The Outcome of Endoscopic Assisted Underlay Tragal Cartilage Myringoplasty

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Abstract

Background: The use of Endoscope is increasing for otologic surgery because it is providing anew perspective on the intricate anatomy of the middle ear.

Study Design: Cross sectional study.

Objective Evaluation of outcomes of endoscopic aidedtranscanal underlay tragal cartilegeMyringoplasty.

Patients and Method: This were aprospective clinical study included Fifteen patients who were operated on for chronic otitis media (COM) and their data and findings. All operations and surgical procedures were performed only with the use of a tragal cartilage graft, lining, and total transcanal endoscopic access. We assessed the postoperative graft up-taking rate and assessed hearing at 6-8 weeks.

Results and Discussion: Out of the 15 patients (9 female and 6 male) the graft take rate was 86% and the comparison of pre and postoperative mean AB gap revealed that the mean AB gap was 31 dB preoperatively while it changed (improved) to 16 dB at 6 to 8 weeks postoperatively, with a statistically significant difference ($P<0.05$).

Conclusions: Endoscopic Myringoplastyis minimally invasive, effective and safe procedure with good success rate and short duration.

Keywords: *Endoscope, cartilage, Myringoplasty.*

Introductions

Myringoplasty: Myringoplasty can be described as the surgical repair of tympanic membrane.(1) Ear surgeries have traditionally been performed using a surgical microscope. Endoscopes have improved the field of otorhinolaryngology. Nowadays, various surgical procedures are easily performed using endoscopes, which reduces the morbidity of cases. Endoscopes are rapidly substitute the microscopic procedures in the otology practice, as first choice for assisting various operations.(2)

Indication of Myringoplasty:

1. Infection,the presence of a perforation exposes the middle ear to the risk of recurrent infection from external sources.
2. Hearing loss,the repeated insult of infections is not only unpleasant for the patient but can affect hearing through both the presence of mucopus and the potential destruction of the ossicular chain.

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3. Social to enable swimming without the need to protect the ear from water, particularly in children, is a relative indication for myringoplasty.

Contra Indication:

1. Cholesteatoma
2. Contralateral hearing
3. Bilateral perforation
4. Eustachian tube dysfunction

Approaches and Incisions:

1. The transcanal method is generally used for minor posterior perforations or can be used to doperforations in medium sized, when the anatomy of the ear canal is adequate and when complete perforation and the anterior edge of the tympanic membrane are visible.
2. Endaural access can be used for any perforation. A self-retaining retractor can be used with this approach.
3. Postauricular approaches. These can be applied in all sizes of and can provides the best viewing angle for anterior TM even without canaloplasty.(3)

Techniques:

Lateral graft technique (overlay): In tympanoplasty using the lateral technique, also known as the overlay procedure(technique) in which the graft is laterally rested to the fibrous layer of the TM ruminants but medially to the malleus handle. Such procedures need to completely remove the squamous epithelium from the TM remnant lateral surface to prohibit the iatrogenic cholesteatomas. Bone canaloplasty is also required for preview and correct placement of the graft.(3)

Medial graft technique (underlay): medial to the entire tympanic membrane, with an elevation of the skin flap of the auditory canal, together with the tympanic membrane, the most used for access, stabilization of the graft below the fibrous annulus.(1)

Graft Selection:

I. Cartilage Myringoplasty

Indications

Highrisk perforation includes-1

Surgical Revisins

Anteriorly to malleus

Perforation Drainage during surgery

Perforation excedding 50%

When traditional techniques used in bilateral perforations they are usually associated with higher failure rate

2. Atelectatic ear: one of the most important indications for cartilage tissue tympanoplasty
3. Cholesteatoma: use of the surrounding cartilage In this operation, the shield and the posterior half of the tympanic membrane (cholesteatoma) were aimed at reducing the frequency of recurrent atrophy, as well as retracting the sac in these problem cases.
4. Pediatric Patients: A universal method for reconstruction of a ruptured TM should be avoided in pediatric patients in years of predisposition to otitis media (<3 years). It's boring if the opposite ear is normal Tympanoplasty is performed on a child under 4 years old. Abnormal contralateral ear measurements are currently being performed, and adenoidectomy and tympanoplasty are usually delayed up to 7 years. If at this stage the disease is still contralateral, the ear can be considered at high risk of failure.(4)

