The Perforation Technique
A Modification to the Frontal Sinus Osteoplastic Flap

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ABSTRACT

Educational Objective: At the conclusion of this presentation, the reader should be familiar with the minimally traumatic modification of the frontal sinus osteoplastic flap.

Objectives: Describe a variation of the traditional osteoplastic flap approach to the frontal sinus that obviates external fixation, reduces complications, and improves postoperative recovery.

Study Design: Retrospective case series.

Methods: Seven consecutive patients who underwent an osteoplastic flap approach to the frontal sinus by two surgeons using the following surgical variation were analyzed. Rather than using a sagittal saw for cuts through the frontal sinus anterior wall, a 1.1 mm wire-passing drill bit was used to methodically perforate the bone and create a form-fitting beveled cut. The overlying peristemeum was preserved. The inferior hinge was created by drilling approximately 4-6 holes across the desired hinge point. An osteotome was used to out-fracture the flap. At the conclusion of the frontal sinus work, the flap was replaced back into its form-fitted window without need for fixation. Patients were evaluated for postoperative ecchymosis, pain, numbness, and cosmetic deformity.

Results: The average length of hospital stay was 1.6 days. There were no complications and no cases of facial ecchymosis or hematoma. Step-off deformities were non-detectable in all seven cases.

Conclusions: The perforation technique of the frontal sinus osteoplastic flap is a simple modification that reduces complications and improves postoperative recovery and cosmesis.

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INTRODUCTION

Despite impressive advances in endoscopic approaches to the frontal sinus, the osteoplastic flap approach to the frontal sinus remains an important tool in surgically treating frontal sinus pathology. For achieving wide access to all areas of the frontal sinus, the osteoplastic flap is superior to all other approaches, including endoscopic approaches, external trephination, and frontoethmoidectomy.

However, it is often considered an approach of “last resort” due to concerns of increased perioperative morbidity and worse cosmetic results. Forehead edema and periorbital ecchymosis are commonly encountered in the immediate postoperative period. Additionally, frontal bossing and anterior plate depression are fairly common late complications of this technique. Frontal bossing can be caused by an ill-fitting boney flap that does not find its original position on repositioning and plating. Additionally, osteoneogenesis that occurs in the boney gap that is created with sagittal saw cuts through the anterior plate may remodel the anterior plate so that it is anteriorly-displaced. Anterior plate depression can also be caused by excessive drilling of bone in creating the flap and poor plating technique. It can also occur as a late complication due to poor healing and boney resorption.

To combat these effects, a technique that creates the anterior boney flap with minimal trauma and bone loss would be beneficial. The perforation technique was devised with this aim in mind.

METHODS

A modification to the traditional osteoplastic flap was developed in order to achieve improvements in perioperative edema and ecchymosis, as well as reduction in bone resorption and bossing causing cosmetic deformity. After obtaining human studies IRB approval, a retrospective review of consecutive surgical cases performed by 2 rhinologists at one institution was completed. Perioperative details including perioperative edema, ecchymosis, length of hospital stay, as well as postoperative complications and cosmetic result were evaluated.

OSTEOPLASTIC FLAP METHOD

A bicoronal incision is used for access, and overlying soft tissue is reflected from the anterior table periostem. Incisions are made through the superior and lateral periostem (and left intact inferiorly overlaying the superomedial orbits). The dimensions of the frontal sinuses are confirmed via image-guidance and appropriate boney cuts are designed with 1-2 mm margins from the edges of the frontal sinuses to safe-guard against inadvertent entry into the anterior cranial fossa.

THE PERFORATION TECHNIQUE

Rather than using a sagittal saw for cuts through the frontal sinus anterior wall, a 1.1 mm wire-passing drill bit is used to methodically perforate the bone and create a form-fitting beveled cut (figure 1). The overlying periostem is preserved. The inferior hinge is created by drilling approximately 4-6 holes across the desired hinge point (figure 2). An osteotome is used to out-fracture the flap (figure 3).

At the conclusion of the frontal sinus work, the flap is replaced back into its form-fitted window without need for fixation (figure 4). The peristemeum is reapproximated with interrupted absorbable suture. The wound is closed with temporary drains to prevent seroma.

RESULTS

The average patient age was 50.7 (range 36-80). The average length of follow-up was 14.4 months (range 1.8 – 20.4 months). The average length of hospitalization was 1.6 days (range 0-3). No patients had postoperative ecchymosis or hematoma formation. 2 patients experienced mild transient edema localized to anterior table (patient 6 and 7). There were no complications. There were no cases of bossing, depression, step-off, or other cosmetic deformity.

DISCUSSION

Cosmetic contour changes to the forehead are a significant long-term concern with the osteoplastic flap procedure. Catalano et al.1 reported a 6.7% rate of cranioplasty for correction of frontal bossing or bone resorption in a series of 59 patients who underwent OPF. In another series of 59 OPF cases with long-term follow-up, Weber, et al.2 reported a 10.2% rate of changes in the contour of the frontal region (4 developed depressions due to bone resorption and 2 had noticeable prominence or “bossing”). Half of these patients (5.1%) reported unhappiness with this cosmetic result.

The described perforation technique attempts to reduce cosmetic contour changes by minimizing bone loss and allowing for improved reduction of the anterior table without need for fixation. In a series of 7 patients, no cosmetic contour changes were noted, and none required additional hardware for fixation (figures 5, 6). Additionally, there were no cases of perioperative morbidity other than 2 cases of mild transient localized edema. Though this case series would need to be larger to demonstrate a statically-significant improvement on cosmetic result, these early results and the theoretical advantages gained by the technique are compelling enough to warrant consideration if the surgeon is trying to minimize these concerns.

CONCLUSION

The osteoplastic flap remains an important technique to achieve wide access to the frontal sinus, however, perioperative morbidity and postoperative cosmesis of this procedure remain important areas for improvement. The perforation technique of the frontal sinus osteoplastic flap is a simple modification that reduces trauma and bone loss, and may improve long-term rates of bossing, depression, and step-off.

REFERENCES