Otoendoscopy - A New Horizon in Ear Surgery

Dr. Debashis Biswas*, Dr. Kaushik Mandal**, Dr. Amitabha Roychoudhury***,
Dr. Ranjan Roychowdhury****

Abstract

Introduction: Middle ear surgery is usually performed with an operating microscope. Surgical eradication of cholesteatoma involves canal wall down or intact canal wall techniques. One of the important causes of failure is residual disease in the posterior tympanum specially the sinus tympani. Endoscopic intraoperative visualization of these regions and subsequent disease clearance has been demonstrated to reduce the recurrence of cholesteatoma in mastoidectomy.

Objective: To demonstrate the effectiveness of otoendoscopy along with microscopy vis-a-vis microscopy alone for disease clearance from the sinus tympani.

Materials and Methods: In this prospective study, a total of 40 ears with acquired cholesteatoma were operated upon between January 2012 and August 2013. Twenty three under went canal wall up (CWU) technique and rest (17) by canal wall down (CWD) procedure. Otoendoscopic evaluation was done after disease clearance of middle ear cleft by microscopy and remaining disease if any cleared.

Results: There were five cases (12.5%) (three CWU mastoidectomy and two CWD mastoidectomy) in which the sinus tympani contained cholestatoma after clearance by microscopy. Otoendoscopy helped to clear remaining cholesteatoma completely in all cases. All patients were followed up for at least six months and no recurrence of cholesteatoma has been detected. So otoendoscopy assisted mastoid surgery provides 100% disease clearance in comparison to 87.5% disease clearance with conventional microsurgery alone.

Conclusion: Otoendoscopy provides a panoramic view of the middle ear cavity and should be added to surgical armamentarium during mastoidectomy procedure for better disease clearance and surgical outcome.

Keywords: Otoendoscopy, ear, sinus tympani, cholesteatoma, canal wall up, canal wall down, microscopic surgery.

Introduction: Middle ear surgery is generally performed with an operating microscope. It is very difficult, however, to operate on certain hidden areas using an operating microscope even if the surrounding bone is removed. Such sites include the epitympanum and posterior parts of the mesotympanum. Surgical eradication of cholesteatoma involves canal wall down or intact canal wall techniques. The choice of technique depends on the extent of the disease. Elimination of a mastoid bowl and better hearing are the major advantages of the canal wall up procedure. The main disadvantage of canal wall up mastoidectomy is the incidence of residual disease, which may be as high as 40%. This high rate of persistent pathology is due to poor visualisation of the middle ear regions that harbour residual disease such as the epitympanum and the posterior tympanum. It is documented that preoperative and intraoperative otoendoscopic evaluation gives more accurate findings than the conventional procedures.

The first endoscope was probably introduced by a German physician named Philipp Bozzini, two centuries ago. Until the end of the nineteenth century developments in endoscopic surgery came from the urologists. In the last 30 years the endoscope has revolutionized endonasal surgery. Mer in 1967 was the first to describe use of an endoscope to view the anatomy of the middle ear. Despite his initial success, the endoscope had only limited use as an instrument to take photographs of the tympanic membrane. Two decades later Nomura popularized the idea of myringotomy to permit endoscopic examination of the middle ear structures. In 1989, Kimura introduced the concept of endoscopy of the middle ear through the eustachian tube orifice. Although as effective as transtympanic endoscopy, it is technically more difficult to perform.

Although otoendoscopy has been introduced years ago, its use in management of ear pathology is still limited. Considering the shortcomings of tympanomastoid surgery using the microscope, we propose to investigate whether addition of otoendoscopy in the surgical armamentarium offers any additional therapeutic benefit.

* Resident Registrar
** Assistant Professor
*** Professor
Dept. of ENT, Vivekananda Institute of Medical Sciences, Ramakrishna Mission Seva Pratishthan
Aims: To demonstrate the effectiveness of otoendoscopy along with microscopy vis-a-vis microscopy alone for disease clearance from the sinus tympani.

Materials and Methods: This prospective study was carried out in the Department of ENT and Head-Neck Surgery, Vivekananda Institute of Medical Sciences, Ramakrishna Mission Seva Prathisthan, Kolkata, between January 2012 and June 2013. Forty consecutive cases of Chronic Otitis Media with Cholesteatoma (Active Squamosal Chronic Otitis Media) attending the outpatient clinic were included. A customized proforma was used to maintain records for each patient. Detailed pre-operative findings and relevant investigations including evaluation under microscope (EUM) and evaluation with otoendoscope were recorded. Transcanal endoscopy was performed preoperatively in all cases for diagnostic evaluation using 2.7 mm, 11 cm Hopkins rod telescopes (0, 30 and 45-degrees).

