Endoscopic Versus Microscopic Type I Cartilage Tympanoplasty for Anterior Perforation-A Prospective Comparative Study

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Abstract

Objective Chronic otitis media with anterior perforation is a challenging condition to treat with a microscope especially if the canal is narrow or has overhang. The endoscope provides the advantage of wide-angle view and transcanal access avoiding postaural approach and canaloplasty. The aim of this study was to compare the anatomical, functional outcomes, and surgical duration between endoscopic and microscopic type I tympanoplasty performed for anterior perforation Design Prospective comparative study Setting Tertiary Referral Hospital Participants A total of 100 cases with anterior perforations were enrolled which was divide into two groups, the microscopic (MT) and the endoscopic (ET) with 50 cases in each group. Main outcome measures Graft uptake rate, hearing outcomes and surgical durations were compared between the two groups. Results The graft uptake in MT and ET was 81.8% and 91.3% respectively, statistically not significant. The mean operative time for MT and ET was 68.68±18.79 minutes and 61.24 ± 11.18 minutes respectively with statistically significant difference (p-0.003). Hearing outcomes were improved after the surgery within the groups. However, there was no significant difference in the hearing between the groups. Conclusions The endoscopic tympanoplasty for anterior perforation provides superior visualization avoiding postaural incision and canaloplasty, with good graft closure rate, improved hearing. It also offers significantly faster completion of surgery than a microscope. Thus, with the endoscope, minimally invasive surgery can be performed. Key points * Anterior perforations are challenging condition and difficult to treat, carrying poor prognosis than central or posterior perforations. * Microscope provide straight line of vision, making it difficult to access anterior perforations. * Endoscope provides wide angle view, high magnification and high definition image which avoids postaural incision or canaloplasty for anterior perforation repair. * Transcanal Endoscopic ear surgery provides advantage of performing minimally invasive surgery. * It indirectly lessens the financial burden to the patient which is significant in the developing countries.

ABSTRACT

Objective

Chronic otitis media with anterior perforation is a challenging condition to treat with a microscope especially if the canal is narrow or has overhang. The endoscope provides the advantage of wide-angle view and transcanal access avoiding postaural approach and canaloplasty. The aim of this study was to compare the anatomical, functional outcomes, and surgical duration between endoscopic and microscopic type I tympanoplasty performed for anterior perforation

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Prospective comparative study

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Graft uptake rate, hearing outcomes and surgical durations were compared between the two groups.

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Conclusions The endoscopic tympanoplasty for anterior perforation provides superior visualization avoiding postaural incision and canaloplasty, with good graft closure rate, improved hearing. It also offers significantly faster completion of surgery than a microscope. Thus, with the endoscope, minimally invasive surgery can be performed.

Key words:

Tympanoplasty, anterior perforation, cartilage, endoscope, microscope

Key points

- Anterior perforations are challenging condition and difficult to treat, carrying poor prognosis than central or posterior perforations.
- Microscope provide straight line of vision, making it difficult to access anterior perforations.
- Endoscope provides wide angle view, high magnification and high definition image which avoids postaural incision or canaloplasty for anterior perforation repair.
- Endoscope provides advantage of performing minimally invasive surgery.
- It indirectly lessens the financial burden to the patient which is significant in the developing countries.

Introduction

An endoscope is a relatively new tool in the field of otology which is gradually gaining its acceptance in the community. After the development of Hopkins rod endoscope by Harrold Hopkins[1] in 1966, it was only in 1992, when El Guindy [2] from Egypt published the first paper on total endoscopic ear surgery i.e. myringoplasty using a fat graft. Between 1966 to 1992, most of the studies published were based on secondary endoscopic ear surgery i.e. endoscopic assisted microscopic ear surgery.[1,3]However, the microscope is still considered as a gold standard tool in otology.[3] Tympanoplasty is considered one of the most common procedures done by otologists to repair tympanic membrane (TM) and to restore hearing.[4] Graft material commonly used is temporalis fascia, but it has recently been replaced by cartilage, especially for anterior and subtotal perforation because of stability and long-term uptake results.[5] Different techniques are described in the literature for doing tympanoplasty which includes overlay, underlay, and over-underlay techniques with each having pros and cons.[6,7,8] The most commonly used technique worldwide seems to be an underlay technique because it is easier to perform and less time-consuming.[6,2]

