

COMPARISON OF ENDOSCOPIC EAR SURGERY AND MICROSCOPIC EAR SURGERY IN PATIENTS WITH ATTIC CHOLESTEATOMA

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Abstract: *The study aimed to compare the effectiveness of microscopic and endoscopic approaches in treating attic cholesteatoma, a condition where abnormal skin growth occurs in the middle ear. The research was conducted prospectively at the ENT Department of Nishtar Medical Hospital from January 2021 to January 2023 on 70 patients with chronic suppurative otitis media with cholesteatoma in the epitympanic region. The patients were randomly divided into two groups, with 35 in each group. Both groups were followed up post-operatively at 1st, third, and sixth months, and their hearing was assessed. The study found that five patients (14.2%) in the endoscopic ear surgery (EES) group and three patients (8.5%) in the microscopic ear surgery (MES) group had suspected facial nerve dehiscence according to pre-operative CT images. During the surgery, 11 patients (35%) in the ESS group and seven (20%) in the MES group showed facial nerve dehiscence. Post-operatively, abnormal taste sensation was reported in 28.5% of cases in the EES group and 42.8% in the MES group. The mean postoperative air conduction thresholds in both groups were not significantly different. The success rate was 100% in both groups, and there was no disease recurrence in either group. It was concluded that the surgical outcomes of the conventional microscopic approach and endoscopic ear surgery are comparable regarding taste sensation, post-operative air conduction, and graft success rate. However, ESS showed better results regarding healing time and post-operative pain. Microscopic surgery was significantly slower than endoscopic surgery. In contrast, the average healing time in the endoscopic group was faster than in the microscopic group.*

Keywords: Attic Cholesteatoma, Endoscopic Ear Surgery, Microscopic Ear Surgery

Introduction

The middle ear and mastoid cholesteatoma are now treated through modern therapeutic approaches involving endoscopes. It can be used to evaluate those regions of the mastoid and middle ear inaccessible otherwise and for endoscopic evaluation of cholesteatoma in the mastoid cavity (Bonali et al., 2020; Rocha et al., 2021; Swarup, 2021). Endoscopic ear surgery (EES) has been recommended as a gold standard for trans canal surgery (Emre et al., 2020; McCabe et al., 2021). Though exclusive ESS is being increasingly used, few authors have compared MES with EES, and data are scarce on the comparison of these surgical techniques, specifically for attic cholesteatomas (Gulsen and Baltaci, 2021; Lubianca Neto et al., 2023). The endoscopic approach provides better access and excellent visualizations but has limitations, including a lack of stereopsis, single-handed work, and extended training. It is a relatively new technique, which explains its marginal role compared to conventional microscopic ear surgery (MES) (Li et al., 2021). In this study, we will compare MES with EES in patients with attic cholesteatoma. In particular, we will evaluate both procedures' intraoperative characteristics and surgical outcomes.

Methodology

The prospective study was conducted in the ENT Department, Nishtar Medical Hospital, from January 2021 to January 2023, on patients with chronic suppurative otitis media with attic cholesteatoma. All patients underwent CT imaging for pre-operative to microscopic evaluation. Patients whose CT imaging showed cholesteatomas in the epitympanum were included in the study. Patients whose computed tomography showed mastoid involvement and mesotympanum cholesteatomas were excluded. Participants provided their informed consent. The hospital's ethical committee approved the study.

Patients were divided into two groups based on the procedure performed. One was the group of patients who underwent exclusive trans-canal EES, and the other was the group of patients who underwent tympanoplasty via MES. A total of 70 patients were included in the study and were randomly divided, with 35 patients in each group. Experienced surgeons performed all surgical procedures. Medical records of the patients were used to collect clinical symptoms, including otorrhea, vertigo/dizziness, hypo/anacusis, and facial palsy. CT scan was used to confirm facial nerve dehiscence (the osseous wall of the facial nerve canal is absent), and images were compared to intraoperative findings. The type of surgery, duration of surgery, post-operative pain, and hearing and complications were evaluated. Intraoperatively, dehiscence was

