tympanoplasty. Selection of patients for particular treatment modality is done with randomized method. We have used preoperative antibiotics, antihistaminic, antacid, antiemetics, and nasal decongestant drop. Regarding the anaesthesia most of cases are done in local anaesthesia with sedation, few cases are done in general anaesthesia.

In conventional tympanoplasty, we have used

- Zeiss microscope
- William wilde's postauricular incision (Fig. 1)
- Temporalis fascia graft used.
- Graft placed by underlay technique



Fig. 1. Right postauricular incision

In endoscopic approaches

We have used

- 0 degree 3mm rigid Hopkins endoscope. (Fig 2)
- Temporalis fascia graft used
- Rosen's endomeatal incision taken
- Set of endoscopic instruments (Fig 3)
- Graft placed by underlay technique (Fig 4. a, b, c, d)



Fig 2. 0 degree Hopkins 3mm, 10cm endoscope



Fig 3. Set of endoscopic Instruments

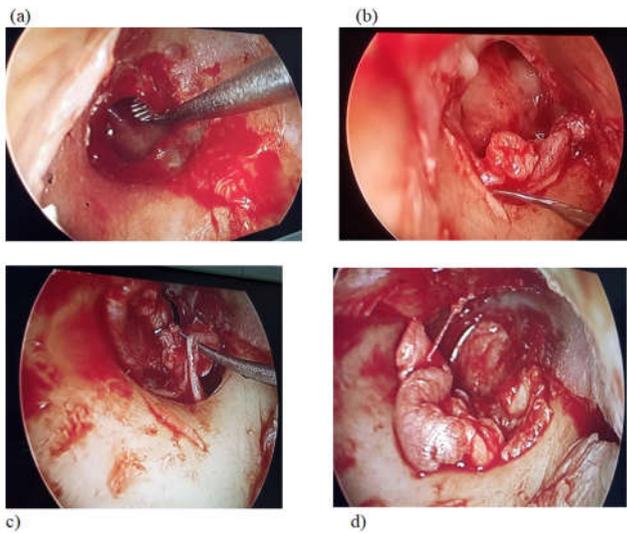


Fig 4– a). Undermining the freshened edges of TM (b)-after endomeatal incision elevation of tympanomeatal flap (c) chorda tympani (d) graft placed by underlay technique with graft adjustment in EAC



Fig. 5. Endoscopic pic showing large perforation

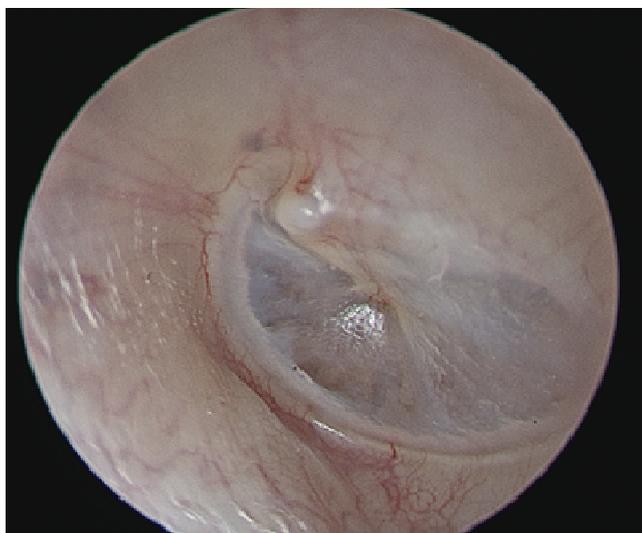


Fig. 6. Post op status after 3 month

Once surgery is done, patients are kept in ward for 1 day, antibiotics, oral antihistaminic, nasal decongestant given. Same given for 2 week postoperative period. Check dressing done next day in morning .next follow up will be 7day for suture removal, then 15day then monthly. PTA is done after 2- 3 month. In the follow up period all patients were examined for pain, wound healing. (Any dehiscence or infection), hearing improvement, discharge or infection. Final assessment of graft uptake was done at 3 months (Fig. 6) and hearing was assessed by postoperative PTA, where postop A-B gap was calculated by taking the average of A-B gap at 500 Hz, 1 kHz and 2 kHz. Successful results were considered as patient having complete graft uptake and post-operative air bone gap ≤ 15 db. Those patients not fulfilling above criteria were considered as failure. Written informed consent was taken from patients before including in the study. Patients were explained in detail about the nature of study, investigations management options and complications. After including patients for the study following, a clinical proforma was used to maintain the record of patients.

RESULTS

This study includes 80 patients suffering from CSOM. Patients presented to ENT OPD with dry central perforation (Fig 4) were admitted in ward and posted for surgery. Present study showed female dominance with 57.5% in conventional tympanoplasty and 62.5% in endoscopic tympanoplasty. Out of 80 cases total 48 cases are of female consisting 60%.

