

CASE REPORT

Delayed nasoseptal flap reuse in patients with revision endoscopic endonasal anterior skull base surgery

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Key Clinical Message

The reuse of the nasoseptal flap represents a favorable option for skull base reconstruction in revision endoscopic anterior skull base surgery. This study demonstrated that a detached nasoseptal flap can remain viable for several days even if not immediately reattached.

KEYWORDS

nasoseptal flap, revision surgery, skull base reconstruction

1 | INTRODUCTION

Recently, the endoscopic endonasal approach (EEA) has been regarded as the primary treatment modality for anterior skull base lesions.¹ The EEA approach results in less morbidity and complications than the traditional open approach.^{2,3} Although using the EEA to treat anterior skull base lesions has many advantages, management of cerebrospinal fluid (CSF) leakage is the biggest clinical challenge for physicians. When no or low-grade CSF leakage is encountered in simple sellar lesions, no special technique is required. However, high-grade CSF leakage is inevitable when the lesion occurs beyond the sellar region, and locoregional or free flaps are needed in such cases. In this situation, using the vascularized nasoseptal flap (NSF) is regarded as a novel technique for skull base reconstruction. The NSF is a mucoperiosteal and mucoperichondrial neurovascular pedicled flap based on the nasoseptal

artery.⁴ Although sinonasal quality of life and olfactory function are impaired by the NSF, it is an indispensable option for high-grade CSF leakage management.^{5,6} Herein, we report the reuse of the NSF in a revision case, which was reattached it several days after takedown from a previously reconstructed site.

2 | CASE REPORT

A 43-year-old man visited the neurosurgeon's office in 2019 and presented with cognitive impairment and gait disturbance. He had been diagnosed with suprasellar craniopharyngioma and was treated with open craniectomy followed by tumor removal by an endoscopic endonasal trans-tuberculum approach. At that time, high-grade CSF leakage was encountered and managed through right NSF elevation and attachment for skull base

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reconstruction. This patient recovered well after surgery, and routine office-based follow-up was performed. One year later, the patient complained of visual acuity change; however, any definite recurrence was not found through magnetic resonance image (MRI) evaluation. The following year (postoperative 2 years), this patient suffered from intermittent headaches, and several recurrent lesions were found through MRI evaluation. Therefore, a revision EEA for recurrent tumor removal was planned and performed 29 months after the initial surgery.

At the beginning of the surgery, a rhinologist performed the takedown of the previously applied NSF from the edge of the flap margin to the pedicle, positioned it in the choana (Figure 1), and further drilled the previous operation site to create a surgical corridor. Subsequently, the neurosurgeon tried to access the tumor; however, the anterior communication artery ruptured during bone

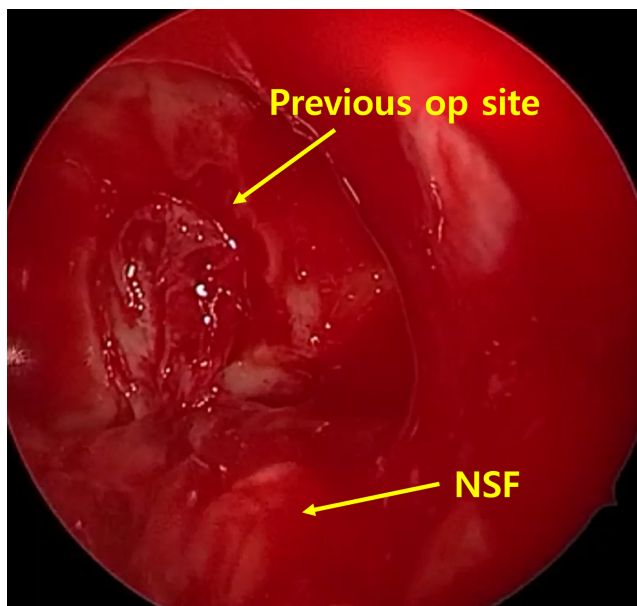


FIGURE 1 Takedown of the previously applied nasoseptal flap (NSF) and positioning it in the choana.

