

Antral Puncture and Lavage

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Introduction:

Focus on maxillary sinus cavity pathology dates back to the 17th century. Treatment for suppuration of maxillary sinus was common during that period. One of the earliest descriptions of intranasal antrostomy as an approach to maxillary sinus was dated back to 1770 by Gooch. Routine puncture of maxillary sinus via the inferior meatus was performed during 1880's following the classic publication of Lichwitz who designed the classic trocar and cannula that can be used for performing the procedure.

Krause in 1887, Mickulicz in 1887 standardized the procedure. Mickulicz understood the anatomical and physiological pitfalls of inferior meatal antrostomy which included its propensity for spontaneous closure making it a temporary procedure. This was hence gradually replaced by canine fossa antrostomy (Caldwell Luc procedure) by 1897.

Acute maxillary sinusitis was common problem during the 17th and 18th centuries. Radiological investigations were not commonly available hence antral lavage was used as a diagnostic as well as a therapeutic procedure for diagnosing and treating acute maxillary sinusitis. Antral puncture and aspiration remained gold standard for diagnosing acute maxillary sinusitis for a long time.

With the advent of functional endoscopic sinus surgery antral lavage has fallen out of fashion. But it should be stated that it remains still the most cost-effective procedure in diagnosing and managing maxillary sinus infections.

Anatomy of inferior meatus:

Inferior meatus is the largest of the three meatuses of the nasal cavity. This is actually the space between the inferior turbinate and the lateral nasal wall. It extends almost the entire length of the lateral wall of the nose. It is broader in front than behind which makes it easy for accessing the lateral nasal wall from here. Anteriorly the nasolacrimal duct opens here. Inferior turbinate is a separate bone unlike the superior and middle turbinates which are components of ethmoid bone. Inferior concha / inferior turbinate matures via endochondral ossification.

Articulations of inferior turbinate:

Anterior – Frontal process of maxilla

Anteromedial – Articulates with the uncinat process of ethmoid bone and lacrimal bone

Posteromedial – Perpendicular plate of palatine bone

Indications for antral lavage:

1. Acute bacterial maxillary sinusitis causing pressure symptoms in middle of face
2. Feeling of numbness of teeth / symptoms that does not resolve with medical management
3. Patients with maxillary sinusitis who are not fit for general anesthesia to perform functional endoscopic sinus surgery
4. Patients on assisted mechanical ventilation who commonly develop sinusitis (nearly 40% of them develop). Lavage in these patients can be performed as a bedside procedure under local anesthesia to clear the pent-up secretions from the maxillary sinuses.
5. In patients with permanent disability of muco ciliary clearance mechanism like Kartagener's syndrome and Young's syndrome. In these patients FESS is almost useless and only inferior meatal antrostomy could salvage them.

Contraindications:

1. In young children in whom maxillary sinus is not fully developed. Maxillary sinus completes its development only after the age of 9.
2. Blow out fracture of orbit / history of blow out fracture of orbit because irrigated fluid from the sinus could infuse into the orbit via the fracture line causing orbital problems
3. Patients who have undergone previous surgeries involving the lateral nasal wall as the needle could enter through the posterior wall of maxillary sinus into the pterygopalatine fossa
4. In patients with atrophic rhinitis because the lateral nasal wall will be pretty thick in these patients making the procedure rather difficult. It may require a chisel and gouge to create inferior meatal opening in these patients. Simple trocar and cannula would not do.

Procedure:

This procedure involves introduction of a canula into the maxillary sinus cavity via an opening made in the inferior meatus. This procedure is rather outdated these days because the maxillary sinus drainage in the presence of normal muco ciliary clearance mechanism is not dependent on gravity. The beating cilia always propels the secretions from the sinus cavity towards the natural ostium which is situated slightly above. There is no point in expecting gravity to work against the natural muco ciliary clearance mechanism.

This surgery is performed under local anesthesia. Topical anesthesia is produced by using 4% xylocaine soaked nasal pledgets. Topical anesthesia lasts about 45 minutes which is more than sufficient for completion of the procedure. While using 4% xylocaine topical anesthesia it should be ensured that the maximum volume of drug used should not exceed 7ml. A reasonable dose of xylocaine that is safe for topical use is 4mg/kg body weight. By mixing xylocaine with adrenaline, the effect of the drug can be prolonged plus the added benefit of vasoconstriction which reduces bleeding. Ideal is to mix 1 ampule of adrenaline to one 30 ml bottle of 4% xylocaine. This will ensure that adrenaline concentration is about 1 in 10000 units. Cottonoids if available are preferred to pledgets.