Chronic otitis media (COM) with large perforation, subtotal perforation, atelectasis, adhesive otitis media, cholesteatoma, tympanosclerotic cases, revision cases are considered as high-risk cases with poor uptake results.[9] Among them anterior perforation is also considered as the poor prognostic factor for the graft uptake because of its difficult access, reduced vascularity, and graft instability.[10, 11]

Microscopy has been the most commonly used tool for ear surgery; however, due to its straight-line vision, it limits the exposure of anterior quadrant or marginal perforations.[12] To overcome this, more invasive procedures that enlarge the surgical field are needed, such as canaloplasty or a postaural approach.[13] Because

of these limitations, the use of an endoscope is rapidly increasing in the past two decades. The main advantage of endoscopes in tympanoplasty is its wider field of view, magnification, high definition image, and superior visualization, including anterior margins avoiding postaural approach and canaloplasty.[13,14] In this study, we evaluated the difference between the graft uptake rate, surgical duration, and hearing evaluation between endoscopic and microscopic type I tympanoplasty in COM with anterior perforation.

Materials and Methods

This is a comparative study of prospectively obtained data carried out in our center from February 2016 to October 2017. We analyzed the 100 patients who underwent surgery for COM with anterior perforation. The subjects were classified into two groups. The first group comprised of the first fifty cases with anterior perforation underwent microscopic tympanoplasty and assigned as MT. The second group was the next fifty cases who had undergone endoscopic tympanoplasty and was assigned as ET. Out of 100 cases enrolled, 6 patients in MT and 4 patients in ET lost to follow up, thus 44 and 46 patients were included in MT and ET respectively. All the data of the cases used for the study are available.

Inclusion criteria for the study were adult patients, age more than 18 years old, suffering from COM with anterior perforation who required primary type I tympanoplasty with patients having minimum follow up of 12 months. Patients having cholesteatoma, revision cases, retraction pockets, atelectasis, ossicular discontinuity, middle ear discharge, and the perforation involving posterior quadrants were excluded from the study. All cases were done under local anesthesia as a daycare basis. Ethical clearance was obtained from the Institutional Review Board of the (removed for blind peer review). Informed consent was obtained from all the participants of the study.

All surgeries were performed by the first author. Tragal cartilage was used as a graft in the cases that were carried out via a transcanal approach whereas conchal cartilage was used in cases that were done by postaural approach. The shield graft technique using barred cartilage with perichondrium reinforcement technique was used in all cases. Demographic data including age, sex, perforation site, operation time, approach, and graft success rate were evaluated.

For the endoscopic group, all cases were performed transcanally, whereas the microscopic group had approached as permeatal and postaural. Nine cases of the microscopic group needed a postaural approach due to the lack of vision of the anterior margin.

Surgical Procedure

A local antibiotic was given in case of preoperative inflammation of the tympanic cavity. The surgery was only performed was the middle ear cavity was dry clinically. A tragal cartilage graft was harvested in the case of a transcanal approach and conchal cartilage was obtained in case of a postaural approach. The perichondrium was removed on both sides in both grafts tragal and conchal.

The margin of perforation was freshened. Two vertical incisions were given at 12 o'clock and 5 o'clock, which related to a horizontal incision about 10mm lateral to the annulus. Tympanomeatal flap was elevated from the posterior canal wall. The posterior annulus was elevated out of the sulcus and the mobility of the ossicular chain was checked.

Gelfoams (SPONGOSTAN Special, Ferrosan Medical Devices A/S, Soeborg, Denmark) were kept in the middle ear accordingly. The barred cartilage shaped according to the size needed was negotiated under the malleus handle (underlay technique). If the middle ear space was compromised due to a medialized handle of malleus, the cartilage was notched to fit the handle of malleus. Then the perichondrium was placed as reinforcement using the underlay technique under the handle of malleus and pushed anteriorly up to anterior margin. The tympanomeatal flap was placed back in the posterior canal wall. The perichondrium was adjusted to fit and tug around the anterior margin of perforation. Thus, perichondrium reinforced barred cartilage graft technique was used in both MT and ET groups. A Final check was done to ensure there was a touch of perichondrium cartilage graft with anterior margin and annulus (Figure).

The EAC was packed with gelfoam and then with ear pack (Osseous Ear

Pack, EonMeditech Pvt ltd.), which was removed after 7 days. No suture was applied in the graft site in case of a transcanal approach. For the postaural approach, the incision site was sutured, and the mastoid bandage was applied.

