MAXILLARY ANTROSTOMY- PROCEDURES AND COMPLICATIONS

Cristina Maria Goanţă¹,², Daniela Cîrciu¹,², Mihail Tuşaliu¹,³*, Vlad Andrei Budu¹,³

¹ University of Medicine and Pharmacy „Carol Davila”, Bucharest, Romania
² Clinical Emergency Hospital „Sf. Pantelimon”, Bucharest, Romania
³ Institute of Phonoaudiology and Functional ENT Surgery „Prof. Dr. D. Hociotă”, Bucharest, Romania

ABSTRACT

Maxillary sinusitis is one of the most frequent pathologies in ENT practice. Usually it resolves with proper medication but sometimes the pathology is hard to manage without surgery. Surgery may be performed, the most used being medial antrostomy. Other types of surgery are: balloon catheters in endoscopic sinus surgery, Caldwell-Luc Procedure and Inferior Antrostomy. The potential complications of endoscopic surgery are: orbital injury, blindness, orbital hematoma, nasolacrimal duct injury, epiphora, and postoperative epistaxis. Skull base injury and cerebrospinal fluid leak are very rare complications that should be discussed with patients undergoing endoscopic sinus surgery. The potential complications of Caldwell-Luc procedure include oroantral fistula, infraorbital nerve injury with associated hypesthesia, and injury to the tooth roots. The main risk associated with inferior antrostomy is nasolacrimal duct injury.

Keywords: maxillary sinusitis, antrostomy, Caldwell-Luc procedure.

RéSUMÉ

L’antrotomie sinusale; procédés et complications


Mots-clés: sinusite maxillaire, antrotomie, opération Caldwell-Luc.
EMBRYOLOGY OF THE MAXILLARY SINUS

The maxillary sinus is present at birth, undergoing further expansion with age. It undergoes 2 main periods of rapid growth, from birth until age 3 years and from age 7 years through early adolescence; it then continues to grow slowly until it reaches adult size by age 18 years.

ANATOMY OF THE LATERAL NASAL WALL

The maxillary sinus lies in the body of the maxilla, its superior border is the inferior orbital wall, anterior the canine fossa, medial it has the lateral nasal wall, inferior the alveolar process of the maxilla. The functional component of the maxillary sinus is the ostiomeatal complex, which is constituted by the uncinate process, the maxillary ostium, the infundibulum, and the ethmoid bulla.

The uncinate process is a sickle- or L-shaped bone that has a free edge along its superior surface, which is taken down during uncinectomy. Superiorly, it can be attached to the lamina papyracea (most common configuration), the middle turbinate, or the skull base. Posteriorly it attaches to the inferior turbinate at the ethmoid process.

Once the uncinate process is taken down, the natural maxillary sinus ostium can be visualized. Because the cilia of the maxillary sinus beat uphill toward the natural maxillary sinus ostium, the natural ostium of the maxillary sinus must be included by means of maxillary antrostomy for a maximal functional benefit. If the natural ostium is missed, mucus recirculation may be a problem.

Surgeries on the maxillary sinus started from the early 1700s and the Caldwell–Luc operation was described in 1893 in the US and then in 1897 in France. In the 1960s the first antrostomy took place.

Functional endoscopic sinus surgery (FESS) is based on the surgical approach performed by Messerklinger and Wigand in Europe via the ostiomeatal complex. FESS has become the standard surgical treatment for chronic maxillary sinusitis, with external approaches being used as an adjunct in more complicated cases or in tumor management.

SURGICAL OPTIONS

Surgery is reserved for patients with confirmed chronic sinusitis—as documented by findings on history, physical examination, and CT scan—who have not responded to medical therapy.

Three main surgical options are: (1) endoscopic uncinectomy with or without maxillary antrostomy; (2) the Caldwell-Luc procedure, and (3) inferior antrostomy (nasoonarial window).

Today, endoscopic maxillary antrostomy and uncinectomy are the standard of treatment for refractory chronic maxillary sinusitis. The Caldwell-Luc and inferior antrostomy approaches are reserved for rare circumstances, such as the case of severe allergic fungal sinusitis in which standard antrostomy alone does not allow complete extirpation of fungal concretions or complete drainage.

PREOPERATIVE STEPS

- Consent should be obtained prior to any surgical procedure. The possible risks of this surgery are: orbital injury, blindness, nasolacrimal duct injury, epiphora, epistaxis, cerebrospinal fluid leak, meningitis and brain abscess, and, of course, persistent rhinosinusitis.
- If an active infection is present, a preoperative antibiotic course may be administered in the weeks prior to surgery. A preoperative steroid course may be administered if significant edema or polyps are observed on examination.