work and massive bleeding was encountered (Figure 2). Four-vessel angiographies and coil embolization were performed by an endovascular neurosurgeon (Figure 3), and then, the rhinologist attempted to reconstruct the skull base defect; however, the reconstruction failed because of massive bleeding despite coil embolization. Nasopore® (Stryker) was applied after the first surgery and removed in the operating room at the initiation of the second surgery. Due to the presence of nasal packing and the absence of separation between the nasal cavity and the skull base, we administered antibiotics, including ceftriaxone, vancomycin, and metronidazole. Four days later, the rhinologist performed a reoperation for skull base reconstruction, and the defect was reconstructed layer by layer using Spongostan® (Ferrosan A/S), Hemopatch® (Baxter Deutschland GmbH), Surgicel® (Ethicon SARRL), and the previously used NSF positioned in the choana. After reconstruction, the patient did not show any CSF leakage, and the operation healed well. The patient underwent radiotherapy from postoperative Day 69 to 112, and received a total dose of 5940 cGy. The NSF was sustained until 9 months after surgery, despite radiotherapy (Figure 4).

3 | DISCUSSION

The invention of neurovascular pedicled NSF allows surgeons to perform aggressive endoscopic skull base surgery. This could also reduce morbidity for patients with skull base tumors because the operation that would have been previously performed through an open approach can be completed through an endoscopic approach. The use of NSF dramatically reduced the postoperative CSF leakage rate compared with that traditional techniques, and Hadad et al. reported that postoperative CSF leakage was less than 5%.⁴ Furthermore, the survival rate of NSF is quite high, and the flap necrosis rate was reported to be 0%–1.3% in a systematic review.⁷ However, the survival

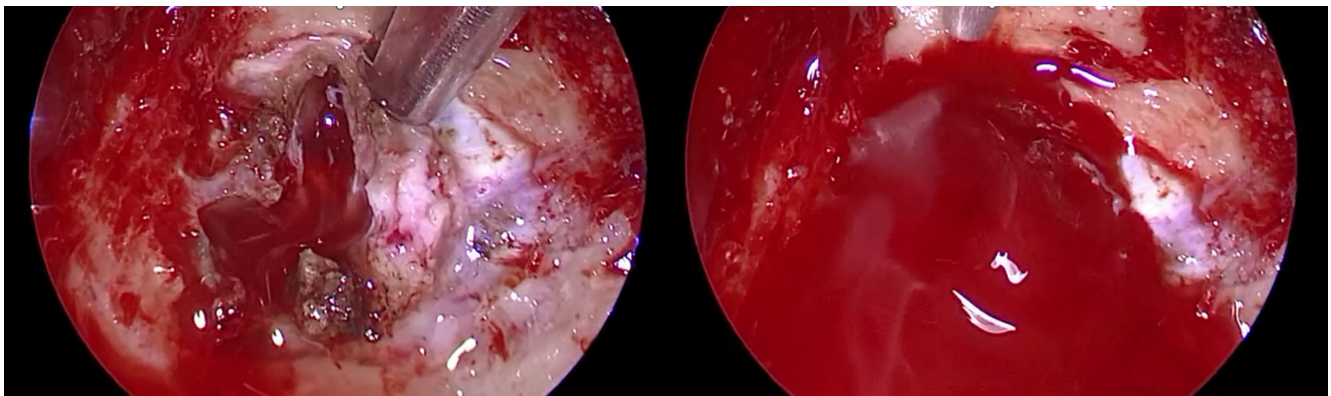


FIGURE 2 Massive bleeding was encountered during surgery.

