SURGICAL MANUAL: ENDOSCOPIC CHOPSTICKS TECHNIQUE

Endoscopic Endonasal Mononostril Approach

bissinger

DISCLAIMER

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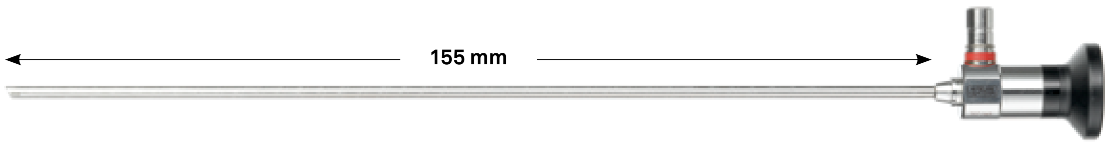
MODULE 1: INTRODUCTION

With ongoing technological advancements and a deeper understanding of endonasal anatomy, the Endoscopic Endonasal Approach (EEA) has become a cornerstone in modern skull base surgery. Although categorized as a minimally invasive approach, the EEA often necessitates the removal of normal intranasal structures to create adequate working space and access deep or lateral lesions – frequently resulting in „sword conflict" between instruments and the endoscope. As contemporary transcranial techniques shift toward minimally invasive paradigms, minimizing the surgical footprint of endonasal approaches is essential to improving postoperative quality of life and aligning more closely with patient expectations. In this context, Professor Sébastien Froelich and his team introduced the mononostril endoscopic chopsticks technique. This technique utilizes angled endoscopes and specially designed low-profile, malleable, and rotatable instruments to preserve normal nasal anatomy while maximizing surgical efficacy. A corner stone of this method is the use of angled endoscopes (30°, 45°, 70°) to "look around corners" rather than removing anatomical structures, thus enhancing exposure while maintaining tissue integrity. The approach also integrates a flexible, rotatable suction tube, whose distal tip can be precisely bent. This enables the surgeon to reach off-axis targets without altering the axis of the shaft – significantly improving maneuverability in confined spaces. The chopsticks technique offers considerable advantages by enabling efficient operation within narrow corridors. Both the endoscope and suction are stabilized by preserved intranasal soft tissues, allowing them to remain close to the working instruments without creating "sword conflict." This results in improved precision, ergonomics, and control during complex procedures.

MODULE 2: EQUIPMENT

The procedure is performed using 3.6 mm rigid endoscopes with 30°, 45°, and 70° **optics** and a working length of 155 mm.



0°	30°	45°	70°
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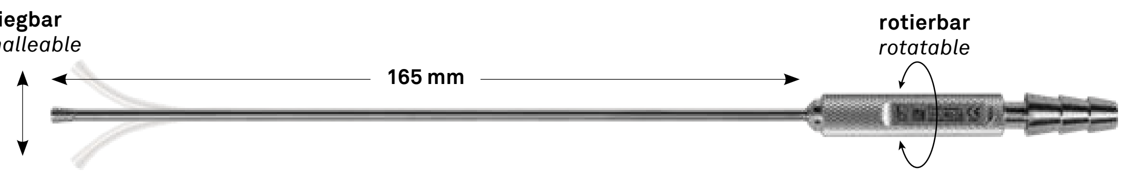
The *specially designed* instruments also include:
- A malleable and rotatable suction tube, where also only the tip can be flexibly bent.



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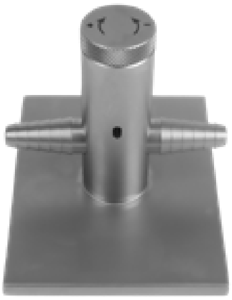
The rotatable suction's ergonomic advantage lies in its ability to direct the malleable tip with minimal movement. Using subtle rotational movements of the fingers, the distal end of the suction can navigate a wide operative field without displacing the shaft. This design ensures optimal maneuverability, particularly in tight anatomical spaces, enhancing surgical precision and minimizing trauma to surrounding structures.

- A suction regulator for rapid adjustment of the suction power.