TYPES OF SURGERY

Endoscopic maxillary antrostomy

In the preoperative holding area, nasal decongestion is done, with the patient receiving sprays of oxymetazoline. Following the initiation of general endotracheal anesthesia, the eyes are protected with eye ointment and thin strips of tape. The nasal passages are decongested with appropriate vasoconstrictors. If septoplasty is to be performed, the septum should be infiltrated with 1% lidocaine with 1:100,000 epinephrine in the submucochondral space. Then, the patient is prepared for surgery. If septoplasty is to be
performed, it may be done either before or after sinus surgery8.

Under endoscopic guidance, the middle turbinate may gently be moved medially, with care to avoid fracturing the turbinate–skull base junction. At this point, the uncinate process should be within view, and it is injected with 1% lidocaine with 1:100,000 epinephrine.

First, the root of the uncinate process is injected. Next, the inferior portion of the uncinate process is injected. The root of the middle turbinate is infiltrated as well. Finally, an injection is placed at the inferior junction of the basal lamella with the lateral nasal wall. This serves to vasoconstrict the sphenopalatine artery. Approximately 1-2 mL of local anesthetic is used at each injection site, with the bevel down (toward mucosa). An appreciable blanch of the mucosa should be observed with each injection.

After decongestion, uncinectomy is the next step. Uncinectomy can be performed in numerous ways.

Under endoscopic guidance, a maxillary ostium seeker is insinuated just behind the uncinate process and used carefully to displace the free edge of the uncinate outwardly and anteriorly. To prevent lamina papyracea injury, care is taken to very gently manipulate only the uncinate process and not to penetrate deeply.

Next, 90-degree upbiting forceps are used to grasp the free edge of the uncinate process. In a controlled push-and-pull fashion, staying parallel to the lacrimal duct, the uncinate process is then removed. Care is taken to engage the uncinate process parallel to the lateral nasal wall, to prevent injury of the lamina papyracea. Any remaining uncinate process may be removed using a combination of microdebridement and pediatric forceps. All portions of the uncinate should be removed carefully to avoid injury to the infraorbital nerve, which is vertical and inferior to the midpupil.

Once the natural ostium is identified, an ostium seeker is placed through the ostium and then carefully pushed posteriorly to widen the ostium. Using a through-cutting forceps, the ostium is enlarged, thereby completing a maxillary antrostomy. The maxillary sinus should be inspected with a 30- or 70-degree scope to ensure that no further disease is present within the sinus and that the natural ostium was included in the antrostomy.

If either a microlith or a polyp is present, it may be removed using curved giraffe forceps or a curved suction.9

If lateralization of the middle turbinate is a concern and in order to allow easier postoperative examination of the maxillary antrostomy in the office, the controlled synechiectomy technique may be used. Briefly, this involves ablating the opposing areas of mucosa from the medial middle turbinate and septum.

The middle meatus may be packed with various products if either postoperative bleeding or lateralization of the middle turbinate is a concern. Many packing materials have been described, ranging from rolled Gelfilm to Merocel packing. The authors’ preference is for a latex-free, glove-covered, trimmed Merocel in the middle meatus. This should be removed at the first postoperative visit (3-5 d).

Balloon catheters in endoscopic sinus surgery

Balloon catheter technology has been used to dilate the maxillary sinus natural ostia without bone or soft-tissue removal. Early reports show sustained patient symptom improvement and sinus ostia patency. Further study and long-term outcomes with this technology will determine its role in endoscopic sinus surgery.11

Caldwell-Luc procedure

For patient’s comfort, this procedure typically is performed under general anesthesia. However, if medical comorbidities preclude general anesthesia, the procedure may be performed with local anesthetic and sedation. Lidocaine, 1% with 1:100,000 epinephrine, is injected in the incision site, and time is allowed for vasoconstriction. Make a 3-cm incision centered over the canine tooth and first premolar while leaving about 0.5-1 cm of gingiva intact above the dentition to facilitate closure.

