International Journal of Otorhinolaryngology and Head and Neck Surgery
Gupta N et al. Int J Otorhinolaryngol Head Neck Surg. 2019 May;5(3):764-768
http://www.ijorl.com
pISSN 2454-5929 | eISSN 2454-5937

Original Research Article

DOI: http://dx.doi.org/10.18203/issn.2454-5929.ijohns20191746

Evaluating the role of otoendoscope in cholesteatoma surgery

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Received: 01 April 2019
Revised: 18 April 2019
Accepted: 19 April 2019

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ABSTRACT

Background: Endoscope assisted ear surgery (EAES) reduces the chances of residual cholesteatomas as compared to the conventional microscopic technique, primarily because of the direct visualization of sites where residual cholesteatoma is common, which is often missed out during the traditional microscopic surgical procedure. The aim of the study was to evaluate the hidden areas of middle ear using endoscopes during the conventional microscopic cholesteatoma surgery.
Methods: The present prospective study was carried out in the Dept. of Otorhinolaryngology and Head & Neck Surgery, Shri Mata Vaishno Devi Narayana Superspeciality Hospital, Katra, Jammu for a period of one year during which a total of 20 patients of acquired cholesteatoma who underwent conventional microscopic surgery were followed by oto-endoscope assisted examination were enrolled.
Results: Otoendoscope was used in all the surgeries to look for residual cholesteatoma in the hidden areas like protympanum, sinus tympani and anterior attic. An overall incidence of cholesteatoma observed and removed from hidden areas using otoendoscope was recorded to be 30% in the present study.
Conclusions: Microscopic ear surgery assisted with oto-endoscope allows a better visualization of the extent of cholesteatoma and thus improved eradication of residual/recurrent disease from the hidden areas of middle ear such as facial recess, sinus tympani, anterior epitympanic space, protympanum and hypotympanum.

Keywords: Otoendoscope, cholesteatoma, Microscope

INTRODUCTION

Since the introduction of endoscope in 1990's to ear surgery many advances have occurred in the surgical techniques used. The endoscope has not only started the concept of minimally invasive ear surgery but in the last two decades, has also changed the anatomical and physiological concepts, we have been following.

Endoscope assisted ear surgery (EAES) has reduced the chances of residual cholesteatomas as compared to traditional microscopic technique. This is primarily because of the direct visualization of sites where residual cholesteatoma is common, such as the anterior and posterior epitympanic spaces, sinus tympani, facial recess, eustachian tube and hypotympanum.[1-4] These sites are often missed out during conventional microscopic surgical procedure's owing to the linear view offered by microscope. Moreover, it was found that retraction pockets extending into the facial recess may be more readily removed by using endoscopes than by converting to an intact canal wall mastoidectomy with a facial recess approach.[3,5]

The primary aim of cholesteatoma surgery is to eradicate the disease and for complete eradication, full exposure

and proper visualization of middle ear spaces is important.[6,7] Keeping this in mind, the present study was conducted to evaluate the hidden areas of middle ear using endoscopes during the conventional microscopic cholesteatoma surgery.

METHODS

The present prospective study was carried out in the Dept. of Otorhinolaryngology and Head & Neck Surgery, Shri Mata Vaishno Devi Narayana Super Speciality Hospital, Katra, Jammu for a period of one year from July 2017 to June 2018 during which a total of 20 patients of acquired cholesteatoma were enrolled. All these patients underwent conventional microscopic surgery for cholesteatoma which on completion was followed by oto-endoscope assisted examination, so as to inspect and clear any cholesteatoma remnant, in the hidden areas.

Patients 12 years and above with acquired cholesteatoma or revision cases with residual or recurrent cholesteatoma or continuous ear discharge even after completion of 1 year of previous surgery were included in the present study while patients aged less than 12 years, cases of mucosal COM, retraction pocket, iatrogenic and congenital cholesteatoma were excluded.

A detailed history, complete ENT examination, pure tone audiometry, HRCT temporal Bone, examination under microscope and endoscopic assessment were performed pre-operatively in all the patients. All these patients were followed up for 6 months post operatively.

