

Trephination of frontal sinus

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Introduction:

Trephination of frontal sinus is a surgical procedure where in a small opening is made in the floor of frontal sinus facilitating drainage of its contents. Trephination of frontal sinus is nothing new. It dates back to prehistoric times. Two Peruvian skulls at the Museum of Man in San Diego show evidence of frontal trephination¹. Frontal sinus surgery was first described in medical literature in 1750. In fact that era was christened as “Era of Trephination”. In 1884 Alexander Ogstun described a trephination procedure² where an opening was made in the anterior table of frontal sinus to evacuate pus. He also dilated the nasofrontal duct and curetted its mucosa. He believed that this procedure could facilitate better drainage of frontal sinus cavity. He also advocated placement of drainage tube inside the nasofrontal duct to prevent stenosis. Approximately about the same time Luc described a similar procedure, and hence this procedure came to be known as Ogstun Luc procedure. This procedure had a high incidence of failure because of increased incidence of nasofrontal stenosis. The first scientific description of Frontal sinus trephination was by Runge in 1750⁴. This procedure was advocated initially to purge the frontal sinus off its infected contents, thereby helping the frontal sinus mucosa to cleanse itself. Currently Functional endoscopic sinus surgery has replaced this surgical modality in the management of sinusitis.

Since drainage of frontal sinus is dependent in nature it was assumed that creating an opening in the floor of the sinus would help in facilitating dependent drainage of the sinus. Frontal sinus surgery still remains a challenge even this day because of complex and highly variable anatomy of the drainage pathway. The proximity of cribriform plate medially, orbit laterally and anterior ethmoidal artery posteriorly adds to the stress while operating in this region.

Indications of frontal sinus trephining:

1. Acute sinusitis not responding to medical management³
2. To identify frontal sinus opening in difficult cases intranasally during endoscopic sinus surgery. This can be performed by flushing fluorescein dye and endoscopically visualizing its flow into the nasal cavity. This is one reliable way of identifying frontal sinus outflow tract^{4,5}.
3. To prevent stenosis of frontal sinus infundibulum after endoscopic sinus surgery. This can be achieved by passing a catheter down into the frontal recess. It can also be used to stent the frontal recess area after completing endoscopic frontal sinusotomy.
4. Can be resorted to during post op follow up after endoscopic frontal sinus surgery for instillation of medications like topical antibiotics and steroid irrigation.

Procedure:

Before the procedure it is important to assess the size of the frontal sinus by taking occipito frontal plain radiograph. This view helps in the assessment of the size of frontal sinus. This should be accurately performed in order to trephine the right area. If image guidance is available that will increase the accuracy of the procedure. Anatomically frontal sinus is highly variable in size. Small frontal sinuses are common occurrence rather than rarity, hence imaging is must before placement of the trephine.

This procedure can be performed both under local / General anesthesia. Local anesthesia has the added advantage of less bleeding and lesser mortality.

2% xylocaine admixed with 1 in 10,000 units adrenaline is used as infiltrating agent. This mixture has the advantage of providing anesthesia as well as local vasoconstriction of blood vessels. About 1/2 ml of this solution is infiltrated over the trochlear nerve area (skin over the antero inferior part of forehead). 10 minutes is given after the injection for the drug to take effect.

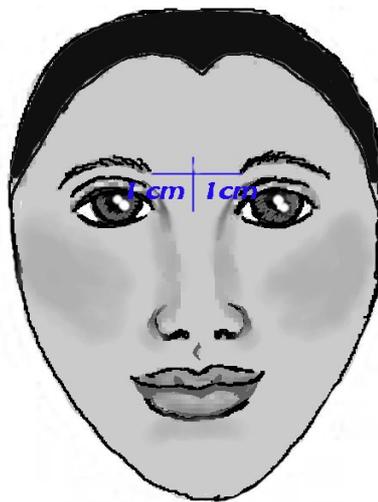


Figure showing the site of trephenation

The point of trephenation is located as shown in the figure above. A horizontal line is drawn between the superior limit of each orbit. Another vertical line is drawn to intersect this horizontal line exactly in the midline. The point of perforation is located about 1 cm lateral to this midline. This depends on the size of the sinus and the location of the intersinus septum.

No incision is necessary. A small puncture is made at this site using a hand drill. After perforating the skin, the drill bit comes into contact with the bone. Bone in this area is drilled out. Hand drill is preferred since the power drills reduce the sensitivity of the surgeon who is drilling making him loose control. Once the bone is penetrated a needle made of teflon is put in place. A small catheter can be connected to this needle and wash can be given using a syringe. Before starting the irrigation procedure it must be ascertained whether the teflon needle is really inside the frontal sinus. This can be done by visualising air bubbles when the syringe filled with saline is connected to the catheter. Initially irrigation is done slowly under endoscopic control.

If frontal sinus trephining is performed to stent the frontal outflow tract following frontal sinus surgery then skin incision is a must before drilling the bone. The site of trephination is identified as shown in the diagram above. A curvilinear incision is made medial to eyebrow along the supraorbital rim. It is easy to hide the incision under the eyebrow by moving the brow medially over the site planned for trephination. Injury to hair follicles should be prevented and it can be achieved by beveling the incision parallel to hair follicles. Cautery should be avoided in this area at all costs⁶. The skin is incised up to the level of periosteum. The periosteum is elevated along the floor of the frontal sinus and over the anterior aspect of frontoethmoid suture line. The supraorbital nerve should not be injured. The trephination is performed either by using a cutting burr or osteotome.

Complications of frontal trephining:

Majority of complications of frontal sinus trephining procedure has been attributed to unfavorable anatomical conditions. Trephination should hence should not be performed if the pneumatization of frontal sinus does not reach up to the superior limit of orbit. In fact in this scenario frontal sinus trephining may not be of much use. Frontal out flow tract can be accessed better endoscopically.

Common complications of frontal sinus trephining include:

1. Cellulitis
2. Injury to brain due to penetration of posterior table of frontal sinus
3. Orbital complications due to needle shift

Guidelines for safe frontal sinus trephination:

1. Radiological evaluation of the size of frontal sinus cavity
2. Meticulous location of the site of trephination
3. Check aspiration should be performed before actual irrigation
4. Irrigation should be performed rather slowly

Conclusion:

Frontal sinus trephination is a safe procedure provided precautions are taken. Even in the current endoscopic era this procedure still has its place. It is rather simple to perform and provides rapid relief in patients with acute frontal sinusitis.

References:

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