Table no 1. Gender distribution (n=80)

Gender	Group		Total
	CT	ET	
female	23 57.5%	25 62.5%	48 60%
Male	17 42.5%	15 37.5%	32 40%
Total	40 100%	40 100%	80 100%

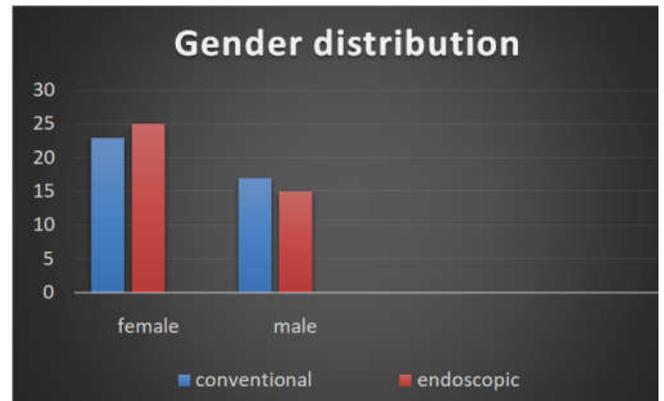
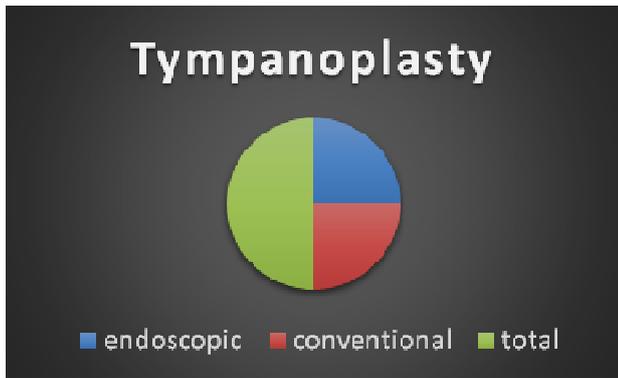


Chart 1.

Table 2. distribution of total cases. Chart-2

Group	N	%
Endoscopic	40	50
Conventional	40	50
Total	80	100



Mean age of which patients are operated for endoscopic tympanoplasty is 31.93 yr. and for conventional tympanoplasty is 31 yr. with p value is of 0.7.

Table no 3. Showing Mean age of surgery

Variables	Group	N	Mean	SD	p value
Age (years)	ET	40	31.93	11.26	0.7
Age (years)	CT	40	31	9.94	0.7

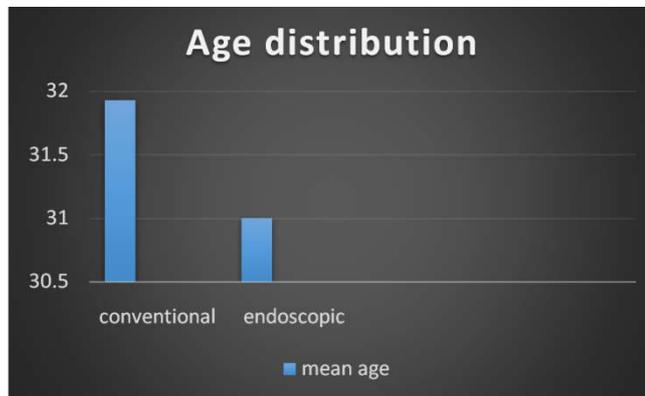


Chart 3.

Table no 4. Presenting clinical feature

Ear discharge	Group		Total
	CT	ET	
Bilateral	9	11	20
	22.5%	27.5%	25%
Left	24	24	48
	60%	60%	60%
Right	7	5	12
	17.5%	12.5%	15%
Total	40	40	80
	100%	100%	100%

p-value <0.01

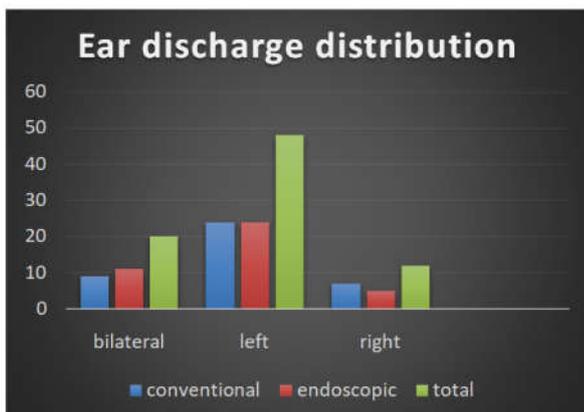


Chart 4.

Table no 5.

Decreased hearing	Group		Total
	CT	ET	
No	5	18	23
	12.5%	45%	28.8%
Yes	35	22	57
	87.5%	55%	71.3%
Total	40	40	80
	100%	100%	100%

p-value <0.01

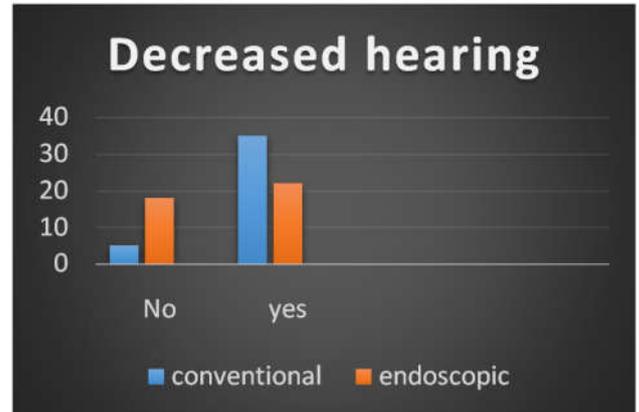


Chart-5

Table no 6. Operated side of ear

Surgery side	Group		Total
	CT	ET	
Left	30	31	61
	75%	77.5%	76.3%
Right	10	9	19
	25%	22.5%	23.8%
Total	40	40	80
	100%	100%	100%

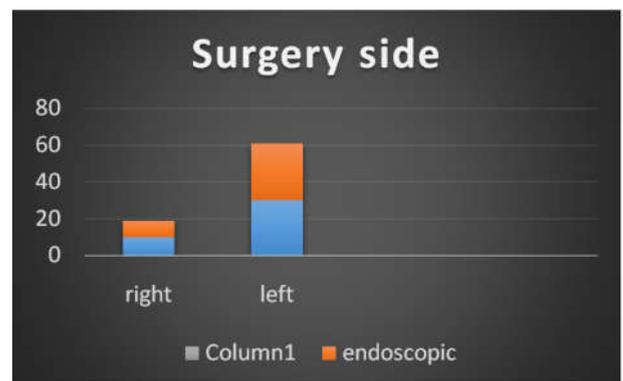


Chart 6.