Each nasal cavity should be packed with 3 packs soaked with 4% xylocaine with 1 in 10000 units adrenaline. Before packing the pack should be squeezed to remove excess xylocaine. The first pack is placed over the floor of the nasal cavity, the second one is placed in the inferior meatus. The third pack is placed in the middle meatus area. Surgeon should be aware that the posterior pharyngeal wall mucosa would also be anesthetized by xylocaine trickling into that area. This could cause the patient to aspirate because the sensation is lost. The surgeon should be conscious about this problem while performing the procedure. The patient should be instructed not to sniff while nasal packing is done as it would promote drug to trickle into the posterior pharyngeal wall.

A short description of innervation of nose and nasal cavity would not be out of place. Nasal innervation can be simplified by dividing it into internal (mucosal) innervation and external (innervation involving the skin of the nose).

Innervation of external nose:

The external nose is innervated by the ophthalmic division of 5th cranial nerve, and maxillary division of 5th cranial nerve. The superior aspect of the nose including the tip is supplied by Infratrochlear nerve. The supratrochlear nerve and external nasal branch of anterior ethmoidal nerves also supply this area. The infraorbital nerve supplies the inferior and lateral aspects of the nose extending up to the lower eyelids.

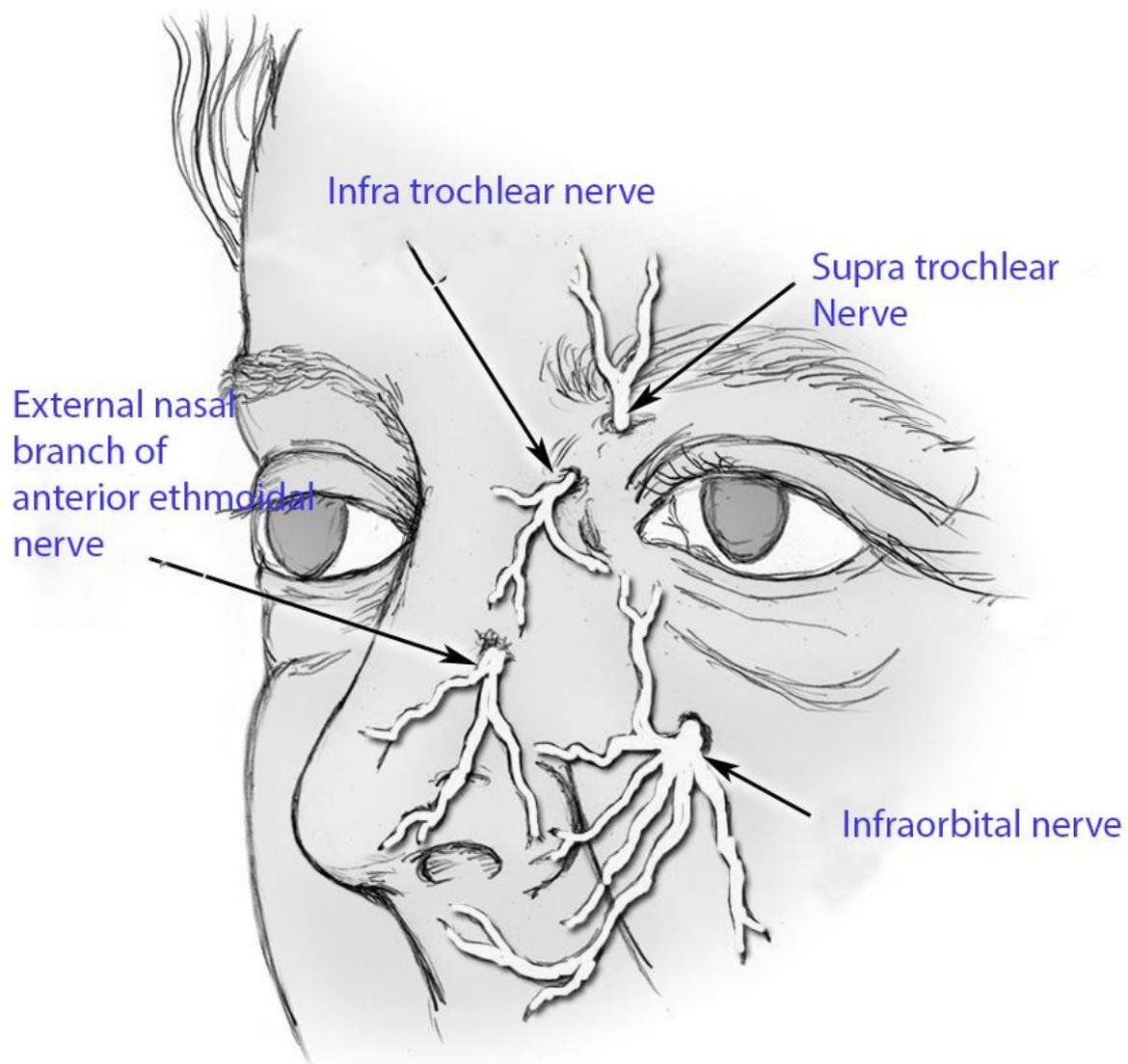


Diagram illustration innervation of external nose

Sensory innervation of nasal mucosa:

The interior of nasal cavity is subdivided into the nasal septum, lateral nasal walls and the cribriform plate. The superior inner aspect of lateral nasal wall is supplied by the anterior and posterior ethmoidal nerves. The sphenopalatine ganglion is located in the posterior end of the middle turbinate and this innervates the posterior nasal cavity. It is this ganglion that is blocked by the pledget placed in the middle meatus of the nose. The anterior and posterior ethmoidal nerves and the sphenopalatine ganglion through the nasopalatine nerve provides sensation to most of the nasal septum. The cribriform plate holds the special sensory branches of the olfactory nerve thus catering to the sensation of smell.

The nerves that are blocked during antral wash are:

1. Superior alveolar nerve near the inferior meatus
2. Anterior ethmoidal nerve near the roof of nasal cavity
3. Posteriorly the sphenopalatine ganglion

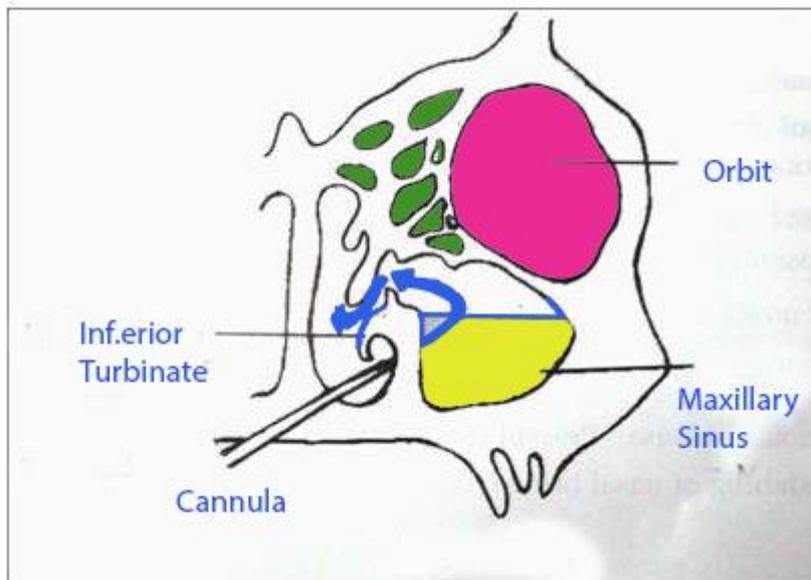


Diagram illustration the theory behind antral wash

The patient is comfortably seated in a chair with adequate back support. Eye pad should be used to blind the patient. This will reduce the anxiety level of the patient.

The Tilley Lichwitz trocar and canula is passed under the attachment of inferior turbinate and is directed towards the outer canthus of the ipsilateral eye. With a firm turn the inferior meatus is punctured. While introducing index finger of the surgeon should be placed at the junction of anterior 1/3 and posterior 2/3 of the trocar canula assembly. This will help in ensuring the safe penetration depth. The trocar is gently removed leaving the canula in position. A syringe is connected to the cannula and aspiration is attempted. If it is inside the maxillary sinus secretions could be aspirated. If the sinus is empty then air will be aspirated. If gross blood is aspirated then it should be construed that the canula is not inside the maxillary sinus cavity. A Higginson's syringe which contains a bulb and a one-way valve is connected to the canula and the other end of the syringe is placed inside a vessel containing water at body temperature. Flushing can be performed by squeezing the bulb of Higginson syringe. Dilute potassium permanganate wash can also given. Three successive washes should be given. A kidney tray should be held under the patient's mouth. The patient can be asked to hold the tray so that their mind will be diverted from the actual

procedure. When the antrum is being flushed the patient should be asked to keep the mouth open so that fluid used for irrigation will drain through the patient's mouth.

