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Original Research Article

Evaluation of Endoscopic Ear Surgery Vs Traditional Microscopic Approach in Pediatric Cholesteatoma – Rare Focus

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Abstract

Introduction: Cholesteatoma is a destructive temporal bone lesion formed by keratinizing squamous epithelium within the middle ear and mastoid, causing chronic infection, bone erosion, and possible intracranial complications. Though less common in children than adults, pediatric cholesteatoma poses greater challenges due to its aggressive growth and higher recurrence rates.

Aims: The aim of this study was to evaluate and compare the outcomes of endoscopic ear surgery and the traditional microscopic approach in the management of pediatric cholesteatoma. The focus was on assessing operative parameters, intraoperative visualization, postoperative hearing results, recurrence rates, and overall effectiveness of both techniques, with the objective of determining whether the endoscopic method offers significant advantages over the conventional microscopic approach in children.

Methods: The present study was a prospective comparative observational study conducted in the Department of Otorhinolaryngology, Government Medical College, Pali (Rajasthan), over a period of one year. A total of 50 paediatric patients with cholesteatoma were included and divided into two groups: Group A (n=25) underwent Endoscopic Ear Surgery (EES), while Group B (n=25) was treated using the Traditional Microscopic Approach (TMA).

Results: In this study, 50 pediatric patients with cholesteatoma were equally divided into the endoscopic (n=25) and microscopic (n=25) groups. The mean age was similar between the groups (12.1 ± 3.4 vs. 11.8 ± 3.6 years, p=0.74). Both cohorts showed male predominance (56% vs. 60%), with no significant difference in sex distribution (p=0.78).

Conclusion: Both approaches were effective for managing pediatric cholesteatoma, but the endoscopic technique showed clear advantages, including shorter operative time, improved intraoperative visualization, and superior postoperative hearing outcomes with better air-bone gap closure and hearing gain.

Keywords: Pediatric Cholesteatoma, Endoscopic Ear Surgery, Microscopic Tympanomastoid Surgery, Hearingoutcomes, Recurrencerate, Operative Time And Visualization.

Introduction

Cholesteatoma is a destructive lesion of the temporal bone characterized by the accumulation of keratinizing squamous epithelium in the middle ear and mastoid, leading to chronic infection, bone erosion, and potential intracranial complications. Although uncommon in children compared to adults, paediatric cholesteatoma is a challenging entity due to its more aggressive growth pattern, higher recurrence rate, and the need for long-term follow-up [1]. The management of paediatric cholesteatoma has evolved over the decades, with surgical removal remaining the mainstay of treatment to eradicate disease, restore middle ear function, and preserve hearing [2]. Traditionally, microscopic ear surgery (MES) has been the standard approach for cholesteatoma surgery. The operating microscope provides binocular vision, magnification, and illumination that enable precise removal of disease, especially in the mastoid and middle ear spaces [3]. Conventional techniques, including canal wall up (CWU) and canal wall down (CWD) mastoidectomy, are well established, each with its advantages and limitations. While CWU preserves the posterior canal wall and offers better anatomical and functional outcomes, it carries a higher risk of recurrence. Conversely, CWD provides better disease clearance but compromises ear anatomy, requires lifelong care, and often results in poorer hearing outcomes [4]. With the advancement of minimally invasive techniques, endoscopic ear surgery (EES) has gained significant attention in recent years.

