

# Endoscopic Ear Surgery Guidelines and Protocol

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In the past few years, the Endoscope has become a very useful tool in the hands of OTOLARYNGOLOGIST. The Endoscope has enabled visualization of the hidden areas of the ear and has opened up new vistas in the ear surgery.

Initially the Endoscope was introduced for diagnostic Oto Endoscopy, but it's now finding its increased usefulness in Endoscopic Middle Ear Surgery. With enhancing experience post operative results are better when compared to previous studies. Use of good endo camera with high definition monitor, makes the surgeon very comfortable with vastly improved post operative results.

Endoscope is now being used for otological diagnosis, myringotomy, insertion of ventilation tubes, myringoplasty, stapedectomy, tympano mastoidectomy, facial nerve decompression, CSF Otorrhoea.

## Advantages of Endoscopes in Any Surgeries:

- Better Illumination – Light delivery close to the object.
- Precise Localization and Magnification.
- Narrow Accesses route - Can be done through narrow passages and natural orifices.

**Use of Endoscope in ear surgery has its distinct set of advantages:**

- Panoramic View retained even in Higher magnification unlike microscopy
- Assessment of entire tympanic membrane, annulus and walls of the external auditory canal in one view.
  - Advantages in Endomeatal incision and Tympanomeatal flap elevation without tearing.
  - Middle ear work – Better Orientation with other structures.
- Easy maneuverability :by lowering and raising the endoscope, magnification is easily altered and by tilting the endoscopes with delicate wrist movements, the field of focus can be changed easily – Lesser time required for adjustments unlike Microscopy.
- Visualization of hidden areas and narrow crevices even with narrow approaches due to wide angle of vision and angled telescopes – Anterior Tympanomeatal Angle, Eustachian tube orifice, Supra tubal recess, Sinus Tympani, Facial recess, Isthmus Tympanicus anticus and posticus are clearly visualized. Retrograde visualization of the Aditus ad antrum, Mastoid antrum and Cavity is possible.
- Practicing ear surgery by trans canalicular route by endoscope is easy as tympanomeatal flap elevation is easier and elegant.
- The thumb of the Operating surgeon obstructing the visibility of the field of surgery is avoided as the light is delivered close to the object, unlike Microscopy. This advantage is distinctly appreciated while curetting bony meatal overhang without injuring underlying Ossicular chain.
- Structures at varied depths are brought into same focus. This advantage is better utilized in curetting the postero superior meatal bony overhang without injuring the underlying Ossicular chain, visualizing the long process of Incus and Fenestra of the foot plate in the same focus while introducing the Teflon piston.
- In Microscopic Ear Surgery the picture seen through Objective of the microscope by the Surgeon may not be exactly same as projected and viewed by the assistant. Endoscopic Ear surgery is essentially a monitor viewed surgery – The picture seen by the Surgeon is also viewed by the Assistant. Hence the Assistant has an effective role in assisting the

surgery and enables effective team work. By the same count Endoscopic ear surgery is the natural method for teaching and learning the Ear Surgeries.

- Better magnification with camera and monitor.
- Scope can be moved around without tilting the head of the patient.
- Endoscope is portable- useful in rural and remote areas.
- Short distance between the light source and tympanic membrane allows a diaphanosopic effect.
- Post operative follow up examination especially operated cavities.
- Photographic video documentation.

#### **Probable Disadvantages of Endoscopic Ear Surgeries and Solutions:**

- Depth perception - Overcome by tilting the endoscope, by palpating the structures with instruments.
- One Handed Surgery – Assistant acts like the second hand, In Trans meatal microscopic surgery one hand is tied with Ear Speculum.
- Bleeding Control – Assistant acts like the second hand in using the suction tip

#### **Indications for Endoscopic Ear Surgeries:**

- External Auditory canal Lesions : Keratosis Obturans, Impacted Foreign Bodies, Removal of Osteoma
- Tympanocentesis, Acid Cautery of Central Perforation
- Intratympanic Medications
- Myringotomy and Grommett Insertion
- Myringoplasty – On lay ,Under lay and Inter lay technique
- Cartilage tympanoplasty

