ORIGINAL ARTICLE

Endoscopic Transcanal Surgery versus Endaural Microscopic Surgery in the Management of Attic Cholesteatomas at a Tertiary Care Center in Multan

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ABSTRACT

Objective: To compare postoperative outcomes in terms of hearing recovery, taste abnormalities and pain, and audiological results of microscopic surgery and endoscopic surgery for the management of attic cholesteatomas.

Study Design: A prospective cohort study design.

Place and Duration of Study: The study was conducted at the ENT Department, Bakhtawar Amin & Nishtar Medical Hospital Multan, Pakistan from June 2021 to December 2022.

Methods: A total of 90 patients were included by consecutive sampling, who were consecutively divided into 45 patients each in group A, microscopic endaural approach arm, and group B, endoscopic surgical approach arm. The sample size was calculated by Epi Info keeping 50% population proportion, 5% margin of error, and 95% CI. Patients diagnosed with cholesteatoma in epitympanum by otomicroscopic findings and CT and booked for surgical treatment were included in the study. Patients with extended cholesteatoma, labyrinth fistulae, wide mastoid involvement eustachian tube dysfunction, revision surgery, and pregnant women were excluded. Informed consent of the participants was taken. Microscopic and endoscopic surgeries were performed by an experienced operator. Patients were followed up after 1st, 3^{rd,} and 6th months of surgery.

Results: Postoperatively, dizziness occurred in 4 (8.8%) patients in microscopic surgery groups and 3 (6.6%) patients in endoscopic surgery group. Abnormal taste sensation was reported in 16 (35.5%) patients in Group A and 12 (26.6%) patients in Group B. In terms of post-operative pain, 9 (20%) patients and 6 (13.3%) had postoperative pain requiring analgesics (*P*= 0.3) in respective groups. The graft success rate in group A was 93.3% and in group B was 91.1%. The mean healing time in group A was 32.1 days and in group B was 34.7 days (*P*= 0.5). Postoperatively, 55.5% of patients in the MES group and 51.1% in the endoscopic ear surgery (EES) group had a hearing threshold between 21-30 decibels.

Conclusion: Both endoscopic endaural and microscopic approaches have similar outcomes for surgical management of attic cholesteatomas in terms of hearing improvement, post-operative pain, and healing times.

Keyword: *Cholesteotoma, Hearing, Middle Ear, Tympanum, Tympanic Cavity.*

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Introduction

Chronic supportive otitis media is an infectious disease that involves middle ear inflammation and tympanic membrane perforation along with persistent otorrhea.[1] Although CSOM is common and frequent in children, adults also suffer from it. It can occur with or without cholesteatoma and can last up to 6 weeks.[2] Its treatment and management can be complex with topical and systemic therapy and if cholesteatoma is found, tymanomastoid surgery is performed along with adjuvant drug treatment.[3]

Attic cholesteatoma is caused by retraction of the Shrapnel membrane or pars flaccida, which extends through the attic, passes through aditus and reaches the anturm, or tympanic cavity. This is usually treated by retro auricular or trans-canal microscopic ear surgery (MES).[4] Though the retro auricular approach is preferably used for treating attic cholesteotoma, the endaural microscopic approach can also be used. Endural approach involves the incision of external auditory canal to widen its diameter and increase access and visibility of the middle ear. It also includes atticotomy, reconstruction of scutum defect, and ossiculoplasty.[5-7]

Like other fields, advent of endoscopy has changed the therapeutic approach for the management of middle ear diseases. Various studies have reported the safety and effectiveness of trans canal endoscopic ear surgery (EES) for the management of middle ear cholesteatomas.[5,6] ESS has benefits like better access, visibility, and relatively lesser disruption of normal tissues. However, it has some limitations like restricted stereoscopic view and a longer learning curve. Considering these benefits and limitations there is an ongoing debate about an ideal approach for the management of attic disease. Few studies compared outcomes of retro auricular approach MES with endoscopic ear surgery, and reported that though the success rate of tympanic graft and audio logical outcomes by both approaches were similar, ESS was associated with better healing and lower post-operative pain.[7-9] In Pakistan, no study has been conducted to compare findings of endoscopic and microscopic surgery for treating attic cholesteatomas. Hence, this study aims to compare postoperative outcomes in terms of hearing recovery, taste abnormalities, and pain and audiological results of microscopic surgery and endoscopic surgery for management of attic cholesteatomas.