The main advantages of cartilage are its stiffness and extremely low metabolic requirements, making it particularly suitable for adverse conditions such as partial perforations, adhesive otitis media, and reoperations.(5)

Cartilage may be harvested with its attached perichondrium from the tragus or the concha. Tragal cartilage is thicker and flatter than conchalcartilage, and it may be more suitable for larger perforations. (6)

II. **Temporalis fascia graft:** The anterior or posterior sectors perforations were restricted to one sector with normal tubaric function tests, with or without retractions of the pars tensa. (5)

III. Other grafting materials have also been used, including loose areolar tissue, vein, and fat. Perichondrium is frequently used in tympanoplasty.

Complication:

1. Retraction of the drumhead following grafting can occur in up to 10%, with some suggesting the use of cartilage to try to prevent this.

2. Elevation of the anteroinferior aspect of the tympanic membrane runs the risk of anterior blunting, a risk with both overlay and underlay techniques.
3. The incidence of iatrogenic cholesteatoma, particularly with the overlay technique which runs a higher risk of leaving some squamous epithelium medial to the graft, can be as high as 4.4%
4. Myringitis can occur, influenced by the presence of infection or choice of material, though most cases resolve within 3 months with short-term topical medication and observation. (7)

Endoscopic Middle EAR Surgery (historical view): The endoscopy of the middle ear firstly presented in 1967 by Mer. Et al. for diagnosis and for surgical procedures (El-Guindy, 1992). Finally, surgery has traditionally been performed on the middle ear. Under the microscope, this is now gradually achieved endoscopically.(8)

Many producers of rigid Hopkins rod lens endoscopes with different diameters, but those for endoscopic ear surgery were come with diameters (2.7, 3 and 4 mm). larger size endoscopy wasgiving more better picture scope and quality, accordingly the best one to use in this operation is the largest one which can fit into canal of the ear. (8)

Advantage of ENDOSCOIC EAR Surgery:

1. Ability to see outside the axis of large surgical instruments. When using a microscope, the field of view is most affected by the use of instruments and possibly the hands of the surgeon. In endoscopic surgery, the surgeon has a panoramic view of the area outside the stem of the instrument.
2. When using a microscope, it is important to position the structure almost at right angles to the axis of the microscope so that the endoscope can see structures in the same plane as the endoscope. Consequently, structures such as the ear canal, facial recoil and tegmen are much better visualized with an endoscope.(9)
3. Operative time is shorter.(10)

Disadvantage of Endoscopic Ear Surgery: Endoscopic surgery also has disadvantages. One-handed surgery is possible with the endoscopic technique, but restricting one-handed access can be an obstacle in certain situations, such as severe bleeding, where endoscopic vision may be blocked by blood and the operation is difficult. In addition, the autoendoscope itself can cause injury, including thermal injury, due to the light emitted from the endoscope tip. Mist can often accumulate over the endoscope. (10,11)

Unfavorable anatomy of the ear canal or anterior perforation creates technically complex microscopic transcanal procedures and ultimately results in a high failure rate.

The endoscope offers a wide and comprehensive transcanal view of all elements of this procedure: the ear canal, tympanic membrane and eardrum, without the need to constantly move the microscope, even with an anterior ridge. (12)

Objectives: To clinically assess the postoperative outcomes of endoscopic assisted Trans canal underlay tragal cartilage myringoplasty.

Patients and Method:

Study Design: This was prospective single group clinical trial been conducted at Al-Sadr medical city in Najaf province, Iraq in the department of otolaryngology-Head and Neck surgery during the period from (January 2019 to march 2020).