Patients are presented with clinical feature of ear discharge and decreased hearing .Ear discharge may be unilateral or bilateral .in conventional tympanoplasty bilateral ear discharge is seen in 22.5% of cases , right side of 17.5% and left side of 60 % . Left ear discharge is most common . In endoscopic tympanoplasty, bilateral ear discharge is seen in 27% of cases with only right side 12.5% and only left side 24%. Left ear discharge is most common presenting symptom in both tympanoplasty. Patients are presented with decreased hearing with ear discharge .Hearing may be normal or decreased. In our study, conventional tympanoplasty 12.5% cases are presented with no decreased hearing and 87.5 % cases does so.in endoscopic tympanoplasty, 71.3% patients are complained of decreased hearing.

Table 7. Showing size of tympanic membrane perforation

Perforation size	Group		Total
	CT	ET	
Small	3	15	18
	7.5%	37.5%	22.5%
Moderate	19	15	34
	47.5%	37.5%	42.5%
Large	17	9	26
	42.5%	22.5%	32.5%
Subtotal	1	1	2
	2.5%	2.5%	2.5%
Total cases	40	40	80
	100%	100%	100%

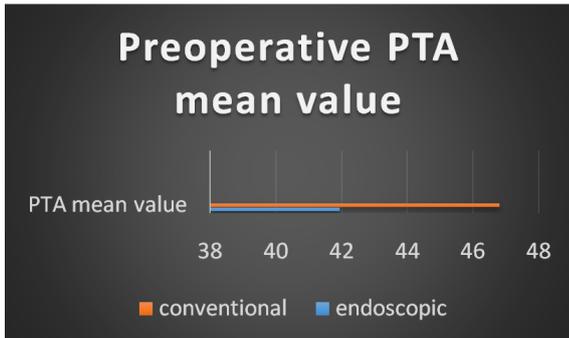


Chart-7. Mean intraoperative time for conventional tympanoplasty was 93.50min and 86.25min for endoscopic tympanoplasty with p value of 0.016

Table no 8. Showing preoperative PTA

PTA	Group	N	Mean	SD	P value
Preop	ET	40	41.93	13.73	0.14
	CT	40	46.80	15.70	0.14

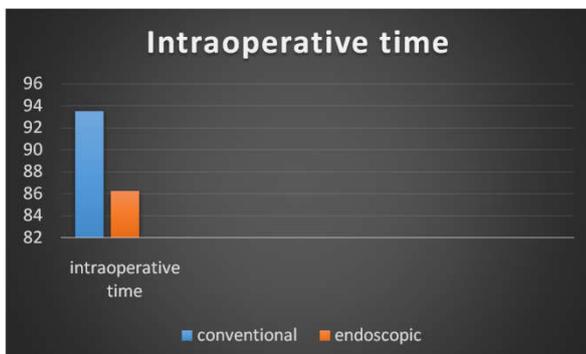


Chart 8.

Table no 9. Showing intraoperative time

	Group	N	Mean	SD	p-value
Intra-op time	ET	40	86.25	12.13	0.016
	CT	40	93.50	14.06	0.016

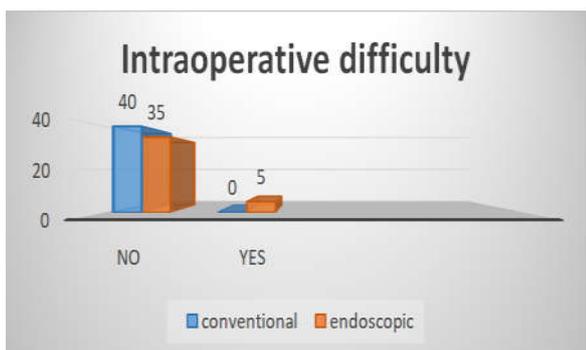


Chart 9.

Table no 10. Showing intraoperative difficulty.

Intra-op difficulty	Group		Total
	CT	ET	
No	40	35	75
	100%	87.5%	93.8%
Yes	0	5	5
	0%	12.5%	6.3%
Total	40	40	80
	100%	100%	100%

