NEUROFUNCTION

Case Report

pISSN 3022-9650 • eISSN 3022-9669
Neurofunction 2025;21(1):17-22
https://doi.org/10.52662/nf.2024.00171

Received: November 28, 2024
Accepted: December 15, 2024

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A case of cerebrospinal fluid rhinorrhea following endoscopic ventricular lavage for ventriculitis after transsphenoidal surgery

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Cerebrospinal fluid (CSF) leakage is a rare but serious complication after transsphenoidal approach surgery (TSA), particularly in complex cases that also require endoscopic ventricular lavage to manage ventriculitis. We report a case of a 77-year-old female with recurrent clivus chordoma who developed ventriculitis and subsequent CSF leakage after multiple TSAs and endoscopic explorations. During endoscopic lavage, the surgical flap detached, leading to postoperative CSF leakage. Repair involved an innovative approach with autologous fat grafting and flap repositioning, successfully sealing the defect and resolving the infection. This case underscores the need for adaptive, multidisciplinary strategies to manage complex postoperative complications after skull base surgery.

KEY WORDS: Cerebrospinal fluid leak, Cerebrospinal fluid rhinorrhea, Transsphenoidal approach, Central nervous system infections, Ventriculitis, Meningiits

INTRODUCTION

Cerebrospinal fluid (CSF) rhinorrhea is a rare but potentially serious complication that can occur after neurosurgical procedures, particularly those involving the skull base, such as transsphenoidal approach surgery (TSA) [1,2]. TSA is commonly performed to access pituitary lesions, but postoperative complications, postoperative complications like infections (e.g., ventriculitis) and CSF leaks, may significantly affect patient outcomes [3].

Endoscopic ventricular lavage is an emerging, minimally invasive technique used to manage severe intraventricular infections such as ventriculitis [4-6]. While this approach can reduce infection burden, it is not without risk. CSF rhinorrhea, though uncommon, may occur after such interventions, further complicating the clinical course.

In this report, we present a unique case of CSF rhinorrhea following endoscopic ventricular lavage performed for the treatment of ventriculitis that developed as a complication after TSA. This case underscores the importance of vigilant monitoring for postoperative complications in patients undergoing complex neurosurgical procedures and highlights the challenges in managing these cases.

Statement of ethics

This study is a case report and does not constitute human subject research.

Therefore, institutional review board approval was not required. The patient was unable to provide informed consent due to their critical condition. Identifying information has been anonymized to protect patient confidentiality.

CASE REPORT

A 77-year-old female with recurrent clivus chordoma, initially diagnosed 24 years ago, underwent multiple TSA over a span of 20 years and second stage craniotomy a year ago at another hospital. Due to accompanied hydrocephalus, ventriculoperitoneal shunt was placed postoperatively.

However, the patient developed a shunt infection and ventriculitis, necessitating shunt removal and external ventricular drain (EVD) insertion. CSF cultures undergone in the operation room identified *Pseudomonas aeruginosa*.

After this clinical course, the patient was transferred to our institution for neurocritical care. On the 13th day since ventriculitis was first diagnosed, at the previous institution, we performed endoscopic irrigation with septostomy. In the operating room, we also conducted cultures of both the EVD catheter tip and CSF, revealing *Acinetobacter baumannii*, which we targeted with intrathecal colistin injection and normal saline irrigation simultaneously. Colistin was injected intrathecally once per day at a dose of 10 mg, followed by clamping the catheter for approximately 2 hours. Afterward, we opened the catheter clamp and initiated continuous irrigation with normal saline at 20 mL per hour through the dual lumen EVD catheter.

A brain computed tomography (CT) scan was performed immediately after the surgery, showing a reduction in ventricle size (Fig. 1). Twelve days after the surgery, a brain magnetic resonance imaging was performed, which showed that debridement within the ventricle was successfully completed (Fig. 2).

As the infections showed no clinical improvement, additional endoscopic irrigation with septostomy was performed 2 weeks later and during the procedure, we observed purulent tissue emerging from the occipital horn of the ventricle.