- Attico antral disease- Limited cholesteatoma and Moderately extensive Cholesteatoma
- Otosclerosis
- Tympanosclerosis
- Adhesive otitis media
- Atelactasis
- Tympanic neurectomy
- CSF otorrhoea
- Ossiculoplasty
- Facial nerve decompression
- Middle ear tumors-early stage
- Second look Endoscopic Ear Surgeries

#### **CONTRAINDICATIONS FOR ENDOSCOPIC EAR SURGERY:**

- Infants and young children
- Congenital anomalies of external and middle ear with abnormal facial nerve course
- Very narrow external auditory canal(<6mm)

#### **General guidelines for Endoscopic Ear Surgery:**

- Do not use ear speculum.
- Insert the instruments a little bit into the external ear and then introduce endoscope. This enables you to see the tip of the instrument clearly.
- While withdrawing instruments, watch the tip of the sharp instruments till it comes out of the external canal completely through the endoscope, thus avoiding damage to the external canal skin. Right hand and Left hand coordination is essential.
- To reduce bleeding, adequate vasoconstriction using Adrenaline soaked cotton balls is helpful.

- Always focus on the instruments tip and the operative field clearly. This will avoid damage to adjacent structures.
- Do not apply suction directly over the tissues as it will increase the bleeding. Instead apply suction over a cotton ball.
- Give adequate and appropriate systemic and local antibiotics prior to surgery to eliminate or reduce infection. This will avoid excessive bleeding.
- Tilt the head end of the patient a little bit to reduce venous pressure and hence the bleeding.
- To get a constant motionless picture of the operating field, the distal stem and not the tip of the endoscope should be rested on the posterior bony meatal wall.
- For beginners operating on left ear is advisable as the right forearm of operating surgeon is free whereas on the right ear right forearm is hindered with patients chest.
- Basic temporal bone dissection training is very essential as in microscopic ear surgery.
- Saline is advisable for defogging the endoscope lens, usage of savlon as defogging agent should be limited.

### **How to avoid injury to the Endoscope?**

- Avoid endoscope hitting against hard bone.
- Use the soft tissues of the external canal to compress the canal thereby straightening the external auditory canal allowing room to introduce the instruments.
- Practice regularly to coordinate your left hand holding the endoscope and the right hand using the instruments.
- Always watch the tip of the instruments through the endoscope till the last moment.
- Do not operate in a bloody field. Wait for the bleeding to stop before proceeding.
- Using the burr along with the endoscope requires practice. Do not operate the burr unless you are close to the area which you are operating. Stop operating the burr if the

operating area is not clear. The burr should be allowed to stop completely before it is withdrawn. The bone work is less when using the endoscope, because of the wide vision and angled telescopes, hence the operating time is less.

- Irrigation and suction should be done by the assistant.
- Periodic irrigation with saline is essential to wash out the debris, infection, bone dust and reduce the heat transmission to the tissues. besides saline acts as a natural de-fogging agent for the telescope.

### **Which endoscope to use?**

- Use Wide angled vision 0 degree 4mm diameter endoscope as much as possible. This provides a straight on view and good orientation. This is a very helpful in the initial steps.
- Usage of angled 30 degree endoscope is done to view the Eustachian tube orifice, Supratubal area, anterior epitympanum, attic & aditus area.
- 30 degree endoscope is specifically useful in making the endomeatal incision and raising the tympanomeatal flap especially along the superior wall.
- Usually 4mm nasal endoscope is used. But in certain situations, like narrow canal, 2.7mm angled endoscope would be helpful. But it compromises the illumination.
- Usage of 45 degree endoscope is done in tympanomastoidectomy to view the sinodural angle and tip of the mastoid. Orientation is difficult but the panoramic view provided by the endoscope helps overcome this problem.