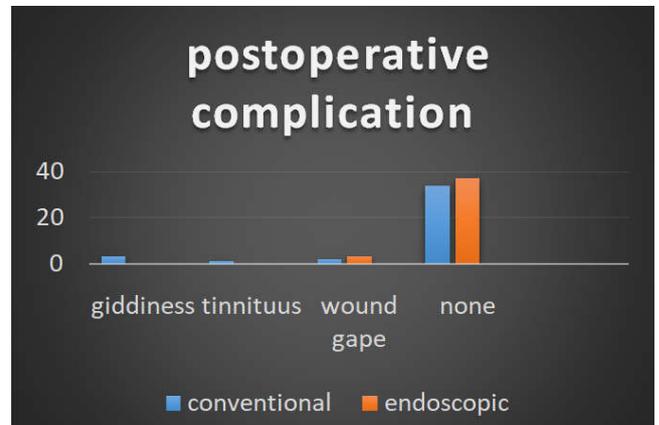


Chart-10

Table no 11. Showing postoperative complication

Immediate post op complications	Group		TOTAL
	CT	ET	
Giddiness	3	0	3
	7.5%	0%	3.8%
Tinnitus	1	0	1
	2.5%	0%	1.3%
Wound gape	2	3	5
	5%	7.5%	6.25%
None	34	37	71
	85%	92.5%	88.75%
Total	40	40	80
	100%	100%	100%

p-value-1.0

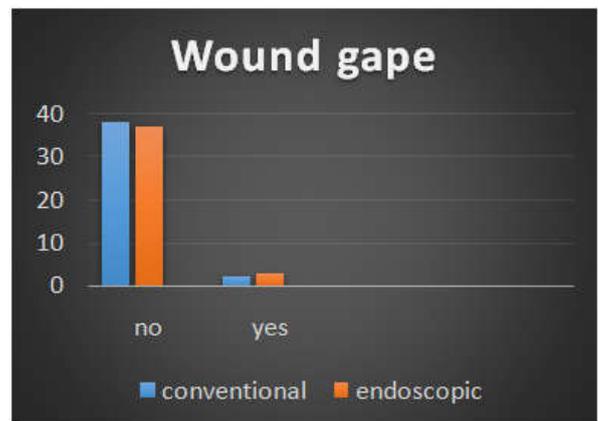


Chart 11

Table 12. Showing wound gape

Wound gape	Group		Total
	CT	ET	
No	38	37	75
	95%	92.5%	93.8%
Yes	2	3	5
	5%	7.5%	6.3%
Total	40	40	80
	100%	100%	100%

p-value-1.0

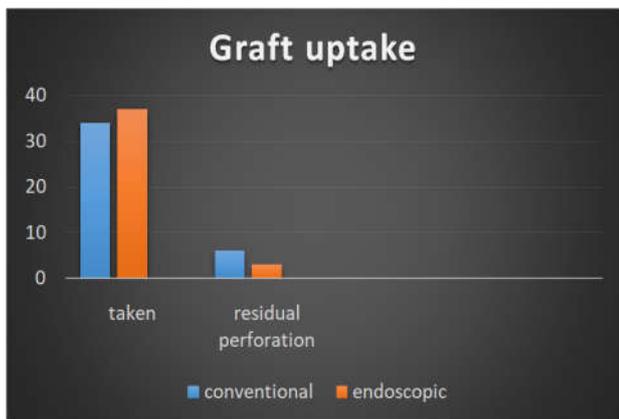


Chart 12

Table no 13. Showing graft uptake

Perforation	Group		Total
	CT	ET	
Taken	34	37	71
	85%	92.5%	88.8%
Residual perforation	6	3	9
	15%	7.5%	11.3%
Total	40	40	80
	100%	100%	100%

Table no 14. Showing postoperative PTA.

PTA	Group	N	Mean	SD
Post op	ET	40	38.36	13.63
	CT	40	40.21	17.83

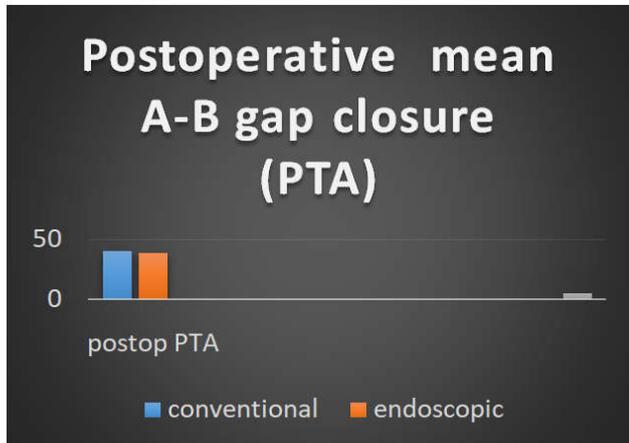


Chart-13

In our study Left ear is most commonly undergone tympanoplasty, with conventional tympanoplasty contributes 75% and 77.5%.endoscopic tympanoplasty. Out of 80 cases total 61 are of left ear consisting 76.3%and 23.8%.are of right ear. Tympanic membrane perforation may be small (single quadrant), moderate (2quadrant), large (more than 2) subtotal fibrous annulus intact) total (fibrous annulus lost from all over) in size In conventional tymapanoplasty 7.5% cases had small perforation, 47.5% cases had moderate, 42.5% had large,and 2.5% had subtotal perforation. Whereas in endoscopic tympanoplasty 37.5 % cases are of small and moderate size perforation and 22.5% had large perforation and 2.5% had subtotal perforation. Preoperative Mean hearing loss (n=40) in conventional tympanoplasty was 46.80d B. Whereas it was 41.93dB in endoscopic tympanoplasty with p value is of 0.14 Which shows that conventional tympanoplasty require little more time than endoscopic tympanoplasty. Intra operative difficulty may be due to recurrent fogging of endoscope, more bleeding, technical problem .In our