Three days after the additional endoscopic irrigation, a routine follow-up CT scan showed severe hydrocephalus and pneumocephalus, as well as the defect of tissue near the site of the previous TSA (Fig. 3). Endoscopic exploration grossly revealed that the surgical flap had become detached. Under general anesthesia, we harvested abdominal fat tissue and reinforced and repositioned the flap. After the procedure, no further CSF leakage was observed and the CSF infection showed significant improvement. Ten days after flap reposition, a brain CT scan showed improvement in pneumocephalus and hydrocephalus (Fig. 4).

Eighteen days after flap reposition, ventriculo-peritoneal (VP) shunt was placed again finally, and the absence of CSF leakage was confirmed via endoscopic exploration.

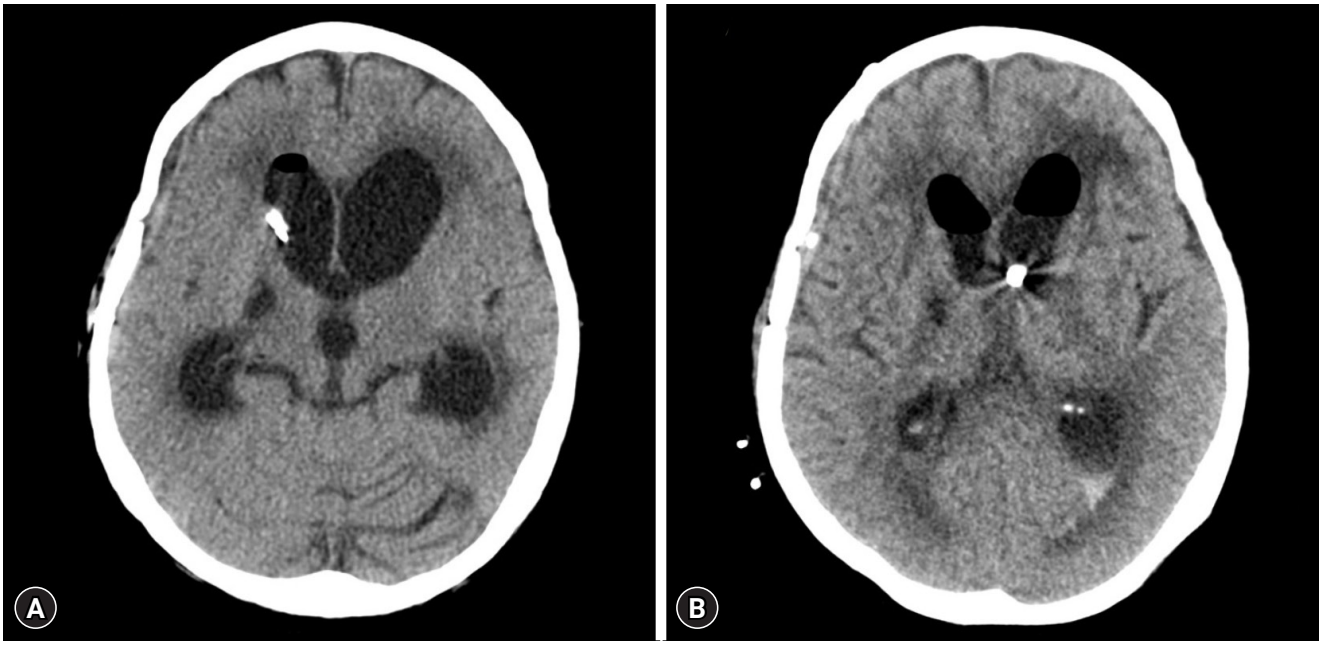

Fig. 1. Brain computed tomography (CT) images before and after endoscopic irrigation and septostomy. (A) Preoperative CT image. (B) Postoperative CT image. On the postoperative CT images, a reduction in ventricular size compared to the preoperative CT images was observed.