RESULTS

Out of the total 20 patients, there were 14 males and 6 females. Most of our patients were from 25-55 years of age with mean age of 40±12.96 years (Table 1).

Table 1: Age wise distribution of patients (n=20).

Age	Number	Percentage (%)
12-25	2	10
26-40	7	35
41-55	8	40
Above 55 years	3	15

All the patients presented with clinical features of ear discharge and decreased hearing. 3 patients presented with otalgia and 6 patients had unilateral tinnitus (Table 2).

All the cases were unilateral diseased ear, with 14 patients operated on right ear and 6 patients on the left. 18 patients out of the total 20 patients underwent canal wall down mastoidectomy out of which 13 patients underwent inside out mastoidectomy and 5 patients underwent outside in mastoidectomy. 2 patients underwent atticotomy and in this patient's reconstruction of the attic were done (Table 3).

Table 2: Clinical features of patients (n=20).

Symptoms	Number	Percentage (%)
Ear discharge	20	100
Impaired hearing	20	100
Otalgia	3	15
Tinnitus	6	30

Table 3: Surgical procedure done (n=20).

Procedure	Number	Percentage (%)
Canal wall down mastoidectomy (inside out)	13	65
Canal wall down mastoidectomy (posterior to anterior)	5	25
Atticotomy	2	10

Otoendoscope was used in all the surgeries to look for residual cholesteatoma in the hidden areas like protympanum, sinus tympani and anterior attic. In our study, 5 patients out of 13 patients who underwent canal wall down mastoidectomy (posterior to anterior), residual cholesteatoma was detected by otoendoscope and removed from sinus tympani and anterior attic, whereas in 1 patient out of 5 patients who underwent canal wall down mastoidectomy (Insideout) residual cholesteatoma was detected by otoendoscope and removed from sinus tympani, anterior attic and protympanum. No cholesteatoma remnants left inadvertently were observed by otoendoscope in 2 patients of microscopic atticotomy. Overall incidence of cholesteatoma observed and removed from hidden areas by endoscope was 30%.

Table 4: Cholesteatoma detected by otoendoscope from hidden areas during surgery (n=20).

Site of cholesteatoma in hidden areas	Number	Percentage (%)
Sinus tympani and anterior attic	5	25
Sinus tympani, anterior attic and protympanum	1	5
Total	6	30

In the present study all the 20 (100%) patients had some form of ossicular discontinuity with incus deformed/ absent in all the 20 (100%) patients and stapes superstructure in 14 (70%) patients. Maximum 13 (65%) patients having M+I-S-, followed by 4 (20%) patients having M+I-S+ and 2 (10%) patients having M-I-S+ (Table 5).

Table 5: Ossicular status, as per Austin classification (n=20).

Type	Ossicular status	Number	Percentage (%)
A	M+I-S+	4	20
B	M+ I-S-	13	65
C	M-I-S+	2	10
D	M-I-S -	1	5

Meatoplasty/concho-meatoplasty was done in 18 (90%) patients. Attic reconstruction was done in 2 (10%) patients who had undergone atticotomy.

Table 6: Surgical procedure in addition to mastoidectomy (n=20).

Surgical procedure	Number	Percentage (%)
Attic reconstruction	2	10
Tympanoplasty	20	100
Meatoplasty	15	75
Conchomeatoplasty	3	15

Postoperatively, on the first day, all the patient's had intact facial nerve functions, 2 patients complained of vertigo which improved by second postoperative day. Rinne's test was negative in all the patients and weber's lateralized to the ipsilateral ear. All patients reported back for follow-up after 6 months. Postoperative Air-Bone gap improved in 17 out of 20 patients. Rest 3 patients were cholesteatoma hearer's. Three patients developed retraction of the tympanic membrane. 2 patients were lost to follow-up after 12months of surgery.

