Revision TSA needs frequent Flap Requirement and increased Risk of Flap Necrosis

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BACKGROUND

Revision surgery for pituitary tumors via the transsphenoidal approach (TSA) becomes technically challenging due to scar tissue and anatomical distortion from previous operations, with additional difficulties in harvesting and achieving successful vascularization of nasoseptal flap (NSF) used for reconstruction. Particularly in revision surgery for pituitary adenomas, the high incidence of intraoperative cerebrospinal fluid (CSF) leaks makes skull base reconstruction critical. This study aimed to retrospectively analyze the frequency of intraoperative and postoperative CSF leaks, NSF utilization, and flap survival rates in patients undergoing revision TSA surgery at a single tertiary medical center, to establish evidence for effective skull base reconstruction strategies in revision surgery.

METHODS

Patients who underwent endoscopic TSA surgery for pituitary adenomas at Samsung Medical Center from April 2021 to March 2025 were retrospectively analyzed. Surgical records and magnetic resonance imaging (MRI) were reviewed to determine the occurrence and severity of intraoperative and postoperative CSF leaks. Cases utilizing NSF for reconstruction were identified, and NSF viability was assessed through contrast enhancement on T1-weighted MRI obtained within 48 hours postoperatively.

RESULTS

Table 1. Patient-level comparison of surgical outcomes

	Primary (patient N = 514)	Revision (patient N = 41)	*p value*
Median age — year (Interquartile range)	53.5 (42.0-63.8)	54.0 (45.0-63.0)	0.741
Male — number (%)	263 (51.2)	19 (46.3)	0.665
Intraoperative CSF leakage — number (%)	258 (50.2)	30 (73.2)	0.003
Grade 1	98 (19.1)	11 (26.8)	
Grade 2	73 (14.2)	4 (9.8)	
Grade 3	87 (16.9)	15 (36.6)	
Postoperative CSF leakage — number (%)	16 (3.1)	1 (2.4)	0.999
NSF reconstruction — number (%)	249 (48.4)	28 (68.3)	0.022

Patient-level analysis was performed after excluding duplicate surgical cases per patient. Intraoperative CSF leaks were significantly more frequent in revision cases than in primary cases (50.2% vs. 73.2%, $p = 0.003$). Despite this, postoperative CSF leaks occurred in only 1 revision case (2.4%). NSF reconstruction was required significantly more often in revision cases (48.4% vs. 68.3%, $p = 0.022$).

Table 2. Procedure-level analysis of NSF viability and management of pre-existing NSF

	Primary (NSF use N = 246)	Revision (NSF use N = 29)	*p* value
Non-enhance flap in postop MRI — number (%)	9 (3.7)	4 (13.8)	0.037
Pre-existing NSF from prior surgery — number (%)	11 (4.5)	1 (3.4)	0.999
NSF reuse	9	1	
Non-enhancement among reused NSF	0	0	

NSF viability was analyzed at the procedure level among NSF-reconstructed cases only (case counts differ from the NSF reconstruction numbers in Table 1 due to exclusion of cases without postoperative MRI and duplicate counting for patients with multiple NSF procedures). Non-enhancing flaps were significantly more common in revision cases (3.7% vs. 13.8%, $p = 0.037$). Among 12 cases with pre-existing NSF from prior surgery, NSFs were reused in 10 and taken down with contralateral NSF harvest in 2.

CONCLUSION

Revision TSA surgery for pituitary adenomas is associated with significantly higher rates of intraoperative CSF leaks and **greater need for NSF reconstruction**, yet postoperative CSF leak rates remain low with meticulous skull base reconstruction. **The higher rate of non-enhancing flaps in revision cases suggests more frequent compromise of NSF vascularization**, likely due to septal scarring and increased risk of sphenopalatine artery injury from prior surgery. Nevertheless, previously harvested NSFs can be successfully reused, maintaining adequate vascularity for effective reconstruction.

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