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ORIGINAL ARTICLE

Comparison of Outcomes in Endoscopic Ear Surgery and Microscopic ear Surgery in Management of Chronic Otitis Media (COM): Squamous Disease in a Tertiary Care Centre: A Randomized Study

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Abstract

Introduction: Chronic otitis media (COM) remains a challenging condition to treat, particularly in its squamous type manifestation. In recent years, there has been increasing interest in the use of endoscopic ear surgery as an alternative to traditional microscope-assisted techniques. This study aimed to compare the efficacy of endoscopic ear surgery with microscope-assisted surgery in terms of disease clearance and hearing improvement among patients with COM-squamous type. **Methodology**: A double-blinded randomised clinical trial was conducted at a tertiary care hospital in South India, involving 112 patients aged 18-50 years. Patients were randomised to either endoscope-assisted or microscope-assisted surgery groups, and disease clearance and hearing improvement were assessed over a 6-month follow-up period. **Results**: All statistical analyses were done using SPSS software version 19.0. Chi Square and paired t tests were used for analysis. There was no statistically significant difference between the two groups in terms of disease clearance ($p = 0.051$). **Conclusion**: It is thus concluded from our study that endoscope assisted ear surgery gives equivalent surgical outcomes when compared to microscopic ear surgery.

Keywords: COM, Chronic Otitis Media, Squamous, Endoscope, Microscope assisted

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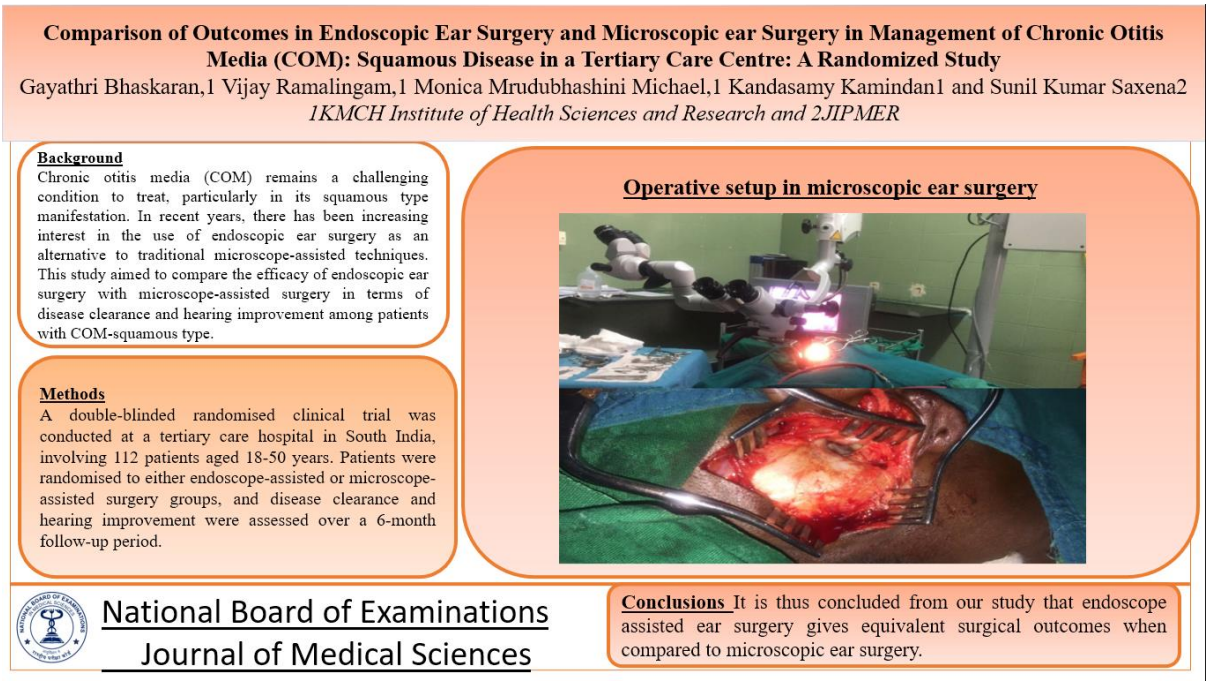
Graphical Abstract



Introduction

Chronic otitis media (COM) is a prevalent condition characterised by inflammation of the middle ear, often resulting in complications such as hearing loss and tympanic membrane defects and it is notorious for severe complications and the associated mortality and morbidity [1,2]. Among its subtypes, COM-squamous type poses unique challenges due to the presence of keratinizing squamous epithelial ingrowths, which can erode bone [3,4] and cause significant morbidity if left untreated. Traditional surgical approaches to COM have primarily involved microscope-assisted techniques, allowing for precise visualisation and manipulation of middle ear structures. However, the advent of endoscopic ear surgery has introduced new possibilities for improved visualisation and less invasive interventions.

Endoscopic ear surgery utilises a narrow-diameter endoscope to provide a magnified view of the middle ear structures, allowing for more precise and minimally invasive procedures. Advantages of endoscopic techniques include better visualisation of hidden areas, reduced need for bone removal, and potentially faster recovery times for patients. While initial studies have shown promising results with endoscopic approaches, further research is needed to compare their efficacy to traditional microscope-assisted techniques.

