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ORIGINAL ARTICLE

How to make your sinus surgery more comfortable: our point of view

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ABSTRACT

BACKGROUND. Endoscopic sinus surgery (ESS) has revolutionized the treatment of nasal and paranasal sinus conditions, offering minimally invasive techniques with improved patient outcomes. However, ESS can be challenging, lengthy, and physically demanding. This article presents a comprehensive overview of factors to consider before and during ESS to enhance surgical ease and patient comfort.

MATERIAL AND METHODS. The paper is a literature review sustaining a point of view on the factors influencing the outcome of endoscopic sinus surgery.

RESULTS. Preoperative considerations encompass a thorough assessment of surgical indications, weighing against medical alternatives as per guidelines. Attention to patient comorbidities, medication management and infection control are paramount. Intraoperatively, collaboration with anesthesiologists is crucial for optimizing patient stability and minimizing complications. Ergonomic considerations, patient positioning and surgical environment optimization contribute to surgeon comfort and procedural efficiency. The surgical procedure entails meticulous preparation of the nasal cavity, preservation of anatomical structures, and adherence to standardized techniques. The sphenoethmoidectomy is described as a sequential five-door procedure, emphasizing anatomical landmarks and meticulous dissection techniques. Hemostasis and the judicious use of powered shavers play pivotal roles in minimizing bleeding and optimizing tissue removal. Navigation systems offer additional support, particularly in complex cases or revision surgeries.

CONCLUSION. ESS requires meticulous planning, technical proficiency, and interdisciplinary collaboration to optimize outcomes. Anticipation and adherence to standardized protocols are paramount in navigating the challenges of ESS, ultimately enhancing surgical ease and patient comfort.

KEYWORDS: endoscopic sinus surgery, factors, outcome, sphenoethmoidectomy, shaver, navigation system.

INTRODUCTION

The introduction of endoscopic sinus surgery (ESS) revolutionized the treatment of the nose and paranasal sinuses. ESS is a minimally invasive surgery designed to minimize the discomfort for the patient and ensure better outcomes, but it can be difficult, stressful, long, and tiring. Therefore, we must consider different factors we can adapt or improve to make the surgery easier and more comfortable. These factors are listed in Table 1.

ELEMENTS TO CONSIDER BEFORE THE SURGERY

At the first consultation, the ENT specialist defines if the case is an indication for surgery according to the European Position Paper on Rhinosinusitis and Nasal Polyps (EPOS) guidelines[1] or if there is an alternative with a medical treatment[2].

For example, it could be more effective in some cases to treat a chronic rhinosinusitis without nasal polyps

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Table 1. Factors influencing the endoscopic sinus surgery.

Checklist
✓ Before the surgery, check the surgical indication
✓ Preoperative management
✓ Intraoperative collaboration with the anesthesiologist
✓ Intraoperative position and preparation
✓ Attitude towards the inferior turbinate, middle turbinate, septum
✓ The ethmoidectomy – standardized surgical approach
✓ The instruments: forceps, shaver
✓ Navigation

(CRSsNP) with a low-dose antibiotic such as clarithromycin for 6 to 12 weeks instead of surgery, or in the case of chronic rhinosinusitis with nasal polyps (CRSwNP), it could be better to consider biotherapy, particularly in a patient who has a recurrent, multi-operated and uncontrolled nasal polyposis[3,4].

If the surgical indication is the option, the surgeon must decide if the surgery must be performed in emergency or can be included in the waiting list[5].

The surgeon decides if additional imaging is necessary, checks the surgical indication at the time of the surgery, or decides to use the navigation system (this one requires a specific number of cuts).

4 to 6 weeks before the surgery, the surgeon contacts the patient to find out if there are any changes in the evolution of the disease since the last consultation.

After a thorough anamnesis and clinical examination, the surgeon confirms if there is still a surgical indication or if the disease has significantly improved or even resolved, cancelling the surgery.

At this time, the surgeon also decides if antibiotics must be prescribed to treat acute bacterial exacerbation.

Controlling the infection should be done whenever it is possible, aiming for total resolution. This is not possible in the case of odontogenic sinusitis.

The patient with comorbidities, such as high blood pressure, asthma, cardiovascular disease, diabetes mellitus, and OAS should be treated in order to minimize the negative effect of the respective pathology on the outcome of the surgery.

Special attention is required for the medication the patient is receiving. Some medications should be maintained (e.g., antihypertensives, anti-diabetes) and others should be stopped or replaced (e.g., anticoagulants, antiaggregants)[6]. This may require consultations from different other specialists.