Patients were followed up at 6 weeks, 12 weeks, 6 months, and with a minimum of 12 months, and thereafter as needed. The average on four frequencies (0.5, 1, 2, and 3 kHz) of hearing thresholds in air and bone conduction and the Air Bone Gap (ABG) was evaluated 7 days before surgery and 12 weeks after.

Statistical Tools

Data were analyzed for graft uptake rate, the difference in operation time and change in pre- and postoperative hearing status using the Fisher exact test, and the dependent and independent t-test in IBM SPSS Statistics for Windows, Version 23.0 (IBM Corp., Armonk, NY, USA). The level of statistical significance was set at $p<0.05$.

Results

During the study period, 100 patients were included, out of which 6 and 4 patients had lost to follow up in MT and ET group, and thus, only 90 patients were assessed. The demographic profile including age, sex, site of perforation, graft uptake rate and follow up range has been shown in table 1. In the MT group, the mean age of patients was 30.89 +- 11.78, and the age ranged from 18 to 60 years old, and in the ET group, the mean age of the patients was 30.43+-10.18 ranged from 18 to 57. There was no statistical difference between the two age groups (p-0.285).

There were 20 males and 24 females in the MT group and 27 males and 19 females in the ET group which was not statistically different (p-0.291).

Based on the laterality of disease, in the MT group, 19 cases were on the right side and 25 on the left side. In the ET group, 26 cases were on the right side, and 20 on the left side. Both were statistically insignificant (p-0.292).

The graft success rate at a minimum of 12 months post-operative period in the MT group was 81.8% with follow up range of 16.09+- 5.071 months and in ET was 91.3% with a followup of 14.67+-4.02 months. Three cases in MT and one case in ET which had initial graft uptake seen at 6 months later failed during follow up of 12 months period. There seem to be improved graft uptake percentage seen in ET then MT however, the data was not statistically significant between the two groups. (p-0.225).

Mean surgical duration was defined as the time of margin freshening up to the time where the ear pack was kept. The mean operative time for MT and ET was 68.68+-18.79 minutes and 61.24 +- 11.18 minutes respectively. The difference obtained was statistically significant (p-0.003). Endoscopic tympanoplasty significantly saved time than the microscopic tympanoplasty.

Hearing outcomes were as shown in table 2. There was a highly statistically significant hearing outcome within the group before and after the surgery in both groups, endoscopic and microscopic. But there was no change in hearing outcomes between the two groups. Thus, the hearing outcome didn't change with either use of an endoscope or a microscope.

Discussion

The microscope has been a widely used tool for the otological procedure and still considered as the gold standard in this field. It provides the main advantage of bimanual handling along with stereoscopic vision, better depth perception, and excellent magnification.[15] However, due to its straight line of vision, it has a drawback of the inability to look around the nooks and corners of the middle ear cavity like sinus tympani, retrotympanum, epitympanum and tensor fold area.[3,13,16] Anterior perforation especially in cases with narrow canal or bony overhang needs postaural approach and/or canaloplasty to perform the tympanoplasty. Nevertheless, microscopic tympanoplasty for anterior perforation is still considered as a high-risk case. The

reasons for the lower success rate in the closure of anterior TM perforation are insufficient visualization, technically challenging procedure, decreased graft viability due to poor vascularization, inadequate anterior membrane remnant, and poor stabilization. [17]

An endoscope, on the other hand, is a newly emerging tool in the town, which is gaining popularity in our community. More and more surgeons are now accepting it to be used for the surgery. Though it was first used by Mer et al in 1967 as a tool to study the middle ear in cadavers and animals, it became only famous when Tarabichi et al started to publish widely and exclusively on transcanal endoscopic ear surgery especially on myringoplasty and cholesteatoma.[1] The scope of the endoscope in ear surgery is expanding since then, not only limited to cholesteatoma but ossicular reconstruction, stapes surgery, facial nerve decompression, and even to excision of vestibular schwannoma.[3] We still need to wait what future brings us more with the expansion of the use of the endoscope in otology.

