The Journal of Laryngology and Otology
April 1994, Vol. **108**, pp. 307–309

The use of rigid endoscopes in cholesteatoma surgery

MATTHEW MAN WAH YUNG, PH.D., F.R.C.S., D.L.O.

Abstract

The existence of blind pockets in the middle ear during cholesteatoma surgery could compromise complete removal of the disease, e.g. from the sinus tympanum. The use of side-viewing rigid endoscopes in conjunction with the operating microscope to control and facilitate cholesteatoma removal during mastoid operation was studied.

Ninety-two primary operations for cholesteatoma over a four-year period were examined. Over one-third (35.9 per cent) of these cases had cholesteatoma extended into the sinus tympanum. Sixty-four operations were small cavity mastoidectomy. The others were either canal wall reconstruction or primary obliteration following open cavity mastoidectomy.

Although residual cholesteatoma was found in three patients, only one was in the middle ear. It is concluded from this study that side-viewing endoscopes could be very useful in cholesteatoma surgery.

Key words: Endoscopy; Cholesteatoma; Mastoid, surgery

Introduction

Microsurgery of the middle ear is traditionally performed under the operating microscope. However, the biggest shortcoming of the operating microscope is that it only provides a straight line view resulting in certain blind pockets during middle ear surgery. It is well recognized that removal of cholesteatoma or granulation tissue from a deep sinus tympanum can be very difficult and is often a blind procedure. It has been reported that about 25 per cent of all residual cholesteatoma following mastoid surgery is in the middle ear (Mercke, 1985). Numerous techniques have been suggested to facilitate cholesteatoma removal from the sinus tympanum such as the use of intratympanic mirrors or the retrofacial approach to the sinus tympanum (Zini, 1967; Buckingham, 1982). These methods have not been widely accepted.

Since the Hopkin's rod was developed in the 1950s it has become one of the most important tools in minimally invasive surgery. These rigid endoscopes provide a large field of view in spite of a small diameter. The endoscopic image provides excellent resolution and fidelity of colour. More importantly, oblique endoscopes provide side views of such good quality that it makes them ideal for the middle ear.

Over the last 20 years, there have been numerous reports on the use of rigid endoscopes to inspect the middle ear (Michel and Chastang, 1975; Nomura, 1982; Gonzalez and Bluestone, 1986). The most detailed studies were provided by Thomassin and his co-workers (Thomassin *et al.*, 1990). They used rigid endoscopes to facilitate cholesteatoma removal in canal wall-up mastoidectomy and also for the systematic second-look procedure. They also advocated the otovideoendoscopic technique, i.e., coupling of the endoscope to a camera and the operation performed while looking at the video image. They claimed a much lower incidence of residual cholesteatoma in their study and attributed the success to the use of rigid endoscopes in cholesteatoma surgery. No similar study has been done involving canal wall-down mastoidectomy.

Materials and methods

Rigid endoscopes (from Smith and Nephew Richards) have been used for cholesteatoma surgery at the Ipswich Hospital since 1988. The wide angle 2.7 mm and 4.0 mm rigid endoscopes (30° and 70°) are used. The fields of view of these wide-angled endoscopes are shown in Table I.

Between 1988 and 1992, 92 primary operations for cholesteatoma were performed by the author. The removal of cholesteatoma was done under the operating microscope. Rigid endoscopes were used after the cholesteatoma was removed to inspect all the blind pockets in the middle ear to ensure that no disease is left behind. The microscope was temporarily moved out of the way and the endoscope was then inserted into the canal. As the posterior canal wall was taken down in all cases, the 2.7 mm endoscopes or even the 4.0 mm endoscope could be inserted without difficulty. Care was taken not to traumatize the ossicles during the insertion of the endoscopes. The areas examined routinely included the sinus tympanum, tubal orifice, obturator foramen of the stapes and the area of the mastoid cavity behind any bony overhang. If necessary angle instruments were guided into

From the Department of Otolaryngology, The Ipswich Hospital, Heath Road, Ipswich, Suffolk.
Accepted for publications: 15 January 1994.

TABLE I
WIDE-ANGLED ENDOSCOPES (FROM SMITH AND NEPHEW RICHARDS)

Diameter	2.7 mm		4 mm	
Direction of view	30°	70°	30°	70°
Field of view	90°	82°	105°	95°

these areas to facilitate the removal of any remaining cholesteatoma. This was done by holding the endoscope with one hand and removing the cholesteatoma with the other hand. The articulating arm was not used to support the endoscope.

Three different types of operations were performed during this period: (i) small cavity mastoidectomy with meatoplasty; (ii) open cavity mastoidectomy with canal wall reconstruction; and (iii) open cavity mastoidectomy with primary obliteration. The patients were followed-up regularly for a period of between 12 months and five years.

Results

The incidence of cholesteatoma present in various sites at the time of operation is illustrated in Table II. The majority of patients had cholesteatoma involving the epitympanum (90.2 per cent). The cholesteatoma extended into the sinus tympanum in 35.9 per cent and into the mastoid antrum in 72.8 per cent of the patients.

The number of patients with each type of operation and the number of patients with residual cholesteatoma are shown in Table III. Sixty-four patients had small cavity mastoidectomy with meatoplasty but one of them developed residual cholesteatoma in the middle ear. It was not certain where the cholesteatoma had been left behind during the operation. Eighteen patients had open cavity mastoidectomy with primary canal wall reconstruction. Again, one patient in this group had residual cholesteatoma but in the epitympanum. Ten patients had open cavity mastoidectomy with primary obliteration but one had residual cholesteatoma in the obliterated site.