An important question is whether the patient with nasal polyps should receive oral glucocorticosteroids (OG) before surgery or not. Current recommendations include using corticosteroids preoperatively in patients with CRSwNP[7,8]. This leads to a significant reduction in the size of the polyps and inflammation. However, studies show that OG can modify the histological findings and the level of the mediators of the inflammation.

FACTORS THAT IMPACT THE QUALITY OF THE SURGICAL ACT

The anesthesiologist

The anesthesiologist plays a major role during all the procedures and can significantly influence the quality of the surgical act[9-11]. Active cooperation with the anesthesiologist is paramount. The surgeon must provide all the information concerning the surgery itself: the indication, the difficulty, the expected duration, the potential risk of complication, and the risk of massive bleeding.

The blood pressure must be kept around 9 or 10 cmHg and should be stable. The surgeon can suggest the use of TIVA (total intravenous anesthesia) instead of gases as recommended in the literature. There is growing evidence that TIVA has advantages over inhalation anesthesia (INA) regarding endoscopic vision and controlling the bleeding[12].

Administration of tranexamic acid could be helpful in case of massive polyposis, as it has been proven to be efficient in controlling intraoperative haemorrhage[13].

The nurses

The nurses working in the operating room must be informed about the materials used for this procedure. This concerns the set of instruments, the bipolar forceps or a cautery, the navigation system, and any stents or nasal packing. This can decrease dramatically the loss of time during the surgery.

The environment

The respect of good ergonomics is of utmost importance to avoid tiredness and, over time, musculoskeletal troubles in the neck, shoulders, hips and legs[14,15].

The position of the patient should be carefully considered. Usually, the patient is positioned in the anti-Trendelenburg position or reverse Trendelenburg position, which allows the venous decongestion in the upper part of the body.

Using horseshoe headrest facilitates access for the surgeon at the operation site and facilitates adequate positioning of the head (see Figure 1).

In frontal sinus surgery, a hyperextension of the head is needed to allow easier access to the frontal recess.

The operating room should be dark for maximum visibility of the screen. The display position should offer comfort, in front of the surgeon, with a few degrees below the line of horizontal gaze. In the case of a 4-hand technique, the monitor is at the head of the patient. The

Figure 1. Horseshoe headrest.

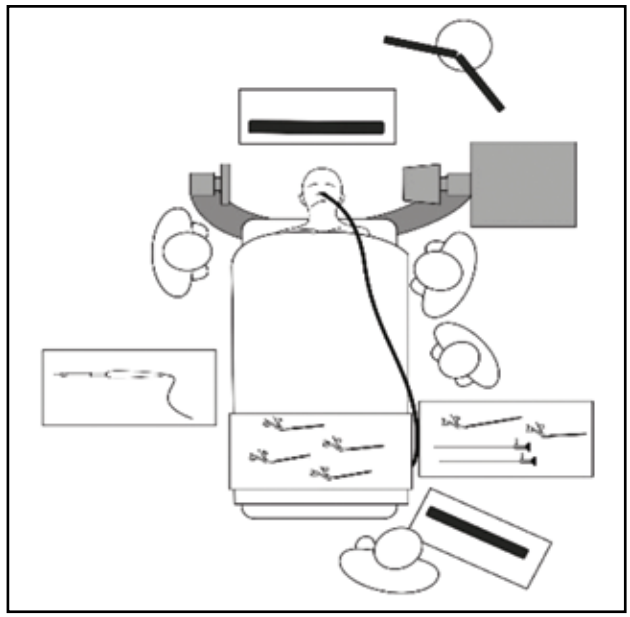

Figure 2. Intraoperative setting.

operating table should be as low as possible, at the level of the elbows. The position of the surgeon can be sitting or standing, ensuring the armrest, and comfort[13]. The surgeon is on the right side or the left side of the table, depending on whether the surgeon is right-handed or left-handed. The operating aid should be facing the surgeon or on the left side of the surgeon if he is right-handed, depending on the type of surgery – two-hand, or four-hand surgery (see Figure 2).

The ocular globes should be always visible during the procedure to detect very early any ocular injury leading to proptosis or mydriasis.