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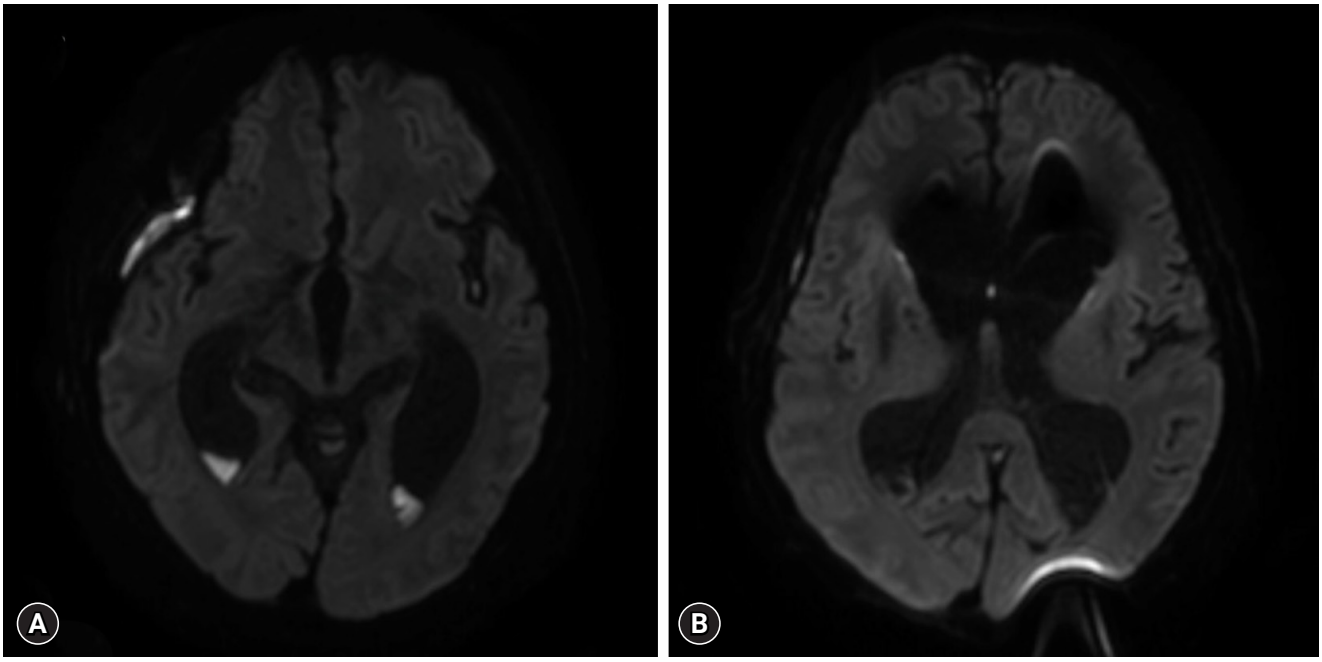

Fig. 2. Comparison of magnetic resonance imaging (MRI) diffusion sequences before and after endoscopic lavage. (A) Preoperative MRI diffusion images show prominent high signal intensity, suggesting infectious material. (B) Postoperative MRI diffusion images show a reduction in high signal intensity, indicating improvement of infection.

Initially, before the onset of ventriculitis, the patient was nearly alert but confused, corresponding to a modified Rankin Scale (mRS) score of 4. After transfer to our institution and during the intensive care, her mental status declined to a stupor, with an mRS of 5. Following flap repositioning and the final VP shunt surgery, her condition gradually improved, showing better responsiveness to stimuli. Ultimately, upon transfer back to the prior institution for rehabilitation, her condition further improved, allowing communication, with an mRS score of 4.

DISCUSSION

Ventriculitis is a severe complication of central nervous system (CNS) infections, carrying a mortality rate of 30–50%. In a retrospective study by Luque-Paz et al. [7], 98 patients diagnosed with ventriculitis were classified according to primary causes: brain abscess (29.6%), meningitis (27.6%), intraventricular catheter-related (17.3%), post-neurosurgery (13.3%), hematogenous (12.2%). The predominant pathogens were streptococci (44.9%), Gram-negative bacilli (27.6%), and staphylococci (15.3%). This case aligns with prior findings, as the patient developed ventriculitis with *P. aeruginosa* and *A. baumannii* following multiple neurosurgical interventions, including TSA, which is known to increase infection risk.