Methodology

A double-blinded randomised controlled trial was conducted to compare endoscopic ear surgery with microscopic ear surgery in patients with COM-squamous type. After approval from the Institutional Ethics Committee, the study was conducted at a tertiary care hospital in South India, between December 2015 and January 2018 and eligible patients aged 18-50 years were recruited. After informed consent, patients were randomised to receive either endoscopic or microscopic

ear surgery using sealed opaque envelopes with varying block sizes. Exclusion criteria included complicated otitis media, a dead ear, and ear malformations (Figure 1).

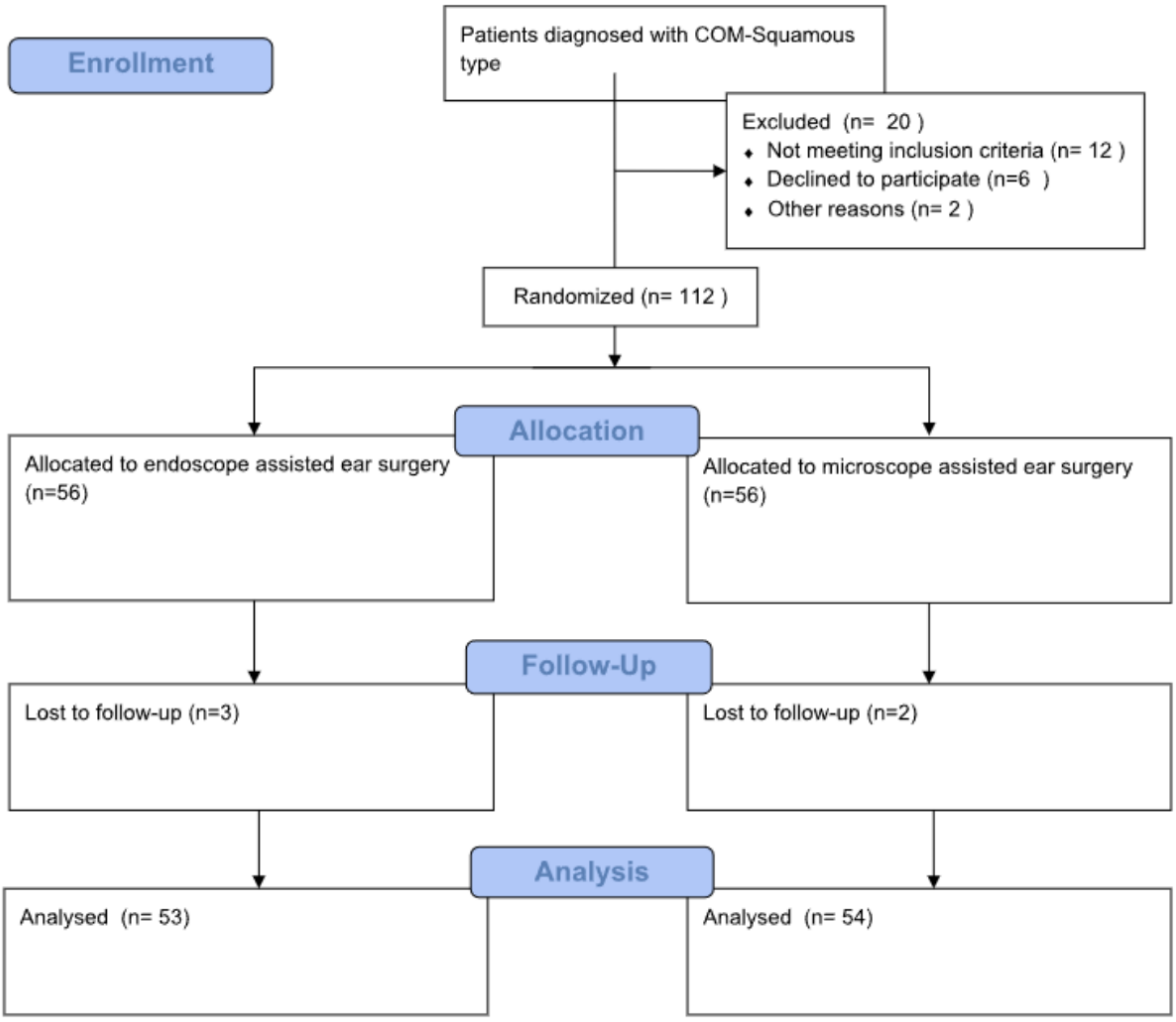


Figure 1. Consort diagram for the randomised clinical trial

Baseline demographic data, including age, sex, and affected ear, were recorded for each patient. Preoperative evaluations included pure tone audiometry and high-resolution computed tomography (HRCT) of the temporal bone to assess disease severity and hearing status, respectively. Surgical fitness was assessed based on clinical and laboratory evaluations, and written informed consent was obtained from all participants.