All participants were informed about the study: We have analyzed (15) patients (10 female and 5 male) their age ranged between 18 to 35 years. All of them complained of chronic suppurative otitis media of mucosal type and decrease hearing.

Hearing assessment done one week before the operation by PTA.

The surgeries were done entirely under total endoscopic transcanal method by means of tragal cartilage as animplant, motivated method.

We have assessed the postoperative implant uptake and done a hearing assessment post operatively after 6-8 weeks.

Inclusion Criteria: Patients with inactive mucosal CSOM with conductive hearing loss.

Statistical Analysis: Data of all patients were checked for any errors or inconsistency and then analyzed using the statistical package for social sciences (SPSS) version 24). Appropriate statistical tests and procedures were applied according the type of variables and requested outcome. Level of significance set at 0.05.

Results

Fifteen patients who met the inclusion criteria, fit for operation and consented to participate were selected and recruited in the study; their average age was 25.1±5.4 years. Additionally, 60% of the patients aged 18-25 years. Females were dominant gender, represented 66.7% of the studied group and the remaining 5 patients were males. Subtotal perforation of tympanic membrane was the more frequent type of perforation, contributed for 46.7%, followed by anterior perforation (40%) and the least frequent type was posterior perforation, (Table 1).

Table 1: Distribution of patients according to site of perforation

Site of perforation	No.	%
Subtotal	7	46.7
Anterior	6	40.0
Posterior	2	13.3
Total	**15**	**100.0**

The success was considered when there is a good graft uptake, while those who failed and those with small residual perforation considered as unsuccessful, therefore, 13 out of the 15 patients had successful endoscopic myringoplasty giving a success rate of 86.7%, (Figure 1).

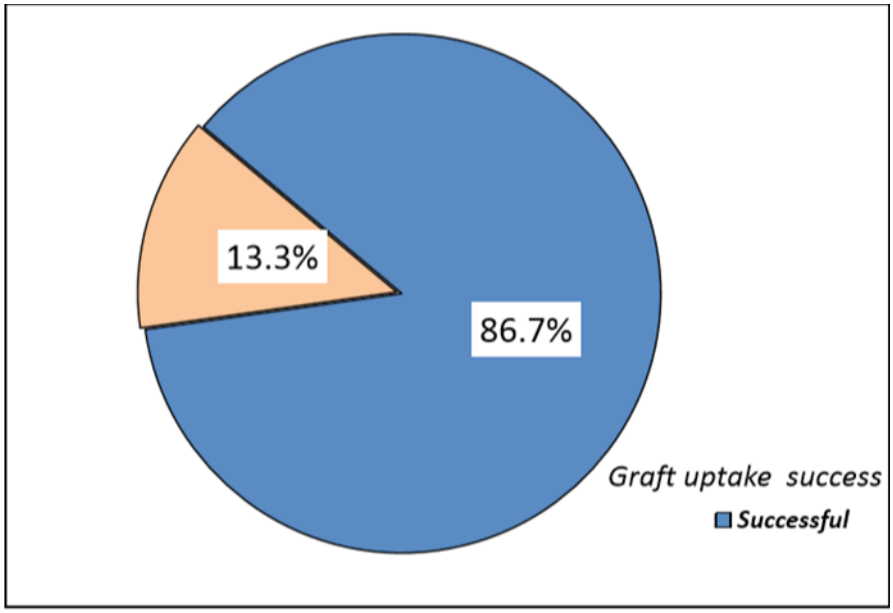

Figure 1. Success rate of endoscopic myringoplasty of the studied group (N=15)

According to the air bone gap (AB gap) values at 6-8 weeks postoperatively, 5 patients reached an ABG of 10 dB, 6 patients with 15 dB, 2 patients with 20 dB, one patient with 25 dB and one patient with 35 dB ABG. Moreover, at 6-8 weeks postoperatively, the mean ABG reduced from 31.0 ± 3.4 at preoperative to reach 16.0 ± 6.8 dB with high-significant difference, (P. value<0.001), as shown in (Fig. 2).

