



Quality of Life Improvement with Virtual Surgical Planning of Nasoseptal Flap Reconstruction of the Anterior Skull Base

Ryan A. Rimmer, MD¹; S. Bulent Omay, MD²

¹Division of Otolaryngology, Yale School of Medicine

²Department of Neurosurgery, Yale School of Medicine

Introduction

Nasoseptal flaps (NSF) are the gold standard local method of reconstruction for cerebrospinal fluid leaks of the anterior cranial base. NSF harvest typically involves incisions along the nasal septum from the sphenoid ostium and choana extending anteriorly to near the mucocutaneous junction.¹ Modifications can be made to adjust for the anticipated defect size; however, most NSF are oversized because precisely sized flap can be challenging to estimate intraoperatively without risking a compromised reconstruction.

There is associated sinonasal morbidity with NSF harvest due to loss of septal mucosa. Techniques have been proposed to improve mucosalization and healing by placing mucosal grafts or “reverse flaps”; however, these techniques rely on turbinate removal, mucosa harvested from other surfaces, or sacrificing a contralateral NSF pedicle.²⁻⁴

Previous work has led to a technique of using 3D printing (Figure 1) to estimate the smallest sized NSF necessary based on the patient's anatomy and defect.⁵

We present preliminary patient reported outcomes comparing virtual surgically planned (VSP) NSF versus standard NSFs in patients with sellar/suprasellar pathology.

Methods and Materials

All patients underwent endoscopic endonasal surgery at our institution with the same two surgeons. Patients were randomized to flap type. Inpatient or emergency cases in which 3D planning could not be performed received standard flap. All patients completed the Anterior Skull Base Nasal Inventory-12 (ASBNI)⁶ survey preoperatively and then again at postoperative follow up visits. This is a validated survey to assess nasal quality of life in patients undergoing endonasal skull base surgery. Patients were seen at standard intervals postoperatively.

Results

Ten patients underwent VSP NSF and eleven patients underwent standard NSF. Average age was 51.5 years in VSP group and 56.7 in standard group. There were more females in the VSP NSF group (N=9) vs the standard group (N=4). Pathology in both groups was most often consistent with pituitary adenoma; however, there were 2 craniopharyngiomas and 1 arachnoid cyst in the VSP group and 1 craniopharyngioma in the standard group. The average VSP NSF length (anterior-posterior) was 3.94 cm and height (cranio-caudal) was 2.05 cm. There were no postoperative cerebrospinal fluid leaks in either group. The mean number of days between surgery date and first postoperative visit was 13.70 days for the VSP group and 17.9 for the standard group. Mean total ASBNI scores did not vary significantly between groups. Results are shown in Table 1 below.

Table 1. Comparison of Mean Anterior Skull Base Nasal Inventory Scores in the Perioperative Period between “Standard” NSF and Virtual Surgically Planned (VSP NSF).

	Mean Preop ASBNI	Mean Postop 1 ASBNI	Mean Postop 2 ASBNI	Mean Postop 3 ASBNI
Standard NSF (N=11)	5.5	23.8	13.6	5.34
VSP NSF (N=10)	4.75	19.8	9.6	4.25

Discussion and Conclusions

These results indicate that virtual surgical planning of NSF reconstruction of the anterior cranial base for sellar/suprasellar pathology is feasible and well tolerated in an expanded cohort.

Our study is limited by the small sample size that precludes statistical analyses; however, most patients with the VSF NSF did report lower mean ASBNI scores than those in the Standard NSF group. It is possible this may be influenced by preconceived conceptions of expectations following the possibility of VSP although most patients were blinded to the type of NSF received. Additional investigation with larger cohorts is warranted.



Figure 1. (A) Generation of segmented virtual sinonasal rendering in preparation for 3D printing. (B) Physical 3D model with NSF planned along right septum. (C) Physical 3D model with nasoseptal flap rotated posteriorly over anticipated skull base defect. Red Asterisk, nasal septum. Yellow triangle, sphenoid sinus. NFS, nasoseptal flap.

Contact

Ryan Rimmer, MD
Assistant Professor
Rhinology & Endoscopic Skull Base Surgery
Yale School of Medicine
Ryan.rimmer@yale.edu

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