Patients in the endoscope-assisted surgery group underwent surgery under general anaesthesia, with the entire procedure performed using a 4mm, 18cm 0-degree or 30-degree endoscope and camera system (Figure 2). A wide posterior tympanomeatal flap was elevated, and the cholesteatoma sac was visualised and dissected using endoscopic instruments. The bony canal rim was curetted and drilled for exposure as needed (Figure 3[i to vii]) and appropriate ossicular reconstruction was performed. The ear canal was packed with gelfoam postoperatively.

Figure 2. Operative setup in endoscopic ear surgery

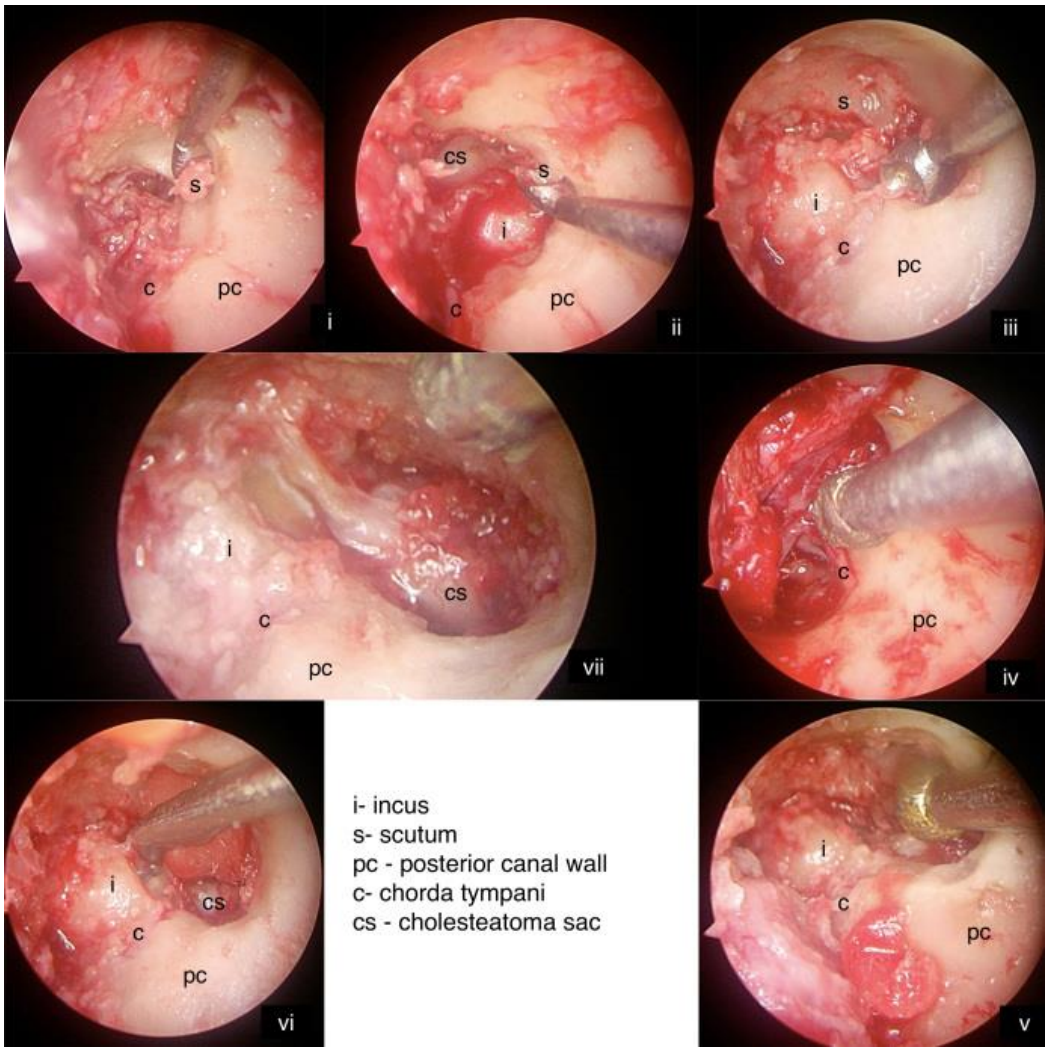


Figure 3. i,ii,iii- identification of chorda tympani(c), scutum(s), incus(i), curetting of the posterior bony canal wall(pc); iv,v,vi,vii- visualisation of aditus ad antrum, identification of cholesteatoma sac (cs) and disease clearance.

Patients in the microscope-assisted surgery group underwent surgery under general anaesthesia with a postaural approach (Figure 4). Under microscope visualisation, the cholesteatoma and granulations were removed, and the mastoid cavity was smoothed with a polishing burr. Temporalis fascia was used for ossicular reconstruction, and the cavity was exteriorized with concho-meatoplasty. A medicated pack was placed in the cavity postoperatively.

Figure 4: Operative setup in microscopic ear surgery

Postoperative care included hospitalisation for three days with administration of intravenous antibiotics, followed by outpatient follow-up visits. Disease clearance were assessed at 6 months post-surgery using HRCT of temporal bone and otoendoscopy (Figure 5) and hearing thresholds using pure tone audiometry.