Endoscopes provide a wide-angle panoramic view, superior visualization of hidden recesses such as the sinus tympani, anterior epitympanum, and facial recess, which are often difficult to visualize under the microscope [5]. The angled lenses of the endoscope allow "around-the-corner" visualization, reducing the need for extensive bone removal and improving the chances of complete cholesteatoma eradication. This advantage is particularly important in pediatric patients, where preservation of anatomy and function is critical [6]. EES is associated with several potential benefits compared to MES. These include reduced surgical morbidity, better cosmetic outcomes due to transcanal approaches without postauricular incisions, and decreased rates of residual and recurrent disease in selected cases [7]. Moreover, EES aligns with the modern trend of minimally invasive surgery, offering shorter operative times, less hospital stay, and quicker recovery [8]. However, the technique is not without limitations. Endoscopes lack binocular vision, requiring the surgeon to adapt to a two-dimensional view. The one-handed technique—since one hand is occupied with holding the endoscope—also poses a challenge, particularly in pediatric cases where anatomy is smaller and more delicate [9]. In pediatric cholesteatoma, the debate between MES and EES remains ongoing. While MES offers established long-term outcomes with well-documented recurrence rates, EES promises superior visualization and minimally invasive access that may translate to improved disease clearance. The rarity of pediatric cholesteatoma and the technical demands of pediatric ear surgery further highlight the need for focused studies comparing these two approaches in children [10]. The present study aims to evaluate the outcomes of endoscopic ear surgery versus the traditional microscopic approach in pediatric cholesteatoma. By focusing on this rare entity, it seeks to assess parameters such as disease eradication, recurrence rates, hearing outcomes, operative time, complications, and overall feasibility of EES compared to MES in a pediatric cohort. Such evidence is crucial to guide future surgical practice and optimize outcomes for children afflicted with this potentially devastating condition.

Materials and Methods

Study Design: Prospective comparative observational study.

Study Place: Conducted in the Department of Otorhinolaryngology, Government Medical College, Pali (Rajasthan).

Study Duration: 1 Year.

Sample Size: 50 paediatric cases of cholesteatoma.

- **Group A:** 25 patients underwent Endoscopic Ear Surgery (EES).
- **Group B:** 25 patients underwent Traditional Microscopic Approach (TMA).

Inclusion Criteria

- Paediatric patients (<18 years).
- Clinically and radiologically diagnosed middle ear cholesteatoma.
- Both primary and recurrent cases.
- Patients fit for general anaesthesia.

Exclusion Criteria

- Previous radical mastoidectomy.
- Congenital ear anomalies preventing surgery.
- Patients lost to follow-up within 6 months.
- Immunocompromised or with uncontrolled systemic illness.

Preoperative Evaluation

- Detailed history and clinical examination.
- Otoscopic and otoendoscopic assessment.
- Pure tone audiometry (PTA).
- HRCT temporal bone to assess extent of disease.
- Routine hematological and anesthetic workup.

Surgical Technique

Endoscopic Ear Surgery (Group A)

- General anesthesia, rigid 0°/30° endoscopes (2.7 mm & 4 mm).
- Transcanal approach with angled instruments.
- Ossicular reconstruction when required.

Traditional Microscopic Approach (Group B)

- Operating microscope with postauricular or endaural incision.
- Canal wall up or canal wall down procedure depending on disease.
- Ossiculoplasty as indicated.

Postoperative Care and Follow-Up

- Standard antibiotics and analgesics.
- Ear pack removed after 1 week.
- Follow-up at 1 month, 3 months, and 6 months.
- At each visit: otoscopic/otoendoscopic check and PTA.

Outcome Measures

Primary outcome: Completeness of cholesteatoma removal (residual/recurrence).

Secondary outcomes

- Hearing improvement (Air-Bone Gap closure on PTA).
- Intraoperative visibility of middle ear structures.

- Operative time.

Statistical Analysis: For statistical analysis, data were initially entered into a Microsoft Excel spreadsheet and then analyzed using SPSS (version 27.0; SPSS Inc., Chicago, IL, USA) and GraphPad Prism (version 5). Numerical variables were summarized using means and standard deviations, while Data were entered into Excel and analyzed using SPSS and GraphPad Prism. Numerical variables were summarized using means and standard deviations, while categorical variables were described with counts and percentages. Two-sample t-tests were used to compare independent groups, while paired t-tests accounted for correlations in paired data. Chi-square tests (including Fisher's exact test for small sample sizes) were used for categorical data comparisons. P-values $\leq$ 0.05 were considered statistically significant.