study no difficulty noted in convention tympanoplasty but 12.5% cases showed difficulty due to excess bleeding which hampered view of endoscope and recurrent fogging. Tympanoplasty has immediate complication and delayed complication. In our study complication such as tinnitus 2.5%, giddiness7.5% ,no wound gape seen in conventional tympanoplasty whereas no tinnitus , giddiness but 7.5% wound gape seen in endoscopic tympanoplasty. 90% conventional and 92.5% endoscopic tympanoplasty showed no immediate complication with p value of 1. In our study Wound gape was seen more common in 7.5% of cases of ET and 5% of CT with p value of 1. 85% of CT and 92.5% of ET showed healthy wound. Failure of graft uptake or residual perforation is also complication of tympanoplasty. In our study graft uptake rate is 85% for conventional (n=40) and 92.5% for endoscopic tympanoplasty. Hence our study showed little more graft uptake rate with endoscopic technique. 15 % cases of CT showed residual perforation whereas 7.5 %cases of showed residual perforation in endoscopic tympanplasty. Mean hearing improvement with postoperative PTA done 6week after surgery is 38.36dB. For ET AND 40.21dB for CT.P VALUE is 0.67 Mean hearing improvement more with conventional tympanoplasty documented in our study.

DISCUSSION

Tympanoplasty is surgery performed to remove middle ear pathology with or without ossicularre construction with reconstruction of a perforated tympanic membrane. There are various approaches for it such as William wilde’s posturalincision, Rosen’s endomeatalincision, Lempert’ send auralincision. It is most common ear surgery to be performed. Our study is comparative study including total 80 cases, with 40 conventional tympanoplasty and 40 cases of endoscopic tympanoplasty. Patients presented to ENT OPD with history of chronic ear discharge with dry central perforation were evaluated on OPD basis and then admitted for surgery. All patients were examined clinically and investigated for routine anaesthesia fitness and PTA.

Age and gender distribution: CSOM occur at any age with no gender preference. CSOM common in lower socioeconomic group, poor nutrition status.Our studyshowed female dominance with 57.5%in conventional tympanoplasty (n=40) and 62.5% in endoscopic tympanoplasty (n=40). Out of 80 cases total 48 cases are of female consisting 60%. Lade²¹ et al. (2014) in their study had, ET (n=30) male to female 50 % (15/15) and for MT (n=30) male to female (13/17) 43.3% male. Jyothi¹⁹ et al. (2017) found male; female ratio as for ET (n=60), (39/21) 65% male and for MT (n=60) male to female ratio (26/34) 43.3% male.Plodpai and paie²⁷ (2017) in his retrospective study found male to female ratio as for ET (n=90) (33/57) with 36.6% male and for MT (microscopic tympanoplasty) n=91 (23/68) male to female ratio with 25.27%male.Most common age at presentation for endoscopic tympanoplasty vs conventional tympanoplasty was 28.5yr vs 31.4 yr (Meanage) in the study done by jyothi et al¹⁹. As reported Harugaop¹⁸ et al (2008) age of presentation varies from 15 yr. to 65 yr. for the ET and MT.Kumar et al²⁴ (2016) reported age at presentation varies from 18-45yr for both ET and MT. *Sinha M et al* reported average age of presentation 33yr for microscopic and 29yr for endoscopic tympanoplasty. *Sinha et al* in their study had, ET (n=22) male to female ratio 12/10 with 55% male and for MT (n=22) male to female ratio 10/12 with 55% female.In our Study Mean age of which patients are operated for endoscopic tympanoplasty (n=40) is 31.93 yr. and for conventional tympanoplasty (n=40) is 31 yr. with p value is of 0.7.

Presenting complaints: In the present study, most common presenting symptom was history of ear discharge and decreased hearing.in conventional tympanoplasty bilateral ear discharge is seen in 22.5% of cases , only right side of 17.5% and only left side of 60 %.In endoscopic tympanoplasty , bilateral ear discharge is seen in 27% of cases with only right side 12.5% and only left side 24%.In our study, conventional tympanoplasty 12.5% cases are presented with no decreased hearing and 87.5 % cases doe’s so.in endoscopic

tyimpanoplasty, 71.3% patients are complained of decreased hearing. A study conducted by Jyothi¹⁹ et al (n=120) shows 100% patient showing ear discharge with 85% showing decreased hearing. Kuo and Wu 2017, most of the patient presented with ear discharge and decreased hearing.

Duration of symptoms: In the present study, Duration of symptoms varies from 3 month to 20 yr. Similar observations are made in studies of Plodpai Y, Paje N²⁰ and Jyothi AC, Shrikrishna BH, Kulkarni NH, Kumar A¹⁹, Kozin ED, Gulati S, Kaplan AB, Lehmann AE, Remenschneider AK, Landegger LD, et al

Comparative results with respect to surgical time: In our study average surgical time for conventional tympanoplasty is 93.50min and in endoscopic tympanoplasty is 86.25min with p value of 0.016. The average time taken for endoscope assisted tympanoplasty was around 75 minutes and for microscopic tympanoplasty was around 90 minutes.^{19, 22, 23, 24} Average time for MT was 130 min and ET is 100min in study done by Jana, et al. Similar observation was made in studies of Tarabichi M³⁸⁹⁷ and Karhuketo TS, Ilomaki JH, Puhakka HJ.²⁹ Dundar R, Kulduk E, Soy FK, Aslan M, Hanci D, Muluk NB, et al

Comparative results with respect to graft uptake: Temporalis fascia graft has low basal metabolic rate, same thickness of TM, can be harvested through same postaural incision, more uptake rate. In our study we have used temporalis fascia graft. In our study graft uptake rate is 85% for conventional (n=40) and 92.5% for endoscopic tympanoplasty. Patel J et al³⁰ Complete uptake rate was 69.23% and 77.77% fortragal perichondrium and temporalis fascia respectively. Sinha M et al study, graft uptake 95% for microscopic and 90% for endoscopic tympanoplasty. Shueb M et al³² study (n=60) graft uptake rate is same 93.33% for endoscopic and microscopic tympanoplasty. Ahmed El- Guindy (Tanta, Egypt), has evaluated the role of the rigid endoscope in the management of 36 cases of dry central perforation of the tympanic membrane. The graft take rate was 91.7%.