Although the incidence of ventriculitis following TSA remains unclear, the connection between ventriculitis and CSF leakage is well-documented. Huang et al. [8] identified key risk factors for intracranial infections post-neuroendoscopic transnasal pituitary adenoma resection, noting that intraoperative CSF leakage (Kelly Grade > 2) and postoperative CSF leakage were independent predictors of infection. Their study highlighted that factors such as age > 45 years, large tumor size, extended surgical time, and significant blood loss also contribute to infection risk, underscoring the importance of controlling intraoperative CSF leakage to prevent complications like pneumocephalus, ventriculitis, and meningitis.

Intraoperative CSF leakage, a common complication of endonasal TSA, occurs in approximately 50% of pituitary tumor surgeries [9]. Autologous fat grafts are commonly used to reconstruct the sellar floor or fat detachment to prevent leakage [10]. In our case, CSF leakage was exacerbated by flap detachment during endoscopic irrigation, which may have stemmed from various factors: mechanical damage from the endoscope, tissue necrosis, or compromised vascular support [4].

The standard management for ventriculitis includes intravenous (IV) antibiotics and ventricular drainage, sometimes coupled with continuous intraventricular irrigation [11,12]. Intrathecal antibiotic therapy has been increasingly recognized for its efficacy in managing severe CNS infections, particularly those caused by multidrug-resistant Gram-negative bacteria. Li et al. [13] demonstrated that patients in the intrathecal/intraventricular antibiotic group

