



A COMPARISON OF OTOENDOSCOPY WITH OTOMICROSCOPY FOR DIAGNOSTIC AND SURGICAL EVALUATION

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ABSTRACT

Introduction: The tympanic membrane is the window into the middle ear, yet simply looking at it with the naked eye is insufficient to identify every condition. To visualize and document middle ear diseases, otologists now use an otomicroscope and an otoendoscope, which are required for surgical treatment [1]. Chronic Otitis Media is one of the common causes of hearing impairment and disability. The microscope revolutionized the surgical management of ear diseases, but the basic optical properties of the microscope have remained the same for the last 30 years [2]. The present study was intended to evaluate and compare the visualization of middle ear structures using an otomicroscope and 0 and 30-degree angled endoscopes in cases of Chronic Otitis Media (mucosal type) and also to make a surgical comparison in terms of advantages and disadvantages of the endoscope with the microscope in myringoplasty. **Aims And Objectives:** To visualize the middle ear structures by 0- and 30-degree angled endoscope and otomicroscope and to compare the results of endoscopic myringoplasty with that of myringoplasty done by using an operating microscope. **Material And Methods:** This was a comparative prospective study in which 100 patients, above the age of 15 years were examined by otomicroscopy and otoendoscopy. The visualization of various middle ear structures and the results of myringoplasty done with an endoscope and microscope were compared and statistically analysed. **Results:** 30-degree angled endoscope provided better visualization of middle ear structures than with the microscope. Endoscopic myringoplasty showed good results in terms of accessibility, duration of surgery, postoperative pain, and cosmesis. **Conclusion:** Otoendoscopy provided better visualization of various middle ear structures as well as showed good outcomes in surgical aspects. Thus, endoscopes can be utilized for better diagnosis, and it can be a good alternative to microscopic myringoplasty.

KEYWORDS

Otoendoscopy, Otomicroscopy, Chronic otitis media

INTRODUCTION

Chronic Otitis Media is one of the common causes of hearing impairment and disability. The microscope revolutionized the surgical management of ear diseases, but the basic optical properties of the microscope have remained the same for the last 30 years [2]. Mer and colleagues introduced middle ear endoscopy in 1967, and since then endoscopes are increasingly used for various middle ear surgeries [3]. Incorporation of otoendoscopy in middle ear surgery gives the surgeon better control over the pathology and therefore achieving better eradication of disease [4]. The endoscopes provide round the corner views of hidden areas of middle ear. The present study was intended to evaluate and compare the visualization of middle ear structures using an otomicroscope and 0- and 30-degree angled endoscopes in cases of Chronic Otitis Media (mucosal type) and also to make a surgical comparison in terms of advantages and disadvantages of endoscope with microscope in myringoplasty.

A) History Of Microscope In Ear Surgery

The word microscope was created in 1618 from two Greek words, micro and scope, to define a system using a combination of lenses for magnification, and it must be used only for the compound microscope. Three scientists can be associated with the first use of a monocular microscope in otology: Kessel in 1872, Weber-Liel in 1876, and Czapski in 1888 [5,6,7]. In 1951, Hans Littmann of the Zeiss company developed a new binocular dissecting microscope, which has been used since 1953 in otologic surgery with great success.

B) Otoendoscopy: Historical Background

The microscope has proved to have limitations because straight line view will produce blind areas and also there is difficulty in the visualization of the posterosuperior area of the tympanic cavity [8]. The first published description of the imaging of the middle ear by passing a fiberoptic instrument through existing tympanic membrane perforation was by Mer and Colleagues in 1967 [3]. Horlbeck et al directed the 0 and 30-degree endoscopes into the middle ear through the myringotomy incision and visualized the round window, oval window, and stapes suprastructure [9].

AIMS AND OBJECTIVES

To visualize the middle ear structures by 0- and 30-degree angled endoscope and otomicroscope and to compare the results of endoscopic myringoplasty with that of myringoplasty done by using operating microscope.

MATERIAL AND METHODS

This was a comparative prospective study, conducted on 100 patients, during the time period of October 2019 to October 2021 presenting to the ENT Out Patient Department, JNMCH, AMU, Aligarh with the diagnosis of Chronic Otitis Media (mucosal type), who were further admitted for surgical management. The patients of age 15 to 50 years with chronic otitis media (mucosal type) which were dry for at least 2 months were included in the study. Patients with canal stenosis, external auditory canal polyp, ossicular disintegrity, chronic otitis media (squamosal type), revision myringoplasty, patients not giving consent, and patients with only hearing ear were excluded from the study.