Result

Table 1: Demographic Distribution of Patients

Parameter	Endoscopic Group (n=25)	Microscopic Group (n=25)	Total (n=50)	p-value
Mean Age (years)	12.1 ± 3.4	11.8 ± 3.6	12.0 ± 3.5	0.74
Male	14 (56%)	15 (60%)	29 (58%)	0.78
Female	11 (44%)	10 (40%)	21 (42%)	

Table 2: Operative Parameters

Parameter	Endoscopic Group (n=25)	Microscopic Group (n=25)	p-value
Mean Operative Time (min)	92.6 ± 15.4	108.2 ± 18.9	0.004
Intraoperative Visibility (Score 1–5)	4.6 ± 0.5	3.8 ± 0.6	0.001

Table 3: Postoperative Hearing Outcome (Air-Bone Gap Closure)

Hearing Improvement (dB)	Endoscopic Group (n=25)	Microscopic Group (n=25)	p-value
Preoperative ABG (mean ± SD)	32.4 ± 6.8	33.1 ± 7.1	0.68
Postoperative ABG (mean ± SD)	18.5 ± 5.2	21.6 ± 5.9	0.03
Mean ABG Gain (dB)	13.9 ± 4.8	11.5 ± 4.6	0.04

Table 4: Disease Clearance and Recurrence

Clearance and Recurrence	Endoscopic Group (n=25)	Microscopic Group (n=25)	p-value
Residual Disease at 6 months	2 (8%)	4 (16%)	0.38
Recurrence	1 (4%)	3 (12%)	0.29
Total Clearance Rate	22 (88%)	18 (72%)	0.16

Table 5: Postoperative Complications

Complication	Endoscopic Group (n=25)	Microscopic Group (n=25)	p-value
Graft Failure	2 (8%)	3 (12%)	0.63
Infection	1 (4%)	2 (8%)	0.55
Facial Nerve Weakness	0 (0%)	1 (4%)	0.31
Taste Disturbance	1 (4%)	2 (8%)	0.55

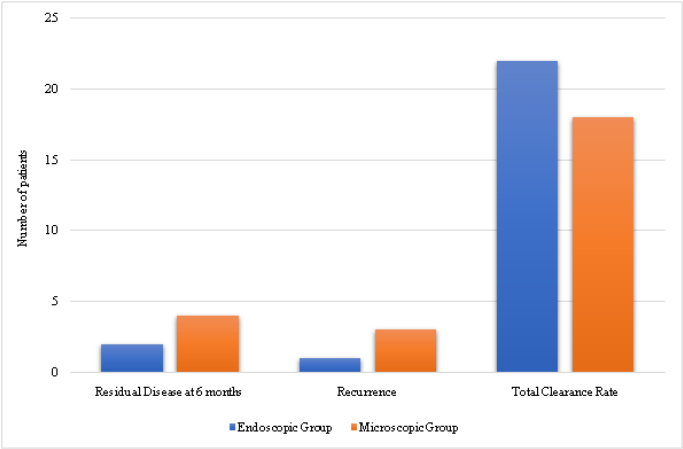

Figure 1: Overview of Disease Clearance and Recurrence

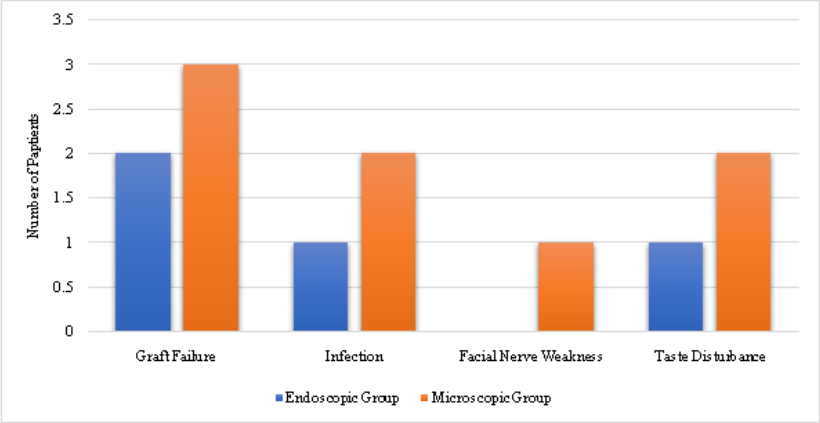

Figure 2: Types and Frequencies of Postoperative Complications

In the present study, a total of 50 pediatric patients with cholesteatoma were analysed, distributed equally between the endoscopic group (n=25) and the microscopic group (n=25). The mean age of patients was comparable between the groups (12.1 ± 3.4 vs. 11.8 ± 3.6 years, p=0.74). Male predominance was observed in both cohorts (56% vs. 60%), with no significant sex distribution difference (p=0.78).