Comparative results with respect to hearing outcome: In case of preoperative mixed hearing loss we have to explain the patient regarding hearing improvement, in tympanoplasty surgery, conductive component of hearing loss will improve but not sensorineural component will not improve. Mean hearing improvement with postoperative PTA done 6 week after surgery is 38.36dB. For ET AND 40.21dB for CT with P VALUE is 0.67. Mean improvement in air bone gap postoperatively in study Sinha M et al³² for microscopic tympanoplasty 23.68dB and endoscopic tympanoplasty was 16.13dB. Shueb M et al³³ in their study mean A-B gap improvement in ET is 17.4dB and in MT is 18.13dB. Raj A, Meher R^{22, 17}. Found graft uptake was 90% in endoscopic method and 85% in microscopic method but there were no significant differences between the gains in the air bone gap in either group. Yadav S.P, S. Agarwal et al³⁵ studied Endoscopic assisted myringoplasty carried out in 50 patients with air bone gap closure was achieved in 80% of cases. Karchuketo TS²⁹ studied the endoscopic assisted myringoplasty in 30 ears of 29 patients with different sized perforation & concluded that the post-operative air bone gap was less than 10 dB in 90% cases.

Comparative results with respect to cosmesis: In microscopic tympanoplasty, 3-5 cm incision in postaural region. For endoscopic tympanoplasty, we used 2 cm incision in preauricular hair region. Patients undergoing endoscopic tympanoplasty had a more desirable cosmetic result than with microscopic tympanoplasty as seen in study of Sengupta A, Basak B, Ghosh D, Basu D, Adhikari D, Maity K.³¹ Shueb M et al¹²⁹ in their study showed similar results. Study conducted by <http://link.springer.com/search?facet-author=%22A.+S.+Harugop%22&+S.+Harugop%22&+S.+Mudhol%22> Harugop <http://link.springer.com/search?facet-author=%22A.+S.+Harugop%22&+S.+Mudhol%22> Mudhol <http://link.springer.com/search?facet-author=%22R.+S.+Mudhol%22&+S.+Mudhol%22> Godhi A¹⁸, on a comparative study of endoscopy assisted myringoplasty and microscopy assisted myringoplasty concluded that

but in terms of cosmetics post-operative recovery the patient in endoscope group had better result.

Comparative results with respect to postoperative complication: Every surgery has its own complication. In tympanoplasty common complications are graft medialisation or lateralisation, residual perforation, wound infections, wound gape. In our study Wound gape was seen more common in 7.5% of cases of ET and 5% of CT with p value of 1. In our study 15 % cases of CT (n=40) showed residual perforation whereas 7.5 % cases of showed residual perforation in endoscopic tympanoplasty (n=40) Patient developed otitis externa with otomycosis after three weeks of the surgery by study of Patel J et al³⁰ post aural wound gaping after 7-10 days of the surgery following suture removal in study done by Kaya I, Sezgin B, Sergin D, Ozturk A, Eraslan S, Gode S, et al⁸⁷ Tseng CC, Lai MT, Wu CC, Yuan SP, Ding YF. Some patient developed tragal perichondritis after two weeks of the surgery by study of Patel J et al³⁰. Other complications such as atelectasis and perforation found in study of Doyle JP, Schleuning AJ, Echevarria J.³¹ and Glasscock ME³² Sinha M et al in their study found reperforation rate in MT (n=22) is 5% and ET (n=22) is 9%

Surgical management

Our study was undertaken with the objective of

- To study the efficacy of conventional & endoscopic tympanoplasty
- To compare outcomes of conventional & endoscopic tympanoplasty
- We had performed 40 cases with endoscopic technique and rest 40 cases with conventional technique.

Comparison between conventional tympanoplasty and endoscopic tympanoplasty. Anterior perforation of tympanic membrane can be easily repaired with endoscope¹²⁹. During the surgery of the patient with microscope tortuosity of the EAC and bony overhang hampers the view of the deeper structures. So we need to frequently manipulate head of the patient. Sometimes it is difficult to see deeper structures inspite of manipulations. So we need to do bone curette and canalplasty becomes mandatory. This in turn may increase operative time. In contrast, endoscope can be easily negotiated through curve EAC. So the endoscope brings surgeon's eye to the tip of the scope. The wide angle of scope brings the tympanic membrane in one frame, so no need to adjust the microscope to see different quadrant of tympanic membrane. We can see the microvasculature of middle ear, vessel over ossicle by zoom in the endoscope. Thus there is no need of frequently manipulating patients head and so canalplasty can be avoided. Similar observations were made in two separate studies by Lakpathi G, Sudarshan Reddy L, Anand²³, Tarabichi M and Usami S, Iijima N et al.²⁷ We can easily see structures with angled endoscopes like round window niche, sinus tympani, anterior epitympanic, Eustachian tube area, facial recess, which are difficult to visualise with microscope. Authors Kumar M, Kanaujia SK, Singh A²⁴ Raj A, Meher R^{17,22} Yadav SP, Aggarwal N, Julaha M, Goel A²⁸ reported similar observations in their study. In endoscope group, we used temporalis fascia as a graft which was harvested through a smaller incision in front of crus of helix. Where as in microscopic group temporalis fascia was used as a graft which was taken from a larger postaural incision. So in the endoscopic tympanoplasty patients had relatively early wound healing and less morbidity in terms of postoperative pain as compared to microscopic group. Microscope is not transportable but endoscope is easily transportable and hence ideal for use in ear surgery camps.

