



Rotation Flaps After Draf Procedures: A Cadaver Study

Nopawan Vorasubin, MD; Adam S Deconde, MD; Christopher Thompson, MD; Jeffrey D. Suh, MD

Department of Head and Neck Surgery, David Geffen School of Medicine at UCLA

Abstract

Objective: To describe the anatomy and application of a local mucosal flap to reduce cicatricial scarring of the frontal recess after Draf IIB procedures.

Methods: Description and illustration of the surgical technique of a local mucosal flap after a Draf IIB procedure in a cadaveric model.

Results: Local rotation flaps can be successfully utilized after Draf IIB procedures. Prior to superior middle turbinectomy, a medially based mucosal flap is elevated from the medial aspect of the middle turbinate to the nasal septum. This flap is then placed on the posteromedial raw bone of the frontal recess after the Draf IIB.

Conclusion: Use of local mucosal flaps to provide primary healing after Draf IIB is technically feasible. Use of local mucosal flaps may decrease the risk of restenosis after frontal sinus surgery.

Introduction

The narrow and variable anatomy of the frontal recess is a challenging region to open endoscopically. Historically, a diseased frontal sinus was approached through an osteoplastic flap and obliteration procedure. Frontal sinus obliteration carries significant morbidities beyond an external scar including dural leaks, orbital fat exposure, and anterior wall depression in 10-20% of the time.¹

Over the last 20-years, less morbid, endoscopic alternatives have been refined to safely provide surgical drainage of the frontal sinuses.² Despite great advances in endoscopic management of this anatomy, there remains a relatively high rate of restenosis (15%) and closure of the ostium (4%).³

The tendency of frontal ostia to restenose is promoted by exposed bony edges of the surgically-widened ostia. Exposed bone predisposes to osteoneogenesis, scar tissue and subsequent closure. Ideally, exposed bone during drillouts of the frontal sinus floor could be covered with viable mucosa to interrupt secondary healing. Indeed, free mucosal grafts have been described and successfully used in Draf III (i.e., removal of the sinus floor from lamina to lamina) approaches.⁴⁻⁵ We hypothesize that it is anatomically feasible to elevate and preserve the mucosa of the middle turbinate head prior to its resection for a Draf IIB (removal of the floor of the frontal sinus to the nasal septum), and transpose this flap onto exposed bone of the newly drilled frontal sinus ostium.

Methods and Materials

Two cadaver heads were provided by voluntary donation for medical education and research purposes through the University of California at Los Angeles Donated Body Program. Dissection was performed by a single surgeon using standard endoscopic sinus surgery instruments including power dissector blades and burrs. 0-, 30-, and 70- degree endoscopes were used interchangeably throughout the dissection and a standard sinus tower was for video and photo documentation

Results

Surgical Technique

First an anterior ethmoidectomy is performed. The agger nasi is then taken down and the frontal recess is identified. This identifies the most anterior extent of the anterior cranial fossa. Identification of this landmark provides a reference for the posterior extent of the middle turbinate flap to avoid interruption of the olfactory fibers and decreases risk of cerebral spinal fluid leak. The medially based mucosal flap is harvested by making a trapdoor-like incision along the medial surface of the middle turbinate using either a beaver blade or a sickle knife. The hinge of the trapdoor should fall along the superior aspect of the medial surface of the middle turbinate. A suction elevator is used to elevate the mucosal flap off the medial surface of the bony turbinate (Figure 1A). The anterosuperior attachment of the middle turbinate is removed (Figure 1B). The frontal