Though temporalis fascia is still commonly used as a graft material, it has been largely replaced by cartilage perichondrium graft especially in high-risk conditions such as large or subtotal perforations, retraction pockets, atelectasis, adhesive COM, and cholesteatoma.[5] Among them anterior perforation is also considered among high risk due to its lack of vascularization, stability, and support for graft. For this, cartilage-perichondrium graft is an ideal graft for the surgery due to its stability and long-term uptake result.[12]

In this study, we made an objective to evaluate if the endoscope holds an advantage over the microscope for anterior perforation. Type I tympanoplasty for anterior perforation using a microscope is difficult to manage especially if the canal is narrow or the margins are not adequately visible. We had graft uptake of 81.8% in the microscopic group and 91.3% in the endoscopic group. The result revealed the endoscopic group having better uptake outcomes than the microscopic group however, it was not statistically significant. The mean operative time was 68.68 +- 18.79 minutes in MT and 61.24 +- 11.18 minutes in ET. Endoscopic tympanoplasty was faster than the microscopic group and it was statistically significant.

Though endoscopic tympanoplasty avoids postaural incision, canaloplasty, mastoid bandaging, it is technically challenging procedure as one must master surgery using one hand. Even the little blood in the canal can smudge the scope, making surgery difficult. These factors might be some of the reasons behind the long surgical duration compared to other studies. We experienced that with more practice the surgery got faster, however, endoscopic surgery required a learning curve to overcome. On the other hand, microscopic tympanoplasty gave the privilege of using two hands for the surgery. Even if we were doing permeatal microscopic tympanoplasty, speculum could be snugly fitted into the wide canal, and still, two hands could easily be used for the procedure which is not possible at all with the endoscope.

However, the postaural approach required more time to be spent on the incision and suturing which was easily avoided in endoscopic tympanoplasty. Thus, we could see that endoscopic ear surgery is minimally invasive surgery decreasing the operation time, morbidity, and complications.

A similar study but retrospective was done by Gulsen et al.[18] with an uptake rate of 93.7% in the endoscopic group and 91.5% in the microscopic tympanoplasty with follow up of less than 12 months. They had a significant difference in surgical time between the two groups as well. The overall total surgical time in their study is lesser than ours. Surgical time depends on the surgeon's experience as well as the learning curve.

A retrospective comparative study was also done by Kuo et al.[19] with a graft uptake of 97.3% in the endoscopic group and 98.2% in the microscopic group but for central perforation. However, this study had very short follow up of 3 months. The study had significant difference in surgical time as well.

We could not find other literature that compared prospectively between microscopic and endoscopic tympanoplasty in anterior perforation. There are few studies published on total endoscopic transcanal ear surgery for anterior perforation.

Tseng et al.[7] published a retrospective study on endoscopic transcanal myringoplasty for anterior perforation using temporalis fascia and/or perichondrium as the graft and had uptake rate of 93% among 59 patients with a follow up of a minimum of 6 months.

Another study was done by Ozdemir et al.[12] on endoscopic transcanal cartilage tympanoplasty in 104 patients, out of which 35.6% had anterior quadrant involvement. The graft used was a tragal perichondrium composite graft and had an uptake rate of 93.2% at a minimum follow up of 6 months. A similar prospective study carried out by Mohanty et al.[10] on transcanal endoscopic cartilage myringoplasty for anterior perforation in 87 patients had uptake result in 91.9% at 1 year follow up which had similar uptake rate as our result.

A systemic review was published by Visvanathan et al.[20] on techniques of successful closure of anterior TM perforation. They described various techniques as anterior anchoring, anterior hitch method, anterior interlay, anterosuperior anchoring, endoscopic push through, butterfly, lateral graft tympanoplasty, hammock tympanoplasty, Felix tympanoplasty, and endoscopic transcanal techniques. The success rate ranged from 87-98% with a minimum follow up of 6 months.

Other studies describing the techniques for the treatment of anterior perforation includes the procedure that does not involve raising tympanomeatal flaps such as endoscopic butterfly-inlay, endoscopic push-through, and endoscopic transcanal inlay with graft uptake ranging from 87.5 to 95.5% .[11,17,21]

There are different studies found in the literature comparing the operative time between microscopic and endoscopic tympanoplasty. Huang et al. [22], Choi et al.[23], and kaya el al.[24], all compared surgical duration in both groups and reported as endoscopic tympanoplasty being faster than microscopic surgery which was statistically significant. However, their study was done for the central perforation and the study was not involving exclusively for anterior perforation as in our study.

All the studies mentioned above had significant hearing improvement pre- and postoperatively, including those studies that used perichondrium and cartilage perichondrium composite graft. In this study, we raised the tympanomeatal flap to check the status of the ossicular chain, other middle ear pathologies, and to perform underlay myringoplasty. This ensures the stability of graft to avoid lateralization. There were no postoperative complications noted in both groups.