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considered if fallopian canal erosion was observed with an endoscope or with a microscope, and it was confirmed by palpation while removing the cholesteatoma matrix. The site of dehiscence was defined according to Moddy and Lambert's classification.(Gulotta et al., 2020) Both groups were postoperatively followed up at 1st, 3rd, and sixth months, and hearing was assessed. After six months, the final hearing recovery was evaluated. (Hill-Feltham et al., 2021) Postoperative pain was graded according to pain level and requirement of analgesics. In case of pain, non-steroidal anti-inflammatory drugs were prescribed. Taste abnormalities were classified as the presence or absence of abnormal taste. Healing was assessed by physical examination and otomicroscopic assessment. Healing time was measured from post-surgery to success of graft and complete tympanic repair, and the follow-up period ranged from 6 to 12 months.

All the data was analyzed by SPSS version 23. Data was presented as mean± SD or percentage. The chi-squared test and Student's T test was used to measure. P value < 0.05 was considered significant.

Results

Thirty-five patients (20 men and 15 women) underwent ESS, and other thirty-five (23 men and 12 women) underwent MES. Intraoperative mastoid involvement was not reported in any patient in MES group. There was no difference in CT findings and intraoperative characters in both the groups.

According to preoperative CT images, 5 (14.2%) patients in EES group and 3 (8.5%) in MES group showed suspected facial nerve dehiscence. Intraoperatively, 11 (35%) patients in ESS groups while 7 (20%) in MES group showed facial nerve dehiscence (Figure 1). Facial nerve dehiscence was confirmed intra operatively. In 2 cases, 1 from each group showed geniculate ganglion involvement. No case of iatrogenic facial palsy was reported. No case of horizontal semicircular canal fistulas was detected.

Post operatively, abnormal taste sensation was reported in 28.5% cases in EES group and 42.8% cases in MES group (P=0.5). The mean post-operative air conduction thresholds in both groups were not significantly different (Table 1). Post-operative dizziness was reported in 5 (14.2%) in MES group and 1 (2.8%) patient in EES group. All patients in endoscopic group reported no or mild pain, whereas 26% patients in microscopic group had severe post-operative pain requiring analgesics (P=0.001). Success rate was 100% with no disease recurrence in either of the group. Mean healing time and operation time in both groups is shown in Table 2. Microscopic surgery was significantly quicker than endoscopic surgery (P=0.0001) Average healing time in endoscopic group was faster than microscopic group (P=0.0002).

Table 1 Post-operative hearing results

Mean postoperative air-conduction thresholds (dB)	MES	ESS
-20	0	2 (5%)
21-41	4 (11.4%)	3 (8.5%)
41-51	15 (42.8%)	14 (40%)
51-	16 (45.7%)	16(45.7%)

Table 2 Average operating and healing time

	MES	ESS	P value
Mean operating time (min)	69.8±8.48	87.7±11.7	0.0001
Mean healing time (days)	47.9± 8.5	36.2± 9.04	0.0002

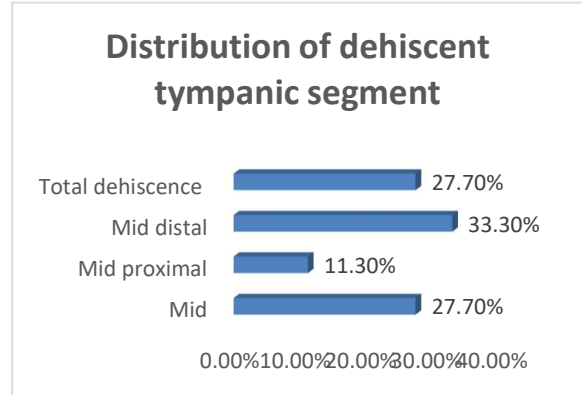


Figure 1: Site wise distribution of dehiscent tympanic segment

Discussion

There is increasing evidence on therapeutic use of endoscopy for various middle ear pathologies. However, post-operative results and selection of patients for suitable for technique remain debatable (Basonbul et al., 2021; Prasad et al., 2016). Most of the studies conducted on advantages of endoscopy are retrospective without comparative design (Tseng et al., 2017). However, a study comparing endoscopic and microscopic approach in cholesteatoma surgery confirmed that EES is safe and both the approaches have comparable results (Panetti et al., 2017). A review study suggested that limited prospective and comparative papers on MES vs EES, several aspects remain debatable (Crotty et al., 2023).

