Case Report

A Case Report of Intraoperative Retroorbital Fluid Dissection After Frontal Mini-Trephine Placement

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Objectives/Hypothesis: We report a case of a 24-year-old male with a history of allergic fungal sinusitis, who experienced an intraoperative retro-orbital fluid dissection after frontal mini-trephine placement. Although mini-trephination of the frontal sinus is a useful technique that is frequently employed during endoscopic sinus surgery, it has potential complications. The purpose of this report is to discuss a previously unreported complication of frontal mini-trephination and its management.

Key Words: Endoscopic sinus surgery; irrigation; orbital complications; lateral canthotomy; decompression.

INTRODUCTION

Frontal mini-trephination has proven itself an invaluable tool for an intraoperative localization tool to identify the frontal outflow tract. It also is indispensable in its ability to irrigate the frontal sinus both intraoperatively and for a few days postoperatively. Mini-trephine irrigation is adept at clearing obstructing debris from the frontal sinus, often times requiring a small amount of pressure to expel the debris from the frontal sinus. Patients tolerate the procedure well and have minimal postoperative complaints from it, including a nearly indistinguishable scar after a few months postoperatively. The procedure is widely utilized, although a paucity of literature has been produced on the subject. Frontal mini-trephine complications include cerebrospinal fluid (CSF) leak when the cannulation is performed lateral to the frontal sinus and profound scar formation from heat transfer to the skin from the drill bit. The purpose of this report is to report an additional complication of mini-trephination and its management.

CASE REPORT

A 24-year-old male presented to the ENT clinic with symptom constellation of nasal congestion, continuous postnasal drip, and a nasal sounding voice. Endoscopic evaluation of his nose showed massive bilateral polyposis extending down to the nasal floor. A computed tomography (CT) scan shown in Figure 1 confirmed the mottled appearance of allergic fungal sinusitis (AFS) debris. Medical management with oral steroids, antibiotics, allergic desensitizations, and nasal irrigations proved fruitless. The patient agreed to undergo a functional endoscopic sinus surgery to include frontal mini-trephinations, canine fossa punctures, and a complete sphenoidectomy with frontal dissections bilaterally (Fig. 1).

At the time of surgery, complete sphenoidectomies had been completed bilaterally, saving the frontal sinuses for last. Bilateral mini-trephinations were performed in a standard fashion according to the technique described by Wormald. To review the procedure, a stab incision in the medial brow—followed by Iris scissor dilation of the tract and scraping of the periosteum over the frontal bone—preceded placement of the drill guide and irrigation-cooled drilling with the Mini-Trephination Set (Medtronic, Inc. Jacksonville, FL). Once the drill hole had been created, the obturator was placed, the drill guide was removed, and the trephine was threaded down the obturator—carefully twisting the trephine into the bone while extracting the obturator. Image guidance confirmed the placement of the trephine into the left frontal sinus. A 10-cc syringe filled with saline was attached to the trephine. Initial irrigation into the left frontal mini-trephine was evaluated endoscopically. Thick pus and AFS debris emerged from the frontal outflow tract. A 20-cc syringe was then attached to the left frontal mini-trephine with fluorescein-stained saline (2 ophthalmologic fluorescein paper tabs in 100 cc of sterile saline). While the assistant irrigated, the surgeon watched flow from the frontal outflow tract. A small amount of fluorescein-stained dye was noted to emerge from the frontal outflow tract before stopping.
During troubleshooting, significant proptosis was noted of the left eye. It was immediately apparent that the orbital contents had massively expanded, pushing the globe forward—most likely from retro-orbital fluid dissection. Immediately, a lateral canthotomy and cantholysis was performed while consulting the assistance of other orbital experts. Additionally, an immediate endoscopic decompression was performed on the affected eye (Fig. 2). Intraoperatively, the orbital consultants extended the lateral cantholysis and performed an orbital floor decompression. At the end of the decompression, the orbit, although remaining somewhat proptotic, was soft. The entire decompression occurred in less than half an hour.