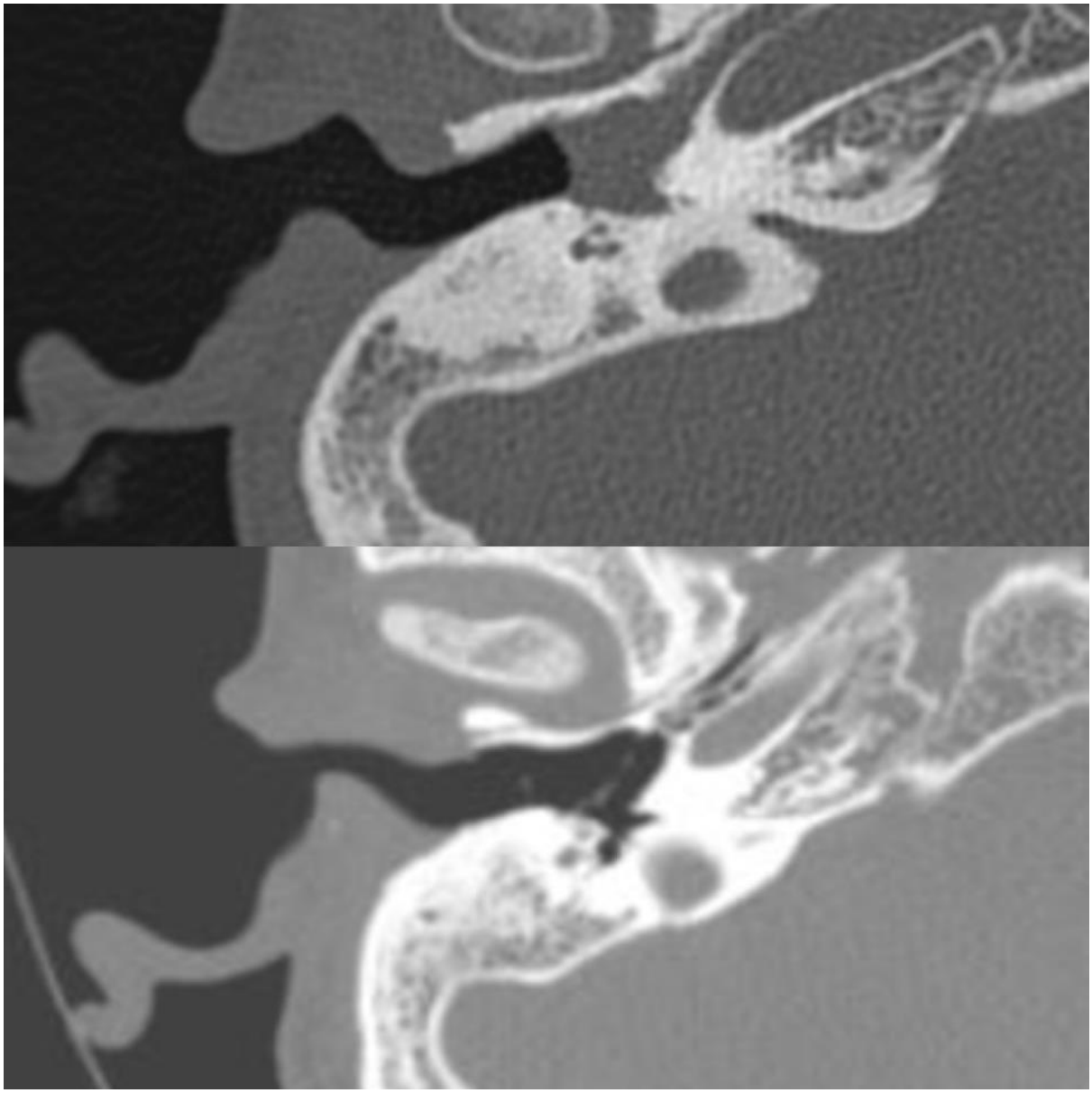


Figure 5. High resolution computed tomography before and after endoscopic ear surgery

Results

A total of 112 patients were recruited and randomised to two groups. 56 patients were subjected to microscopic ear surgery, out of which 54 patients were followed up till 6 months, 2 patients failed to follow up. 56 patients underwent endoscopic ear surgery, 53 patients followed up. 3 failed to follow up. All patients had the disease only in one ear. Baseline demographic characteristics like age were comparable between the two groups. Preoperative audiological characteristics of patients of both groups were similar (Table 1).

Table 1. Comparison of preoperative hearing thresholds between the two groups

Group	Mean (SD) pure tone hearing level in dB	Statistical test
Endoscopic Surgery Group N=56	**41.15(12.23)**	**Independent t test**
Microscopic Surgery Group N=56	**43.34(13.87)**	
p- value		**0.377***

Postoperative Disease clearance

Disease clearance was assessed by a high resolution computed tomography of the temporal bone and otoendoscopy (Figure 6). In our study, it was found that disease clearance after endoscopic ear surgery was not significantly different from microscope-assisted surgery. (Figure 7) Statistical analysis was carried out using Chi-Square test and p-value was found to be 0.05 (Table 2).

