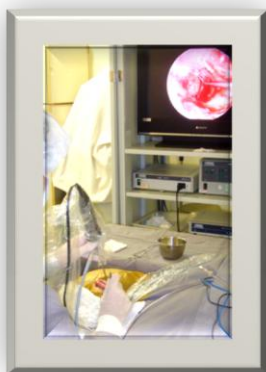
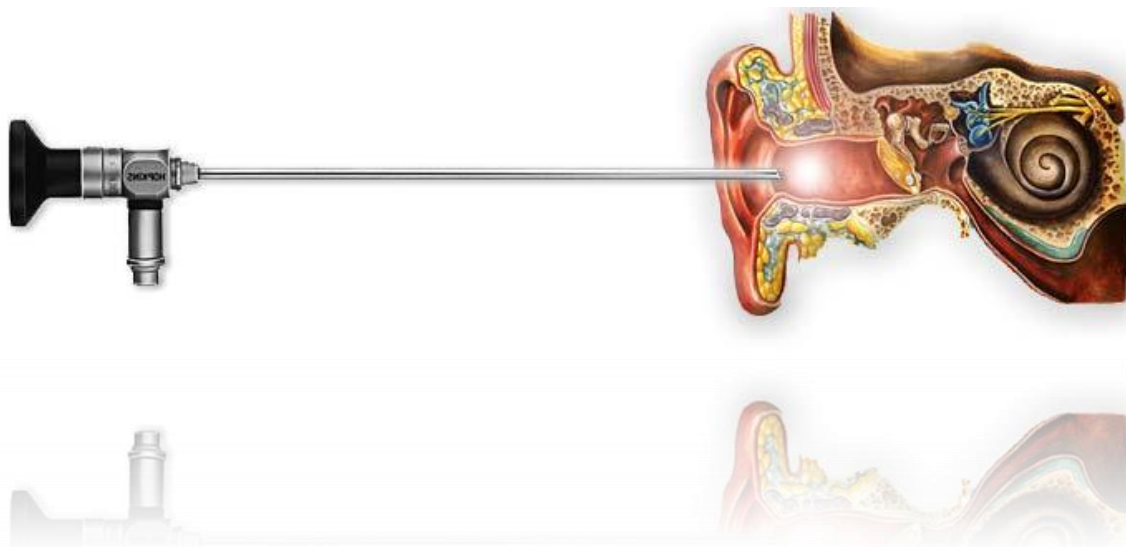


ENDOSCOPIC EAR SURGERY



DISSECTION MANUAL

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1) Introduction:

Middle ear surgery can generally be performed with the aid of an operating microscope. However, under a potentially minimally invasive trans-canal approach, it is very difficult to operate on several sites using a microscope alone unless the surrounding bone is removed. Such sites may include the epitympanum as well as the inferior and posterior parts of the mesotympanum^{1,2}.

Although it has been more than 15 years since the introduction of operative endoscopy to middle ear surgery there is still a very limited role for the endoscope in the surgical management of middle ear disease across the globe¹.

There are several possible reasons for that, such as the current idea of a limited and marginal role for endoscopes in middle ear surgery, a potentially long learning curve through the hassles and tribulations of adapting newer techniques and newer instrumentation, and, in our opinion, the use of smaller-diameter endoscopes in the ear, which sometimes can be very frustrating for the novice middle ear endoscopic surgeon, since it cancels one of the most important advantages of using an endoscope: the wide field of view of the endoscope when compared with the microscope²⁻¹³.

The operating microscope provides a very good quality magnified image in a straight line, however, the surgeon's field of view is limited to the narrowest segment of the ear canal². When using a traditional 4 mm, 18 cm sino-nasal



endoscope the surgeon also gets a magnified vision that enables to change rapidly from a close-up to a wide angle view, just by going closer or by withdrawing the instrument¹. Further, it provides an all-round vision to the surgeon who can rotate angled endoscopes to visualize the deep and hidden structures.

In this manual, we are going to discuss the current techniques for endoscopic middle ear dissection, discussing the equipment needed, surgical indications, and also showing the potential advantages and disadvantages of the procedures.

2) Equipment:

In order to perform an effective endoscopic middle ear dissection you will need:

Endoscopes: traditional 4 mm, 18 cm sino-nasal instruments with 0 and 45-degrees angles, the same used in traditional endoscopic sino-nasal procedures.

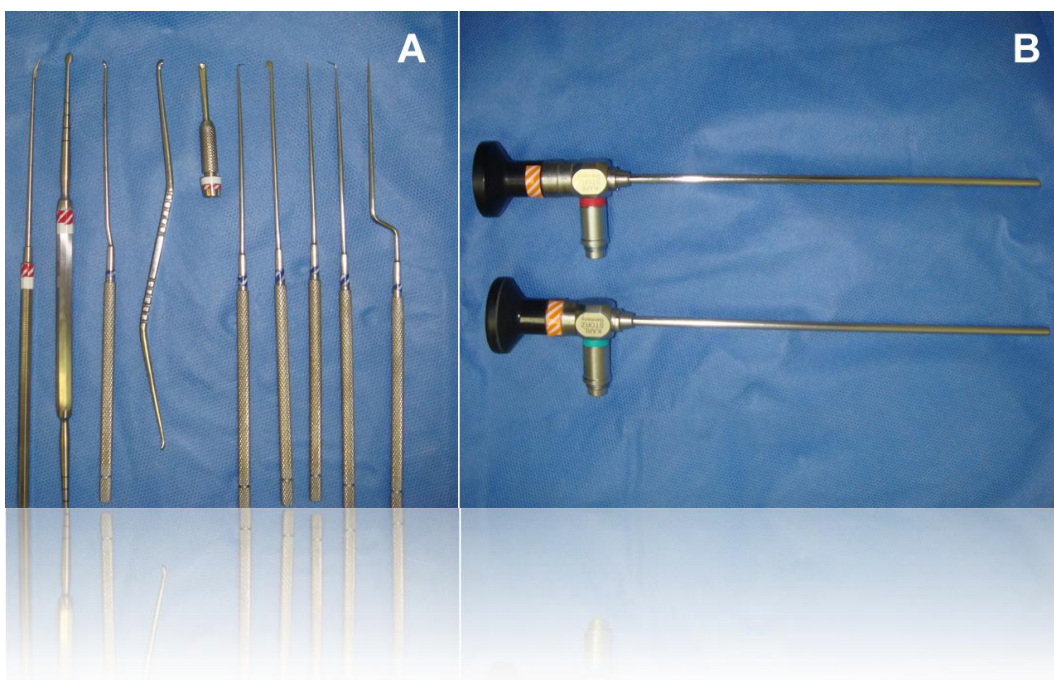
Vídeo equipment: high quality video camera, light source and fiber optic cable. The video should be positioned in front of the surgeon.

Instruments: traditional otologic surgery instruments with curettes and freer elevators.



Drill: very delicate high speed drills can be used with diamond or cutting burs (2 mm of diameter)

Temporal bone tray: the temporal bone must be attached to a tray or holding device at the surgical position. The temporal bone (at the surgical position) should be placed in front of the surgeon.



Also, remember that adequate illumination of the middle ear space can be accomplished with lower settings on the regular light source (because of the size of the cavity), without the need for Xenon systems. The required setting varies according the size of the middle ear space and to the different manufacturers. It should be adjusted to the lowest settings that allows adequate visualization. In addition, the tip of the endoscope always requires continuous cleaning. Accidental endoscope movement can cause direct trauma by the tip of the instrument.



3) Indications:

Minimally invasive endoscopic middle ear surgery is currently performed for small to medium ear drum perforations, limited cholesteatoma management and otosclerosis^{5,6,7}.

However there are some authors describing an endoscopic minimally invasive approach for other middle ear lesions, such as round window fistula repair, placement of ear tubes and even dilatation of the auditory tube⁸.

4) Contra-indications:

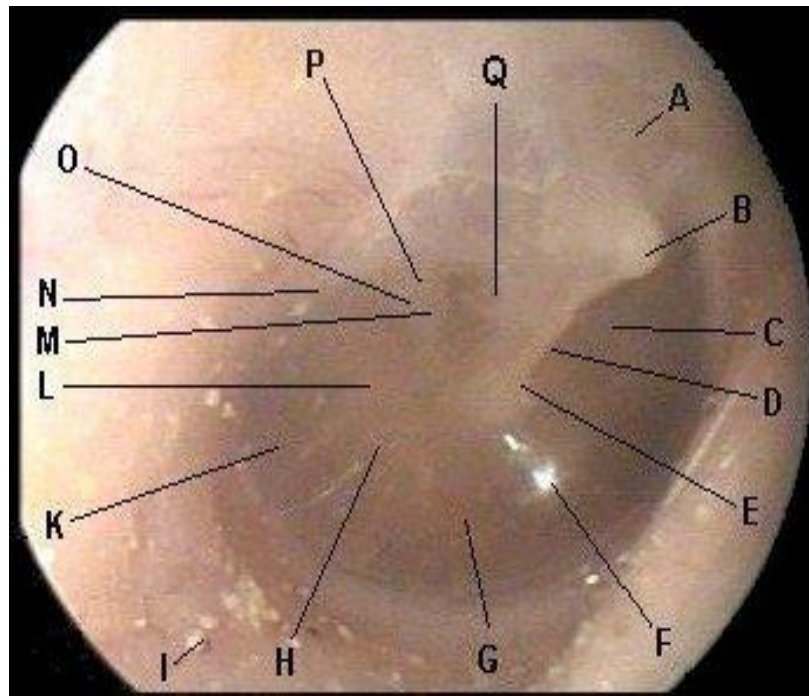
The current contra-indications for this kind of surgery may include extensive middle ear cholesteatoma with mastoid invasion, large ear drum perforations and cases of chronic suppurative middle ear. Also, one formal contra-indication is the lack of specialized equipment.

5) Dissection technique:

The endoscopic dissection begins with a 4mm, 0 degree endoscope. An inspection and initial cleaning of the ear canal is done. Any secretion is



suctioned until there is a good visualization of the tympanic membrane. In some specimens, if the tympanic membrane is not completely opacified you can identify:

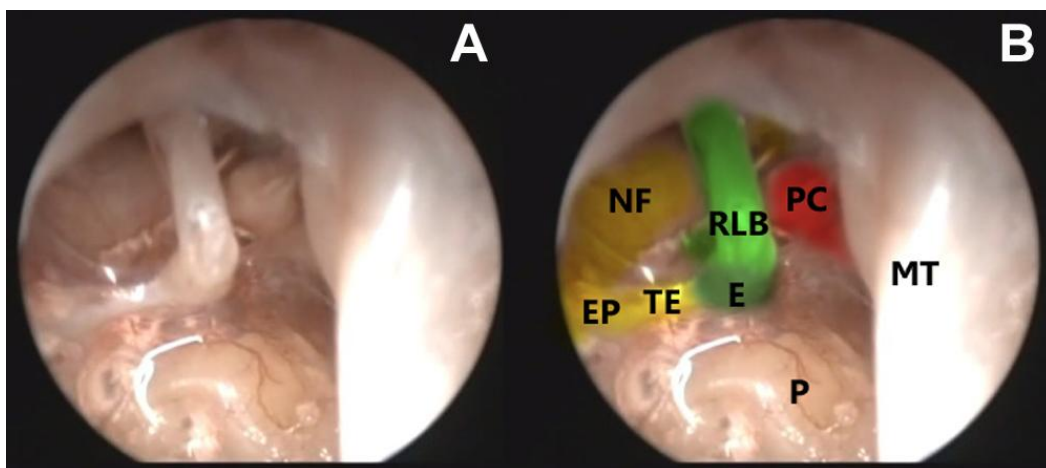


- | | |
|--|---|
| a) Pars flaccida | j) Test |
| b) Short process of the malleus | k) Round window niche |
| c) Pars tensa (ant. superior quadrant) | l) Pars tensa (post. Inferior quadrant) |
| d) Manubrium of malleus | m) Incus (lenticular process) |
| e) Umbo | n) Chorda tympani |
| f) Light reflex | o) Incudostapedial joint |
| g) Pars tensa (ant. Inferior quadrant) | p) Incus (long process) |
| h) Promontory of cochlea | q) Pars tensa (post. Superior quadrant) |
| i) External auditory canal | |



5.1) Accessing the middle ear:

A large tympano-meatal flap is raised with a small knife and elevator. This flap should have limits at 11 and 6 o'clock and can be completed by small scissors. At this point, the following structures should be viewed (0-degree, 4 mm endoscope):



MT: Tympanic membrane

TE: stapes tendon

P: Promontory of cochlea

EP: Pyramidal eminence

E: Stapes and incudostapedial joint

PC: Cochleariform process

RLB: Incus (long process)

Round and oval window niches

NF: Facial nerve

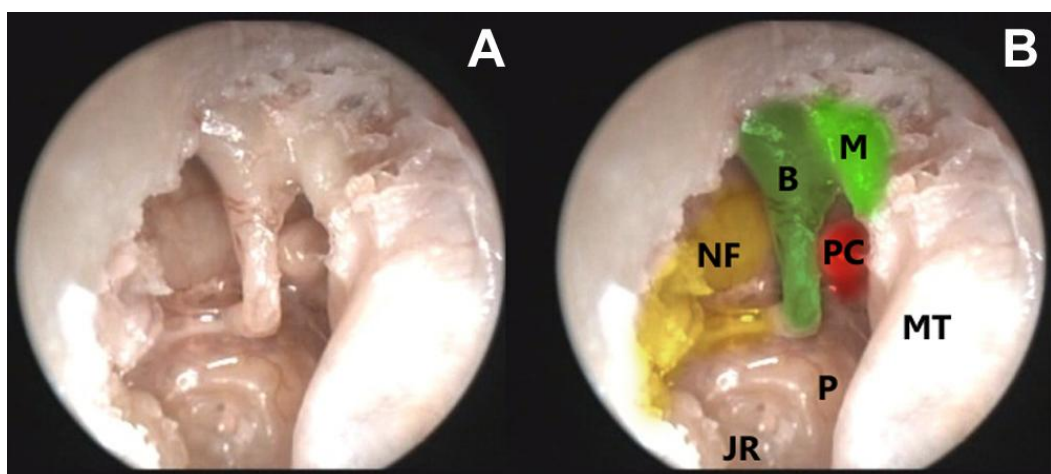
After viewing these structures curettage or drilling can be performed at the posterior wall of external auditory canal, to better expose the chorda

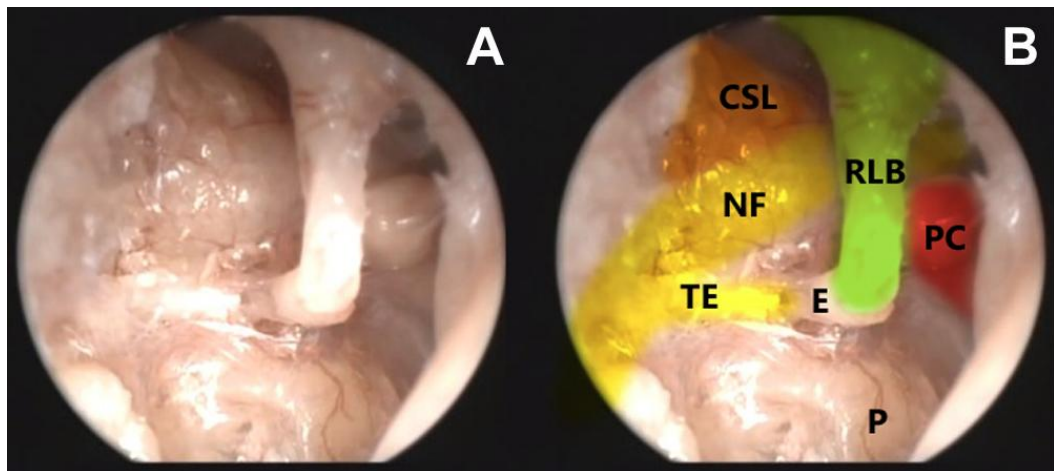


tympani nerve and facial recess. Inspection with a 45 degree endoscope can also be performed to look the entire facial recess.

5.2) Attic access:

The next step is the curettage or drilling at the attic area. This should be done carefully to avoid any unnecessary damage to the ossicular chain. The attic exposure should include complete visualization of the incudo-malleolar joint. After viewing these structures with 4-mm endoscope and 0 degrees, an inspection of the middle ear is performed with endoscope 4mm 45 degrees. With this tool you can angled can the view and look at the Eustachian tube (anterior), tensor tympani channel, lateral semi-circular canal and the entrance of the mastoid antrum.



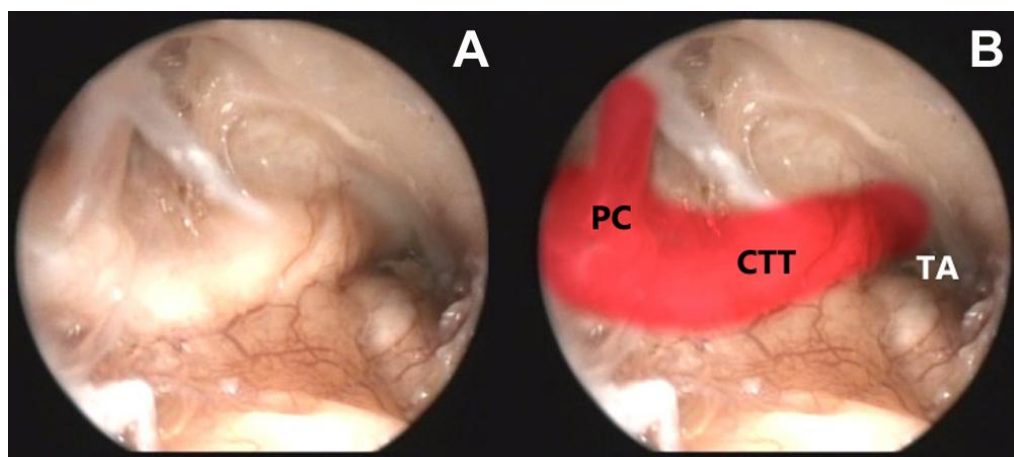
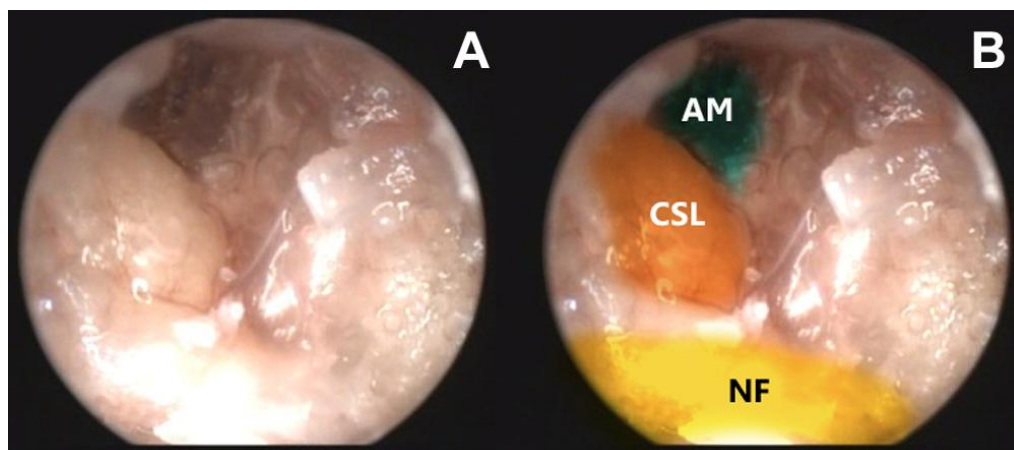


5.3) Ossicular chain:

At this point you should cut the stapedial tendon and disarticulate the incudostapedial joint. The stapes should be removed. In some specimens it should be difficult to fracture the stapes superstructure properly, since it may not be completely rigid.

You can practice, if possible, an endoscopic stapes surgery, creating a small perforation at the stapes footplate, measuring the distance between the footplate and the long process of the incus and positioning the prosthesis.

After this step, you can remove completely the ossicular chain. This will allow an excellent visualization of structures such as semi-circular channel, mastoid antrum, auditory tube, among others:





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