### **Light source, Camera and Monitor:**

- Light source – Halogen, Xenon and LED.
- Camera – Single chip Digital Camera with Zoom and focus adjustment with Surgical grade monitor.

- High Definition Camera with HD monitor is the ideal for advanced and precise Endoscopic Ear Surgeries.

#### **ENDOSCOPE HANDLE:**

- The usefulness of endoscopes lies in its easy maneuverability and ability to shift from one operating field to another with ease which is not possible with operating microscopes.
- Endoscopic holders is very useful in selected cases especially operating near delicate structures (operating around foot plate of stapes and along facial nerve) when the surgeon feels working with both hands would be beneficial.

Types of endoscopic handles in use are

- Endoscopic holder with stand
- Endoscope holder attached to the objective lens of operating microscope

#### **Endoscopic Ear Surgery Levels of Learning:**

Endoscopic ear surgery depends on the surgical experience which is best acquired in clearly defined increments. we recommend a systematic & incremental training programme that requires mastery of a level before proceeding to the next level. In addition to providing essential endoscopic skills (Diagnostic oto endoscopy, navigating the endoscope through narrow canal along with instrumentation, achieving hemostasis) lower level procedures reinforce anatomical knowledge & allow the surgeons to function as a team.

Training levels coincide with the surgical modules and provide prerequisite skills for the next training level. The performance of a higher level procedure by a single surgeon as opposed to a team is not recommended due to potential disaster if there is vascular injury or csf leak where a skilled assistant ably assists and works like a third hand of the surgeon. We also strongly believe that the same endoscopic surgeon must be well versed in the corresponding open conventional

procedure. Minimum of 25 cases should be performed in each level before proceeding to the next level.

#### **ENDOSCOPIC EAR SURGERY TRAINING PROGRAMME:**

- Level I: Cadaver Endoscopic Ear Surgeries, Oto endoscopy, Post operative follow up, Documentation, Clearance of the debris, Cauterisation of the granulations

- Level II: Intra tympanic Medications, Tympanocentesis, Cauterisation of Central Perforation Endoscopic Myringotomy and Grommet insertion
- Level III: Post aural Endoscopic Myringoplasty, Endoscopic Endomeatal Myringoplasty,
- Level IV: Endoscopic stapedectomy, Endoscopic Atticotomy and Resection of Limited Cholesteatomas, Perilymph fistula Repair, ossiculoplasty.
- Level V: Endoscopic Tympano Mastoidectomy(Moderately extensive and Extensive Cholesteatoma), CSF Otorrhoea, Glomus Tympanicum, Tympanic Neurectomy, Tympanosclerosis resection
- Level VI: Facial Nerve Decompression (Entire Fallopien Canal), Inner ear Surgeries, Endoscopic approach to CP Angle and Petrous Apex.

#### **PRE OPERATIVE PREPARATIONS:**

- Avoid aspirin 1 week before surgery
- Xylocaine and other medications should be tested for allergy
- Patients should be explained about endoscopic procedure and consent also should be obtained for open procedures.

#### **Anaesthesia for Endoscopic Ear Surgeries:**

- For Children and Apprehensive Adults – General Anesthesia
- For Adolescence and Adults – Local Anesthesia is Preferred. Infiltrations solution is 2% Xylocaine with Adrenaline mixture (Dilution 1 in 2lakhs to 1 in 80,000), Topical solution is 4% Xylocaine with Adrenaline mixtures equal parts.
- For Extensive lesions , Complications, Infections not under control – General Anesthesia is preferred to Local Anesthesia.

#### **ADVANTAGES OF LOCAL ANASTHESIA:**

- Surgery can be done as day care procedure
- Reduced intra operative bleeding
- Hearing can be tested on table



- Potential complications like facial nerve palsy can be detected on table
- Surgery can be done for those with complications for GA

**GENERAL ANESTHESIA:**

**Hypotensive anesthesia is preferred.**

**During general anesthesia mean arterial pressure is maintained between 50 to 60 mmHG, So that bleeding in surgical fields is less..**