The endoscope should be kept in a vertical position, resting on the nostril opening for stability (see Figure 3A

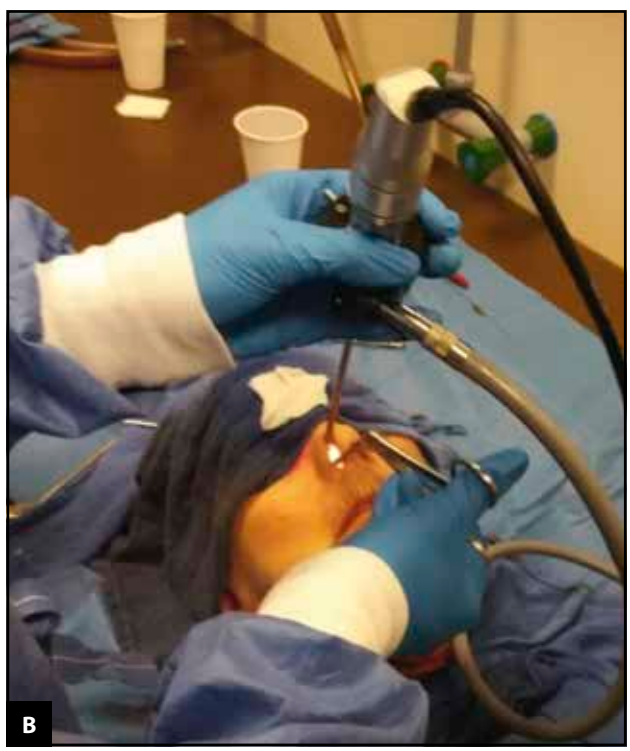

Figure 3. **A.** Correct position in case of routine endonasal surgery; **B.** Good position for a right endonasal surgery / photo in the lab of anatomy.

and B). The surgeon must avoid any conflicts of interest between the telescope, the light cable, and the suction. Handling the forceps correctly is important.

The procedure

The procedure starts with the preparation of the nasal cavity with decongestants.

Topical vasoconstrictors should be used every time to obtain an optimal surgical field[16,17]. Xylocaine 5% + naphazoline or a solution of Adrenaline must be applied on pledgets. It gives optimal vasoconstriction with little rebound effect. Some teams use cocaine topically. The latter is a very potent vasoconstrictor, but its use is controlled medicolegally.

There are reports of serious adverse events attributable to systemic absorption of vasoconstrictors, which is why they should be used with caution in patients with cardiovascular diseases.

Infiltration with Xylocaine adrenaline 1% is facultative. We should be careful not to confuse the products because of the risk of complications. There were reports of Takotsubo syndrome[17] or spasm of the ophthalmic artery[18]. Usually, the solution is injected in the lateral nasal wall near the uncinate, the axilla of the middle turbinate to anesthetize the anterior ethmoidal nerve; another site of injection is at the posteroinferior attachment of the middle turbinate to block the sphenopalatine ganglion; additional injections can be done along the inferior turbinate or septum if needed.

Surgical procedure steps:

- The first step of the procedure consists of a lateralization of the inferior turbinate.

Inferior turbinates are important anatomic structures in the nose. They play a major role in nasal physiology and therefore must be preserved and respected as long as possible.

Lateralisation, also known as outfracturing, of the inferior turbinate increases the space needed to perform any endonasal procedure.

- What about the nasal septum?

In case of an obstructive septal deviation, a septoplasty must be performed endoscopically or in the conventional way.

When an ethmoidectomy or an endonasal procedure must be performed, we recommend to start sinus surgery on the most patent side and finish the procedure with the contralateral sinus surgery. This is particularly relevant when the surgeon uses the microdebrider. When the septoplasty is done before the sinus surgery, the mucoperichondrium flap can be aspirated by the suction and this decreases the visibility during the sinus procedure.

In case of a limited septal deviation, with or without a septal spur, luxation of the nasal septum is usually done. This can be complicated by a cerebrospinal fluid (CSF) leak, as Bruno Fayet et al.[19] published in 2007.

A limited endoscopic septoplasty is recommended and is less traumatic than a significant outfracture of the nasal septum.

Studies are showing that FESS combined with a septoplasty may reduce the revision rate[20]. Actually, this gives better access to the ethmoid, facilitates postoperative care, and prevents the development of synechiae.

- What about the middle turbinate?

The middle turbinate is a part of the ethmoid bone. It belongs to the turbinate plate of Mouret and therefore must be preserved as long as possible[21]. However, the middle turbinate may have some anatomical variations, such as pneumatized middle turbinate (30% of the general population) or paradoxically bent middle turbinate (20% of the general population), which can restrict the access to the ethmoid[22]. In these cases, a partial limited resection of the inferior part of the body of the middle turbinate is recommended. It must be done gently, with true cutting forceps (see Figure 4).

