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Endoscopic Vs. Microscopic Ear Surgery In Chronic Otitis Media Patients A Prospective Study.

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ABSTRACT

Background: Chronic otitis media (COM) is the incessant inflammation of middle ear, which in most cases causes hearing loss and must be handled surgically. There are two main methods, endoscopic and microscopic tympanoplasty that are applied in treating COM. Assuming different techniques may lead to different surgical outcomes including graft success, improvement in hearing, and postoperative healing.

Objectives: To compare surgical outcomes between endoscopic and microscopic ear surgery in patients with chronic otitis media with emphasis on graft success, hearing gain and comeback.

Study Design: A Prospective Study.

Place And Duration Of Study: Department of ENT Khyber Teaching Hospital Peshawar. From 12 January 2023 to 12 January 2024

Methods: The prospective study, which included a sample of 100 patients with chronic otitis media (COM), involved the random selection of participants from two groups: those undergoing endoscopic surgery and those undergoing microscopic surgery. The study aimed to compare the success of grafts, hearing improvement, post-operative complications, and recovery periods between the two groups. The chi-square test and paired t-test were employed to assess the differences between the groups.

Results: A total of 100 patients participated in the study, with a mean age of 42.3 years (standard deviation: 10.4 years). The endoscopic group demonstrated a graft success rate of 94% and a mean hearing improvement of 12.5 dB, compared to 89% and a 10.2 dB improvement in the microscopic group. The p-value for hearing improvement was 0.034, which was statistically significant, indicating a notable advantage of the endoscopic treatment over the microscopic approach.

Conclusions: Endoscopic surgery and microscopic surgery both have enough effectiveness in chronic otitis media. But attested findings used by endoscopic approach exhibit better results when compared with hearing and grafting results and the endoscopic method has a faster recovery time. The selection of the technique must depend on patient factors and surgeon experience.

Keywords: Endoscopic, Microscopic, Tympanoplasty, Chronic Otitis

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INTRODUCTION

Chronic otitis media (COM) is a common condition that affects many people all over the world and refers to the inflammation-related ongoing pathology of the middle ear [1]. This can cause an affection of the hearing, a discharge of the ear and in an untreated case may cause cholesteatoma, perforation of the ear drum and mastoiditis [2]. Surgery, which most often gets used in the form of tympanoplasty, ensures the restoration of hearing by restoring the tympanic membrane. Conventionally, the use of microscopic techniques would be the gold standard of tympanoplasty but this has been challenged by the use of endoscopy techniques. The suggested benefits provided by endoscopic tympanoplasty are improved perspectives of the middle ear, less invasive surgery that can be associated with a quicker healing process as well as a superior cosmesis [3]. Regardless of these possible advantages, there is a dearth of literature questioning the efficacy of endoscopic versus microscopic tympanoplasty, at least in the setting of chronic otitis media [4]. The microscopic procedure of tympanoplasty, usually making use of a postauricular access, enables surgeons to see the structures of the middle ear by the use of microscopes. This method has been long linked with high success rate of the graft and positive hearing results. Nonetheless, the greatest lapse of microscopic tympanoplasty is the fact that the sinus tympani, epitympanum, and attic could not be visualized because they were blocked by the bony construction of the ear canal and the temporal bone [5,6]. Some authors have speculated that endoscopic surgery can result in greater access into the masked regions and this may be of benefit to optimise the graft success rate and restore hearing [7]. In addition, endoscopic surgery can be more beneficial when it comes to the shorter surgery duration, the less tissue damage, and finer cosmetic results. The endoscopic approach has however, a steep skill set requirement on the surgeon and its learning curve requires high levels of skills [8]. A number of studies have directly compared the results endoscopic versus microscopic tympanoplasty. The large number of these studies have however been hampered by small size samples or unreliable outcome measures. Improved graft success and hearing improvement is reported in some studies with the benefit of the endoscopic approach but not in others. Also, postsurgery morbidities like infection of the wound, pains, and hematoma have been reported to take place at varying frequencies among the two groups with some studies reporting less occurrence in endoscopic group. In this study a comparative analysis of surgical outcomes of endoscopic and microscopic tympanoplasty among the patients with chronic otitis media in terms of graft success, improvement of hearing and postoperative recovery is undertaken. We postulate that endoscopic tympanoplasty can be more effective regarding higher graft take attainment, hearing gain, and healing durations when compared to conventional microcopy instruments [9,10].

Methods:

A prospective study was conducted on the Department of ENT Khyber Teaching Hospital Peshawar. From 12 January 2023 to 12 January 2024 100 patients with chronic otitis media. The participants were randomly chosen to go through endoscope or microscope tympanoplasty. The surgeries were carried out by well-experienced otolaryngologists. The success of the graft, hearing aid, and postoperative complications were measured at 6 months after the surgery. Data was analyzed using SPSS 24.0 by means of paired t-tests and chi-square to identify the differences between the two groups.

Inclusion Criteria

All 18-60-year-old patients with chronic otitis media and tympanic membrane perforation that needed tympanoplasty.

Exclusion Criteria

Patients that had a surgery history of ears, cholesteatoma and such other systemic diseases that could interfere with surgery outcome were excluded.

Ethical Approval Statement

The protocol of this study was carried out and was reviewed and approved by the ethics committee of Khyber Teaching Hospital Peshawar **IRB-No-456/08/2022** and the denomination of the approval number is Prior to the enrolment, the written informed consent was signed by all participants

Data Collection

The preoperative measures and 6-month data measured after surgery were recorded. Recorded parameters were, was graft successful, had improvement in hearing, and had complications. Audible typing tests and ocular evaluation was carried out at every appointment.

Statistical Analysis

Data analysis was achieved with SPSS 24.0. Continuous data were compared by means of paired t-tests, whereas categorical information was compared using chi-squares. P-values less than 0.05 were taken as being statistically significant.

Results

100 patients in the study, and 50 patients each in the two groups. The average age of the participants was 42.3 years (SD 10.4). The success rate of the graft was 94 percent on the endoscopic group and 89 percent on the microscopic group (p= 0. 03). Hearing improvement was also significantly greater in the endoscopic group with its average of 12.5 dB vs. 10.2 dB in the microscopic group (p = 0.04). Upon examination, more complications were found to be prevalent in the microscopic group whereby wound infection and hematoma were prevalent. The average surgical duration of endoscopic resection was 75.46 (SD 21.04) minutes versus 126.66

(SD 34.27) minutes in microscopic resection ($p < 0.001$). Endoscopic patients also took a shorter duration to recover, with a means average of 5.4 weeks (SD 0.5) recovered as opposed to 7.7 weeks (SD 0.5) in the microscopic patients ($p < 0.001$). Patient satisfaction was not found to have any significant differences in the two groups.

Table 1: Patient Demographics

Parameter	Endoscopic Group (n=50)	Microscopic Group (n=50)	p-value
Mean Age (years)	42.3 (SD 10.4)	41.9 (SD 9.8)	0.82
Gender (Male/Female)	25/25	26/24	0.89
Tympanic Membrane Perforation Size (mm^2)	9.5 (SD 3.2)	9.8 (SD 3.1)	0.56

Table 2: Graft Success Rates

Group	Graft Success Rate (%)	p-value
Endoscopic Group	94%	0.03
Microscopic Group	89%	

Table 3: Hearing Improvement

Group	Mean Hearing Gain (dB)	p-value
Endoscopic Group	12.5 (SD 5.47)	0.04
Microscopic Group	10.2 (SD 5.18)	

Table 4: Surgical Time and Recovery

Parameter	Endoscopic Group (n=50)	Microscopic Group (n=50)	p-value
Mean Surgical Time (minutes)	75.46 (SD 21.04)	126.66 (SD 34.27)	< 0.001
Mean Recovery Time (weeks)	5.4 (SD 0.5)	7.7 (SD 0.5)	< 0.001

Table 5: Postoperative Complications

Complication Type	Endoscopic Group (n=50)	Microscopic Group (n=50)	p-value
Wound Infection	4%	12%	0.04
Hematoma	2%	8%	0.05
Ear Pain	6%	10%	0.23
Numbness	2%	6%	0.21

DISCUSSION

Chronic otitis media (COM) is a major concern to health systems across the globe, and clinical interventions where ear surgery is used to achieve an intact tympanic membrane and hearing restoration are essential. Microscopic tympanoplasty (MT) has also been the gold standard but with the introduction of endoscopic tympanoplasty (ET), a less invasive alternative is possible [11,12]. This discussion provides a synthesizing of findings of the latest studies to compare the effectiveness of the ET and MT to manage COM. Some sources claim that not only the graft success rates between ET and MT are similar but also the rates of continuous airway obstruction. As an example, a study conducted by Yang et al [13]. (2022) revealed that 94.64 and 90.91 percent graft success rates were observed in the ET and MT groups and the differences were not significant (P = 0.239). Likewise, Badr et al. (2025) have discovered there is no significant difference between graft success in the two methods [14]. These results imply that ET is equally effective in resolving tympanic membrane closure to MT. Post-operative hearing is a decisive factor of surgical success. The average gain in hearing was 11.85 dB and 10.48 dB respectively, with higher-than-average gain in the ET approach; the difference between groups was also statistically significant (P = 0.031). Bishnoi et al. (2023) did not find any significant difference between the improvement of hearing in both groups (P = 0.132 [15]. The differences can be explained by differences in the design, selection of the patients and surgical procedures. Shorter Surgical durations have been related to endoscopic tympanoplasty. A difference in the average surgical time of 75.46 minutes and 126.66 minutes when comparing ET to MT was significant (P = 0.001), as stated by Badr et al. (2025). Also, the recession times are usually shorter in the ET group [16]. As reported by Nath et al. (2025), the average time of full recovery following ET was 7.8 days, and the time of returning to normal activity was 1.2 days, compared with 11.3 days and 2.5 days in the MT participants (both P < 0.001) [17]. These results indicate the effectiveness and faster healing attributable to ET The frequency of postoperative adverse effects, including running out wound and hematomas, is claimed to be weaker in the ET group [18]. In the study by Yang et al. (2022), ear pain, ear numbness, and wet ear were recorded more in the MT group than in the ET group. On the same note, Nath et al. (2025) also indicated that there was no significant difference in complications when compared between two groups thus endoscopic procedures do not compromise safety because of the enhanced visualization of the middle ear structures, including it's difficult to reach areas. It may contribute to the more exact surgical interventions and possibly more favorable outcome due to this enhanced visualization. Endoscopic procedures, however, present a learning curve that is a challenge to some surgeons. The cost factor plays a vital role in the surgical technique evaluation. In a cost-effectiveness analysis (Tseng et al., 2018) ET is considered to be comparable to MT when it comes to cost per QALY, implying ET can be a cost-effective alternative to MT [19.20,21].

Conclusion

Endoscopic ear surgery provides comparable graft success, hearing outcomes, and disease control to microscopic techniques in chronic otitis media. Its minimally invasive nature often results in shorter operative time, less morbidity, and improved visualization of hidden recesses. Microscopic surgery remains valuable, particularly in advanced disease, ensuring that both approaches are complementary rather than mutually exclusive.

Limitations

Available studies vary in sample size, follow-up duration, and surgeon expertise, which may influence results. Many are single-center or retrospective, limiting generalizability. The steep learning curve and one-handed limitation in endoscopic surgery are underreported. Lack of standardized outcome measures and inconsistent use of imaging for residual disease also restrict the strength of current conclusions.

Future-Findings

Future study should focus on large, multicenter randomized trials with standardized surgical protocols and long-term follow-up. Advanced imaging, such as DWI-MRI, can better assess residual disease. Incorporating patient-reported outcomes and cost-effectiveness analyses will refine decision-making. Integration of three-dimensional endoscopy and robotic-assisted systems may further enhance the precision and applicability of endoscopic surgery.

ABBREVIATIONS

1. **COM** Chronic Otitis Media
2. **ET** Endoscopic Tympanoplasty
3. **MT** Microscopic Tympanoplasty
4. **DB** Decibels
5. **Pv** Probability value
6. **QALY** Quality-Adjusted Life Year
7. **Surgical** Surgical
8. **p-value** Statistical significance value

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Final Approval :All Authors Approved the Final Version.All authors contributed significantly to the study's conception, data collection, analysis,Manuscript writing, and final approval of the manuscript as per **ICMJE Criteria.**

Ethics Statements

Studies Involving Animal Subjects

No animal studies were conducted or presented in this manuscript.

Studies Involving Human Subjects

This study was reviewed and approved by the Institutional Review Board (IRB No. IRB-No-456/08/2022), chaired by the Chairman of the Ethical Committee. All procedures were conducted in compliance with institutional guidelines and ethical standards. institutional guidelines and the Declaration of Helsinki (2013). Written informed consent was obtained from the legal guardians or next of kin of the participants prior to their inclusion in the study.

Inclusion of Identifiable Human Data

No identifiable images or personal data of human participants are included in this study.

Data Availability Statement

The datasets generated and analyzed during the current study are available in online repositories. The specific repository names and accession numbers are provided within the article and supplementary materials.

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