Using electrocautery, dissection is carried down through the soft tissue and peristome to bone. Next, a periosteal elevator is used to widely elevate periosteum from the anterior wall of the maxilla. Care is taken to identify and avoid injury to the infraorbital nerve, which is vertical and inferior to the midpupillary line. In the canine fossa, with mallet and osteotome, the maxillary sinus is penetrated through its anterior thin bone. Thereafter, rongeurs are used to enlarge the opening. Any pus from the maxillary cavity may be sent for culture. The disease within the sinus can be addressed appropriately. Next, the sinus is irrigated. The incision is then closed using 3-0 or 4-0 absorbable suture.12

Inferior antrostomy

Vasoconstriction is begun with topical oxymetazoline on pledgets. Next, 1% lidocaine with 1:100,000 epinephrine is injected under endoscopic guidance along the lateral nasal wall underneath the inferior turbinate. A 3-mL syringe with a 27-gauge needle facilitates the injection. Because the nasolacrimal duct lies approximately 1 cm anterior to the natural maxillary ostium, the injection and surgical antrostomy site
is about one to two thirds of the distance back along the inferior turbinate.

Next, the maxillary sinus is punctured in this region using a curved suction or trocar. This antrostomy should then be enlarged with through-cutting forceps. The maxillary sinus disease should then be extirpated appropriately.

**POSTOPERATIVE STEPS**

The stomach and nasopharynx should be suctioned prior to extubation. After extubation, the patient is taken to the postoperative care unit for recovery. Once the patient is awake, he or she is examined to check extraocular motility and to look for evidence of excessive bleeding or proptosis. If the patient is doing well, the individual may be discharged home after all postanesthesia protocol parameters have been satisfied.

**POSTOPERATIVE FOLLOW-UP**

Postoperative care of the patient with chronic sinusitis is essential for long-term success.

The patient is sent home with appropriate pain medications and instructions for nasal saline irrigations.

The patient returns for the first postoperative visit 3-5 days after surgery. At this time, the middle meatus packing is removed and all crusts and dried blood clots are carefully débrided.

Weekly follow-up may be needed for the first month; biweekly follow-up with débridements may be indicated for the second month.

Further follow-up is then determined by the severity of the patient’s disease, healing, and symptoms.

Further medical management after surgery, using antibiotics, nasal steroids, antihistamines, allergy medications, and oral steroids, is individualized based on the patient and further flares of sinusitis.

**COMMON CAUSES OF FESS FAILURE**

* Incomplete uncinectomy or failure to include the natural maxillary sinus ostium within the antrostomy, thereby creating recirculation between two ostia.
* Lateralization of the middle turbinate or turbinate remnant and postoperative synechiae formation are also common.

**SURGICAL COMPLICATIONS**

**Potential complications of endoscopic surgery**

Orbital injury, blindness, orbital hematoma, nasolacrimal duct injury, epiphora, and postoperative epistaxis. Skull base injury and cerebrospinal fluid leak are very rare complications that should be discussed with patients undergoing endoscopic sinus surgery. With simple maxillary antrostomy, however, the risk of skull base injury should be negligible.

**Potential complications of Caldwell-Luc procedure**

The main complications associated with the Caldwell-Luc procedure include oroantral fistula, infraorbital nerve injury with associated hypesthesia, and injury to the tooth roots.

**Potential complications of inferior antrostomy**

The main risk associated with inferior antrostomy is nasolacrimal duct injury. Recirculation of mucus from the natural maxillary ostium through the newly created inferior antrostomy is possible. This usually occurs when inferior turbinate reduction is also performed.

A systemic classification of complications supports the comparative assessment of therapy results and emergency management.

According to the European Rhinologic Society (ERS), complications may be classified into two levels of severity:

1. „Adverse events“: may resolve spontaneously, easy to handle.
2. Grade A complication (technique complication): leads to an additional surgery, without permanent harm – orbital emphysema, ecchymosis of the eyelid, minor bleeding, synechiae, hyposmia, atrophic rhinitis, hypesthesia of the lip and teeth.
3. Grade B complication (major complication): irreversable damage – reduced visual acuity/blindness, brain abscess, direct injury of brain tissue, injury of the internal carotid artery, anosmia.

Another source introduces a classification with three categories:

a) „Minor complication“: intraoperative controllable without consequences.

b) „Major complication“: controllable during surgery or in revision surgery, without permanent harm.

c) „Serious complication“: high risk of permanent harm.

**CONCLUSIONS**

The surgery for maxillary sinusitis can be a stressful event for both the surgeon and the patient but, with good anatomy knowledge, a good examination of the CT scans before surgery and postoperative care, the chances of success are very high.
REFERENCES