Canal wall up or canal wall down mastoidectomy was performed depending on the intra-operative findings of disease extension. Otoendoscopic evaluation was done in every case, after disease clearance with the operative microscope to evaluate the presence of any remaining disease in any corner of the tympanic cavity with special attention to sinus tympani. Any such remaining disease was removed with the help of the otoendoscope. Standard postoperative management was carried out for all patients.

Patients were followed up at three and six months post-surgery for any residual or recurrence of cholesteatoma.

Results: Forty patients with cholesteatoma were included in the study. The male female ratio was 1:1. The mean age was 28.12 years, ranging from 9 to 58 years. The standard deviation was 12.87. Amongst the forty cases, five (12.5%) patients were of paediatric age group (i.e. less than 15 years). The intraoperative findings of disease extension were as follows: 38 (95%) of the ears had attic cholesteatoma, 17 (42.5%) had cholesteatoma extension in the sinus tympani, 17 (42.5%) into the antrum and 14 (36%) in the other mastoid air cells.

The initial operation was performed, as usual, with the operating microscope in all 40 cases. Canal wall up (CWU) mastoidectomy was performed in 23 cases (57.5%), whereas canal wall down (CWD) technique was used in 17 cases (42.5%). All cases were approached through the standard (Wilde’s) post-auricular incision. After complete disease clearance of cholesteatoma using the operating microscope, otoendoscopy was used to verify and detect any cholesteatoma remaining in any areas. In case any remnant was detected, it was removed under endoscopic control.

Three (13%) out of 23 ears undergoing canal wall up (CWU) surgery and 2 (11.8%) out of 17 ears undergoing canal wall down (CWD) surgery had residual cholesteatoma in the sinus tympani detected by otoendoscopy after the surgeon had achieved satisfactory eradication of pathology using the microscope.

So, out of the total 40 cases, 23 operated with canal wall up procedure and 17 operated with canal wall down procedure, five cases (12.5%) had residual disease in the sinus tympanum after primary surgery with operating microscope. This residual disease was cleared under endoscopic control in all five cases.

Therefor comparing the disease clearance between microscopy vis- a-vis combination of microscopy and otoendoscopy, we have found that microscopy could clear disease in 35 cases (87.5%) and the combination of otoendoscopy with microscope provided complete disease clearance from all the 40 (100%).

The operation were completed by interposition ossiculoplas, augmentation ossiculoplasty or simple ossiculoplasty with the cartilage from the tragus where applicable. In all cases we have performed tympanoplasty according to the patient’s indications. In all cases we applied aural pack with ribbon gauze soaked in soframycin ointment and a mastoid bandage which was removed in due course.

All patients underwent microscopic and otoendoscopic examination at 3 and 6 months after surgery, to look for any sign of recurrent or residual cholesteatoma and no recurrence has been detected till date.

Discussion:

In our study, canal wall up tympanomastoidectomy (CWU) was the technique done in 23 cases (57.5%) and canal wall down tympanomastoidectomy (CWD) was performed in 17 cases (42.5%). Mohamed M.K et al documented the necessity of endoscopy in tympanomastoid surgery. They operated on a total of 294 ears with acquired cholesteatoma (primary or secondary).

In that study, 212 (72%) cases were operated upon using canal wall up (CWU) technique, and 82 (28%) cases were operated upon using canal wall down (CWD) procedure. Otoendoscopy was incorporated complementary to the microscope as a principal part of the procedure in all cases. As in our study higher number of patients underwent CWD mastoidectomy (42.5%) compared to the above mentioned study, possibly due to late presentation of the patients when the disease has resulted in more bone erosion.

Shelton and Sheehy in 1990 reported residual cholesteatoma in one third of their cases and attributed it
to poor control over areas difficult to reach with the microscope. Dodson EE et al. in 1988 observed that residual disease may reach up to 42% in canal wall up technique, & 12% in canal wall down technique. In our study we have found that intraoperative residual cholesteatoma was 13% in CWU mastoidectomy operation and 11.8% in CWD mastoidectomy operation when using microscope only and no residual cholesteatoma was left when both microscope and otoendoscope were used in tympanomastoid surgery.

Thomasin et al. in 2007 reported that the sinus tympani was considered the main site of recurrence. According to them ST remains the most difficult diseased site in the middle ear and can be challenging to address. The present study also confirmed ST was the only site of intraoperative cholesteatoma remnant in both CWU and CWD groups (total 5 cases, 3 CWU mastoidectomy and 2 CWD mastoidectomy).