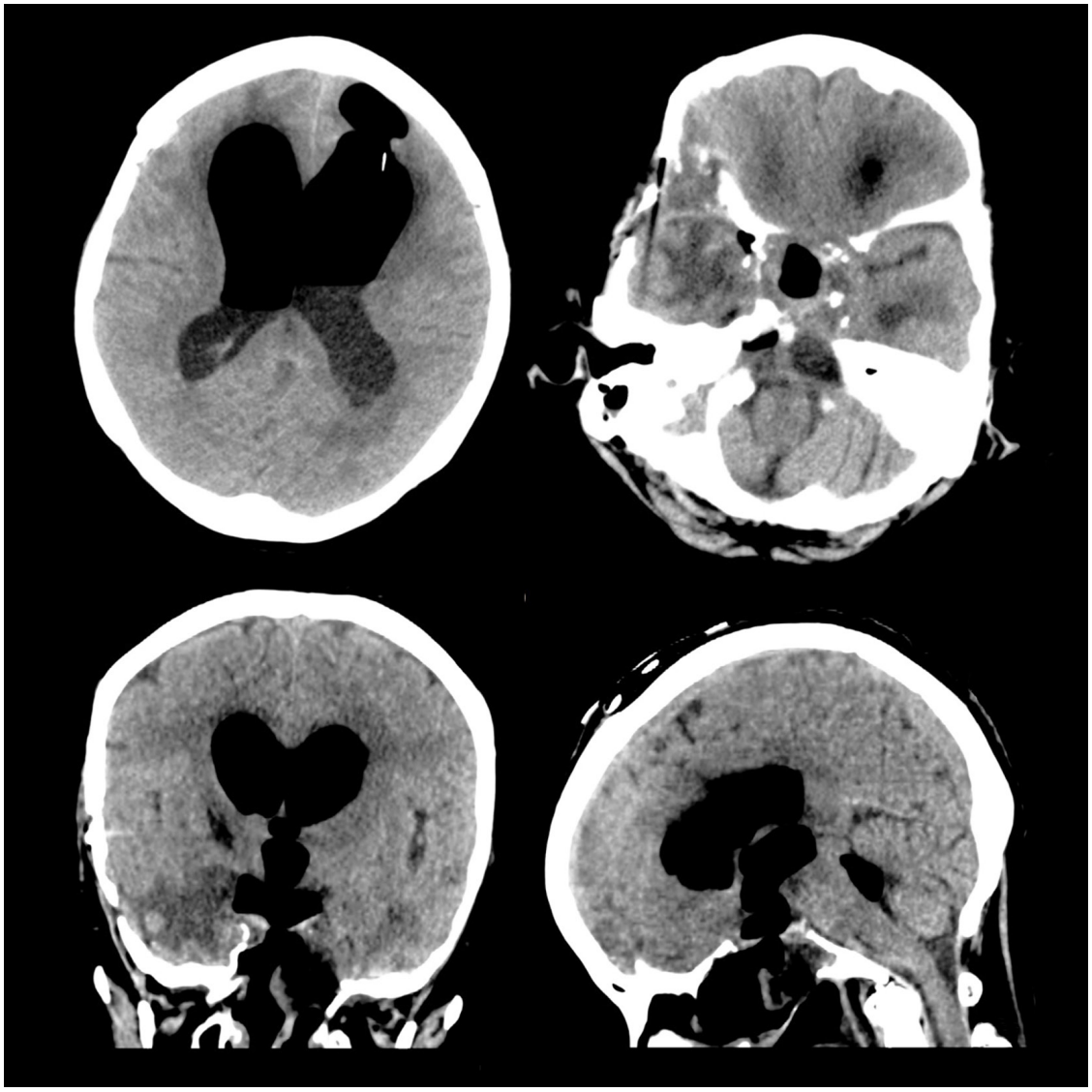

Fig. 3. Brain computed tomography image 3 days after the additional endoscopic irrigation. Severe pneumocephalus and hydrocephalus with flap defect are observed.

had significantly lower mortality rates compared to those receiving IV antibiotics alone, with pronounced benefits in cases involving extensively drug-resistant Gram-negative bacteria. Furthermore, the intrathecal/intraventricular group showed significant improvements in microbiological clearance and reductions in CSF neutrophil counts, alongside better CSF glucose levels. In our case, *A. baumannii* was identified, and we implemented a combined treatment strategy of IV colistin alongside intrathecal colistin and normal saline irrigation. This approach was crucial in achieving infection control and highlights the potential role of intrathecal antibiotics as an adjunctive therapy for managing complex infections involving multidrug-resistant pathogens.

Although intrathecal antibiotics therapy has demonstrated its efficacy, it can still be insufficient due to challenges such as multidrug-resistant pathogens, limited antibiotics penetration, and impaired CSF drainage in infected ventricles [14]. Recent studies have explored the efficacy of endoscopic lavage in ventriculitis treatment. Terada et al. [15] reported improved clinical outcomes, lower mortality, and shorter drainage catheter duration in ventriculitis patients treated with neuroendoscopic irrigation. Al Menabbawy et al. [16] similarly confirmed that endoscopic lavage improved outcomes, reduced hospital stays, and minimize complications significantly.

Neuroendoscopic techniques offer several advantages in treating ventriculitis, including precise access to deep infected structures with minimal incisions. Endoscopic lavage allows for controlled,