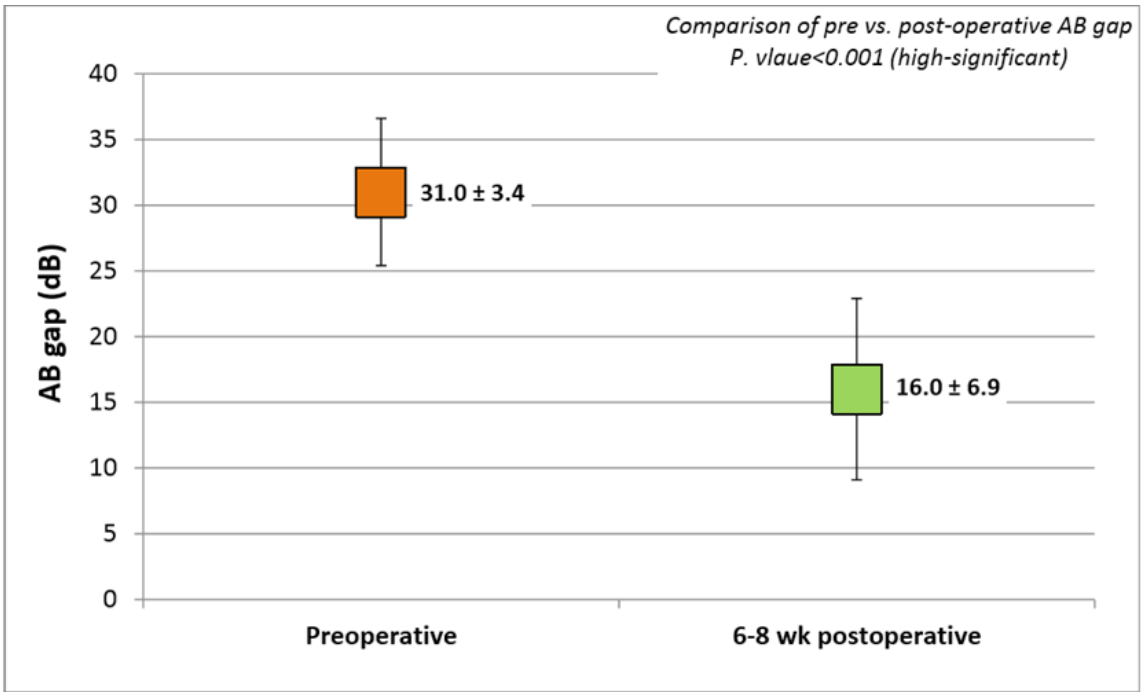

Figure 2 Graphical comparison of mean Air bone gap pre and 6-8weeks postoperatively

Table 2: change in mean AB gab at 608 weeks postoperatively with mean difference (improvement)

Statistics	Preoperative	6-8 wk postop	Difference (improvement)	P. value
Mean	31.0 dB	16.0 dB	15.0 dB	<0.001 High significant difference
SD	5.6 dB	6.9 dB	2.8 dB	
Range	25 to 35 dB	10 to 17 dB	12 to 23 dB	

Further analysis was performed to assess the relationship between success rate and other variables including age, sex, site of perforation and time of surgery, none of these variables showed a significant effect on or correlation with the outcome of endoscopic myringoplasty, in all comparisons, P. value non-significant > 0.05, (Tables 3 and 4).

Table 3: Relation of success outcome with site of perforation (n=15)

Site of perforation	Successful (n=13)		Unsuccessful (n=2)		P. value
	No.	%	No.	%	
Subtotal	5	71.4	2	28.6	0.267
Anterior	6	100.0	0	0.0	
Posterior	2	100.0	0	0.0	

Table 4 Relationship of success outcome with Time of Surgery (N=15)

Time of surgery	Successful (n=13)		Unsuccessful (n=2)		P. value
	Number of patients	%	Number of patients	%	
< 60 min	4	100.0	0	0.0	0.649
60 - 75 min	5	83.3	1	16.7	
90 min	4	80.0	1	20.0	