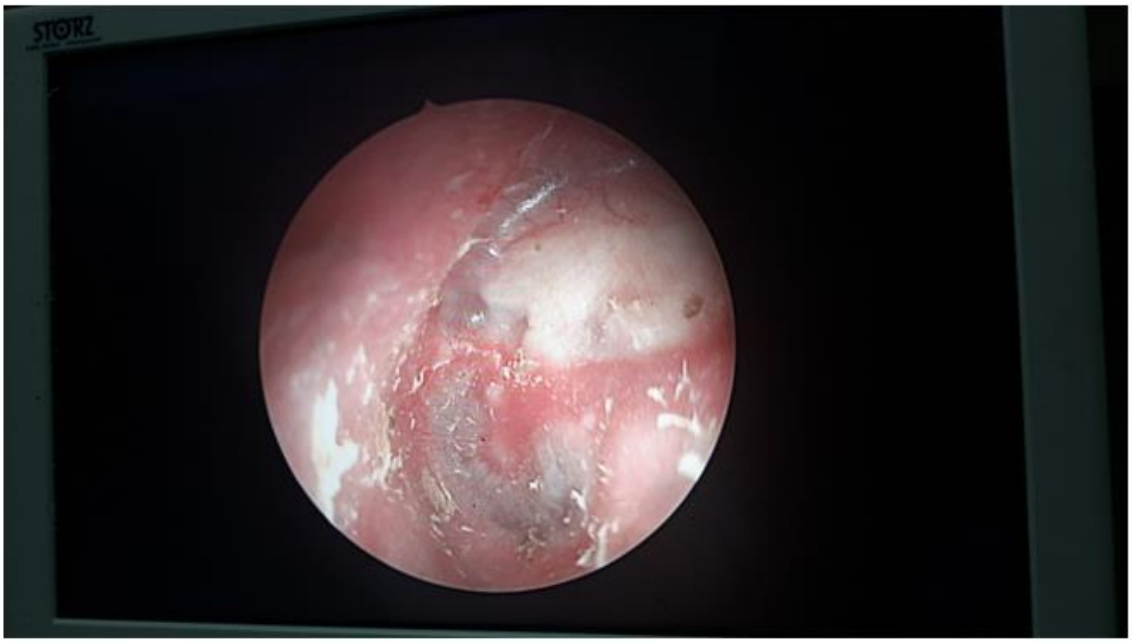


Figure 6. Postop otoendoscopy showing healed neotympanum and scutum reconstructed with conchal cartilage.

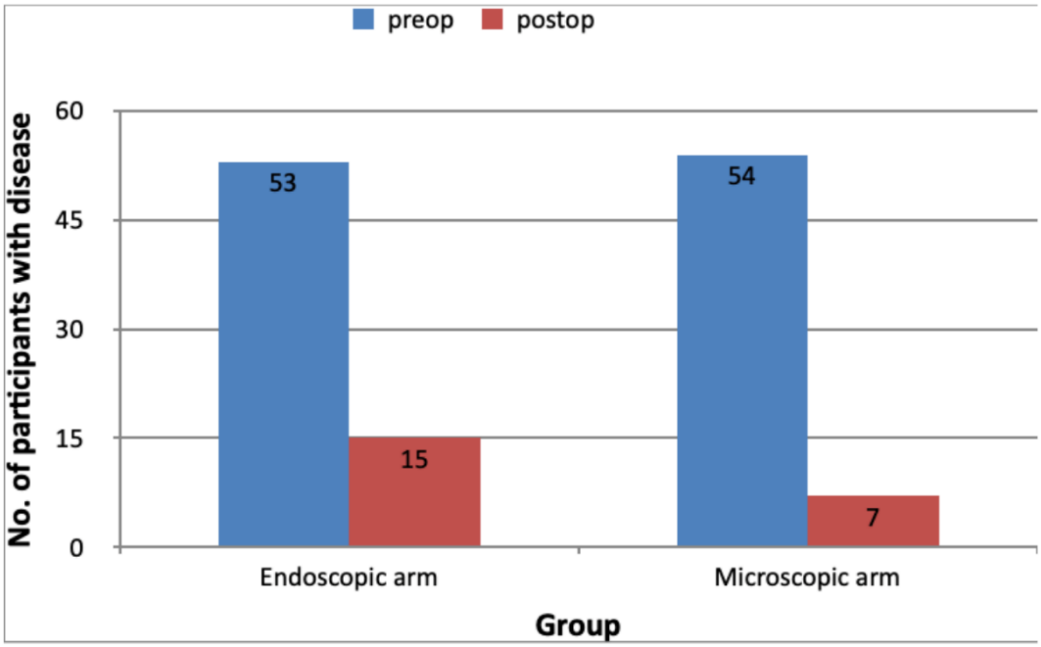


Figure 7. Comparison of disease clearance between the groups

Table 2. Comparison of disease clearance between the groups:

Group		DISEASE present	NO DISEASE	Statistical test used	P value
ENDOSCOPIC Surgery Group	Count	15	38	Chi-Square test	0.05
	% within Group	28.3%	71.7%		
MICROSCOPIC Surgery Group	Count	7	47		
	% within Group	13%	87%		

Hearing improvement between two groups

The hearing improvement was compared between the two groups. The data was found to be normally distributed. Hence comparison was done by independent t test. Both groups individually demonstrated statistically significant improvements in hearing thresholds (Figure 8) postoperatively, although the difference between the groups was not statistically significant (p = 0.845). So far, very few studies have compared surgical outcomes between microscope assisted and endoscope assisted surgeries in the management of chronic otitis media – squamous type.