DISCUSSION

Mastoidectomy, one of the most frequently performed procedures in otorhinolaryngology practice, conducted under the operating microscope has been found to have its limitations as the view during surgery is defined and limited by the narrowest segment of the ear canal. It was a must to create a parallel port through the mastoid to gain keyhole access to the attic, but the visualization with the microscope was still limited. The surgeon can visualize the structures only directly ahead and is unable to see objects that are "around the corner." These limitations can be overcome with the complementary help of endoscopes which enable clear visualization of middle ear recesses not well seen with microscope.[1,4,8]

The main goals for Cholesteatoma surgery are disease eradication leading to safe and dry ear, hearing preservation and/or restoration, maintenance of temporal bone anatomy, and prevention of recurrence. Complete resection of cholesteatoma is paramount among these prerequisites.[9,10]

The use of endoscope in middle ear surgery represents a significant advancement in the management of cholesteatoma especially from hidden areas. Endoscopic middle ear surgery can offer some advantages compared to the traditional microscopic technique, guaranteeing excellent visualization of mesotympanic structures and direct visual control of hidden areas such as anterior epitympanic spaces, retrotympanum and protympanum. The present study was conducted to evaluate the role of endoscope in assisting ear surgery done under microscope.

In the present study, maximum patients were in the age group of 20-50 years. Toran et al studied surgical management of sinus tympani cholesteatoma on patient aged between 7 years to 73 years with the mean age of 23 years while Presulti et al studied endoscopic management of acquired cholesteatoma on patients with the mean age of 34.03 years.[11,12] Marchioni et al studied endoscopic approach to tensor fold in patients with attic cholesteatoma with median age of 38.4 years.[13]

The present study included 14 (70%) males and 6 (30%) females. Toran et al in their study included 42 (65.7%) males and 22 (34.3%) females where as in a study by Tarabichi, 22 (31.8%) patients were males and 47 (68.1%) females.[11,14] Sajjadi in his study of endoscopic middle ear and mastoid surgery for cholesteatoma included 116 (51.7%) males and 108 (42.2%) females.[15]

In the present study all the 20 (100%) patients had ear discharge and impaired hearing while tinnitus was complained by 6 (30%) patients and otalgia by only 3 (15%) patients. Ayubi et al studied value of oto-endoscopy for residual disease after Radical and modified radical mastoidectomy for cholesteatoma and their patients, presented with foul smelling aural discharge as the major complaint in 45%, deafness with aural discharge in 55%, whereas 45% had history of bilateral ear discharge.[16]

In the present study, 14 (70%) patients were operated on the right side and in the remaining 6 (30%) patients, left side was operated. In all the 20 patients, unilateral side was only operated. In the study by Toran et al done on 64 ears, 6 patients underwent surgery for both the ears. In the study by Sajjadi, there were 224 patients with 249 primary ears, with 25 bilateral cases.[11,15]

In the present study, out of the 20 patients, 18 (90 %) patients underwent canal wall down mastoidectomy, 2 (10%) patients underwent atticotomy with attic reconstruction. Yung, performed 231 cholesteatoma operations wherein closed cavity mastoidectomy was done in 53 (22.9%) cases, small cavity mastoidectomy with obliteration of the residual mastoid bowel using a cartilage perichondrial composite graft was carried out in 115 (49.7%) cases, open mastoidectomy with primary canal wall reconstruction was done in 44 (19.0%) cases and open mastoidectomy with primary obliteration of mastoid cavity was carried out in 19 (8.2%) cases.[17] While, Badr-El-Dine studied the endoscope assisted

surgery of sinus tympani cholesteatoma and of the 294 cases 212 (72.1%) cases were operated upon using canal wall up (CWU) technique and 82 (27.8%) cases were operated upon using canal wall down (CWD) procedure.[18]