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- CLARIS REVERSE Non-Stick Bipolar Forceps: These special bipolar forceps are characterized by its unique opening and closing behavior. Due to the crossed design of the legs, the forceps opens and closes in a reverse manner. This makes the forceps very easy to insert into narrow cavities and thus has a very good preparation performance. Like all of our non-stick forceps, this one also features our proven solid silver tips.

REVERSE
NON-STICK

- **MITHRAS** Bipolar Micro-Coagulation Forceps: This shaft instrument sets new standards for minimally invasive surgical procedures, for example for endonasal approaches. Where access to the surgical field is limited, the new MITHRAS instruments with a diameter of just 3 mm offer a unique solution. The new designs utilize the familiarity of the standard handle shapes that surgeons know and take them to the next level of surgery. The electrode inserts can be attached to both handles and the different geometries allow flexibility in different specialties.

MITHRAS

MODULE 3:
PATIENT POSITIONING AND INSTRUMENT HANDLING

The patient is placed in the supine position with head fixation under neuronavigational guidance. The abdomen is prepared for autologous fat harvesting. Both nostrils are packed with epinephrine-soaked cottonoids to minimize bleeding. Bone removal is performed using extended drills with a distal bend and self-irrigating sleeve, equipped with 3 or 4 mm pure diamond burrs.

Instrument Handling: The surgeon holds the endoscope and the rotating malleable suction tube in the nondominant hand, while the dominant hand operates the primary surgical instrument.
The endoscope rests gently in the purlicue (the space between the thumb and index finger), allowing the fingers to rotate and manipulate the suction's distal end. The preserved nasal soft tissues support both instruments, stabilizing them and reducing instrument clashing.
Important Note: Avoid excessive gripping of the endoscope or instruments. Maintaining a light, flexible hold is critical to preventing instrument conflict and allowing for delicate, controlled movements.
The rotatable suction, with its curved tip, offers exceptional maneuverability despite spatial constraints. This unique design allows the suction to remain straight while the tip adjusts directionally, expanding the working range without obstructing the field.
When targeting laterally located tumors (e.g., petrous apex, jugular tubercle, occipital condyle), a contralateral mononostril approach is used. This aligns the surgical axis with the lesion's extension, optimizing visualization and instrument reach.

MODULE 4:
TUMOR EXPOSURE AND RESECTION

After lateralizing the middle turbinate (MT) and, if necessary, the inferior turbinate depending on tumor location, the posterior nasal septal mucosa is incised using an angled needle-tip monopolar electrocautery. The extent of mucosal incision is precisely tailored to the tumor's sagittal location.

Transtuberculum, Transsellar, and Transclival Approach (Upper and Middle Clivus): A vertical incision is made above the choanal arch at the junction of the septum and rostrum.

Using a double-ended Cottle septum elevator, the septum is fractured from the rostrum and gently displaced contralaterally, preserving the contralateral mucosa. The mucosa is then elevated bilaterally from the rostrum, creating a free mucosal leaflet on the operative side.

The rostrum is drilled with a 3-mm diamond burr, removing the sphenoidal keel to widely open the sphenoid sinus (SS). Depending on sinus pneumatization and the position of the sphenoidal septum, the ipsilateral SS may be preserved—especially for contralateral cavernous sinus or petrous apex lesions. In such cases, partial drilling of the SS septum while preserving its mucosa may be required. Coagulation allows for mucosal retraction while maintaining tissue integrity and exposure.

The anterior wall of the SS is then drilled laterally until the sphenopalatine foramen is reached. The palatovaginal canal's vascular bundle is identified and coagulated. The floor of the SS is drilled to enhance access. Laterally, the vidian canal and pterygosphenoidal suture serve as landmarks for the foramen lacerum. The paraclival and lacerum segments of the internal carotid artery (ICA) are identified and, as needed, exposed.

For tumors extending to the lower petrous apex, jugular tubercle, or foramen, the fibrocartilage of the foramen lacerum is incised and removed to allow deeper lateral access below the ICA's lacerum segment.