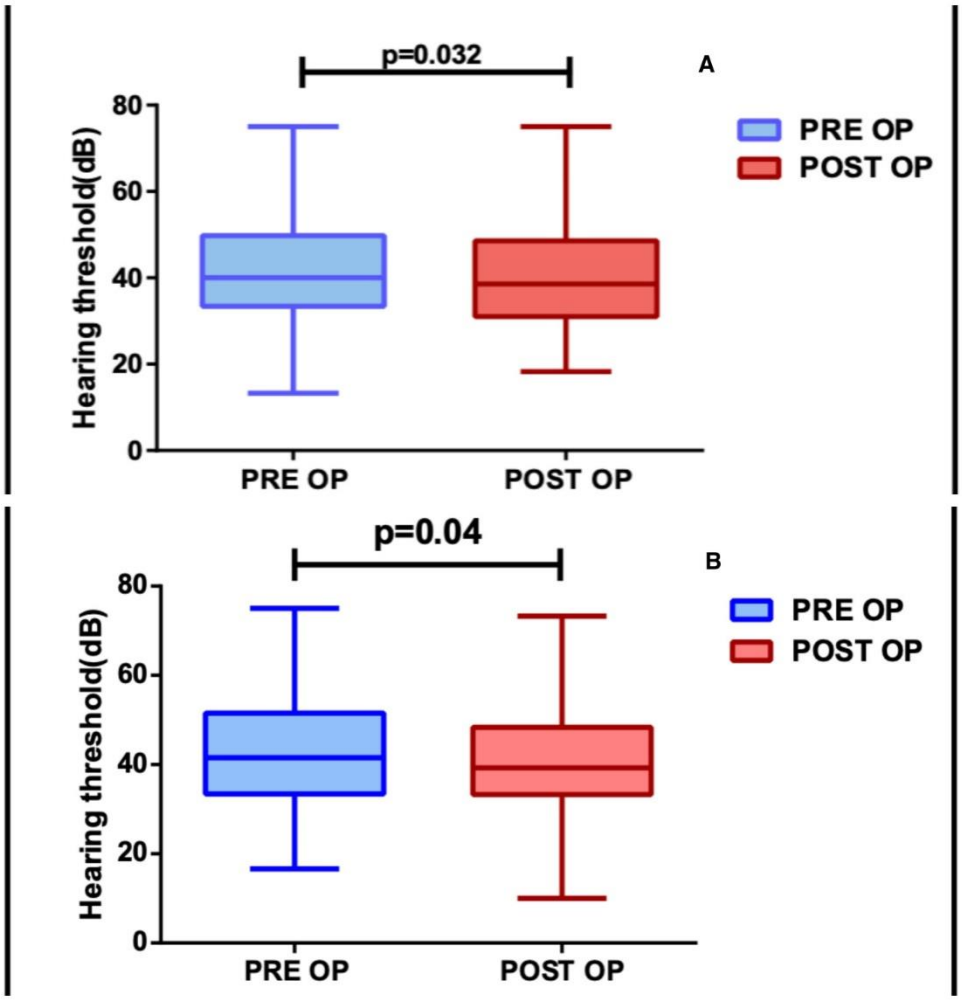


Figure 8. Showing hearing improvement comparison before and after Endoscopic (A) and Microscopic (B) ear surgery

Discussion

The findings of this study suggest that endoscope-assisted ear surgery is comparable to microscope-assisted surgery in terms of disease clearance and hearing improvement among patients with COM-squamous type. These results are consistent with previous studies demonstrating the efficacy of endoscopic techniques in the treatment of COM. While endoscopic surgery offers several potential advantages, including improved visualisation and reduced invasiveness, its effectiveness appears to be similar to that of traditional microscope-assisted techniques.

One possible explanation for the comparable outcomes between endoscope-assisted and microscope-assisted surgery is the meticulous surgical technique employed in both approaches. Both techniques allow for thorough disease clearance and precise reconstruction of middle ear structures, leading to favourable outcomes in terms of disease control and hearing improvement. Additionally, the similarity in outcomes may also be attributed to the surgeon's experience and familiarity with both techniques, ensuring consistent results across the study groups.

Endoscopic ear surgery has gained increasing attention in recent years as a

minimally invasive alternative to traditional microscope-assisted techniques. Studies have reported several potential advantages of endoscopic approaches, including improved visualisation of hidden areas of the middle ear, reduced need for extensive posterior canal wall removal, and potentially augmenting faster recovery times for patients. Tarabichi et al. (2013) conducted a prospective interventional trial evaluating endoscopic ear surgery in 146 patients with chronic otitis media. They reported a high rate of disease clearance (92.5%) and favourable outcomes in terms of hearing improvement. The study demonstrated the feasibility and effectiveness of endoscopic techniques in the management of chronic otitis media [5].