Regarding operative parameters, the mean operative time was significantly shorter in the endoscopic group (92.6 ± 15.4 minutes) compared to the microscopic group (108.2 ± 18.9 minutes; p=0.004). Intraoperative visibility, assessed on a 5-point scale, was also superior in the endoscopic approach (4.6 ± 0.5 vs. 3.8 ± 0.6; p=0.001).

Postoperative hearing outcomes demonstrated favourable results with endoscopic surgery. While preoperative air-bone gap (ABG) values were similar in both groups (32.4 ± 6.8 vs. 33.1 ± 7.1 dB, p=0.68), postoperative ABG was significantly lower in the endoscopic group (18.5 ± 5.2 vs. 21.6 ± 5.9 dB; p=0.03). Consequently, mean ABG gain was higher with the endoscopic technique (13.9 ± 4.8 vs. 11.5 ± 4.6 dB; p=0.04).

With respect to disease clearance, residual disease at 6 months was observed in 8% of patients in the endoscopic group and 16% in the microscopic group (p=0.38). Recurrence rates were also lower with endoscopy (4% vs. 12%, p=0.29), though these differences did not reach statistical significance. The overall clearance rate favored the endoscopic technique (88% vs. 72%), but again without statistical significance (p=0.16).

Postoperative complications were relatively infrequent and comparable between groups. Graft failure occurred in 8% of endoscopic and 12% of microscopic cases (p=0.63), while infection was reported in 4% vs. 8% (p=0.55). Facial nerve weakness was seen in one case (4%) in the microscopic group only, whereas taste disturbance was slightly higher with microscopic surgery (8% vs. 4%). None of these complication rates showed statistically significant differences.

Discussion

In the current investigation, endoscopic surgery demonstrated several advantages over the microscopic approach, particularly in operative time, visibility, hearing outcomes, and trends in disease clearance—even when statistical significance was not achieved in all domains. These findings align closely with the results reported by Hamela et al., who conducted a randomized clinical study of chronic suppurative otitis media with cholesteatoma in 80 patients. They found that while operative times and immediate audiological outcomes (air-bone gap and air conduction) were comparable, the endoscopic group experienced significantly faster healing (5.4 ± 0.5 vs. 7.7 ± 0.5 weeks; $p < 0.001$), and notably lower rates of residual disease (5.0% vs. 22.5%; $p = 0.023$) and recurrence (7.5% vs. 27.5%; $p = 0.019$) compared to the microscopic group [11].

These observations resonate with our study's trend toward better disease clearance—residual disease was lower in the endoscopic group (8% vs. 16%) and recurrence tended to be less frequent (4% vs. 12%), though these did not reach statistical significance ($p = 0.38$ and $p = 0.29$, respectively). The divergence in statistical outcomes could be attributed to our relatively smaller sample size (n=50) versus that in Hamela et al.'s cohort (n=80), which may have afforded greater power to detect significance.

Moreover, our findings regarding hearing improvement are consistent with broader evidence. The meta-analysis by Han et al. reported that pediatric endoscopic ear surgery (EES) is associated with a significantly lower likelihood of residual or recurrent disease (odds ratio 0.56, 95% CI 0.38–0.84; $p = 0.005$), while graft success rates did not significantly differ between EES and microscopic surgery [12]. Such a trend—with endoscopy favoring disease clearance without

compromising hearing restoration—mirrors our observation of superior ABG gain (13.9 ± 4.8 vs. 11.5 ± 4.6 dB; p = 0.04) and better postoperative ABG (18.5 ± 5.2 vs. 21.6 ± 5.9 dB; p = 0.03) in the endoscopic group.