In the present study, 5 out of the 13 patients who underwent canal wall down mastoidectomy (Posterior to anterior), residual cholesteatoma was detected by otoendoscope and removed from sinus tympani and anterior attic, whereas in 1 out of the 5 patients who underwent canal wall down mastoidectomy (Inside out), residual cholesteatoma was detected by otoendoscope and removed from sinus tympani, anterior attic and protympanum. No cholesteatoma remnants left inadvertently were observed by otoendoscope in 2 patients of microscopic atticotomy. Overall incidence of cholesteatoma observed & removed from hidden areas by endoscope was 30%. In the study by Yung, site analysis of residual cholesteatoma revealed an incidence of 3.6% in epitympanum, 10.5% in sinus tympani, 1.4% in mesotympanum and 0.7% in mastoid bowl.[17] 8.2% patients were found to have residual cholesteatoma. The commonest site of residual cholesteatoma was still in the blind area of the sinus tympani giving an incidence of 10.5% in spite of endoscopic assisted surgery. In comparison the incidence of residual cholesteatoma in mastoid bowl was only 0.7%. In the study by Badr-el-Dine the overall incidence of intraoperative residual cholesteatoma detected with endoscope was 22.8%.[19] Sinus Tympani was most common site in both CWU and CWD followed by facial recess and under surface of scutum in the CWU cases. In another study by Mohamed M.K. Badr-El-Dine, in the primary surgery after completion of microscopic cleaning, the overall incidence of intra operative residuals detected with the endoscope was 49 (16.7%) cases.[18] Sinus tympani was the most common site of intraoperative residuals in both CWU and CWD groups (36.7%), followed by the facial recess (28.6%) and the undersurface of the scutum in the CWU cases (20.4%) and the anterior epitympanic recess (14.3%). In a study by Sajjadi on endoscopic middle ear and mastoid surgery for cholesteatoma in 249 patients, of the 182 (73.09%) cases receiving primary closed cavity technique, once the microscopic cholesteatoma was resected and the surgeon was confident there was no visible cholesteatoma, endoscopy revealed a 22% incidence of cholesteatoma residual at the time of the primary operation (40 patients).[15] The distribution of the residual cholesteatoma was 55% in the sinus tympani (22 patients), 30% in the attic (12 patients), and 15% in the cog areas (6 patients).

In the present study all the 20 (100%) patients had some form of ossicular discontinuity, with incus deformed/ absent in all the 20 (100%) patients and stapes superstructure in 14 (70%) patients. Maximum 13 (65%) patients having M+I-S-, followed by 4 (20%) patients having M+I-S+ and 2 (10%) patients having M-I-S+. In the study by Toran et al, 62 (96.8%) ears had some forms of ossicular discontinuity with incus and stapes damaged in 26 (40.6%), only incus in 14 (21.9%), malleus, incus and stapes in 16 (25%), malleus and incus in 6 (9.3%) and intact ossicles in 2 (3.12%).[11]

In the present study, tympanoplasty was done in all the patients, meatoplasty/concho-meatoplasty was done in 18 (90%) patients while attic reconstruction was done in 2 (10%) patients who had undergone atticotomy. In the study by Presulti et al, 18.7% patients underwent scutum reconstruction using a mastoid cortical bone graft, ossicular chain reconstruction was performed in 18 (56.2%) patients during the first surgery and all the patients underwent an overlay myringoplasty.[12] In study by Badr-el-Dine reconstruction was performed in primary surgery in 86 (93.5%) and postponed to second stage in 6 (6.5%) cases.[19]

In the present study, 3 (10%) patients had mild retraction of tympanic membrane, no cholesteatoma pearl, iatrogenic facial nerve injury, vertigo, sensorineural hearing loss or recurrence/residual cholesteatoma was seen in any of the patients. Toran et al in their study of 64 ears reported that 6 ears (9.4%) never became dry (follow-up time 6 months to 2 years), 3 of these ears (4.6%) had cholesteatoma along with extensive granulation tissue of mastoid bowl.[11] Tarabichi in their study on 69 patients had no iatrogenic facial nerve injuries, bone threshold was stable and 5 (6.8%) ears required revision for recurrent and clinically evident disease.[14] 8 (10.9%) ears were revised for failed ossicular reconstruction or persistent perforation, with 1 of these reconstruction failures showing a small incidental pearl attached to the underlying of tympanic membrane. Moderate to severe retraction in other areas of tympanic membrane was evident in 28 (38.3%) ears but none of these required any further intervention.

CONCLUSION

Microscopic ear surgery assisted with oto-endoscope allows a better visualization of the extent of cholesteatoma and thus improved eradication of residual/recurrent disease from the hidden areas of middle ear such as facial recess, sinus tympani, anterior epitympanic space, protympanum and hypotympanum.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

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Cite this article as: Gupta N, Lal M, Gupta R. Evaluating the role of otoendoscope in cholesteatoma surgery. Int J Otorhinolaryngol Head Neck Surg 2019;5:764-8.