Badr-el-Din et al. (2002) performed a comparative study between endoscopic and microscopic approaches in 75 patients with chronic otitis media. They found that endoscopic ear surgery was associated with better preservation of ossicles and improved functional outcomes compared to microscope-assisted surgery. This study highlighted the potential benefits of endoscopic techniques in preserving middle ear anatomy and function [6].

Pradhan et al. (2015) conducted a study on 28 patients undergoing endoscopic atticotomy >10dB closure of A-B gap and disease clearance at 12-month follow-up, indicating the efficacy of endoscopic approaches in achieving favourable surgical outcomes [7].

It was found in one of the study on benefit of intraoperative usage of endoscopes showed that it gave the surgeon a better visualisation over the pathology, thus leading to proper eradication of disease [8].

In the study Marchioni et al recurrences were defined as re-retraction of the attic requiring revision and residuals were defined as insufficient primary resection of the epidermal matrix. Residuals were also defined by computed tomography just like in our study. CT was performed most frequently at 1-year follow-up. We had a follow up period of 6 months for the computed tomography study [9].

Microscope-assisted ear surgery has been the traditional approach for the management of chronic otitis media and has demonstrated long-standing success in disease clearance and hearing improvement. While endoscopic techniques offer certain advantages, microscope-assisted surgery remains a widely used and effective approach in otologic surgery.

Sasaki et al. (2006) conducted a study comparing outcomes between microscope-assisted and endoscopic surgery in 56 patients with chronic otitis media. They found significant hearing improvement and disease clearance in both groups, with no significant differences observed between the two approaches. This study emphasised the comparable efficacy of microscope-assisted surgery in achieving favourable outcomes [10].

Uyar et al. (2006) retrospectively analysed outcomes in 78 patients undergoing microscope-assisted attico-antrostomy for chronic otitis media. They reported low rates of recurrent disease recurrence and favourable hearing outcomes with microscope-assisted surgery. This study highlighted the effectiveness of traditional surgical techniques in achieving disease control and hearing improvement [11].

Austin et al. (1989) conducted a retrospective study comparing outcomes between canal wall up and canal wall down

procedures in patients with chronic otitis media. They found that canal wall down procedures were associated with lower rates of disease recurrence and better long-term outcomes. This study underscored the importance of good surgical technique in achieving successful outcomes in the management of chronic otitis media [12].

Several studies have compared outcomes between endoscopic and microscope-assisted ear surgery to determine the optimal approach for the management of chronic otitis media. While both techniques have demonstrated efficacy in achieving disease clearance and hearing improvement, differences in surgical technique and patient selection may influence outcomes. In one of the studies it is documented that attic cholesteatoma can be treated completely by a trans-canal approach alone [13]. Another study states that the endoscope allowed a clear understanding of cholesteatoma extension and improved eradication of even residual disease from hidden areas such as anterior epitympanic recess, retrotympanum, and hypotympanum which sometimes may be difficult to visualise with the operating microscope [14].

Mahadevaiah et al. (2008) conducted a comparative study between endoscopic and microscope-assisted surgery in paediatric patients with chronic otitis media. They found comparable outcomes in terms of disease clearance and hearing improvement between the two approaches, highlighting the feasibility of endoscopic techniques in paediatric otologic surgery [15].

Ramalingam et al. (2019) compared outcomes between endoscopic tympanoplasty with and without gelfoam in patients with chronic otitis media. They found similar rates of graft uptake and hearing improvement between the two groups [16].

It was found in one of the studies that an endoscopic technique allows transcanal, minimally invasive surgery and surveillance of cholesteatoma with long-term results that compare well to those of standard post aural methods of treatment [17]. In another study done by Dodson EE et al., the long-term results of an ear with use of endoscope had useful hearing and few problems with chronic medical care and therefore was more gratifying to the operating surgeon on follow up [18]. Overall, the literature supports the efficacy of both endoscopic and microscope-assisted ear surgery in the management of chronic otitis media-squamous type. While endoscopic techniques offer certain advantages, such as improved visualisation and reduced invasiveness, microscope-assisted surgery remains a widely used and effective approach. The postoperative pain and healing seems better results for endoscopic ear surgery patients [19]. In a study by Preyer S, use of endoscopes in ear surgery has been found to reduce the morbidity by reduction of normal bone removal and better chances of conservative surgery by improving visual control [20]. Further research is needed to compare long-term outcomes and determine the optimal approach for individual patients with chronic otitis media.

Conclusion

In conclusion, this randomised controlled trial demonstrates that endoscope-assisted ear surgery is equivalent to microscope-assisted surgery in the treatment of COM-squamous type. Both techniques offer satisfactory outcomes in terms of disease clearance and hearing improvement, with no significant

differences observed between the two groups. These findings support the use of endoscopic techniques as a viable alternative to traditional microscope-assisted surgery in the management of COM. However, further research with longer-term follow-up and larger sample sizes is warranted to confirm these findings and establish the optimal surgical approach for patients with COM-squamous type.

Conflict of interest

There is no conflict of interest involved with any of the authors.

Ethics approval and consent to participate

The ethical committee clearance was obtained in the m from The Institutional Human Ethics Committee (DCGI Reg. no. ECR/342/Inst/PY/2013) with reference no. /JIP/IEC/21/754. An informed consent for willingness to participate in the study was obtained from the patients before recruitment into the study.

Consent for publication

Not applicable

Availability of data and materials

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Competing interests

The authors declare that they have no competing interests.

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References

1. Akinpelu OV, Amusa YB, Komolafe EO, Adeolu AA, Oladele AO, Ameye SA. Challenges in management of chronic suppurative otitis media in a developing country. J Laryngol Otol. 2008 Jan;122(1):16–20.
2. Dubey SP, Larawin V. Complications of chronic suppurative otitis media and their management. Laryngoscope. 2007;117(2):264–7.
3. Sadé J. Surgical planning of the treatment of cholesteatoma and postoperative follow- up. Ann Otol Rhinol Laryngol. 2000 Apr;109(4):372–6.
4. Palva T. Surgical treatment of cholesteatomatous ear disease. J Laryngol Otol. 1985 Jun;99(6):539–44.
5. Tarabichi M, Nogueira JF, Marchioni D, Presutti L, Pothier DD, Ayache S.Transcanal endoscopic management of cholesteatoma. Otolaryngol Clin North Am.2013 Apr;46(2):107–30.
6. Badr-el-Din M. Value of ear endoscopy in cholesteatoma surgery. Otol Neurotol. 2002;23(5):631–5.
7. Pradhan P, Samal S, Mandal S (2015) Anatomical and Hearing Outcomes of Endoscopic Assisted Atticotomy with Cartilage Tympanoplasty in Cases of Limited Mastoid Disease. Ann Otolaryngol Rhinol 2(10): 1064.
8. El-Meselaty K, Badr-El-Din, M, Mandour M, Mourad M, Darweesh R. Endoscope affects decision taking in cholesteatoma surgery. Otolaryngol Head Neck Surg. 2003 Nov;129(5):490–6.
9. Marchioni D, Villari D, Mattioli F, Alicandri-Ciufelli M, Piccinini A, Presutti L. Endoscopic management

of attic cholesteatoma: a single-institution experience. Otolaryngol Clin North Am. 2013 Apr;46(2):201-9. doi: 10.1016/j.otc.2012.10.004.

10. Sasaki T, Xu A, Ishimoto S, Ito K, Yamasoba T, Kaga K. Results of hearing tests after total middle ear reconstruction. Acta Otolaryngol. 2007 May;127(5):474–9.
11. Uyar Y, Oztürk K, Keles B, Arbağ H, Ulkü CH. Anterior attico-antrostomy for cholesteatoma surgery. Ann Otol Rhinol Laryngol. 2006 Feb;115(2):150–5.
12. Austin DF. Single-stage surgery for cholesteatoma: an actuarial analysis. Am J Otol. 1989 Nov;10(6):419–25.
13. Aoki K. Advantages of endoscopically assisted surgery for attic cholesteatoma. Diagn Ther Endosc. 2001;7(3–4):99–107.
14. Presutti L, Marchioni D, Mattioli F, Villari D, Alicandri-Ciufelli M. Endoscopic management of acquired cholesteatoma: our experience. J Otolaryngol Head Neck Surg. 2008 Aug;37(4):481–7
15. Mahadevaiah A, Parikh B. Modified intact canal wall mastoidectomy — long term results in hearing and healing. Indian J Otolaryngol Head Neck Surg. 2008 Dec;60(4):317–23.
16. Ramalingam V, Ramanathan M, Muraleedharan A, Kamindan K, Ramkumar T, Venugopal M, Rajeswari M. A Study on Outcome of Myringoplasty in Dry Ear (Quiescent/Inactive CSOM) Without Using Gelfoam in Middle Ear. Indian J Otolaryngol Head Neck Surg. 2019 Nov;71(Suppl 2):1609-1614. doi: 10.1007/s12070-019-01687-x.
17. Tarabichi M. Endoscopic management of cholesteatoma: long-term results. Otolaryngol Head Neck Surg. 2000 Jun;122(6):874–81
18. Dodson EE, Hashisaki GT, Hobgood TC, Lambert PR. Intact canal wall mastoidectomy with tympanoplasty for cholesteatoma in children. Laryngoscope. 1998 Jul;108(7):977–83.
19. Magliulo G, Iannella G. Endoscopic versus microscopic approach in attic cholesteatoma surgery. Am J Otolaryngol. 2018 Jan-Feb;39(1):25-30. doi: 10.1016/j.amjoto. 2017.10.003.
20. Preyer S. Endoscopic ear surgery - a complement to microscopic ear surgery. HNO.2017 Jan;65 (Suppl 1):29–34.