The patient awoke and was noted to have 20/200 vision. Follow-up CT and magnetic resonance imaging (MRI) evaluation performed the evening of the surgery showed a fluid collection in the superior orbit posterior to the globe. On postoperative day 1, the patient returned to the operating room to drain this fluid collection and complete the frontal dissection. Since there was clearly a significant problem obtaining access with a Draf IIA approach, it was elected to proceed with a Draf III instead. Revision surgery proved uneventful, with the Draf III providing excellent visualization of the frontal sinuses (Fig. 3). Exploration of the superior orbit was performed via a superior lid crease incision. Aspiration of the region yielded 1 cc of fluorescein-stained saline. The lateral canthotomy incision was left open, and a Frost suture was placed to maintain moisture to the cornea. The patient was evaluated by ophthalmology within 2 hours following the initial procedure, and within 2 hours following the modified Lothrop procedure. The Frost stitch was then taken down on the second postoperative day, the patient was evaluated by ophthalmology, and it was noted that intraocular pressures were below 30 mm Hg, as measured using a Tono-Pen. Visual acuity was noted to have returned to its premorbid state of 20/20. The patient was subsequently discharged home on the third postoperative day. The patient’s long-term recovery was uneventful, and at the 6-month postoperative visit the patient’s vision remained normal and he denied recurrence of sinus symptoms (Fig. 2 and Fig. 3).

**DISCUSSION**

The mini-trephination of the frontal sinus is a technique that provides external access to the frontal sinus...
with little patient morbidity. It is a technique that adeptly identifies the frontal sinus outflow tract, allowing for a safe and directed dissection of the frontal sinus.\(^1\)\(^-\)\(^4\) Despite its minimal morbidity, complications may arise when performing mini-trephination, including retro-orbital fluid dissection. As a paucity of literature has been published on this subject, one must rely on the management of retro-orbital hematoma to guide treatment decisions.\(^5\)\(^,\)\(^6\)

Predisposing factors for orbital complications in functional endoscopic sinus surgery include lamina papryacea dehiscences, extensive polypoid disease, and previous surgery.\(^7\) Review of the preoperative CT scan allows for identification of orbital dehiscence into the frontal sinus, which is a common finding in patients with chronic sinusitis requiring frontal sinus dissection. It is important to recognize that patients affected by AFS frequently have severely thickened secretions and the force to displace these secretions can overcome even intact bone. Thus, caution should be taken when choosing to irrigate after mini-trephination. In cases where orbital dehiscence is identified, predissection of the anterior ethmoids and inferior aspect of the frontal sinus is recommended. Further, mini-trephine irrigation should be watched closely. This may be accomplished by visualizing the inferior aspect of the frontal outflow tract endoscopically, providing gentle pressure to the plunger while irrigating, and by placing one hand over the ipsilateral eye to evaluate for increased pressure while the surgeon irrigates. If fluid fails to emerge from the frontal outflow tract, or the orbital contents expand, further irrigation should be stopped immediately.

Early recognition and surgical drainage of retro-orbital edema is key in reducing long-lasting complications as any delay can have a significant impact on the patient’s functional recovery. Hayreh et al.\(^8\) reported that irreversible optic-nerve damage can occur after 105 minutes due to compressive optic neuropathy that may result from retrobulbar hemorrhage. The same study demonstrated no apparent optic nerve damage when central retinal artery occlusion was less than 100 minutes. Thus, timely intervention is critical in preserving vision of the affected eye. When the complication was recognized, an immediate lateral canthotomy with inferior cantholysis was performed, along with an orbital floor decompression. This expeditious management likely resulted in avoiding the long-term loss of vision.

Adjuvant medical therapies include the administration of mannitol, acetazolamide, and high-dose steroids.\(^9\) Once a decision is made to intervene, both medical and surgical therapies should be instituted. Priority should be given to timely decompression of the orbit as the best visual outcomes are achieved with a combination of medical and surgical intervention.\(^8\) Our patient was administered dexamethasone 10 mg intravenously at the time of the complication and every 8 hours for 48 hours following surgery.

**CONCLUSION**

Frontal sinus mini-trephination is a useful technique in identifying the pathway to the frontal sinus. Despite its relatively low complication profile, one must be familiar with its possible complications and be adept at their consequent management. Early diagnosis and immediate surgical treatment of retro-orbital complications are necessary in order to reduce the likelihood of long-term sequela. Once the diagnosis of retro-orbital hematoma is made, it should be treated as a true emergency, since early treatment has proven to prevent permanent vision loss.\(^10\)

**BIBLIOGRAPHY**