Methods

A prospective study was conducted at the ENT Department of Bakhtawar Amin & Nishtar Medical Hospital Multan, Pakistan from June 2021 to December 2022. Patients diagnosed with cholesteatoma in epitympanum by otomicroscopic findings and CT and booked for surgical treatment were included in the study. This study employed a cohort design utilizing consecutive sampling of participants presenting with cholesteatoma in epitympanum by otomicroscopic findings and CT and booked for surgical treatment were included in the study. The cohort comprised a total of 90 participants who were sequentially enrolled and assigned into two groups: Group A consisted of 45 participants undergoing the microscopic endaural approach, while Group B comprised 45 participants undergoing the endoscopic surgical approach. Patients with extended cholesteatoma, labyrinth fistulae, wide mastoid involvement eustachian tube dysfunction, revision surgery, and pregnant women were excluded. Informed consent of the participants was taken. Ethical Review Committee of the hospital approved the study on dated: 11th May 2021 vide letter no: 20/120.

A total of 90 patients were included by consecutive sampling, who were divided into group A microscopic endaural approach arm (n=45) and group B (endoscopic surgical approach arm (n=45).

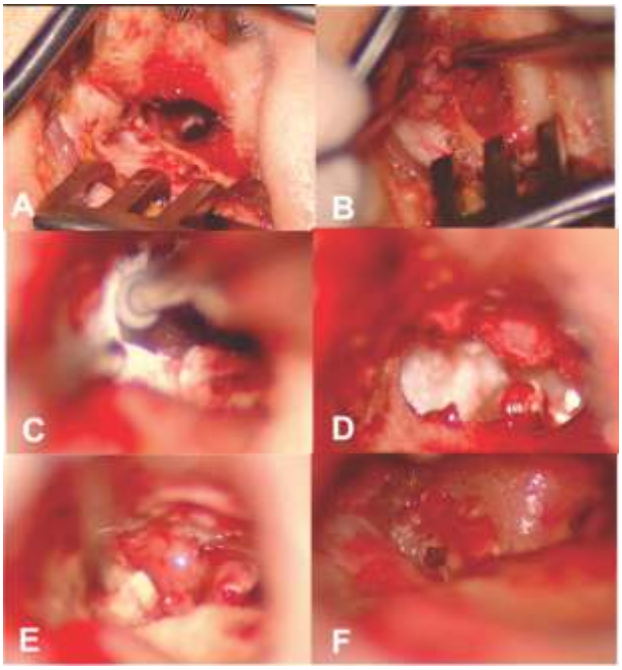

Fig.1: Microscopic surgery

A: Making of Shambaurg incisions, B: Making of tympanomeatal flap

C: Removing tegmental wall to uncover cholesteatoma

D: Exposing and removing cholesteatoma

E: Extracting cholesteatoma between Crus posterius stapedis

F: Complete removal

The sample size was calculated by Epi Info keeping a 50% population proportion, 5% margin of error, and 95% CI. A full medical history, baseline demographic and clinical data of all participants, and findings of otomicroscopic evaluation and CT scan of the middle ear and mastoid were recorded. Microscopic and endoscopic surgeries were performed by an experienced operator. For microscopic surgery Shambaugh incision was given to create tympanomeatal flap in the posteroinferior and posterosuperior regions of external auditory canal (Figure.1).

For ESS tympanomeatal flap was directly created in the posteroinferior and posterosuperior regions of the external auditory canal (Figure.2). The rest of the steps for both procedures were similar and were performed according to protocol.

The presence of pre-operative symptoms including vertigo/dizziness, facial palsy, and otorrhea were evaluated and recorded. CT images were used for the evaluation of facial nerve dehiscence. Intraoperative findings such as erosion of the Fallopian canal were recorded. Patients were followed up after 1st, 3rd, and 6th months of surgery. AAO-HNS hearing classification system was used for the final evaluation of hearing after 6 months.[8] Taste changes were subjectively evaluated as presence or absence Post-operative pain was graded as no pain, mild pain (no analgesic needed), and pain requiring analgesic. Non-steroidal anti-inflammatory drugs were prescribed to patients requiring analgesics. Physical and otomicroscopic examinations were used to evaluate healing time. The mean follow-up time for post-operative outcomes was 15.8 months.

SPSS version 23 was used for data analysis. Student's *t*-test was applied for continuous data and Fisher's exact test for categorical data. *P* value <0.05 was considered statistically significant.

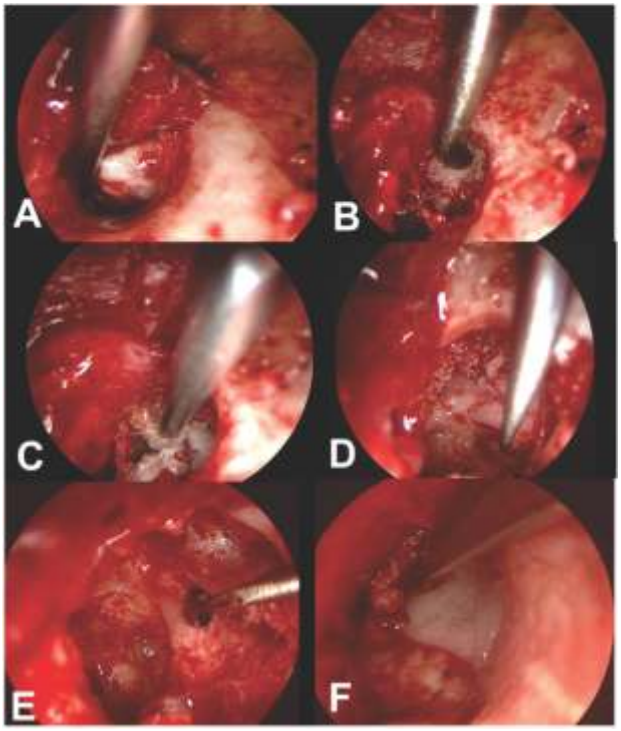

Fig.2: Endoscopic surgery

A: Creating tympanomeatal flap and exposing cholesteatoma

B: Removing tegmental wall to uncover cholesteatoma

C: removing cholesteatoma

D: Extracting cholesteatoma between Crus posterius stapedis

F: Complete removal

Results

The average age of patients in the MES group was 41.3 years and in EES was 44.2 years. There was no significant difference between both groups regarding study parameters. Eighteen patients in the MES group and 17 patients in the EES group were male. (Table-1). The gender difference between both groups was not significant. Preoperative CT scan demonstrated suspected facial nerve dehiscence in 6 (13.3%) patients in group A and 8 (17.7%) patients in group B (*P*= 0.8). Intraoperatively, 9 (20%) patients in group A and 11 (24.4%) patients in group B had facial nerve dehiscence (*P*= 0.8). The mean operative time in group A was 67.9 minutes and in group B was 76.7

Table-1: Gender distribution in study groups

Variable	MES n (%)	EES n (%)
Male	18 (40%)	17 (37.8%)
Female	27 (60%)	28 (62.2%)

Microscopic Ear Surgery (MES), Endoscopic Ear Surgery (EES)

minutes (*P*= 0.08). None of the patients developed iatrogenic facial palsy and the cholesteatoma matrix was fully removed.(Table-2). Postoperatively, dizziness occurred in 4 (8.8%) patients in microscopic surgery groups and 3 (6.6%) patients in the endoscopic surgery group. Abnormal taste sensation was reported in 16 (35.5%) patients and 12(26.6%) patients respectively. (Table-3). In terms of post-operative pain, 9 (20%) patients in group A and 6 (13.3%) in group B had post-operative pain requiring analgesics (*P*=0.4). Auditory results are shown in Table-4. Postoperatively, 55.5% of patients in the MES group and 51.1% in the EES group had a hearing threshold between 21-30 decibels.

Table-2: Comparison of preoperative symptoms between study groups

Variable	MES n (%)	EES n (%)	*P*-value
Facial palsy	-	-	
Mastoid extension of cholesteatoma	-	-	
Vertigo	-	-	0.9
Recurrent otorrhea	32 (71.1%)	33 (73.3%)	
Facial nerve canal dehiscence	6 (13.3%)	8 (17.7%)	0.8
Intra-operative facial nerve canal dehiscence	9 (20%)	11 (24.4%)	0.8

Table-3: Comparison of postoperative symptoms between study groups

Variable	MES n (%)	EES n (%)	*P*-value
Complete removal of the cholesteatoma	45 (100%)	45 (100%)	
Mean operative time	67.9 minutes	76.7 minutes	0.08
Vertigo	4 (8.8%)	3 (6.6%)	0.7
Pain	9 (20%)	6 (13.3%)	0.4
Abnormal taste	16 (35.5%)	12 (26.6%)	0.5
Success rate	93.3%	91.1%	1
Healing time	33.1 days	35.8 days	0.6

Table-4: Comparison of audiological results between both microscopic and endoscopic surgeries

Decibel (dB)	Preoperative air-conduction hearing thresholds		Postoperative air-conduction hearing thresholds		*P*-value
	Microscopic Surgery n (%)	Endoscopic Surgery n (%)	Microscopic Surgery n (%)	Endoscopic Surgery n (%)	
-10	4 (8.7%)	5 (11.1%)	3 (6.7%)	4 (8.9%)	1
11-20	12 (26.7%)	15 (33.3%)	8 (17.8%)	7 (15.5%)	0.8
21-30	20 (44.4%)	18 (40%)	25 (55.5%)	23 (51.1%)	0.7
>30	9 (20%)	7 (15.5%)	9 (20%)	11 (24.4%)	0.3

After 3 months, 1 patient in group A and 2 patients in group B had tympanic membrane perforation in the absence of infection or cholesteatoma recurrence. The graft success rate in group A was 93.3% and in group B was 91.1%. The mean healing time in group A was 3.1 days and in group B was 35.8 days (*P*= 0.6). At 6 months follow up there were no cases of disease recurrence in either of the groups in terms of true recurrence or residual cholesteatoma.

Discussion

CSOM is an infection of the middle ear with inflammation and perforation of the tympanic membrane with recurrent otorrhea. CSOM occurring with cholesteatoma requires tympanomastoid surgery. Transcanal microscopic and endoscopic surgeries are the approaches used for removal of attic cholesteatomas. In the current study, we compared outcomes of endaural microscopic approach and endoscopic approach for management of attic cholesteatomas. Endoscopy has been effectively used for the treatment of middle ear cholesteatomas. It provides better visualization due to several angulations.[9,10] A study by Manzoor et al reported that both microscopic retroarticular performed in 122 patients and ESS performed in 250 patients have the same post-operative outcomes.[11] Patients of both studies did not report any disease recurrence similar to our study results. Another study reported that endoscopic management of attic cholesteatoma was superior to the conventional microscopic approach due to better visualization, less postoperative time, less pain, and less

complications.[12] A study on epitympanic cholesteatoma found that the endoscopic approach offers better visualization and disease clearance and preserves normal anatomical structures like middle ear mucosal folds and ossicles.[13]

In the current study, there was no difference in preoperative and intraoperative findings in both the groups which means groups were ideal for comparison. Preoperative CT scan demonstrated suspected facial nerve dehiscence in 6 (13.3%) patients in group A and 8 (17.7%) patients in group B (*P*= 0.8). Intraoperatively, 9 (20%) patients in group A and 11 (24.4%) patients in group B had facial nerve dehiscence (*P*= 0.8). The results showed that ESS and MES did not differ in terms of hearing outcomes, abnormal taste sensation, graft success rate, and dizziness. These findings are consistent with previous studies which reported that hearing results and graft success rates for MES and EES are comparable.[14,15] These results are in contrast with the meta-analysis of 13 studies comparing microscopic and endoscopic approaches, reporting that residual and true recurrence was less common in endoscopic surgery with a residual recurrence of 0.50 as compared to 0.70 in microscopic surgery. However, the surgeries were not different with respect to hearing outcome and graft success similar to our study where 91.1% and 93.3% success rate was reported respectively.[16] No national study has been conducted comparing endoscopic and microscopic approaches for attic cholesteatomas, this is one of the strengths of our study that it is the first study conducted in this field.

The analysis of healing time and post-operative pain showed no difference between both groups. This was in in contrast with the finding of a previous study which reported that ESS has less post-operative pain and faster healing time compared to retroauricular MES.[17] A previous study reported that ESS had lower post-operative pain than microscopic surgery.[18] Similarly, another study also confirmed that endoscopic procedures were associated with significantly lower VAS scores on postoperative days 1 (*P*<0.001) to 7 (*P*=0.007) compared to the microscopic approach.[19] Increased pain in retro auricular MES can be explained by external incision and drilling of the mastoid bone. In the current study, there was no case of disease recurrence; however, the follow-up period was only 6 months thus no definite conclusion could be drawn in this regard. This may be the major limitation of our study.

The findings of this study suggest that both microscopic and endoscopic approaches differed only in terms integral incisions, following surgical steps were similar as shown in figure.1 and 2. Thus, the choice between endoscopic and microscopic approaches should be based on their pros and cons. The microscopic approach includes use microscope and provides magnification and 3-D vision, and enable the surgeon to use both hands. The transcanal EES provides optimal visualization, proximity to the surgical field, and tissue preservation. However, ESS allows the use the of one hand only, and presence of bone dust and blood in flied requires frequent cleaning, which makes its less efficacious compared to microscopic surgery.[20] The limitation of this study is the small sample size, a larger study is recommended for detailed analysis.

Conclusion

Both endoscopic endaural and microscopic approaches have similar outcomes for surgical management of attic cholesteatomas in terms of hearing improvement, post-operative pain and healing times.

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Conflict of Interest: The authors declare no conflict of interest

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Authors Contribution

SB: Idea conception, study designing, manuscript writing and proofreading
MTI: Data collection, data analysis, results and interpretation
AI: Study designing, data collection