Discussion

Endoscope have been used for middle ear inspection for decades. However, recent improvement of camera and optical technologies have yielded endoscopes that provide extremely high-definition video with a wide-angle field of view, surgeons are increasingly using endoscopes not only for visual inspection, but also for dissection. The increased resolution and field of view of current endoscopes have provided surgeons with a fresh look at middle ear anatomy. (13)

In the present study we assessed the surgical outcomes in addition to the feasibility of procedures in 15 patients who were operated on with Endoscopic-Transcanal-Myringoplasty with the use of tragus-cartilage. In our study, the graft take rate was 86.7% (13 out of 15), and the other 13.3% (2 out of 15) with subtotal perforation, one failed due to infection and the other one residual small perforation present that healed by cauterization after 3months of surgery.Comparable to Amit Saini et al study of 42 patients (19 were male and 23 female) in 2018 was 90.9 % is consistent with our study. (8)

In MuaazTarabichi study in 2010 the closure of perforation was evident in 59 ears, a success rate of 92%. (14) GokgozMC et al study at 2018 the take rate was 94% of fifty patient and 6 months postop. (15) Another study conducted by Leandro De Borborema Garcia et al, study in 2015, included 22 patients foundthat after 3 months of surgery, closure of TM perforation reported in 86.4% of cases(16)Raj et al at 2001 found graft take rate 90% this result is consistent with our study. (17)A significant improvement in the hearing outcome was reported where the average ABG was 31 dB preoperatively and it changed (improved) to 16 dB at 6 to 8 weeks postoperatively, with signifcaint difference (P<0.05) .

ABG improved to 11.91+-8.41db in Dipesh Shakya et al study comparable to our study. (17)The mean ABG was 22.40 db and improved to 9.1db by Amit Saini et al study. (8)In the study of Dawood MR,in 2017 of 26 cases of successful myringoplasty, the mean ABG reduction was 20.73db (18), and this is consistent with our study. Average air bone gap closure achieved was 10.1db the study of 30 patient by MunishKambatattiShekharappa et al (19), this result compatible with our study.Mokbel et al at 2015 reported improved hearing outcome in patients undergoing myringoplasty and is consistent with present study. (20)

In present study, the operative time ranges between 50-90 min,with the mean of 67 min and this is consistent with Ghaffar et al 2006 they reported that the mean operative time 62-85min (21)Huang et al (2016) reported the mean operative time 80.4 in patient underwent endoscopic myringoplasty. (22), the present study better than this study. In the study of Patel et al 2015 mean time was found to be 75 min and this is comparable to our study. (23)Furthermore, Raj et al. evaluated the value of rigid-endoscope in management of of dry central perforation of TM, their findings when compare endoscopic Myringoplasty versus conventional microscope indicated 90% uptake rate in endoscopic versus 85% in the microscopic, these findings supported ours (17)

Guer RS et al. in their research showed that changes in the external auditory canal, such as stenosis, tortuosity and protrusions of bones, interfere with the view of TM under a microscope. Therefore, it is necessary to manipulate the patient›s head or microscope several times to see all parts of the TM. Sometimes, despite manipulation, TM cannot be fully visualized; hence canaloplasty must be performed. This can increase up the operation time. Conversely, endoscope brings the eyes of surgeons close to the scope end. The wide zero degree viewing angle allows visualization of the entire TM. Saves surgery time without the need to regularly adjust the patient›s head or doing a canaloplasty.(24)

Sekaattin Gulsen and others stated that transcanal endoscopic tympanoplasty is reliable alternate to Microscopy tympanoplastyin management of COM, with comparable success rate of graft uptake and outcomes of hearing (25) Similarly, Amit et al.in their study concluded that even novices and junior surgeons can used this procedures as it is safe reliable and with good outcomes, hence surgeons, can apply endoscopic procedure in this way without fear of serious complication or adverse outcomes.(17)

Conclusion

Endoscopic myringoplasty is minimally invasive, effective and safe procedure with good success rate and short duration.

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