Nine patients in the MT group required postaural incision to perform the surgery due to a narrow canal and lack of visualization of the anterior margin. All the cases in the ET group were completed via a transcanal approach. It is all because of the wide-angle view of the endoscope where the anterior margin could easily be seen. This adds up the advantage of endoscopic surgery to be minimally invasive surgery preventing complications as well as a financial burden which plays a big role in a developing country like ours.

There are few limitations of this study which include small sample size, lack of randomization and short follow up period. This could hamper the generalizability of the results. In our opinion, the surgeon should also be blinded during the surgery to decrease the bias especially if the surgical duration is also considered in the study. The learning curve could also be the factor that affects the surgical time.

Conclusion

The endoscope had comparable graft uptake rate and hearing improvement compared to the microscope. However, it had a significant difference in surgical duration with the endoscope offering faster completion of procedure than the microscope. The Endoscope offered the advantages of a wide panoramic view, magnification without loss of resolution, and superior visualization, making it a wonderful tool to perform surgery especially for anterior perforation, avoiding postaural incision and canaloplasty. Thus, with the endoscope, minimally invasive surgery can be performed avoiding unnecessary tissue dissection, and retraction decreasing the surgical duration, complications, morbidity, and indirectly decreasing the financial burden.

References

1 Thomassin J.-M. (2016) The History and Development of Endoscopic Ear Surgery (EES). *J. Laryngol. Otol.* **130** , S46–S47.

2 El-Guindy A. (1992) Endoscopic transcanal myringoplasty. *J. Laryngol. Otol.* **106** , 493–495.

3 Preyer S. (2017) Endoskopische Ohrchirurgie – eine Weiterentwicklung der modernen Ohrchirurgie. *HNO* **65** , 29–34.

4 Sakalli E., Celikyurt C., Biskin S., *et al.* (2017) A novel myringoplasty technique: the placement of a complementary graft descending from the scutum to support an anterosuperior perforation.*Eur. Arch. Oto-Rhino-Laryngology* **274** , 127–131.

5 MK S. & SM S. (2017) Cartilage Myringoplasty: An Ideal Grafting Technique for Complex Perforations. *J. Clin. DIAGNOSTIC Res.***11** .

6 Harris J.P., Wong Y.T., Yang T.H., *et al.* (2016) How I do it: Anterior pull-through tympanoplasty for anterior eardrum perforations. In *Acta Oto-Laryngologica* pp. 414–419. Taylor and Francis Ltd.

7 Tseng C.C., Lai M.T., Wu C.C., *et al.* (2016) Endoscopic transcanal myringoplasty for anterior perforations of the tympanic membrane. *JAMA Otolaryngol. - Head Neck Surg.* **142** , 1088–1093.

8 Faramarzi A., Hashemi S.B. & Rajaee A. (2012) "mucosal pocket" myringoplasty: A modification of underlay technique for anterior or subtotal perforations. *Am. J. Otolaryngol. - Head Neck Med. Surg.***33** , 708–713.

9 Cabra J. & Monux A. (2010) Efficacy of cartilage palisade tympanoplasty: Randomized controlled trial. *Otol. Neurotol.***31** , 589–595.

10 Mohanty S., Manimaran V., Umamaheswaran P., *et al.* (2018) Endoscopic cartilage versus temporalis fascia grafting for anterior quadrant tympanic perforations — A prospective study in a tertiary care hospital. *Auris Nasus Larynx* **45** , 936–942.

11 Celik H., Samim E. & Oztuna D. (2015) Endoscopic "Push-Trough" technique cartilage myringoplasty in anterior tympanic membrane perforations. *Clin. Exp. Otorhinolaryngol.* **8** , 224–229.

12 Ozdemir D., Ozgur A., Akgul G., *et al.* (2019) Outcomes of endoscopic transcanal type 1 cartilage tympanoplasty. *Eur. Arch. Oto-Rhino-Laryngology* .

13 Furukawa T., Watanabe T., Ito T., *et al.* (2014) Feasibility and advantages of transcanal endoscopic myringoplasty. *Otol. Neurotol.* **35** , 140–145.

14 Marchioni D., Molteni G. & Presutti L. (2011) Endoscopic Anatomy of the Middle Ear. *Indian J. Otolaryngol. Head Neck Surg.***63** , 101–113.