The section must be done step by step in a horizontal way parallel to the plan of the opercula of the middle tur-

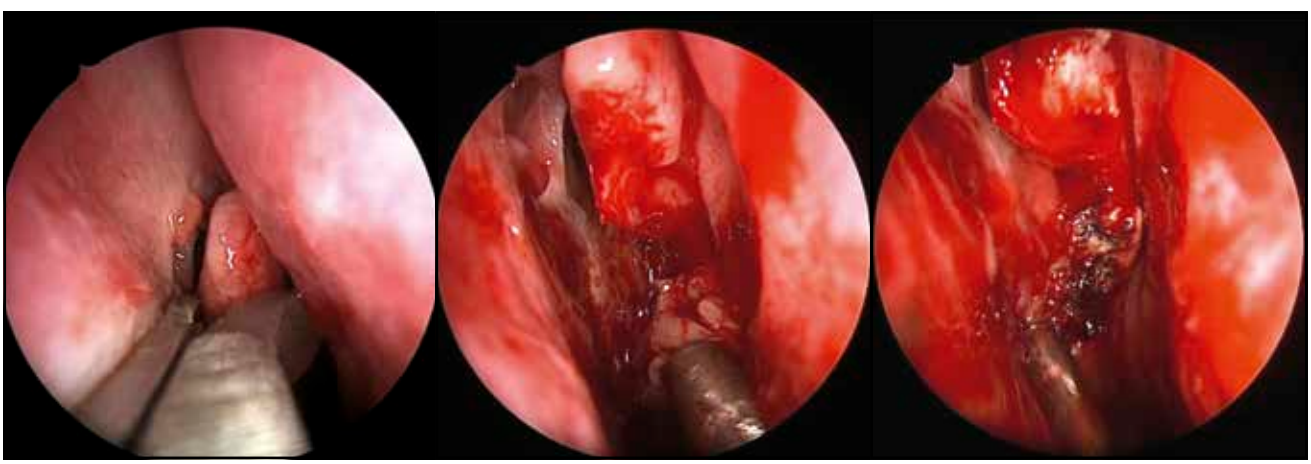

Figure 4. Cutting the middle turbinate.

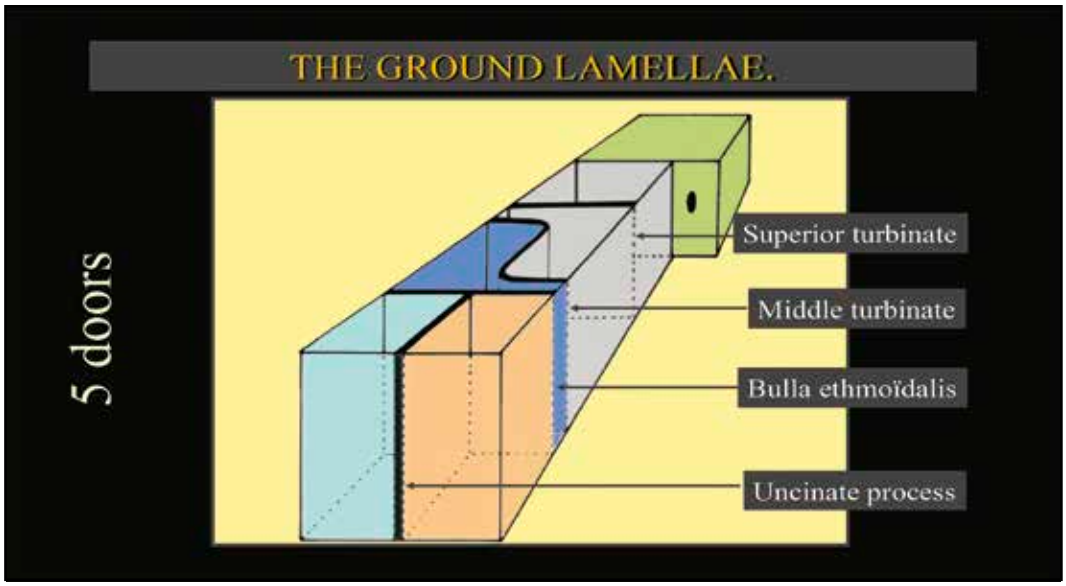

Figure 5. The 5 doors dividing the ethmoidal corridor.

binate, to avoid any penetration in the skull base.

We must remember that the junction between the middle turbinate, the cribriform plate and the lateral lamella of the olfactory fossa, the depth of the fovea ethmoidalis[23] and the anterior ethmoidal artery are the weakest areas of the skull base. These areas can generate CSF leak in case of middle turbinectomy or brutal manipulation of the middle turbinate[24].

- The sphenoethmoidectomy[25,26].

The sphenoethmoidectomy is described as a 5-door procedure (see Figure 5).

Surgery must be done in a standard manner from anterior to posterior and vice versa.