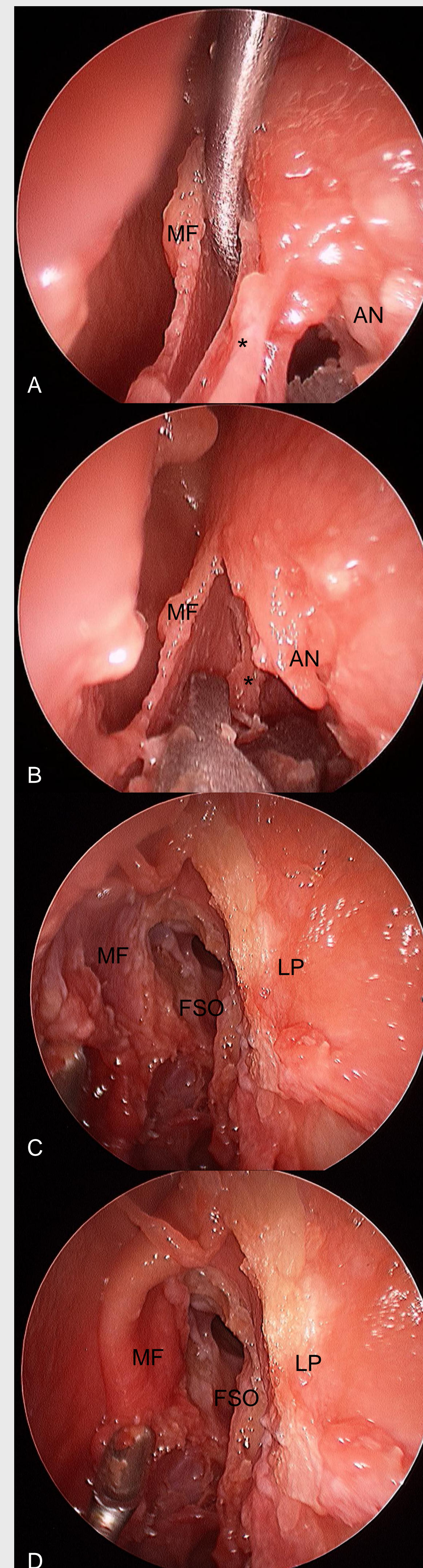


Figure 1. Endoscopic view of left middle meatus. A. Mucosal flap (MF) is elevated off the medial surface of the middle turbinate (*). B. The superior/anterior attachment of the middle turbinate is taken down as part of a Draf IIB. C. View of completed Draf IIB of a widely patent frontal sinus ostia (FSO) from agger nasi (AN) to lamina papyrea (LP). D. The medially based MF is rotated into position to cover the posteromedial exposed bone of the FSO.

ostia is identified and widened using a combination of curettes and drills to remove the entire floor of the frontal sinus from the lamina papyrea to septum (Figure 1C). To protect the flap during drilling of the frontal sinus floor, it can be superoposteriorly placed during use of powered instrumentation. The previously harvested mucosal flap is then unfurled and draped over the exposed bone along the previously drilled posteromedial aspect of the widened frontal sinus ostia (Figure 1D).

Discussion

Postoperative frontal sinus restenosis is a continuing challenge for rhinologists. The narrow anatomy and often exposed bone predispose to neo-osteogenesis, scar and restenosis. Animal models have implicated neoosteogenesis from exposed bone as a source of 56% or restenoses.⁶ Additionally, secondary intention healing predisposes to scarring, adhesions and fibrosis.⁷

Recently, mucosal flaps, which have been used with great success in anterior skull base reconstruction, have been investigated for their utility in frontal sinus drillout reconstruction for coverage of exposed bone. Coverage of exposed bone offers interruption of osteoneogenesis and prevention of healing by secondary intention decreasing the risk of bony overgrowth and cicatricial scarring of the surgically widened ostia. Hildenbrand et al and Conger et al both describe the use of a free mucosal transplant grafts taken from the septum (or inferior turbinate in cases where the septal mucosa is not an option) prior to septectomy in Draf III procedures. With this technique, Hildenbrand only had one case that required reoperation, while Conger had none proving this to be an effective solution for minimizing frontal sinus restenosis. Translation of this surgical innovation in Draf III procedures is viable for Draf IIB procedures and offers promise of decreased stenosis rates.

Conclusions

Use of local mucosal flaps to provide primary healing after Draf IIB is technically feasible, and, based on published results with free transfer mucosal grafts, may decrease the risk of restenosis after frontal sinus surgery. Further studies would be needed to assess the clinical efficacy of this technique in minimizing restenosis.

References

1. Weber R, Draf W, Keerl R, et al. Osteoplastic frontal sinus surgery with fat obliteration: technique and long-term results using magnetic resonance imaging in 82 operations. *Laryngoscope*. 2000;110(6):1037-1044.
2. Batra PS, Cannady SB, Lanza DC. Surgical Outcomes of Drillout Procedures for Complex Frontal Sinus Pathology. *The Laryngoscope*. 2007;117(5):927-931.
3. Anderson P, Sindwani R. Safety and efficacy of the endoscopic modified Lothrop procedure: A systematic review and meta-analysis. *The Laryngoscope*. 2009;119(9):1828-1833.
4. Hildenbrand, T, Wormald, P J, & Weber, R K. (2012). Endoscopic frontal sinus drainage Draf type III with mucosal transplants. *American journal of rhinology & allergy*, 26(2), 148-151.
5. Conger, B T, Riley, K, & Woodworth, B A. (2012). The Draf III mucosal grafting technique: a prospective study. *Otolaryngology - head and neck surgery*, 146(4), 664-668.
6. Rajapaksa, S P, Ananda, A, Cain, T M, et al. (2004). Frontal ostium neo-osteogenesis and restenosis after modified endoscopic Lothrop procedure in an animal model. *Clinical otolaryngology & allied sciences*, 29(4), 386-388.
7. Tran, K N, Beule, A G, Singal, D, et al. (2007). Frontal ostium restenosis after the endoscopic modified Lothrop procedure. *The Laryngoscope*, 117(8), 1457-1462.

Contact

Nopawan Vorasubin, M.D.
David Geffen School of
Medicine
Email:
nvorasubin@mednet.ucla.edu