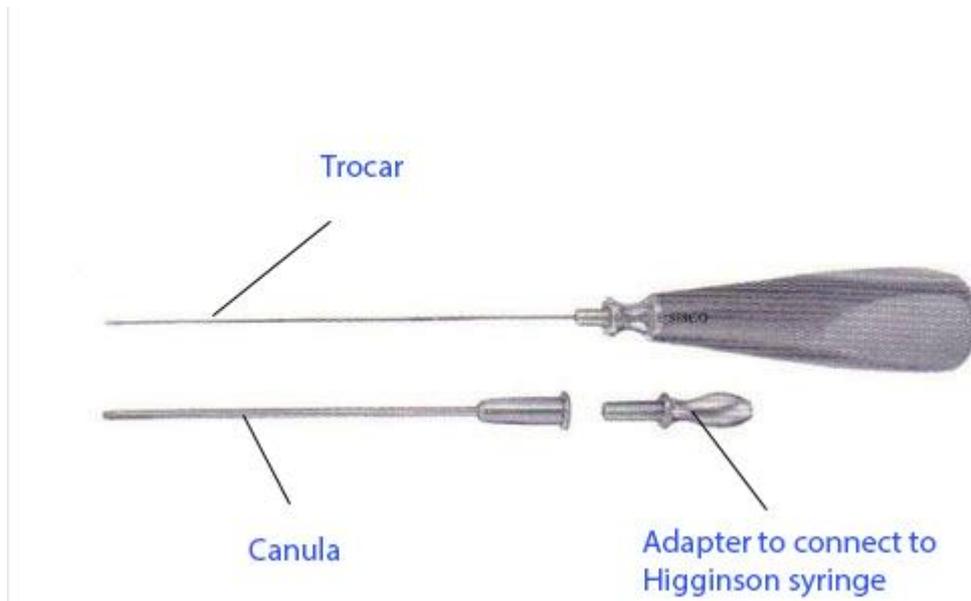


Image showing Lichwitz trocar and cannula

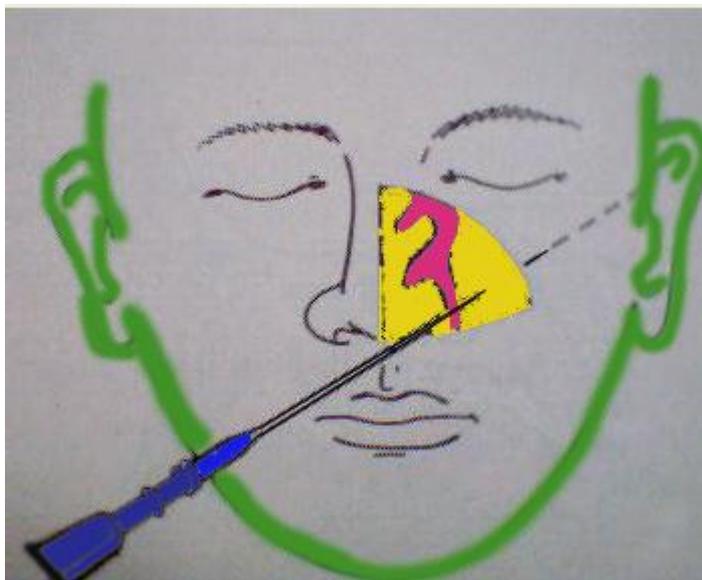


Image showing the course of the trocar and cannula



Image showing the nasal opening of nasolacrimal duct in the inferior meatus. Injury to this structure should be avoided at all costs during the procedure.

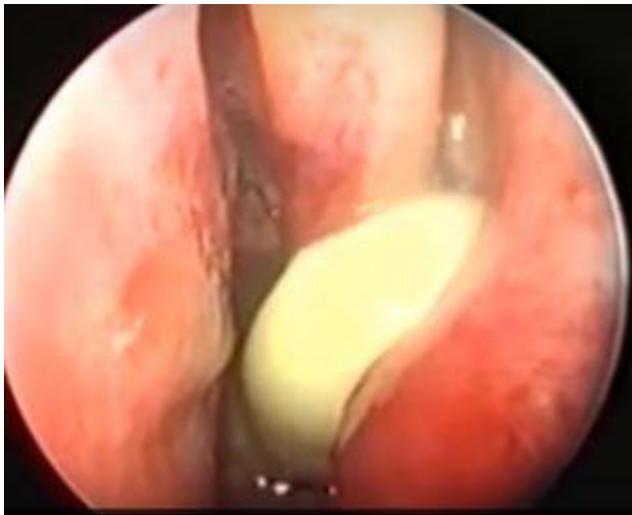


Image showing pus draining from the inferior antrostomy



Image showing the fluid used for antral wash draining through the antrostomy

Complications:

1. Bleeding
2. Orbital damage. Perforation of orbital floor will cause proptosis and pain
3. Cheek swelling: This is caused by breaching the soft tissue of the cheek and the anterior wall of the sinus.
4. Air embolism due to injury to veins
5. Infection of maxillary sinus
6. Vaso vagal shock