Craniovertebral Junction (CVJ) Approach (Inferior Clivus, C0–C2): A vertical mucosal incision is made above the choanal arch along the lower septum and extended midline onto the nasopharyngeal mucosa. The pharyngeal raphe is incised with monopolar electrocautery until tumor-bearing bone is reached. Traction sutures may be placed on the incision margins to improve exposure.

For CVJ or lower clivus tumors with limited sphenoid sinus pneumatization, drilling occurs beneath the SS. The inferior sinus wall is unroofed while preserving its mucosa, which is then retracted superiorly after coagulation. Clival drilling proceeds below the SS, maintaining a trajectory under the lacerum ICA segment and guided by neuronavigation.

The pterygosphenoidal fissure helps identify the ICA's lateral boundary. Tumor resection is performed using 30°, 45°, and 70° endoscopes (Module 2: Equipment) with curved, malleable suction (Module 2: Equipment) and dedicated instruments.

MODULE 5: CLOSURE AND SKULL BASE RECONSTRUCTION

With the increasing use of the EEA, effective skull base reconstruction has become crucial. Despite significant advances, closure remains one of the most technically demanding aspects of endoscopic endonasal surgery, particularly for tumors extending intradurally. Over time, the evolution of vascularized flaps and refined techniques has markedly reduced postoperative cerebrospinal fluid (CSF) leak rates.

Our philosophy treats endoscopic endonasal surgery as a variation of conventional transcranial approaches, with the same reconstruction goals: to restore the physiologic barrier between the intradural space and nasal cavities. In this context, nasal mucosal closure is analogous to skin closure in cranial surgery—offering the most natural form of healing by reapproximating mucosal edges.

However, compared to transcranial closures, endoscopic reconstruction must overcome several unique challenges: limited operative space, restricted depth perception, and the need for angled visualization. Preoperative planning of the closure technique is critical to ensure preservation of mucosa and procedural success.

Step-by-step Closure Technique:

1. Sphenoid Sinus Cranialization: After tumor resection, the sphenoid sinus (SS) mucosa retained during exposure is completely removed. In some cases, preservation of one or both sphenoid sinuses may be considered depending on the tumor location (e.g., inferior clivus or CVJ). Angled scopes and instruments are used to access and remove residual mucosa from lateral recesses.

2. Fat Graft Insertion: In cases of dural defect, a piece of autologous fat is inserted through the dural opening in a “snowman-like” configuration. Additional fat is compactly packed into the SS and surgical cavity to obliterate dead space. Fat is pre-soaked in saline with gentamicin.

3. Mucosal Suturing: Closure begins with the rostral and/or nasopharyngeal mucosal incisions. Using a 5-0 monofilament absorbable suture on a 16-mm (3/8c) needle, the pituitary forceps is employed for handling. - The needle passes from the lower edge of the lateral mucosal leaflet to the contralateral margin. Three loops are formed externally before tightening and securing with a mosquito forceps. - Continuous suturing follows, either (Type 1) from one side of the incision to the other or (Type 2) across the nasal septum. If tissue is deficient, the contralateral septal mucosa can be included in the closure.

4. Knot Tying and Sealing: Once the incision is closed, the final knots are made on the nasal septum superficially at the level of the vestibule. Fibrin glue is applied along the suture line and around the sphenoidal ostium.

5. Nasal Packing: A silicone rhinology sheet, cut into a “fish-shaped” form, is placed over the closure to maintain moisture, support healing, and prevent choanal obstruction.

6. Postoperative Positioning: In cases of intraoperative CSF leakage, the patient is positioned at a 30° head elevation in a semi-sitting posture for at least 10 days to minimize intracranial pressure.

This modular closure strategy aims to replicate the integrity of transcranial barriers while adapting to the anatomical and technical constraints of endonasal access.

MODULE 6: SPECIAL CONSIDERATIONS AND SURGICAL TIPS

This section provides key insights and intraoperative considerations to optimize the use of the chopsticks technique in endoscopic endonasal skull base surgery.