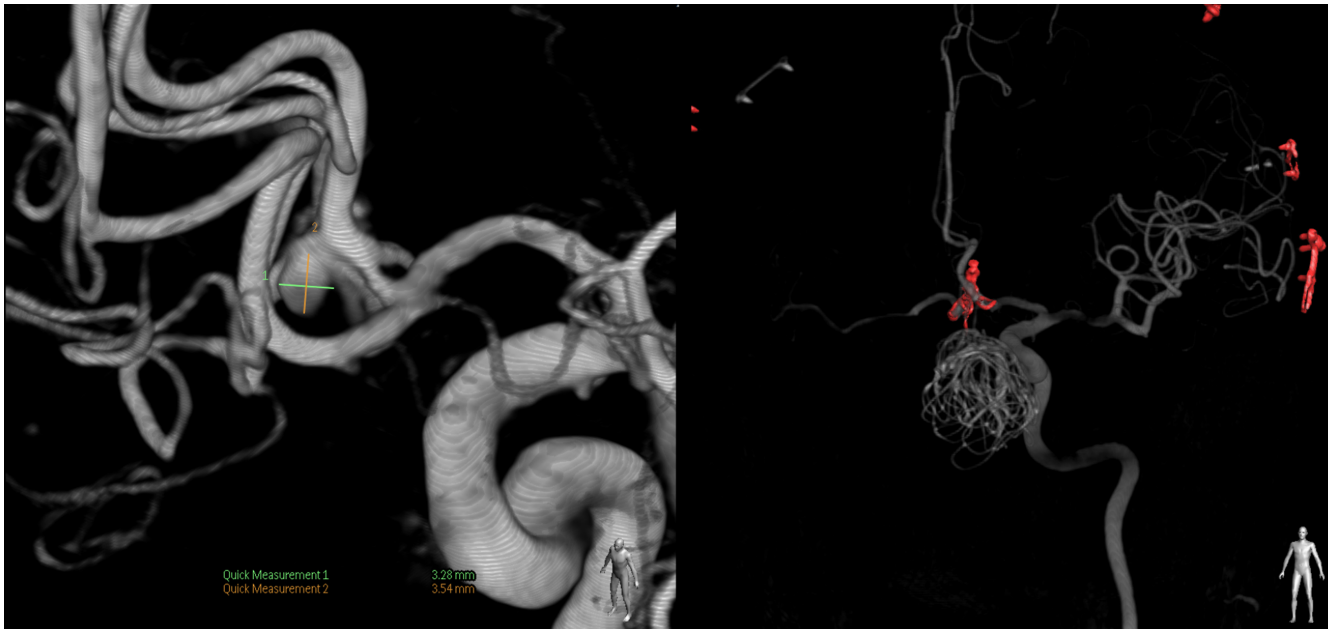


FIGURE 3 Anterior communicating artery pseudoaneurysm is found on four-vessel angiography (A) and coil embolization of pseudoaneurysm (B).



FIGURE 4 Nasoseptal flap (NSF) sustained 3, 6, and 9 months after surgery.

rate is significantly influenced by several factors, especially in patients with diabetes mellitus, cardiovascular problems, advanced age, postoperative infections, and prior radiotherapy in the paranasal region.⁸

The reuse of an NSF in revision endoscopic skull base surgery was previously reported by Zanation et al., who found that CSF leakage was prevented in 87.5% of patients who underwent revision surgery.⁹ However, in this study, NSF reattachment was performed in the same manner as a takedown. To date, no case regarding the delayed reuse of NSF several days after takedown has been reported. Our case suggests that the NSF can sustain even if left unattached for several days only if its pedicle is well maintained without injury. Additionally, in our case, the reattached NSF sustained despite postoperative radiotherapy. Radiation-induced vascular damage has been

demonstrated previous, so flap viability might also be affected by radiotherapy. Therefore, we regarded this case as clinically significant.

In this study, we did not assess the viability of the NSF following surgery. Various techniques have been reported to evaluate NSF viability, including MRI, intraoperative Doppler ultrasound, and intraoperative intravenous indocyanine green fluorescence injection.^{10–12} Among these techniques, our skull base center typically employs immediate postoperative MRI to assess tumor removal status and NSF viability. However, in this case, we were unable to perform an immediate postoperative MRI evaluation due to the patient's postoperative care in the intensive care unit.

Even if the NSF is located below the choana for several days, it may not be safe from the risk of infection. However, this risk can be reduced with massive povidone-iodine

and normal saline irrigation. Nevertheless, using the NSF located on the other side could be an alternative; however, considering the possibility of cartilage necrosis caused by using both NSFs and the accompanying saddle nose, the reuse of the NSF would be a good option to reduce the patient's morbidities.

AUTHOR CONTRIBUTIONS

Ye Hwan Lee: Writing – original draft. **Seung Hoon Lee:** Writing – review and editing. **Min Young Seo:** Conceptualization; methodology; project administration; writing – review and editing.

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CONFLICT OF INTEREST STATEMENT

None.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are not openly available due to reasons of sensitivity and are available from the corresponding author upon reasonable request. Data are located in controlled access data storage at Korea University College of Medicine.

CONSENT STATEMENT

Written informed consent was obtained from the patient to publish this report in accordance with the journal's patient consent policy.

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