Discussion

It is obvious that a smaller endoscope would be more easily inserted into the middle ear. However, it only provides a small image size and a small field of view. The 2.7 mm endoscopes used in this study provide a good compromise between diameter of the endoscope and the image size. For canal wall-down mastoidectomy operations, the 4.0 mm endoscopes can often be used as there is more room once the canal wall is taken down, thus providing a larger image. In general the 30° endoscopes are preferred to the others because they give a much better forward view than the 70° endoscopes and hence offer better orientation during the introduction of the endoscopes into the middle ear. At the same time, they give a side view adequate enough to examine the sinus tympanum in most cases. These endoscopes give a much better and wider image than that of the intratympanic mirrors. Also they do not get scratch marks on the lens as are often found on intratympanic mirrors.

It is also recognized that the advantage of using an endoscope coupled to a video camera will provide a magnified image of the operation field on the monitor. However, the otovideoendoscopic technique as suggested by Thomassin *et al.* (1990) was not used in this study. It was felt that the videoendoscopic image would compromise the appreciation of colour difference between squamous epithelium and middle ear mucosa which is so important in cholesteatoma surgery.

The attachment of a video camera to the endoscope also increases the weight of the endoscope and makes it more difficult for it to be manoeuvred.

When endoscopic eradication of cholesteatoma in necessary, it is easier to hold the endoscope with one hand and use the surgical instruments with the other hand, rather than using an articulating arm to support the endoscope. Although a fixed endoscope allows both hands to be free for manipulation, it reduces the manoeuvrability of the endoscope and is therefore found to be unnecessary in our experience.

Cholesteatoma was found in the sinus tympanum in about one in three patients in this study. The routine use of endoscopes to control this area gives the surgeon more confidence at the end of the operation that eradication of the disease is complete as it minimizes any blind procedure. It also allows better documentation of the operative findings.

The most common cholesteatoma operation in this study was small cavity mastoidectomy with meatoplasty since most of the mastoid bones operated on were sclerotic. The exteriorization of cholesteatoma was usually commenced from the attic region and extended backward only as far as the bottom of the cholesteatoma sac (Smyth and Brooker, 1992). Endoscopes were used to inspect the mastoid region beyond the limit of exteriorization to ensure that no squamous epithelium was left behind. In this particular group there was no residual cholesteatoma in the mastoid region.

In spite of the endoscopic control, one patient in this study still suffered from residual cholesteatoma in the middle ear. It is still possible that small areas of squamous epithelium in the middle ear cavity could not be identified by the operating microscope or the rigid endoscopes.

The number of patients in this study is small and the follow-up period is short. However, the preliminary results are encouraging and the endoscopes are now indispensable equipment for cholesteatoma surgery in our Clinic.

TABLE II
INCIDENCE OF CHOLESTEATOMA IN VARIOUS ANATOMICAL SITES (1988–1992 : 92 PATIENTS)

Sites	No. of patients	Incidence (%)
Epitympanum	83	90.2
Middle ear cavity	42	45.7
Sinus tympanum	33	35.9
Mastoid antrum	67	72.8

TABLE III
NUMBER OF RESIDUAL CHOLESTEATOMA AFTER CANAL WALL-DOWN MASTOIDECTOMY (1988–1992 : 92 PATIENTS)

Type of operation	No. of operations	No. of residual cholesteatoma
Small cavity mastoidectomy	64	1
Open cavity mastoidectomy with canal wall reconstruction	18	1
Open cavity mastoidectomy with primary obliteration	10	1

https://doi.org/10.1017/S0022215100126611 Published online by Cambridge University Press

References

Buckingham, R. A. (1982) The clinical appearance and natural history of cholesteatoma. In *Cholesteatoma and Mastoid Surgery, Proceedings of the Second International Conference*, Kugler Publications, Amsterdam, pp 13–21.

Gonzalez, C., Bluestone, C. D. (1986) Visualization of a retraction pocket/cholesteatoma: indications for use of the middle ear telescope in children. *Laryngoscope* **96:** 109–110.

Mercke, U. (1985) The cholesteatomatous ear one year after intact canal wall mastoidectomy. *Acta Oto-Rhino-Laryngologica (Belgica)* **39:** 230–233.

Michel, J., Chastang, R. (1975) Tympanoscopie ou endoscopie de l'oreille moyenne. *Revue de Laryngologie, Otologie, Rhinologie* **96(11–12):** 721–723.

Nomura, Y. (1982) A needle otoscope. *Acta Otolaryngolica (Stockholm)* **93:** 73–79.

Smyth, G. D., Brooker, D. S. (1992) Small cavity mastoidectomy. *Clinical Otolaryngology* **17(3):** 280–283.

Thomassin, J. M., Duchon-Doris, J. M., Emram, B., Rud, C., Conciatori, J., Vilcoq, P. (1990) Otochirugie Endoscopique. *Annales D'Oto-laryngologie et de Chirugie Cervico-Faciale (Paris)* **107:** 564–570.

Zini, C. (1967) La microtympanoscopic indirecte. *Revue de Laryngologie, Otologie, Rhinologie* **88(9):** 736–738.

Address for correspondence:
M. W. Yung, Ph.D., F.R.C.S., D.L.O.,
ENT Department,
The Ipswich Hospital,
Heath Road Wing,
Ipswich,
Suffolk IP4 5PD.

https://doi.org/10.1017/S0022215100126611 Published online by Cambridge University Press