1. Selection of Nostril:
- When the lesion is lateralized, especially in regions such as the petrous apex, jugular tubercle, or occipital condyle, a contralateral mononostril approach is recommended.
- This optimizes the surgical corridor and aligns the endoscopic line of sight with the lesion's axis for improved visualization and control.

2. Preservation of Nasal Structures:
- Avoid routine removal of the middle turbinate. Lateralization is preferred and should be done only if necessary.
- The inferior turbinate may also be preserved or gently lateralized depending on tumor location.

3. Use of Angled Endoscopes:
- Mastery of 30°, 45°, and 70° endoscopes (Module 2: Equipment) is critical for visualization around bony landmarks and for assessing tumor extension in complex anatomic regions.
- Frequent switching between scopes may be needed to maintain optimal depth perception.

4. Avoiding Instrument Conflict:
- The "sword fighting" of instruments can be minimized by ensuring that the endoscope and suction are supported by preserved mucosa and septal structures.
- Keep a relaxed grip and gentle instrument handling, especially in narrow corridors.

5. Maintaining Orientation:
- Use anatomical landmarks such as the vidian canal, sphenopalatine foramen, and the clival lines to maintain spatial orientation. - Neuronavigation should be used consistently to verify depth and trajectory.

6. Hemostasis and Field Clarity:
- The flexible, rotatable suction enables targeted aspiration around corners and in lateral recesses without displacing the working instrument.
- Use of bipolar forceps with a rotative angled tips allows for precision coagulation in narrow and around the corner areas.

7. Instrument Design Philosophy:
- All instruments in this system are designed with low profiles and malleable components to optimize ergonomics, preserve anatomy, and enhance surgical freedom.
- The chopsticks technique emphasizes controlled parallel manipulation of instruments, improving accuracy during resection and closure phases.

These pearls help fully leverage the benefits of this approach, reduce complications, and improve surgical outcomes.

MODULE 7: POSTOPERATIVE CARE AND FOLLOW-UP

Effective postoperative care is essential to optimize patient recovery, reduce complications, and ensure long-term success of the endoscopic endonasal mononostril chopsticks technique.

1. Immediate Postoperative Management:
- The patient should be placed in a semi-sitting position with the head elevated at least 30° for the first 7–10 days, especially in cases with intraoperative CSF leak.
- Neurological status and visual function should be assessed regularly. - Maintain nasal packing and splints (if used) in place for 7 days unless otherwise indicated.

2. Nasal and Wound Care:
- Daily nasal irrigation with saline solution is recommended starting 48–72 hours post-surgery to promote healing and prevent crust formation.
- Avoid nose blowing, heavy lifting, or straining during the first 2–3 weeks. - A follow-up nasal endoscopy should be scheduled within 1–2 weeks to assess healing, mucosal re-approximation, and ensure patency of the surgical corridor.

3. Infection Control and Antibiotic Use:
- Prophylactic antibiotics are typically administered for 7–10 days postoperatively.
- Monitor for signs of meningitis, sinusitis, or graft infection. - Intranasal corticosteroids may be considered after 2–3 weeks if inflammation or granulation tissue is present.

4. CSF Leak Monitoring:
- Watch for signs of persistent CSF rhinorrhea such as clear nasal discharge or headache exacerbated by position.
- Imaging and lumbar drainage may be considered if a leak is suspected. - Prompt surgical revision is indicated for unresolved or recurrent leaks.

5. Endocrine and Neurological Follow-Up:
- Hormonal panels should be reviewed in patients with pituitary involvement to detect potential hypopituitarism.
- Long-term imaging follow-up (MRI/CT) should be arranged based on the type and location of the lesion.

6. Rehabilitation and Return to Activity:
- Most patients may resume light activities within 2–3 weeks and return to normal activities by 4–6 weeks depending on surgical complexity.
- Patients should be educated about symptom monitoring and when to seek urgent care.

Adhering to a structured postoperative protocol helps enhance patient outcomes and complements the minimally invasive philosophy of the chopsticks technique.