Method For Diagnostic Evaluation: Patients were explained about both the procedures and written informed consent was taken before the examination. A proper middle ear evaluation was carried out with the Carl Zeiss Otomicroscope and Karl Storz 0 and 30-degree rigid endoscopes. The middle ear structures assessed were the middle ear mucosa, oval window niche, round window niche, facial recess, sinus tympani, pyramid, handle of malleus, long process of incus, incudostapedial joint, stapes suprastructure, eustachian tube opening, hypotympanum. The percentage of cases of visualization of the middle ear structures using both methods were calculated and subjected to statistical analysis.

Method For Surgical Evaluation: A total of 100 patients were selected having central perforation of pars tensa. These 100 patients were randomly divided into two equal groups of 50 patients each. Patients in Group-A had undergone microscopic myringoplasty and Group-B had undergone endoscopic myringoplasty. All the patients underwent myringoplasty under local anaesthesia and temporalis fascia was used as a graft material in both groups. The approach for microscopic myringoplasty was post aural and the endoscopic was endomeatal. The patients were kept in follow-up for 3 months. The duration of surgery, ease of accessibility, post-operative pain, cosmesis result, pre-operative and post-operative audiogram, graft uptake were compared in both groups. Mann-Whitney U test and Chi-Square test were used for statistical analysis and statistical significance calculated. Graft uptake and post-operative audiogram were assessed after 3 months. Cosmesis result was after 2 weeks.

OBSERVATION AND RESULTS

In our study, conducted in 100 patients, most of the patients were in the age group of 25-34 years. Male predominance was found as 54 were males and 46 were females.

A) Diagnostic Evaluation

- 1) Middle ear structures which were better evaluated with 30-degree endoscope than microscope (statistically significant) were: Oval window niche, round window niche, facial recess, sinus tympani, pyramid, the long process of incus, incudostapedial joint, stapes suprastructure, eustachian tube opening and hypotympanum.
- 2) Middle ear structures better evaluated with 0-degree endoscope than microscope (statistically significant) were: Round window niche, oval window niche and facial recess (Table No. 1).
- 3) No statistically significant advantage of endoscopes over the microscope was found in the evaluation of middle ear mucosa.

B) Surgical Evaluation

The various areas of the middle ear were easily accessible in 70% of cases with the endoscope as compared to the microscope in 50% of cases. A statistically significant result was obtained in this parameter. The average time taken for surgery in the microscopic and endoscopic group were 120 minutes and 96 minutes respectively (Chart No.02). On Post Operative Day 3, 70% of patients in the endoscopic group and 40% in the microscopic group experienced moderate to severe intensity. Cosmesis result was better in the endoscopic group as compared to the microscopic group as 92% of patients in the endoscopic group rated their cosmesis result as excellent, while 80% were just satisfied in the microscopic group (Chart No. 01). Graft uptake in the microscopic group was 90% in the microscopic group and 88% in the endoscopic group, and there was also no statistical difference. Post-operative Air-Bone Gap within 20 dB was seen in 86% of patients in the microscopic group and 80% in the endoscopic group.

DISCUSSION

A) Diagnostic Evaluation

Evaluation of middle ear mucosa in this study, showed no statistically significant advantage of endoscopes over the microscope. When compared to a microscope, oval window and round window niche visualization with a 0- and 30-degree endoscope provided a better view with a statistically significant result (P -value<0.05). Shehzad Ghaffar et al. had mentioned that the medial wall of the middle ear is best viewed with the 30-degree endoscope [4]. Klug C et al. and Livi et al. had stated that the round window niche is better visualized with a wider angle of 30-degree endoscope [10,1]. The visualization of facial recess, sinus tympani and pyramid were much better with a 30-degree endoscope with the statistically significant result, in comparison with the microscope (P value<0.05). Walter Livi et al. and Tarabichi had found that the facial recess was best viewed by 30 and 70-degree endoscopes [1,11]. According to Klug C et al. Sinus tympani is better viewed with a 30-degree endoscope [10]. The visualization of the long process of incus, incudostapedial joint and stapes suprastructure with 30-degree endoscope showed better visualization with the statistically significant result on comparison with the microscope (P value<0.05). Toth M et al studied a detailed anatomical description of the medial wall, the auditory ossicles, stapedius muscle, and the pyramid with a 30-degree endoscope [12]. On comparing the visualization of eustachian tube opening and hypotympanum, 30-degree endoscope showed better view as compared to the microscope with the highly statistically significant result (P -value <0.05). Klug C et al. had described that the tympanic orifice of the tube can be seen better with a 30-degree endoscope [10].

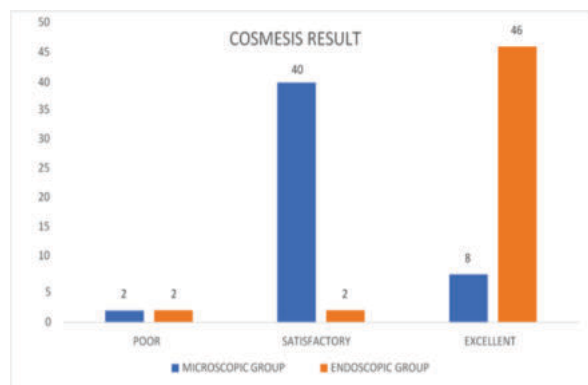
B) Surgical Evaluation

The various areas of the middle ear were easily accessible with the endoscope in 70 % of cases, with statistically significant result as compared to the microscope in 50% of cases. The endoscope can be easily negotiated through a curvy External Auditory Canal, avoiding frequent head manipulations. A similar observation was stated by Tarabichi in his study [11]. The average duration for the microscopic surgery was 120 minutes and that for endoscopic surgery was 96 minutes. A similar observation was there in the study conducted by Patel J. et al., Huang TY et al., and Lakpathi G et al [8,9,10]. The difference in the operating time may depend upon the surgeon and his/her expertise. However, it is the general observation that time taken in the endoscopic group is significantly lower in comparison to the microscopic group as the endoscopic group avoided long post aural incision and frequent head manipulations. On post-operative Day 3, 35 patients and 20 patients in the microscopic group and in the endoscopic group respectively experienced moderate to severe intensity pain. As the incision length was less in comparison to microscopic surgery, there was less dissection of normal tissues, less intraoperative bleeding causing less postoperative pain. Gadag R. et al.

in their study found that postoperative recovery was better in the endoscopic group [16]. In our study, 92% and 16% patients in the endoscopic group and microscopic group rated their cosmetic result as excellent, 2 patients in both groups showed poor cosmesis results and rest were just satisfied. Lakpathi G et al and Kumar et al in their study found that 100% of patients in the endoscope group rated their cosmetic results as excellent [15,17]. The graft uptake was present in 45 patients in the microscopic group and 44 patients in the endoscopic group. This result was in concurrence with the study conducted by Lakpathi G et al, Kumar et al [15,17]. In the post-operative audiogram done after 3 months, 43 patients (86%) in the microscopic group and 40 patients (80%) in the endoscopic group were having A-B Gap closure within 20 dB. In the study conducted by Lakpathi G et al., almost 90% of patients post-operatively had an improvement in conductive hearing loss with an average between 0- and 20-dB conductive hearing loss in both the microscopic and endoscopic group [15]. Harugop AS et al. in their study found that almost all the patients in both the microscopic and endoscopic groups had a post-operative hearing threshold within 30 dB [2].

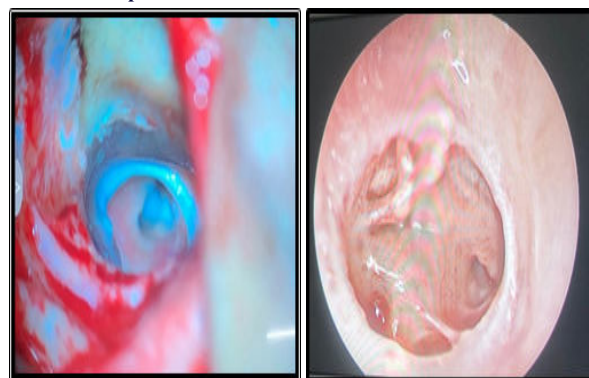
Table No. 1: Visualization Of Blind Niches By Microscope And 0- And 30-degree Angled Endoscope.

Blind Niches	Microscope		0 Degree Endoscope		30 Degree Endoscope	
	No.	%	No.	%	No.	%
FACIAL RECESS						
Not visualized	97	97	96	96	70	70
Visualized	3	3	4	4	30	30
					P-Value<0.05(HS)	
SINUS TYMPANI						
Not visualized	100	100	100	100	80	80
Visualized	0	0	0	0	20	20
					P-Value<0.05(HS)	
HYPOTYMPANUM						
Not visualized	64	64	60	60	32	32
Visualized	36	36	40	40	68	68
					P-Value<0.05(HS)	



Graph No 1: Cosmesis Result Of Endoscopic And Microscopic Myringoplasty.