In endoscopic ear surgery the biggest disadvantage is that, it is a one handed technique^{20,25,26}. Surgeon has to hold the scope in one hand all the time during surgery. Surgery has to be performed by other single hand. If during surgery excessive bleeding occurred then it becomes extremely difficult to operate as only one hand is free. Blood soils the tip of microscope which obscures the surgical field. Thus required to clean tip of endoscope frequently. Where as in microscopic technique both hands are free to operate. Thus procedure is easily performed in

microscopic technique. Similar observation was made in studies of Usami S, Iijima N, Fujita S, Takumi Y²⁷, Tarabichi M⁷ and Karhuketo TS, Ilomaki JH, Puhakka HJ.¹²³ El-Guindy A. Endoscopic transcanal myringoplasty. Another disadvantage of Endoscope is that it provides monocular vision which leads to loss of depth perception.¹⁰¹⁻¹⁰⁸. To avoid damage to the vital structure one needs to be extra cautious. This difficulty may be overcome by experience. We used Savlon as a defogging agent for endoscopes. Nomura, K., Oshima, H., Yamauchi, D. et al¹⁶, studied the ototoxic effect of ultrastopantifog solution applied to the guinea pig middle ear. Recently an endoscope holder is used to hold the endoscope so that both hands of the surgeon are free to operate. Bottrill I, Perrault DF, Jr, Poe D^{8,9}. In vitro and in vivo determination of the thermal effect of middle ear endoscopy on middle ear structure.

Summary

In this study 80 cases of tympanoplasty studied between periods of June 2017 to December 2019 in our ENT department.

- Study showed female dominance with 57.5% in conventional tympanoplasty and 62.5% in endoscopic tympanoplasty
- In our study Mean age of which patients are operated for endoscopic tympanoplasty (n=40) is 31.93 yr. and for conventional tympanoplasty (n=40) is 31 yr.–
- In the present study, Duration of symptoms varies from 3 months to 20 yr.
- In microscopic tympanoplasty, 3-5 cm incision in the postaural region. For endoscopic tympanoplasty, we used 2 cm incision in the preauricular hair region.
- In the present study, most common presenting symptom was history of ear discharge and decreased hearing.
- In our study average surgical time for conventional tympanoplasty is 93.50 min and in endoscopic tympanoplasty is 86.25 min
- In our study graft uptake rate is 85% for conventional (n=40) and 92.5% for endoscopic tympanoplasty
- Mean hearing improvement with postoperative PTA done 6 weeks after surgery is 38.36 dB for ET AND 40.21 dB for CT
- In our study Wound gape was seen more common in 7.5% of cases of ET and 5% of CT
- In our study 15% cases of CT (n=40) showed residual perforation whereas 7.5% cases showed residual perforation in endoscopic tympanoplasty (n=40)

CONCLUSION

After a detailed discussion and comparison with literature, we conclude that

- Endoscopic tympanoplasty as a technique has a long learning curve.
- Endoscopic technique is as efficacious as and less invasive than microscopic surgery.
- Endoscopic technique of tympanoplasty can yield similar results as microscopic technique with better cosmetics and less pain.
- Post-operative hearing also shows almost similar results.
- Surgical time is less for endoscopic than conventional tympanoplasty.
- Graft uptake rate is more for endoscopic than conventional tympanoplasty.

Conflict of Interest: There is no conflict of interest

Abbreviations

- 1) TM- Tympanic membrane
- 2) EAC- External auditory canal
- 3) PTA-pure tone audiometry