Five landmarks divide the ethmoidal corridor:

1. The sagittal portion of the uncinate process. Uncinectomy can be performed with various instruments: sickle knife, Cottle elevator, cutting instrument (Blakesley forceps), curette, spoon, and shaver.
2. The anterior wall of the bulla ethmoidalis. Opening of the bulla ethmoidalis can be done with a curette, cutting instrument (Blakesley forceps), and shaver. When you resect the anterior wall of the bulla ethmoidalis, you approach the skull base and the anterior ethmoidal artery. This artery is always at the level of the roof and it is in a bony canal that can be dehiscent. It is at the posterior limit of the frontal recess and can be situated at some distance from the roof; in front of it, there is the posterior meatic cell, also known as the first fovea ethmoidalis.
3. The basal lamella of the middle turbinate. The perforation of the ground lamella should be done inferiorly and medially.
4. The basal lamella of the superior turbinate. During the posterior ethmoidectomy, it is important to identify the roof of the ethmoid, as it marks the location of the skull base. The Onodi cell is the last ethmoid cell, situated more posterior, lateral and superior than expected. Its close proximity to the optic nerve is of paramount importance.
5. The anterior wall of the sphenoid sinus. The opening of the sphenoid sinus can be performed transethmoidally or transnasally. It requires the presence of a CT scanner in the OR, as there are different degrees of pneumatization of the sphenoid sinus. Traditionally, the sphenoidotomy is performed after a complete ethmoidectomy. Endonasal sphenoidotomy is carried out through the sphenoethmoidal recess.

Dissection of the skull base is then performed from posterior to anterior.

The frontal recess dissection has a major rule: avoiding mucosal stripping!

The anatomy of the frontal recess is very complex and must be assessed with a sinus CT scan in axial, coronal, and sagittal cuts. 3D reconstruction may be necessary to identify all the frontoethmoidal cells.

The surgery needs specific instruments, such as curved suctions, curved curettes, mushroom forceps (see Figure 6).

- The haemostasis[27,28].

Good haemostasis is essential during the procedure.

One easy way to clean the surgical field from blood clots is to regularly clean the operating cavity with saline. This task is typically performed by the aid in collaboration with the surgeon. When necessary, we can use patties soaked in a solution of diluted adrenalin. When there is bleeding originating from a vessel, cauterization with an endonasal bipolar device is required.

The quality of intraoperative haemostasis significantly

Figure 6. Curved instruments (curettes, suction, forceps) for the frontal sinus surgery.

influences healing. Increased blood presence correlates with higher postoperative crusting.

- The Shaver[29,30].

Coming from the orthopaedic surgery, the shaver has taken more and more space in the setting of endonasal surgery in the last decade. The use of powered soft-tissue shavers in standard functional endoscopic sinus surgery provides significant advantages over the use of standard instrumentation. Increased safety, improved results, decreased blood loss, and potential cost savings are significant advances offered by using this instrumentation. The principle of functioning is blading, drilling, and aspiration. It should be used in a sweeping, rather than penetrating, manner. Alternating between suction, palpation, and debridement is recommended. Blades or drills can be utilized. When you use a blade (tricot or sinus blades), you can debulk grossly a big extensive nasal polyposis, but you can also use it gently in a nontraumatic way.

The shaver can be called the "brush" for the rhinologist. 4 principles must be observed when you use it:

1. never deploy the blade past the field of vision,
2. never put pressure on the sinus walls,
3. work parallel to the sinus walls (follow the plates),
4. never keep your foot on the pedal all the time.

If these principles are not observed, publications regarding major complications have been reported, such as intraorbital damage or intracranial injury[31].

- The navigation system[32].

At the moment, the navigation system is not considered medico-legally necessary to use.

It makes a correlation between the patient, the scanner, and a registered instrument. It can give information to the surgeon about the location of the instrument in a complex situation: difficult anatomy, loss of landmarks, loss of orientation. The navigation system is, of course, very useful in case of revision surgery, frontal sinus surgery or surgery for a tumor, but it can be also very useful in the case of primary sinus surgery. With the help of navigation, the surgery is more complete and safer. The more it is used, the shorter the time required for surface matching, resulting in improved accuracy.

CONCLUSIONS

- Endoscopic sinus surgery can be long, difficult, tiring, and stressful.
- Many factors can influence the quality of surgery. Taking into account all these factors will facilitate or enhance the comfort of your surgery.
- There is a need to thoroughly discuss the indication.
- Good collaboration with the anesthesiologists is paramount.
- Good intraoperative preparation of the patient will ensure a better outcome.
- Standardized surgical technique with adequate material and identification of all landmarks is important.

And finally, anticipation is the most important thing.

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