15 Kozin E.D., Gulati S., Lehman A., *et al.* (2015) Systematic Review of Endoscopic Middle Ear Surgery Outcomes. *Laryngoscope***125** , 1205–1214.

16 Tarabichi M. (2000) Endoscopic management of cholesteatoma: long-term results. *Otolaryngol. Head. Neck Surg.* **122** , 874–81.

17 Gulşen S. & Erden B. (2020) Comparison of endoscopic butterfly-inlay versus endoscopic push-through myringoplasty in repairing anterior perforations of the tympanic membrane. *J. Laryngol. Otol.***134** , 128–134.

18 Gülşen S. & Arıcı M. (2019) Endoscopic transcanal versus conventional microscopic tympanoplasty in treatment of anterior tympanic membrane perforations. *Eur. Arch. Oto-Rhino-Laryngology***276** , 3327–3333.

19 Kuo C. hung & Wu H. mei (2017) Comparison of endoscopic and microscopic tympanoplasty. *Eur. Arch. Oto-Rhino-Laryngology***274** , 2727–2732.

20 Visvanathan V., Vallamkondu V. & Bhimrao S.K. (2018) Achieving a Successful Closure of an Anterior Tympanic Membrane Perforation: Evidence-Based Systematic Review. *Otolaryngol. - Head Neck Surg. (United States)* **158** , 1011–1015.

21 Eren S.B., Tugrul S., Ozucer B., *et al.* (2015) Endoscopic Transcanal Inlay Myringoplasty: Alternative Approach for Anterior Perforations. *Otolaryngol. - Head Neck Surg. (United States)***153** , 891–893.

22 Huang T.Y., Ho K.Y., Wang L.F., *et al.* (2016) A comparative study of endoscopic and microscopic approach type 1 tympanoplasty for simple chronic otitis media. *J. Int. Adv. Otol.* **12** , 28–31.

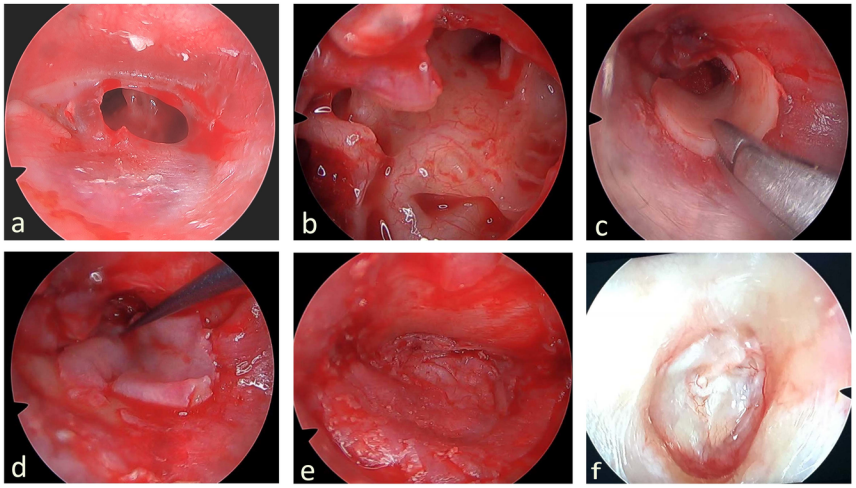
23 Choi N., Noh Y., Park W., *et al.* (2017) Comparison of endoscopic tympanoplasty to microscopic tympanoplasty. *Clin. Exp. Otorhinolaryngol.* **10** , 44–49.

24 Kaya I., Sezgin B., Sergin D., *et al.* (2017) Endoscopic versus microscopic type 1 tympanoplasty in the same patients: a prospective randomized controlled trial. *Eur. Arch. Oto-Rhino-Laryngology***274** , 3343–3349.

Figure Legend

Figure 1:

1. Preoperative anterior perforation
2. Middle ear and ossicles assessed after elevation of tympanomeatal flap
3. Barred cartilage placed in underlay fashion
4. Perichondrium placed over barred cartilage as reinforcement
5. Final position of the graft ensuring all tugged under the margin and anterior annulus
6. Final graft uptake after 12 months of surgery



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`Table 2 hearing results for ANL.docx` available at https://authorea.com/users/326022/articles/472404-endoscopic-versus-microscopic-type-i-cartilage-tympanoplasty-for-anterior-perforation-a-prospective-comparative-study