Our results are in tandem with the series by Young et al. in 1994 who studied the use of endoscope in cholesteatoma surgery and documented that endoscope provided better control over pathology in difficult-to-visualize areas. Mohamed et al. in 2009 documented that the use of endoscopes achieved a significantly higher degree of control over middle ear disease and dramatically reduced the incidence of cholesteatoma recurrence particularly in those hidden recesses such as the sinus tympani. Meselaty et al. (2003), Tarabichi et al. (2010), Migirov et al. (2011) also opined that endoscopy provides better control over pathology and better eradication of disease and allowed complete eradication of cholesteatoma. In our study we have also found that complete clearance of the cholesteatoma (100%) could be achieved when otoendoscopy was added in the surgical armamentarium during mastoidectomy operation.

Ozturan et al. in 1996 stated that the ST is the most often mentioned inconspicuous region for which endoscopic ear surgery has a place. They believed that while endoscopes may improve visualization of this area, they do not solve the problem of removing the disease. We disagree with this statement, as in our experience using the 30° endoscope together with the specially adapted instruments, perfect control over the disease could be achieved, enabling complete intraoperative disease clearance in our series.

Different surgical techniques have been proposed to access the ST. The usual approach when using microscope is to perform blind probing with blunt instrumentation. The anterior approach consists of drilling the posterior wall of the EAC, delineating the facial nerve and circumnavigation of the microscope around the patient's head. Even with this careful dissection, only a minority of ST with limited depth (less than 1mm) could be adequately accessed by this approach as described by Cesario de Abreu CE et al. in 2007. Toran et al. in 2004 also described in detail the surgical steps to manage ST cholesteatoma but they concluded that complete removal of pathology could not always be confirmed. On the other hand, posterior approaches, i.e. from the mastoid to the tympanic cavity, necessitate excessive drilling in the retrofacial region as commented by Pickett BP et al. in 1995. In the present study, ST was approached endoscopically. Our results showed that endoscopes offer effective control of the disease due to better visualization round the corner. Moreover, as the disease clearance is done under direct vision without unnecessary drilling the procedure remains safe. The facial recess approach or posterior tympanotomy provides access to oval window region and facial recess, but it does not permit visually controlled surgery of the tympanic sinus, as noted by Thomaasin et al. in 1993. Facial recess approach was not performed in any of our patients.

Bottrill and Poe in 1995 concluded that wide-angle endoscopes, particularly 30° and 45°, provide a panoramic view of the oval window, facial recess as well as sinus tympani even with preservation of posterior canal wall and with no need for posterior tympanotomy. According to our experience, the 30° endoscope gave the best overall exposure of the middle ear recesses particularly ST in both CWU and CWD procedure. Our results show that endoscopy provides effective control over the disease thereby reducing the need to drill superfluous bone.

All patients in our series were followed up 3 and 6 months after their surgery. The patients underwent microscopic as well as otoendoscopic examination at follow up. At the end point of our study, 6 months post-surgery, none of our patients had any sign of recurrent or residual cholesteatoma. It is needless to say that long-term follow-up is very important when discussing the recurrence rate of cholesteatoma. The rate of recurrence increases with follow-up time. In our study, through follow-up to date is relatively short, further observation are planned to assess long-term results.

Summary: Forty cases of active squamous COM (cholesteatoma) were treated surgically within a period of 18 months and followed up for a period of 6 months each. Five (12.5%) cases belonged to the paediatric age group (less than 15 years). Preoperatively, all the patients were evaluated clinically, under microscope and otoendoscopically. All of our patients had cholesteatoma. The disease was found most commonly in the attic followed by the sinus...
tympani and the antrum. A canal wall up or a canal wall down mastoidectomy was performed depending on the intra-operative findings of disease extent. 57.5% of patients underwent canal wall up and 42.5% underwent canal wall down mastoidectomy. Otoendoscopic evaluation was done in every case, after disease clearance with the operative microscope, to evaluate the presence of any remaining disease in any corner of the tympanic cavity with special attention to the sinus tympani. Out of the total 40 cases, five cases (12.5%) had residual disease in the sinus tympani after primary surgery with operating microscope. We found that microscopy alone could clear disease in 35 (87.5%) patients and the combination of otoendoscope with microscope provided complete disease clearance in all the 40 (100%) cases. Patients were followed up for a minimum period of six months post-surgery for any residual or recurrent cholesteatoma and no residual/ recurrent disease was detected.

Conclusion: Otoendoscope has proven to be an extremely useful tool to be look into and clear disease from the recesses of the middle ear and mastoid cavity. The use of the endoscope could achieve significantly higher degree of control over the disease during tympanomastoid surgery. It also reduced the incidence of intraoperative remaining cholesteatoma and residual or recurrent disease at six months follow up. Further observation is planned to assess longer-term results and confirm the efficacy of endoscopy as an adjunct in cholesteatoma surgery.

We conclude that otoendoscope provides an enlarged panoramic view of the middle ear cavity, which ensures better disease clearance and superior surgical outcome and should be added to the surgical armamentarium during a tympanomastoid surgery.

References: