THE VALUE OF ENDOSCOPY
IN OTOLOGY AND NEURO-OTOLOGY

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The challenges still facing otologists intraoperatively are the inability to determine the patency of the Eustachian tube and the inability to inspect some hidden areas of the middle ear.

The endoscope technology development may help to bridge this gap in our analysis of the middle ear cavities.

Material, applications, advantages and disadvantages will be underlined for each otologic approaches: external ear canal, mastoid cavity and Eustachian tube.

Endoscopy of the cerebellopontine angle (CPA) is a simple and helpful intraoperative refinement, which allows to reach the delicate and deep neurovascular components running through the CPA with minimal morbidity.

Our standard practice combining surgical and endoscopic procedure was to use the retrosigmoid approach.

Between 1993 to 2001, we applied such a procedure in various circumstances including tumor removal (395 cases) as well as neurovascular conflicts (421 cases).

Key words: endoscopy, middle ear, cerebellopontine angle

Endoscopy is now firmly established as a major investigative and therapeutic technology in a wide range of disciplines.

Although the speciality of otolaryngology has been in the forefront of developments in endoscopic techniques, the otologists and skull base surgeons have been less than enthusiastic in its possible applications.

Despite the illumination and magnification offered by the operating microscope, it has distinct limitations. The operator can visualise structures only directly ahead and is unable to see around structures.

These limitations can be overcome with the complementary help of an endoscope, which allows looking around the corner.

The use of the endoscope as a complementary tool in otology and neuro-otology develops the concept of minimally invasive approaches.

Nevertheless, the endoscope must be considered as an adjunct to the microscope, not as a substitute.

Consequently, the right title of my presentation should be endoscope-assisted microsurgery in otology and neuro-otology.

ENDOSCOPY IN OTOLOGY

The pioneers in middle ear endoscopy\(^1\) using various rigid endoscopes were Mer (1967), Marquet (1970), Lundborg (1970), Michel (1970), Eichner (1978). But it was not until the 1990’s that endoscope-assisted middle ear surgery was popularised by numerous authors\(^2\)–\(^6\).

Endoscopy of Eustachian tube using tiny fiberoptic instrument begun in 1976 (Jansen)\(^7\). Then Yamashita (1983)\(^8\) developed a pneumatic endoscope of Eustachian tube, Kimura (1989)\(^9\) and Magnan (1990)\(^10\) have been developing microfiberscopy of Eustachian tube and middle ear. But the difficulties encountered are still considerable and represents a strong limitation for routine application of Eustachian tube endoscopy.

There are three routes for exploring the tubotympanic cavities using an endoscopic procedure: via the...
external ear canal, via the mastoid cavity and through a posterior tympanotomy or via the nose and the pharynx by cannulation of the pharyngeal opening of the Eustachian Tube.

1—TRANSTYMPANIC ENDOSCOPY OF THE MIDDLE EAR

The major limitation of microscopic inspection and surgery is the inability to visualise the many recesses that characterise the middle ear and that are so frequently involved by disease such as: the retrotympanic, attic, protympanic spaces.

Endoscopes confers the ability to see “around the corner”.

1—Material and Method (Photo No. 1)

Rigid endoscope provides precise maneuvre within middle ear.

The best are 6 cm in length, 4 mm in diameter, 0°, and 6 cm in length, 2.7 mm in diameter, 0°, 30° and 45°.

Only autoclaved endoscopes are used with video endoscopic control.

Camera and light cable are protected with sterile covers.

Sterile antifog drop or warm saline solution is applied to the endoscope lens at the tip.

The surgeon is facing the monitor, one hand is used to hold the endoscopic system while the dominant hand is used to act with adapted microinstruments.

When viewing a video monitor, it is important to assure that both the camera and the angled endoscope are properly oriented to avoid trauma to the middle ear structures.

Caution is especially required regarding the use of angled endoscopes when the stapes is present.

2—Applications

2.1 Endoscopes are useful for photodocumentation and inspecting the tympanic membrane, defects in the bony canal, mastoid cavities and tympanic retraction pocket. Endoscopic assessment for the depth of tympanic retraction pocket should be considered as the gold standard for establishing the decision process of whether to operate.

2.2 The endoscope may be passed through the tympanic membrane by creating a myringotomy, through an existing perforation or by elevating a tympanomeatal flap. A wide view of middle ear can be assessed including the incudostapedial joint, the retrotympanum and the bony part of the tube (Photo No. 2).

2.3 Perilymphatic fistulas get more complete and accurate exposure of each window niche. The site and the size of fistula were imaged better with the endoscope than by microscope (Poe)\(^1\).

2.4 In some selected patients endoscopic procedure alone can be considered and performed to treat a simple tympanic retraction pocket or a small tympanic perforation (Karhuketo)\(^2\).

3—Comments

Whatever the value of endoscopy, the endoscope is not intended to replace microsurgery.

Difficulties still exist with middle ear endoscopy. Bleeding can be difficult to control and the lens is easily soiled if contact is made with the canal wall. There is some visual limitations to differentiate with certainty pathological findings either due to too little illumination or to the glare of excessive light. The risk of damage to the ossicular chain should not be underestimated.

The last and not the least, the endoscopes is hand-held in surgeon’s non dominant hand so that only one hand is free for surgery. The surgeon must often alternate between dissection and suction aspiration of blood from the field, reducing the operating efficiency compared to two-handed techniques (Bottrill, Poe)\(^3\).

2—TRANSMASTOID ENDOSCOPY

OF THE MIDDLE EAR

The ability to confidently evaluate mastoid and tympanic cavities following surgery for cholesteatomatous ear disease is of utmost importance (O’Donoghue)\(^4\).

Endoscope can be passed transmastoidically into the middle ear through the facial recess and control the entire panorama of the middle ear.

Furthermore, endoscopes can be passed transtympanically to adequately inspect the sinus tympani.

1—Material and method

Video endoscopic equipment and preparation for cleaning disinfection and sterilisation are the same as
previously mentioned.

In addition, we used an ultra-compact needle-endoscope with light camera allowing detailed examination of the ossicular chain.

2. Applications

2.1 Endoscopy is a complementary help in the intact canal wall for primary acquired cholesteatoma. After microsurgical resection, endoscopes may help inspect for possible residual disease in the sites hardest to visualise with the operating microscope including the anterior epitympanic recess, the sinus tympani, the inferior margin of the scutum.

This is especially recommended in the cases of intact ossicular chain, to control the complete matrix removal, medial and anterior to the ossicles (Photo No. 3).

The ability in improving cholesteatoma removal should reduce the incidence of residual disease and the frequency of planned second look operation (Thomassin16, Tarabichi17, Badr-el-Dine18).

This must be confirmed by further long-term follow up studies (Youssef and Poe18).

Photo 1

Different endoscopes in size and angled tip are required to perform a successful middle ear endoscopy.

Photo 2

A and B anatomic endoscopy of retrotympanum using direct (A) and 30° (B) endoscopes. C right tympanic perforation scopes with a 4 mm 0° endoscopes.

D right endoscopic control after removal of a right tympanic retraction pocket.


Photo 3

Endoscopic second look by right transmastoid approach.

A digivideo, overview of the posterior tympanotomy
B digivideo, overview of the attic space and ossicular chain
C same case using mono-chip camera, 4 mm 0° endoscope
D closer view through the posterior tympanotomy.

Photo 4

Endoscopic second look by left transmastoid approach

A well ventilated middle ear cavities with incus (i) transposition.

B residual cholesteatoma (ch) in the anterior epitympanum.

C and D same case using 4 mm diameter endoscope then 1 mm endoscope to get a closer view in the epitympanum.

ch : residual cholesteatoma, i : incus transposition.
After the completion of the middle ear reconstruction microsurgery, again the endoscope can be used through the mastoid and posterior tympanotomy to control the correct positioning of the ossicular replacement during the packing of the ear canal.

2.2 Endoscopic second look operation

Endoscopy could offer the surgeon a reliable and less invasive alternative than the standard microsurgical approach.

Residual cholesteatoma is most commonly found in the epitympanum, retrotympanum and oval window niche rather than in the mastoid cavity (Photo No.4). Second look procedures can be performed through a transcanal approach or through a small post-auricular incision. But the endoscopic second look procedure requires a well-ventilated middle ear cavity, which is clearly seen on the CT Scan. Consequently, in these selected patients the question is: is there a real need for a second look?

2.3 Endoscope-assisted microsurgery is helpful during middle ear or petrous bone surgery in various circumstances to control the total removal of tumoral process such as glomus tumor or petrous apex cholesteatoma (Photo No.5).

3–TRANSEUSTACHIAN TUBE ENDOSCOPY

The development of ultrathin microfiberoptic endoscopes similar to angiofiberoscopes offers the otologist an unique opportunity to see the inside of the tube and to visualise the middle ear from the front towards the back (Edelstein). [5]

1–Material and method

The most convenient microfiberoptic endoscopes used is 0.8 mm in diameter, 4200 pixels with no bending tip.

The light source must be sufficiently powerful, so a xenon light source is recommended.

The patients are scoped under general anaesthesia in the operating room. The nasal cavities are first packed with vasoconstricting agents. The cannulation of the Eustachian tube via nasopharynx is performed following two procedures: using microfiberscope with a bending tip (1.2 mm de diameter), but the scoping is limited to the cartilaginous part of the tube, or by introducing a catheter into the pharyngeal opening of the tube and then the microfiberscope up to the middle ear.

There is no landmark with regard to the inside of the Eustachian tube. The aperture of the cartilaginous tube is virtual, and look like a slit-like lumen because the walls are collapsed. The isthmus is the narrowest part, and its sizes are from 2.5 mm to 0.5 mm.

Thereafter the lumen progressively enlarges reaching the middle ear cavity. With regard to middle ear endoscopy through the Eustachian tube, the endoscopic landmarks are the cochleariformis process and the tensor tympani due to the curved Eustachian tube, the microfiberscope course always is below the tensor tympani, then medial the long process of the incus until reaching the sinus tympani (photoNo. 6). The average scoping takes 20 minutes.

2–Results

2.1 In the Eustachian tube (Table I)

Out of 163 microfiberscopies of the Eustachian tube, the tube was blocked in 2 cases (1.3% of cases) and stenosis in 3 cases.

The most common finding was mucosal thickening and mucous secretion inside the Eustachian tube.

2.2 In the middle ear.

Using Eustachian tube microfiberscopy we have the sinus tympani in front of us and are able to check if there is any cholesteatoma left during the surgical procedure.

| Table I
Microfiberscopy of Eustachian Tube: Results N=163 |
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<tr>
<td>Eustachian tube lumen &amp; Chronic otitis</td>
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<tr>
<td>Normal ear</td>
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<td>Chronic otitis</td>
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<td>ET pathology</td>
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After the tympanoplasty and before withdrawing the microfiberscope from the Eustachian tube, a final scoping of the closed middle ear cavity offers an endoscopic evaluation of the ossiculoplasty.

3—Comments

The cholesteatoma matrix identification is still delicate. The image sharpness obtained is adequate enough. The problem is the cleaning of the distal lens due to the quantity of mucous secretion inside the Eustachian tube and due to the blood effusion in the tympanic cavity. This point is easily resolved during concomitant open surgery of the middle ear.

Until now the post-operating follow-up behind an intact tympanic membrane and regarding the diagnosis of residual cholesteatoma has been unreliable.

ENDOSCOPY IN NEURO-OTOLOGY

The first comprehensive description of endoscopy of the cerebellopontine angle was provided by French surgeon Doyen20) who in 1917 described an endoscopic technique to selective fifth nerve section in trigeminal neuralgia. A further description of this technique was outlined by Prott21) in 1974, who advocated a transmastoid retrolabyrinthine approach to the CPA. Oppel and Mulch22) described a similar approach in 1979 for selective trigeminal root section. However, the instrumentation available until relatively recently was a major deterrent to progress, and the approach found few disciples.

The basic interest of the endoscopic procedure is to get a more comprehensive “mapping” of the neurovascular components without the necessity of cerebellar retraction keeping the anatomic relations between vascular and neural elements undisturbed. The endoscope has the advantage of giving magnified high resolution images and provides an unobstructed panoramic view of all nervous and vascular structures crossing the area, unlike the monaxial one offered by the operating microscope. Also its use does not necessitate excessive cerebrospinal fluid (CSF) drainage as the view is as clear inside as outside it. These advantages allow clear identification of the vascular and neural components crossing the cerebellopontine angle in atraumatic and less invasive way. Thus, the combination of the endoscope to the operating microscope in CPA surgery, is an intraoperative refinement that should be applied in various circumstances including tumor removal as well as neurovascular conflicts23).

1—Endoscopic anatomy of the CPA

From an endoscopic view point the CPA is divided into two parts separated by the acoustico facial bundle with a superior level above it, an inferior level below it and an intermediate level at its level (O’ Donoghue)24).

Superior level or trigeminal area:

In this level we find the pons, the Vth and VI nerves, more superficial, above and lateral to the Vth nerve the Dandy’s vein which joins the superior petrosal sinus, and the tentorium cerebelli above. Deeper and anterior to the Vth the superior cerebellar artery (SCA) which is the most common offending vessel in trigeminal neuralgia.

Intermediate level or acoustico facial bundle area:

At this level we get the acustico facial bundle and the loop of the anterior inferior cerebellar artery (AICA). The root entry zone (REZ) of the facial nerve is clearly seen passing below the eighth nerve and pushing the flocculus downwards. By using a 30-degree endoscope we get a better view of the REZ and it is in this place where we can find the most common offending vessels in cases of hemifacial spasm, the posterior cerebellar artery (PICA) and the vertebral artery.

We can see also clearly the REZ of the facial nerve, which might appear greyish in colour which is characteristic of neurovascular conflicts.

Inferior level or lower cranial nerves area:

At this level we see the roots of the lower cranial nerves, the PICA rising from the vertebral artery, and the hypoglossal nerve.

2—Material and method

2.1 Endoscopes

We recommend rigid instrument for precise surgical manoeuvres. The safest endoscope is 6 cm in length, 4 mm in diameter, 0°. This provides a panoramic view and the limited length prevents inadvertent contact with lying deeper structures. The most
useful endoscopes is 11 cm in length, 4 mm in diameter, 30° angled.

The 60° and 70° angled endoscopes are dangerous since the surgeon cannot appreciate the exact position of the tip of the endoscope.

2.2 Aseptic technique

Telescopes marked as autoclave can be steam-autoclaved at a maximum temperature of 134°C (272°F) for 5-8 minutes at 2-2 atmospheric pressures.

A sterile cover protects camera and light cable. A warm (37°C) saline solution is used as antifog agent and the tip of the endoscope must be cleaned after each withdrawal.

To respect aseptic conditions, the surgeon must check the progression of the endoscope using a video camera and monitor (and not by direct inspection through the eyepiece).

Lastly, we recommend to avoid prolonged direct contact between the tip of the endoscope and the nerves to prevent from thermal effect and neural injury.

Both the nursing staff and the surgeon should be fully trained in the use of endoscopy.

2.3 Approaches

Our standard practice combining surgical and endoscopic procedure was to use the retrosigmoid approach which is a posterior and direct approach to the cerebellopontine angle. Now, through middle fossa, retrolabyrinthine, translabyrinthine, trans-cochlear–approaches, the endoscope is used with the same technique and for the same purposes as in the retrosigmoid approach.

Whatever the approach to the skull base, endoscopes are needed to “map” the anatomical landscape, a great deal of which is normally hidden beyond the rather limited view obtained with the operating microscope.

3. Tumor removal

3-1 Acoustic neuroma, meningioma

Before tumor removal:

When facing small or medium size tumor, prior removal, the endoscope allows visualisation of the following: the cerebellar arteries, the medial pole of the tumor and the acousticofacial nerve bundle as it exists the ponto-medullary junction, the facial nerve situated anteriorly and hidden from view, the trigeminal nerve and the abducent nerve in the background of the operating field (Photo No.7).

The endoscope gives the surgeon a mapping of all the neurovascular components of the CPA, minimising retraction and dissection.

Intracanalicular extent

In hearing preservation, the problem facing the surgeon is to provide maximal exposure of the intrameatal tumor while at the same time minimising risk of inadvertent injury to the labyrinth. Usually the tumor can be rolled out “en bloc” from the lateral end of the internal auditory canal. When the tumor fills the fundus, we use an angled instrument and the lateral part of the tumor is dissected from medial to lateral, from anterior to posterior, so as to protect the facial and cochlear nerves.

The fundus of the internal auditory canal, which is not visible with an operating microscope, is seen with the endoscope. Both the completeness of the tumor excision and the continuity of the facial and cochlear nerves are checked (MC Kennan)25).

If there is a small fragment left (Photo No.8). The lateral dissection in the internal auditory canal is performed endoscopically with curved instruments. Assisted-dissection is carried out using a 30° angled endoscope and a tip-angled raspatory with which the tumoral fragment is carefully rolled out of the lateral recesses of the internal auditory canal (Magnan26; Goksu27).

After tumor removal

Whatever the tumor size, a final endoscopic inspection controls the internal auditory canal and the cerebellopontine angle which appear to be free of tumor. The course of the facial and cochlear nerves are gradually followed, and the integrity of the nerves is checked. In addition, inadvertent opening of labyrinthine structures is checked and control of all bleeding is ensured.

3-2 Epidermoid cyst

Dealing with an epidermoid cyst of the CPA a major problem is to obtain a total resection of the cyst which is usually difficult without incurring injury to the
The value of endoscopy in otology and neuro-otology

Endoscopic view of a tympanic glomus (A) and of a petrous apex cholesteatoma (B) expanded around the internal carotid artery (IC).

Photo 5

The different steps of a transeustachian microfiberscopy: (1) aperture, (2) cartilaginous part, (3) isthmus, (4) protympanum with processus cochleariformis and tensor tympani. Then (5) incudostapedial joint and facial canal.

Photo 6

The different steps of a transeustachian microfiberscopy: (1) aperture, (2) cartilaginous part, (3) isthmus, (4) protympanum with processus cochleariformis and tensor tympani. Then (5) incudostapedial joint and facial canal.

Photo 7

Small acoustic neuromas and their adjacent structures within the cerebellopontine angle.

Photo 8

Endoscope-assisted microsurgery in acoustic neuroma removal A–B–C to control the course of the facial nerve. D E to control the lateral end of the internal auditory canal.

n: neuroma, f: facial nerve, c: cochlear nerve, tc: transverse crest.

Photo 9

A: left hemifacial spasm endoscopic view of left cerebellopontine angle with vertebral artery ectasia (va)
B: MRI with T2 sequence CISS shows the offending vessels, vertebral (va) and posterior inferior cerebellar arteries (pica), with distortion of the neural structures at the level of the root exit zone of the facial nerve (arrow).

HEMIFACIAL SPASM

Photo 10

A and B: Disabling positional vertigo with the anterior inferior cerebellar artery (aica) as offending vessel (right size).
C: left unilateral tinnitus induces by several vascular loops from the anterior inferior cerebellar artery (aica). Endoscopic control during microvascular decompression of the eight nerve (VIII).
TRIGEMINAL NEURALGIA

A: overview of the right cerebellopontine angle. The teflon pad is superior to the trigeminal nerve and hides the superior cerebellar artery above.

B: before the microvascular decompression, closer view with 4 mm, 30° endoscope at the level of the trigeminal nerve (V) showing the loop of the offending superior cerebellar artery at the entrance of the Meckel cave (M).

C: closer view

D: microvascular decompression

E: control teflon position.

Photo 11

Endoscope above

Endoscope below

The different steps of endoscope-assisted microdecompression

A: the tip of the endoscope is above the acousticofacial nerve bundle.

B: the tip of the endoscope is below the acousticofacial nerve bundle, the two vertebral arteries are visible.

C: neurovascular conflict between the vertebral artery and the facial nerve (arrow)

D: using the operating microscope, the vertebral artery is mobilized and the posterior inferior cerebellar artery becomes visible.

E: teflon (arrow) between the facial nerve (VII) and the vertebral artery.

The matrix surrounding the keratine and adhering to the neural and vascular structures, the completeness of the surgical excision is confirmed endoscopically.

Out of 11 patients operated on using endoscopy-assisted microsurgery, fragments of the cyst wall was left in 3 cases due to adherence with hidden and vital areas such as cavernous sinus, in between the basilar artery and the brain stem.

4 Neurovascular compression syndromes

In 1934, Dandy suggested for the first time the theory of artery-nerve conflict in the cerebellopontine angle to explain cases of idiopathic trigeminal neuralgia. Jannetta popularised this concept as a cause of hemifacial spasm, trigeminal neuralgia, disabling positional vertigo and unilateral disabling tinnitus.

Microvascular decompression as a surgical treatment for neurovascular compression syndromes was renewed by using endoscope-assisted procedure.

Per-operative endoscopy is the key for the safe and reliable identification of the offending vessels. Endoscopy provides a dynamic and panoramic view of the entire neurovascular bundle without causing any distortion. This enables multiple sites of compression to be visualised, which would otherwise escape detection. The tip of the endoscope is passed above and below the acousticofacial bundle. The REZ of the facial and cochleovestibular nerves as well as the porus are explored to identify the precise location of the offending vessels in cases of hemifacial spasm (most commonly the PICA) or on cases of positional vertigo and tinnitus (most commonly the AICA). Also the endoscope helps the identification of all important structures in the region especially labyrinthine vessels which render the microvascular decompression unsafe regarding the hearing. In cases of trigeminal neuralgia, the trigeminal nerve is explored from its exit from the Meckel’s cave to its entry in the brainstem (most common offending vessel is the SCA).

In this assessment we can meet, in certain difficult cases, the problem of precise identification of the offending vessels and their exact location. The nerve can be offended by more than one vessel in hidden areas.
So, very meticulous exploration of all suspected conflict locations should be done especially that endoscopy has the capacity to explore all the hidden corners.

**Microvascular decompression procedure:**

Whatever the location of artery-nerve conflict the purpose of the microvascular decompression procedure is to change the axis of the offending vascular loop, and keep it away of the offended nerve.

This surgical manoeuvre is done under the operating microscope. First the offending vessel is carefully mobilised using microelevators and microhooks. Meticulous and careful dissection allows to change the vessel axis of direction. Then, the microvascular decompression is realised with a small Teflon pad which is adjusted with a microhook to hold away the artery from the nerve. While the vascular decompression at present is done with the microscope, the adequacy of the decompression can be checked by endoscopy (Photo No.12). The operation ends by a new endoscopic control of the quality of the surgical act, the good positioning of the Teflon pad and the absence of contact between the decompressed nerve and all adjacent vascular structures. The endoscope allows the performance of this control without disturbance to the accomplished microvascular decompression.

**Results:**

Results of the microvascular decompression in 265 hemifacial spasms.

The most common offending vessel was the posterior inferior cerebellar artery associated with the vertebral artery in 43% of cases, alone in 16%. The results after 6 months follow-up were: relief 91%, failure 9%. After revision surgery relief reached 96% (Table II).

Post operative complications were very few: facial paralysis: 0, total hearing loss: 2, partial hearing loss: 3.

Results of microvascular decompression in 141 trigeminal neuralgia.

The most common offending vessel was the superior cerebellar artery in 76%, alone in 50%, associated with aberrant venous structure in 26%.

The results after 6 months follow up were complete relief in 81%, partial relief in 6%, and failure in 13%, with no morbity.

After revision surgery the success rate was 92% of patients (Table III).

Results of endoscope-assisted microvascular decompression of the VIIIth nerve were less successful (Table IV).

**Table II**

Hemifacial Spasm N=265 (207F/58M)

<table>
<thead>
<tr>
<th>Causes of failures and revision surgery</th>
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<tr>
<td>6 cases: multiple offending vessels – 4 successes, 2 failures</td>
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<tr>
<td>3 cases: trigeminal decompression – 2 successes, 1 failure</td>
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<tr>
<td>2 cases: aberrant vein – 1 success, 1 improvement</td>
</tr>
<tr>
<td>3 cases: teflon granulation – 3 successes</td>
</tr>
<tr>
<td>2 cases: no explanation – 2 failures</td>
</tr>
<tr>
<td>1 case: facial anomaly – 1 improvement</td>
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<tr>
<td>1 case: no decompression</td>
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**Table III**

Trigeminal Neuralgia N=141 (86F/55M)

Causes of failure and revision surgery

| 6 cases: recurrence due to fibrous tissue inducing new neurovascular conflict – 4 success, 2 failures |
| 3 cases: teflon displacement – 3 successes |
| 2 cases: aberrant vein – 1 success, 1 failure |
| 4 cases: no explanation, 4 partial rhizotomy |

**Table IV**

Tinnitus, Disabling positional vertigo

N=15

6 cases: aica – 2 successes, 4 unchanged
4 cases: pica – 3 successes, 1 unchanged
4 cases: multiple offending vessels
1 success, 1 improvement, 2 unchanged
1 case: abnormal vein 1 success

SUCCESS RATE: 46%
5. Vestibular neurotomy

Minimally invasive retrosigmoid approach is particularly suited to vestibular neurotomy to treat incapacitating vertigo in Menière’s disease when residual hearing still exists. Retrosigmoid approach is not technically difficult provides excellent access, and allows a sure and selective section of the vestibular nerve.

Endoscopic vestibular neurotomy can be performed using a similar approach\(^{34,35}\). We have been able to carry out vestibular neurotomy with the endoscope alone in 16 of 45 patients undergoing vestibular neurotomy to control disabling vertigo in Menière’s disease.

Difficulties and obstacles encountered during endoscopic vestibular neurotomy included:

- insufficient spontaneous retraction of the cerebellum prior to opening of the basal cisterns,
- the presence of thick arachnoïd wrapping requiring dissection,
- difficulty in determining with certainty whether the nerve section is complete.

Refinements in the instruments available are necessary to overcome these difficulties. As yet, there are no advantages for the use of endoscopic vestibular neurotomy in comparison with the operating microscope with regard to the safety and efficiency of the operation.

References