This prospective study was conducted to compare MES with EES in patients with attic cholesteatoma, particularly we evaluate intraoperative characteristics and surgical outcomes of both procedures. The comparison of both groups showed that there was no difference regarding age, CT findings, disease duration and pre-operative hearing between both groups. This indicates that study groups were homogenous and ideal for analysis of clinical impact of endoscopy. Both groups did not differ significantly regarding post-operative abnormal taste sensation, dizziness, hearing and graft success. This was comparable to results of a systematic review which showed that hearing results and tympanic graft success rate of both the procedures were comparable (Wang et al., 2023).

However, regarding healing time and post-operative pain endoscopic group showed better results. A previous study showed that a day after surgery endoscopic group had lower pain compared to microscopic group (Kim et al., 2021). Reduced pain in EES is due to lack of external incision and mastoid bone drilling. The average healing time in endoscopic group was 36.4 days and in MES group was 47.7 days. This because MES involves more surgical manipulation due to which more time is required for ear drum repair and success of tympanic graft. In our study, microscopic surgery had shorter operating time compared to

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endoscopic surgery. These findings suggest that future evolution of learning curve can improve operating times, as seen in otosclerosis surgery (Pauna et al., 2020). Learning curve and long operating time are the potential underlying factors for lesser use of EES. While comparing EES and MES, trans-canal approach under microscopic view can be used in some cases of middle ear cholesteatomas as it allows two hands procedure and 3D vision avoiding the need of post auricular incision.

In this study we did not compare trans canal approach in both surgeries and more research on this topic is needed to clarify it. On the basis of our observation, the decision to choose between endoscopic and microscopic approach should be based on balance between their pros and cons. In this study, no case of cholesteatoma recurrence was reported; however, we had too short follow-up time (12.4 months) so definite conclusion about disease recurrence can't be drawn.

Conclusion

The surgical outcomes of conventional microscopic approach and endoscopic ear surgery are comparable in terms taste sensation, post-operative air conduction and graft success rate. However, ESS showed results in terms of healing time and post-operative pain.

Declarations

Data Availability statement

All data generated or analyzed during the study are included in the manuscript.

Ethics approval and consent to participate

Approved by the department Concerned.

Consent for publication

Approved

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Conflict of interest

The authors declared absence of conflict of interest.

Author Contribution

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Coordination of collaborative efforts.

Conception of Study, Final approval of manuscript.

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Study Design, Review of Literature.

Conception of Study, Development of Research Methodology Design, Study Design,, Review of manuscript, final approval of manuscript.

SHAHLLA MAJEED (SR)

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References

- Basonbul, R. A., Ronner, E. A., Kozin, E. D., Lee, D. J., and Cohen, M. S. (2021). Systematic review of endoscopic ear surgery outcomes for pediatric cholesteatoma. *Otology & Neurotology* **42**, 108-115.
- Bonali, M., Fermi, M., Alicandri-Ciuffelli, M., Mattioli, F., Villari, D., Presutti, L., and Anschuetz, L. (2020). Correlation of radiologic versus endoscopic visualization of the middle ear: implications for endoscopic ear surgery. *Otology & Neurotology* **41**, e1122-e1127.
- Crotty, T. J., Cleere, E. F., & Keogh, I. J. (2023). Endoscopic Versus Microscopic Type-I Tympanoplasty: A Meta-Analysis of Randomized Trials. *The Laryngoscope* **133**, 1550-1557.
- Emre, I. E., Cingi, C., Muluk, N. B., and Nogueira, J. F. (2020). Endoscopic ear surgery. *Journal of Otology* **15**, 27-32.
- Gulotta, G., Visconti, I. C., Pace, A., Iannella, G., Rossetti, V., Mastino, P., Vicini, C., Salzano, F., Artico, M., and Greco, A. (2020). Facial nerve dehiscence and cholesteatoma: Pediatrics vs adults. *International Journal of Pediatric Otorhinolaryngology* **138**, 110260.
- Gulsen, S., and Baltacı, A. (2021). Comparison of endoscopic transcanal and microscopic approach in Type I tympanoplasty. *Brazilian journal of otorhinolaryngology* **87**, 157-163.
- Hill-Feltham, P. R., Johansson, M. L., Hodgetts, W. E., Ostevik, A. V., McKinnon, B. J., Monksfield, P., Sockalingam, R., Wright, T., and Tysome, J. R. (2021). Hearing outcome measures for conductive and mixed hearing loss treatment in adults: a scoping review. *International journal of audiology* **60**, 239-245.
- Kim, D. J., Lee, H. M., Choi, S.-W., Oh, S.-J., Kong, S.-K., and Lee, I.-W. (2021). Comparative study of endoscopic and microscopic tympanoplasty performed by a single experienced surgeon. *American Journal of Otolaryngology* **42**, 102788.
- Li, B., Zhou, L., Wang, M., Wang, Y., and Zou, J. (2021). Endoscopic versus microscopic surgery for treatment of middle ear cholesteatoma: A systematic review and meta-analysis. *American Journal of Otolaryngology* **42**, 102451.
- Lubianca Neto, J. F., Schuster, A. K., Fanzini, T. A., Lubianca, J. P. N., Mostardeiro, L. R., and Eavey, R. D. (2023). Comparison between endoscopic and microscopic butterfly cartilage graft inlay tympanoplasty: a systematic review and meta-analysis. *European Archives of Oto-Rhino-Laryngology* **280**, 151-158.
- McCabe, R., Lee, D. J., and Fina, M. (2021). The endoscopic management of congenital cholesteatoma. *Otolaryngologic Clinics of North America* **54**, 111-123.
- Panetti, G., Cavaliere, M., Panetti, M., Marino, A., and Iemma, M. (2017). Endoscopic tympanoplasty in the treatment of chronic otitis media: our experience. *Acta oto-laryngologica* **137**, 225-228.
- Pauna, H. F., Pereira, R., Monsanto, R., Amaral, M. S. A. d., and Hyppolito, M. A. (2020). A comparison

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- between endoscopic and microscopic approaches for stapes surgery: a systematic review. *The Journal of Laryngology & Otology* **134**, 398-403.
- Prasad, S. C., Giannuzzi, A., Nahleh, E. A., Donato, G. D., Russo, A., and Sanna, M. (2016). Is endoscopic ear surgery an alternative to the modified Bondy technique for limited epitympanic cholesteatoma? *European Archives of Oto-Rhino-Laryngology* **273**, 2533-2540.
- Rocha, A. K. P. B., Ramos, H. V. L., Almeida, R. B. S., Rêgo, A. P. V., Fonseca, S. A. d. C. B., Freitas, L. B., Garcia, J. L., and Costa, C. C. (2021). Endoscopic ear surgery: a scoping review. *Brazilian Journal of Development* **7**, 13319-13329.
- Swarup, A. (2021). "Design, Development and Pre-Clinical Validation of a Novel Instrument to Facilitate Transcanal Endoscopic Ear Surgery," University of Toronto (Canada).
- Tseng, C. C., Lai, M. T., Wu, C. C., Yuan, S. P., and Ding, Y. F. (2017). Comparison of the efficacy of endoscopic tympanoplasty and microscopic tympanoplasty: A systematic review and meta-analysis. *The Laryngoscope* **127**, 1890-1896.
- Wang, T. C., Shih, T. C., Chen, C. K., Hsieh, V. C. R., Lin, D. J., Tien, H. C., Chen, K. C., Tsai, M. H., Lin, C. D., and Tsai, C. H. (2023). Endoscopic versus microscopic type I tympanoplasty: An updated systematic review and meta-analysis. *Otolaryngology-Head and Neck Surgery*.



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