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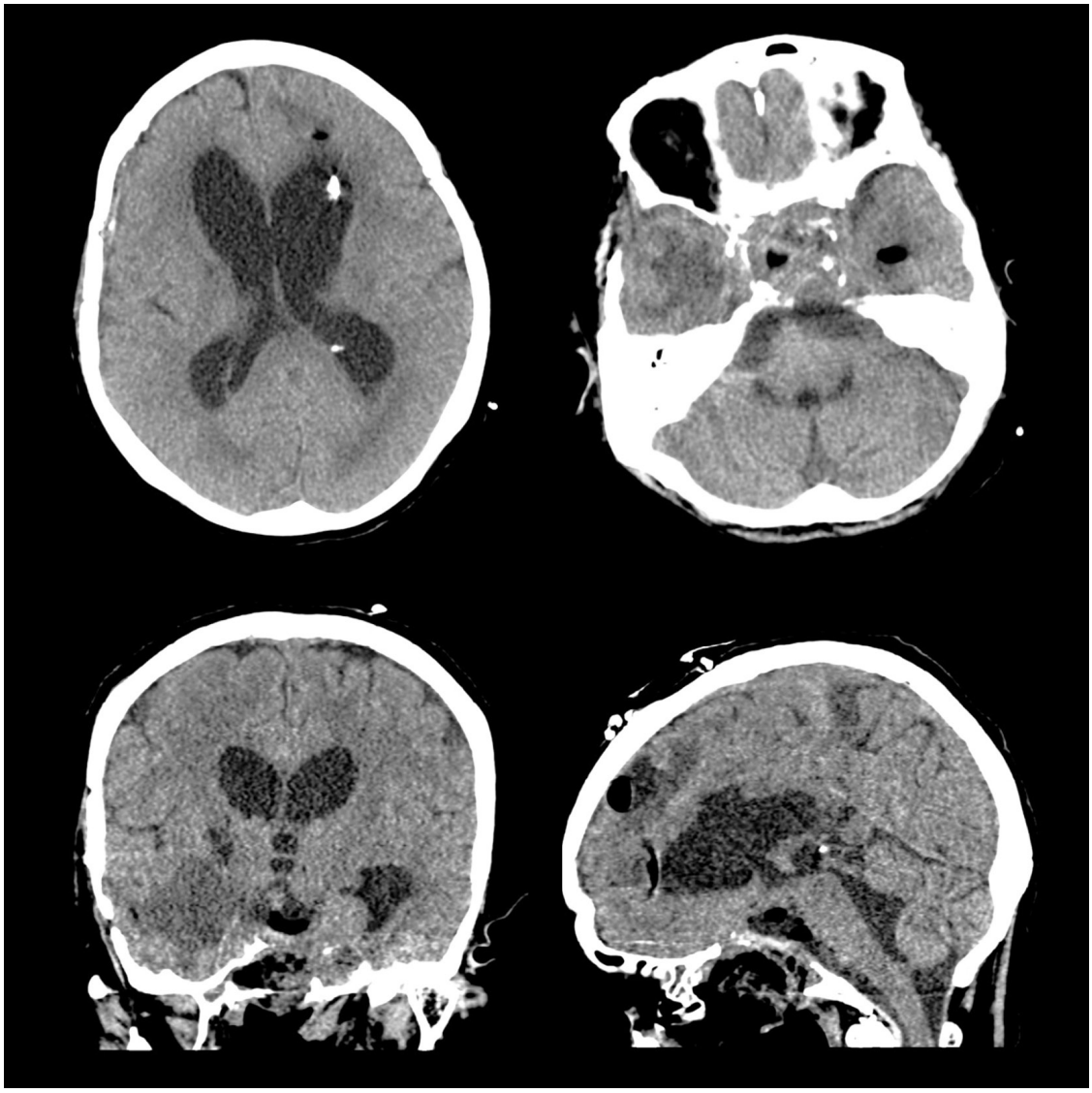

Fig. 4. Brain computed tomography image 10 days after flap repositioning. Improvement of pneumocephalus and hydrocephalus is observed.

high flow irrigation, enabling safe removal of infection nidi, debris, and membrane, thereby improving antibiotic penetration both via intravenous and intrathecal [4]. Despite these benefits, our case highlights a potential complication: flap detachment during the procedure. Lee et al.'s [4] retrospective review of 777 TSA cases showed that factors such as dural defect size and flap support significantly influence postoperative CSF leakage risk. They found that buttress placement reduced leakage in small defects, while larger defects required combined fat graft and buttress support for effective closure.

In this patient's case, endoscopic lavage was pivotal for ventriculitis management, yet it presented additional challenges with detachment of the surgical flap. Recognizing the importance of tailored, interventions based on dural defect size and securing optimal flap positioning were crucial in achieving successful closure and preventing recurrent leakage and associated CNS infection.

CONCLUSION

This case underscores the complexities and challenges in managing postoperative complications following TSA for recurrent clivus chordoma, particularly when compounded by CSF leakage and ventriculitis. While endoscopic lavage proved effective in reducing the infection burden, it presented unique risk, as demonstrated by the mechanical detachment of the surgical flap, leading to CSF rhinorrhea.

The successful management of these complications required a multi-dimensional approach combining endoscopic lavage, intrathecal antibiotics administration, and elaborate reconstructive techniques. The use of autologous abdominal fat grafting and flap repositioning was pivotal in sealing the defect, preventing further CSF leakage, and mitigating infection risks. This case highlights the critical need for vigilant monitoring, personalized surgical strategies, and adaptive intraoperative techniques in treating complex cases involving skull base tumors and postoperative infections.

Through careful integration of endoscopic and reconstructive methods, we achieved successful patient outcomes, providing valuable insights into managing similar case in future neurosurgical practice.

CONFLICTS OF INTEREST

No potential conflict of interest relevant to this article was reported.

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