

TECHNIQUE TO ADD SUPERIOR AND LATERAL REACH OF THE NASOSEPTAL FLAP FOR FRONTAL SINUS POSTERIOR TABLE SKULL BASE DEFECTS: THE ORBITO-FRONTAL RECESS EXPANSION



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INTRODUCTION

- Skull base defects in the superior and lateral aspects of the posterior table of the frontal sinuses are challenging to reconstruct because of access and reach of reconstructive options.
- At times, external approaches are needed to reconstruct such defects, or more mobile non-vascularized grafts are used, potentially increasing the morbidity and healing time of the procedure. We present a



RESULTS

- Performing an OFR expansion leads to a significant gain in CC and LL length posterior table coverage by the NSF (Table 2)
- An average and significant gain of 0.89 cm in CC axis length can be seen after ORF expansion (P = 0.0017) (Figure 3A, 3B)
- An average and significant gain of 0.58 cm in LL axis length can be seen after ORF expansion (P = 0.0051) (Figure 3C, 3D)
- After OFR expansion the NSF could completely cover the posterior table in the CC

technique that increases superior and lateral reach for the pedicled, vascularized nasoseptal flap (NSF) to address defects in this region.

Figure 1. Orbito-frontal recess sinus CT scan tri-planar views

A. Axial view **B.** Coronal view **C.** Sagittal view. Images represented in bony windows. Yellow arrow represents the OFR

axis length **100%** of the time and **90%** of time in the LL axis length

MATERIALS & METHODS

- In this cadaveric study, 10 specimens were used to investigate the feasibility of increasing the superior and lateral reach of a NSF to reconstruct a posterior table defect of the frontal sinuses.
- Reach of the flap within the frontal sinus
 was measured in centimeters in a craniocaudal (CC) axis from the inflection point
 between the posterior table and ethmoid
 skull base to the point directly superiorly
 where the anterior and posterior table met,
 and the latero-lateral (LL) axis from the
 lateral most inflection point of the meeting
 of the posterior table and the ethmoid skull
 base to the side wall of the sinus.

SURGICAL TECHNIQUE





- The orbito-frontal recess (OFR) expansion technique is based on the lateral expansion of the frontal recess creating more room for the nasoseptal flap to be laid on the posterior table without kinking or folding
- The OFR is the region where the lateral aspect of the posterior table merges the medial orbital wall creating a zone of bone thickening that can be seen on imaging (Figure 1A, B and C)

Surgical steps

- 1. Perform a standard total ethmoidectomy and frontal sinusotomy (Figure 2A)
- Resect the middle turbinate as part of the sinus surgery to allow full access to the ethmoid skull base for the NSF to lay flush against
- **3.** Ensure that the lamina papyracea is well identified and clear of residual septation
- 4. Using a 60- or 70-degrees diamond burr, carefully drill the thickened bone overlying the OFR (Figure 2A, 2B)
- 5. Raise an ipsilateral NSF that will be translocated towards the frontal recess
- 6. When the OFR is NOT expanded the flap does not fit through the hourglass shaped frontal recess limiting its reach, and unable

Figure 2. Basic steps for an orbito-frontal recess expansion

A. View of the posterior table (green) after a standard total ethmoidectomy and frontal sinusotomy. Note the narrowness of the frontal os and the thickened bone and remaining partition overlying the OFR (blue) **B.** View of the posterior (green) and anterior (red) tables after OFR (blue) expansion. **C.** Nasoseptal flap reach without OFR expansion. Note the exposed posterior table (green) **D.** Nasoseptal flap reach with OFR expansion. Note the completely covered posterior table with only the anterior table visible (red).

Abbreviations: AEA: anterior ethmoid artery; NSF: nasoseptal flap; OFR: orbito-frontal recess

Table 2. Nasoseptal flap coverage of the frontal sinus posterior table

	Overall (SD)	No OFR expansion (n=10)	OFR expansion (n=10)	p value
Nasoseptal flap length (in cm)	7.6 (0.58)			
Frontal sinus posterior table CC length (in cm)	2.16 (0.41)			
Frontal sinus posterior table LL length (in cm)	2.23 (0.46)			
NSF CC reach covering the posterior table (in cm)		2.12 (0.79)	3.01 (0.66)	0.0017
NSF LL reach covering the posterior table (in cm)		2.53 (0.69)	3.11 (0.61)	0.0051

Figure 3. NSF posterior table coverage relative to OFRE versus no OFRE

A. Nasoseptal flap cranio-caudal posterior table coverage reach difference after OFR expansion **B.** Nasoseptal flap cranio-caudal posterior table coverage gain in individual specimens. **C.** Nasoseptal flap laterolateral posterior table coverage reach difference after OFR expansion **D.** Nasoseptal flap laterolateral posterior table coverage gain in individual specimens.

Abbreviations: CC: cranio-caudal; LL: latero-lateral; NSF: nasoseptal flap; OFR: orbito-frontal recess; OFRE: orbito-frontal recess expansion

DISCUSSION / CONCLUSION

The study demonstrates that a technique for selectively removing bone to expand the orbitofrontal recess region allows for improved coverage both superiorly and laterally along the posterior table of the frontal sinus with a standard nasoseptal flap. This novel technique increases the field of coverage and case selection for this common reconstructive option, adding to our reconstructive armamentarium for this challenging region, while potentially decreasing procedure morbidity.

to cover the posterior table (Figure 2C)
When the OFR is expanded, the NSF pedicle has more room to lay on the skull base and can be further extended to cover the posterior table in cranio-caudal and laterolateral axes. (Figure 2D)

posterior table in CC axis(%) NSF complete coverage of the posterior table in LL axis(%)

60 (6/10)	100 (10/10)	0.0253
80 (8/10)	90 (9/10)	0.5312

Abbreviations: CC: cranio-caudal; NSF: nasoseptal flap; LL: latero-lateral; OFR: orbito-frontal recess; SD: standard deviation



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