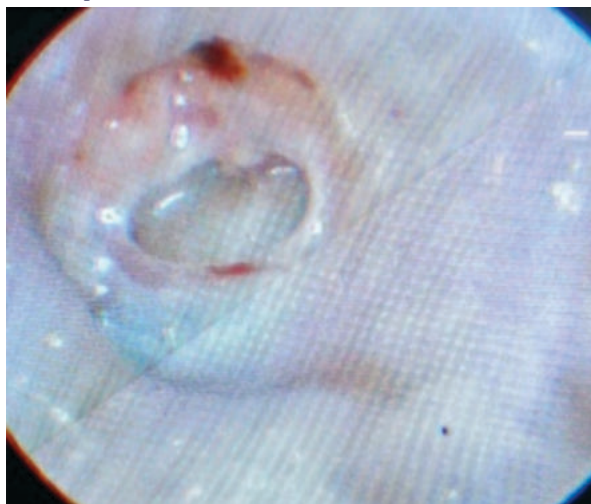
Picture No.1 -Visualization Of Central Perforation By Microscope And Endoscope



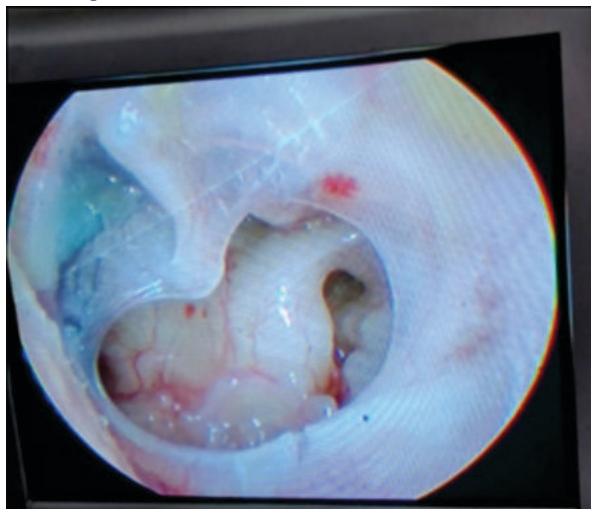
A)Microscope

B)Endoscope

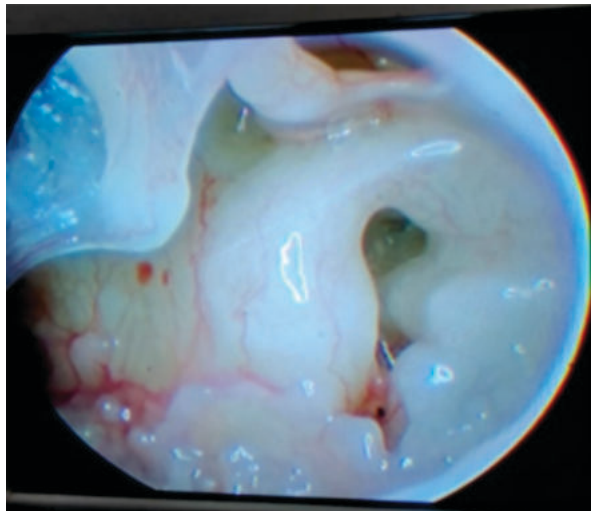
Picture 2- Visualization Of Middle Ear By Microscope, 0° And 30° Endoscope



Microscope



Zero Degree Endoscope



CONCLUSION

The main advantage of endoscopic myringoplasty observed was that it took considerably less time, reduced post-operative pain, easy accessibility to difficult areas, better cosmetic results, and easy transportability. The major disadvantage of the endoscopic approach was its one-handed technique and this becomes cumbersome, when there was excessive bleeding, obscuring the view of the operating field. However, this problem can be solved by developing a stand for it, which can fix the scope in the desired position. Endoscopes provides

monocular vision which leads to loss of depth perception. So, one has to be extra careful, while close to vital structures and positioning of the graft. Thus, endoscopic myringoplasty can be a good alternative to microscopic myringoplasty and in the future, endoscopes may be utilized for various ear surgeries like tympanoplasty, stapedotomy and cholesteatoma surgeries.

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