4) ET – endoscopic tympanoplasty

5) MT- microscopic tympanoplasty = CT –conventional tympanoplasty

6) Yr – year

7) A-B gap – air bone gap

8) CSOM- chronic suppurative otitis media

9) dB – decibel

10) IAC – internal auditory canal

11) fig-figure

BIBLIOGRAPHY

1. Wullstein, H. 1956. Theory and practice of tympanoplasty. *The Laryngoscope*, 66: 1076–1093. doi:10.1288/00005537-195608000-00008.
2. Gerber MJ, Mason JC, Lampert PR. 2000. Hearing results after primary cartilage tympanoplasty. *Laryngoscope* 110(12):1994–1999
3. Dornho Ver JL. 1997. Hearing results with cartilage tympanoplasty. *Laryngoscope* 107(8):1094–1099
4. Shambaugh GE. 1990. Closure of tympanic membrane perforations. In: Glasscock ME III, Shambaugh GE (eds) *Surgery of the ear*, 4th edn. W. B. Saunders, Philadelphia, pp 334–348
5. Jahrsdoerfer RA, Cain WS, Cantrell RW. 1981. Endolymphatic duct obstruction from a jugular bulb diverticulum. *Ann Otol Rhinol Laryngol.*, 90:619–23.
6. Dornhoffer JL. Hearing results with cartilage tympanoplasty. *Laryngoscope*. 1997 Aug;107(8):1094–9
7. Tarabichi M. Transcanal endoscopic management of cholesteatoma. *Otol Neurotol*. 2010 Jun; 31(4):580–8.
8. Bottrill I, Perrault DF, Jr, Poe D. In vitro and in vivo determination of the thermal effect of middle ear endoscopy. *Laryngoscope*. 1996 Feb;106(2 Pt1):213–6.
9. Bottrill I, Perrault DF, Jr, Poe D. 2003. In vitro and in vivo determination of the thermal effect of middle ear endoscopy. *Laryngoscope* 1996 Feb;106 (2 pt 1) 213–6 Chu, EA and Jackler, RK (2003) The Artificial Tympanic Membrane (1840- 1910): From Brilliant Innovation to Quack Device. *Otology & Neurotology* 24:507-518
10. Mer SB, Derbyshire AJ, Brushenko A, Pontarelli DA. Fiberoptic endoscopes for examining the middle ear. *Arch Otolaryngol* 1967;85:387–93.
11. Willemot J. 1975. Les techniques d'endoscopie et de reproduction de l'image en oto-rhino-laryngologie. *Acta Otorhinolaryngol Belg.*, 29:227–33.
12. Aimi K. 1978. The tympanic isthmus: its anatomy and clinical significance. *Laryngoscope.*, 88:1067–81.
13. Marchioni, D., Alicandri-Ciuffelli, M., Molteni, G. et al. 2010. Endoscopic tympanoplasty in patients with attic retraction pockets. *Laryngoscope*. 2010; 120:1847–1855.
14. Takahashi, H., Sato, H., Nakamura, H. et al. 2007. Correlation between regulation functions and outcome of type-I tympanoplasty. *Auris Nasus Larynx*. 34:173–1761
15. Nomura, K., Oshima, H., Yamauchi, D. et al. 2014. Ototoxic effect of ultrastopantifog solution applied to the guinea pig middle ear. *Otolaryngol Head Neck Surg*. 151:840–844.
17. Raj, A., Mejer, R. Endoscopic transcanal myringoplasty: a study. *Indian J Otolaryngol Head Neck Surg*. 2001; 53:47–49.
18. Hagurop, A.S., Mudhol, R.S., Godhi, R.A. A comparative study of endoscope assisted myringoplasty and microscope assisted myringoplasty. *Indian J Otolaryngol Head Neck Surg*. 2008; 99:298–302.
19. Jyothi AC, Shrikrishna BH, Kulkarni NH, Kumar A. Endoscopic myringoplasty versus microscopic myringoplasty in tubotympanic CSOM: a comparative study of 120 cases. *Indian J Otolaryngol Head Neck Surg*. 2017 Sep; 69(3):357-62.
20. James AL. Endoscope or microscope-guided pediatric tympanoplasty? Comparison of grafting technique and outcome. *Laryngoscope*. 2017 Nov; 127(11):2659-64.

21. Lade H, Choudhary SR, Vashishth A. Endoscopic vs microscopic myringoplasty: a different perspective. *Eur Arch Otorhinolaryngol*. 2014 Jul; 271(7):1897-902.
22. Raj A, Meher R. Endoscopic transcanalmyringoplasty: a study. *Indian J Otolaryngol Head Neck Surg*. 2001 Jan;53(1):47-9.
23. Lakpathi G, Sudarshan Reddy L, Anand. Comparative study of endoscope assisted myringoplasty and microscopic myringoplasty. *Indian J Otolaryngol Head Neck Surg*. 2016 Jun; 68(2):185-90.
24. Kumar M, Kanaujia SK, Singh A. A comparative study of endoscopic myringoplasty vs conventionalmyringoplasty. *Otorhinolaryngology Clinics*. 2015; 7(3):132-37.
25. Liberati A, Altman DG, Tetzlaff J, Mulrow C, Gotzsche PC, Ioannidis JP, et al. The PRISMA statement for reporting systematic reviews and meta-analyses of studies that evaluate health care interventions: explanation and elaboration. *PLoS Med*. 2009 Jul; 6(7):e1000100
26. Vrabec JT, Deskin RW, Grady JJ. Meta-analysis of pediatric tympanoplasty. *Arch Otolaryngol Head Neck Surg*. 1999 May; 125(5):530-4.
27. Tarabichi M. Endoscopic middle ear surgery. *Ann OtolRhinolLaryngol* 1999;108:39-46.
28. Usami S, Iijima N, Fujita S, Takumi Y. Endoscopic-assisted myringoplasty. *ORL J OtorhinolaryngolRelat Spec* 2001;63:287-290.
29. Yadav SP, Aggarwal N, Julaha M, Goel A. Endoscope-assisted myringoplasty. *Singapore Med J* 2009; 50:510-512.
30. Karhuketo TS, Ilomaki JH, Puhakka HJ. Tympanoscope-Assisted Myringoplasty. *Otorhinolaryngology*. 2001; 63:353-8.
31. Patel J et al. *Int J Res Med Sci*. 2015 Aug;3(8):1953-1957
32. Doyle JP, Schleuning AJ, Echevarria J. Tympanoplasty: Should grafts be placed medial or lateral to the tympanic membrane? *Laryngoscope*. 1992; 82:1425-30.
33. Glasscock ME, III Tympanic membrane grafting with fascia: overlay vs. under surface technique. *Laryngoscope*. 1973; 83:754-70.
34. Yadav SPS, Agarwal N, Julaha M, Goel M. endoscope assisted myringoplasty. *Singapore med J*. 2009; 50(5):510-2.
35. jana, et al. Study of Microscopic and Endoscopic Type I Tympanoplasty *International Journal of Contemporary Medical Research* 2018;5(10):J1-J4.