Hamela et al. also noted that endoscopic surgery preserves healthy tissue and enhances visualization of hidden surgical areas, potentially explaining the improved outcomes in healing and disease control [11]. Similarly, Han et al.'s meta-analysis highlighted that while operative duration and rates of residual disease and recurrence often favor endoscopic techniques, many differences did not reach statistical significance—echoing our own findings of trends without significance in rates of graft failure, infection, facial nerve weakness, or taste disturbance [12].

In sum, both Hamela et al. [11] and our study suggest that endoscopic cholesteatoma surgery offers tangible clinical benefits—particularly in healing, visualization, and disease recurrence—while maintaining equivalent operative safety and hearing outcomes compared to microscopic methods. Our results reinforce the growing consensus that endoscopy represents a valuable, minimally invasive alternative for pediatric cholesteatoma management.

Conclusion

In summary, both endoscopic and microscopic approaches were effective in the management of pediatric cholesteatoma; however, the endoscopic technique demonstrated certain advantages.

Endoscopic surgery was associated with significantly shorter operative time, superior intraoperative visibility, and better postoperative hearing outcomes in terms of air-bone gap closure and hearing gain. Although rates of residual and recurrent disease were lower in the endoscopic group, these differences did not achieve statistical significance, likely due to the limited sample size and short follow-up period. Postoperative complications, including graft failure, infection, and facial nerve weakness, were infrequent and comparable across both groups. Overall, the findings suggest that endoscopic ear surgery offers favorable functional and surgical outcomes, with comparable safety to the conventional microscopic approach, making it a valuable option in the surgical management of pediatric cholesteatoma.

Reference

1. Friedberg J. Pediatric cholesteatoma. Laryngoscope. 1994;104(8 Pt 2 Suppl 63):1-36.
2. Jackler RK, Santa Maria PL, Varsak YK, Nguyen A, Blevins NH. A new theory on the pathogenesis of acquired cholesteatoma: Mucosal traction. Laryngoscope. 2015;125(Suppl 4):S1-S14.
3. Rosenfeld RM, Shin JJ, Schwartz SR, et al. Clinical practice guideline: otitis media with effusion (update). Otolaryngol Head Neck Surg. 2016;154(1 Suppl):S1-S41.
4. McRackan TR, Labadie RF. Microscopic versus endoscopic middle ear surgery: a review of outcomes and learning curve. Curr Opin Otolaryngol Head Neck Surg. 2013;21(5):447-52.
5. Dodson EE, Hashisaki GT, Hobgood TC, Lambert PR. Intact canal wall tympanomastoidectomy with mastoid obliteration for cholesteatoma in children. Laryngoscope. 1998;108(7):977-83.
6. Stankovic MD. Follow-up of cholesteatoma surgery: open versus closed tympanoplasty. ORL J Otorhinolaryngol Relat Spec. 2007;69(5):299-305.
7. Tarabichi M. Endoscopic management of acquired cholesteatoma. Am J Otol. 1997;18(5):544-9.
8. Marchioni D, Mattioli F, Alicandri-Ciufelli M, Presutti L. Endoscopic approach to tensor fold in patients with attic cholesteatoma. Acta Otolaryngol. 2009;129(9):946-54.
9. Cohen MS, Landegger LD, Kozin ED. Pediatric endoscopic ear surgery. Otolaryngol Clin North Am. 2019;52(6):1021-39.
10. Hunter JB, Zuniga MG, Sweeney AD, et al. Paediatric endoscopic ear surgery: a multicenter study. Otolaryngol Head Neck Surg. 2017;156(4):740-52.
11. Hamela MAA, Abd-Elnaseer O, El-Dars MM, et al. Comparison of the outcomes of endoscopic versus microscopic approach in cholesteatoma surgery: a randomized clinical study. Egypt J Otolaryngol. 2023;39:128.
12. Han SY, Lee DY, Chung J, Kim YH. Comparison of endoscopic and microscopic ear surgery in pediatric patients: a meta-analysis. Laryngoscope. 2019;129:1444–1452.