Case Report

Endoscopic endonasal repair of post-traumatic sphenoid sinus cerebrospinal fluid leak with encephalocele

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ABSTRACT

While cerebrospinal fluid (CSF) rhinorrhoea due to a road traffic accident is uncommon, its occurrence is clinically important because of the serious complications involving the central nervous system, such as meningitis. Often, the management of a post-traumatic CSF leak requires a multidisciplinary strategic approach. We report a case of post-traumatic sphenoid-sinus CSF leak with meningocele successfully repaired using a transnasal endoscopic multilayer technique in a setting with scarce resources. The initial neurosurgical intervention consisted of decompression of a massive pneumocephalus, followed by a definitive endoscopic skull-base repair. This procedure resulted in the cessation of the CSF leak and complete recovery. This case report highlights what can be achieved with a multi-disciplinary approach in a resource-constrained setting, such as South Sudan.

Key words: cerebrospinal rhinorrhoea, sphenoid sinus fracture, meningocele, endoscopic endonasal repair, resource-limited

Introduction

Traumatic cerebrospinal fluid (CSF) leak is a recognized complication of head injury. It occurs in 1–3 % of closed-head traumas and 10–30 % of basilar-skull fractures.[1] Traumatic CSF rhinorrhoea accounts for about 90% of all CSF leaks, with 80% caused by motor-vehicle accidents or falls.[2] Accurate identification of the defect site and the presence of associated meningo-encephalocele are crucial before surgery. Localization can be aided by imaging and intra-operative fluorescein, though the sphenoid sinus remains a particularly challenging site. Persistent leaks lasting two to three weeks or more typically require surgical intervention, most effectively managed through an endoscopic endonasal approach.[3,4] We present a case of post-traumatic sphenoid-sinus CSF leak with encephalocele, managed collaboratively by ENT and Neurosurgery teams in Juba, South Sudan, demonstrating that complex skull-base repairs are achievable even in resource-limited environments.

Case Report

On 14th June 2025, a 37-year-old male sustained a severe head injury following a fall and presented three weeks later with a persistent clear nasal discharge

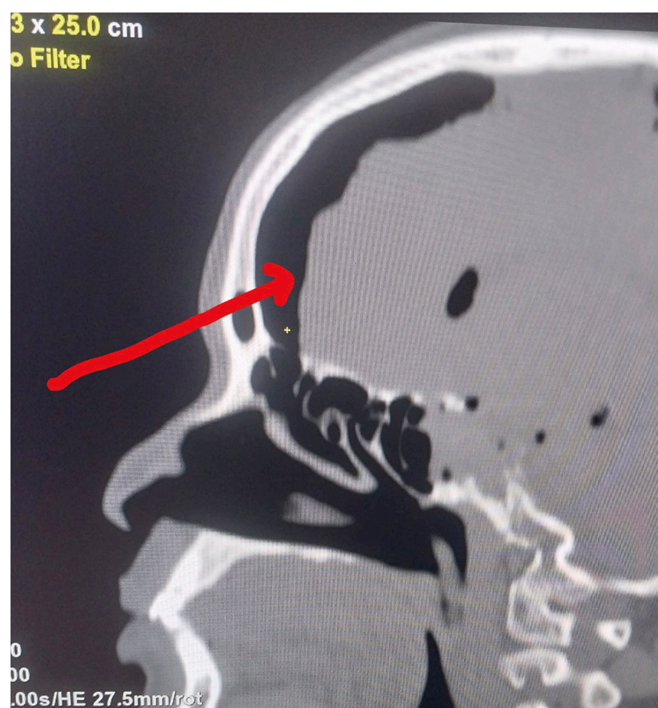

Figure 1. CT scan sagittal view of massive pneumocephalus (Credit: Dr Justin Rubena Luamaya)

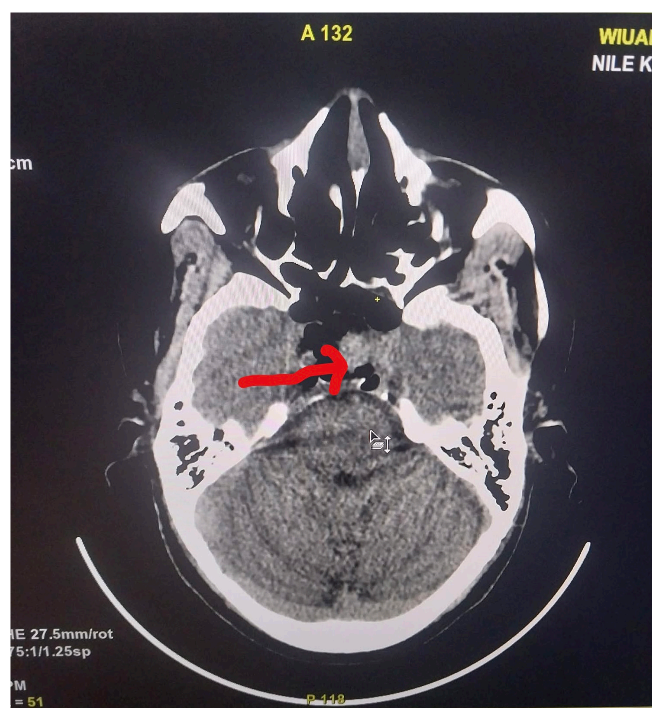

Figure 2. CT scan showing meningocele (hernia of the meninges and brain tissue through the lateral sphenoid sinus wall defect from the middle cranial fossa. (Credit: Dr Justin Rubena Luamaya)

from the left nostril and a constant severe headache. He was assessed clinically by a Consultant Neurosurgeon followed by CT imaging revealing a small fracture of the sphenoid bone with marked intracranial air collection - pneumocephalus (Figure 1). The CT scan in an axial view showed herniation of a meningocele from the left middle cranial fossa into the sphenoid sinus (Figure 2).

A burr hole was performed, with insertion of a drain to decompress the pneumocephalus, which led to gradual neurological stabilization and a reduction in headache. However, CSF rhinorrhoea persisted and one month later (24th July) rhinoendoscopy revealed, upon Valsalva manoeuvre, a gush of CSF from the left sphenoid sinus. CT imaging confirmed a posterolateral sphenoid-sinus defect with associated meningocele herniation, and endoscopic endonasal multilayer reconstruction was performed on the 2nd August.

A zero-degree scope (a rhinoscope with a camera allowing visualisation of the whole nasal cavity) was used to navigate through the nasal cavity alongside the medial attachment of the left superior turbinate to visualize the sphenoid opening. Blakesley forceps were used to do an uncinectomy (procedure to clear the uncimeatal complex) to expose the posterior rim of the maxillary ostium (Figure 3). During this exposure of the mucosa, a branch of the sphenopalatine artery was severed, but bleeding was controlled using bipolar cautery. The anterior wall of the sphenoid was removed using a Kerrison Rongeurs instrument. This exposed the CSF leak site and the meningocele, which was seen protruding and pulsating from the lateral sphenoid wall.

Approximately 80 % of the anterior sphenoid-sinus wall was removed to expose the lateral aspect of the defect. A bipolar cautery was used to shrink the herniated meningocele and delineate the defect.

Multilayer reconstruction was performed as follows:

1. Underlay tragal cartilage for structural support.
2. Autologous abdominal fat to obliterate dead space and seal the defect (Figure 4).
3. Surgicel and Gelfoam for additional reinforcement.
4. A vascularized naso-septal flap was rotated over the defect (Figure 5).
5. Additional layers of Surgicel, bone wax, and tetracycline-soaked gauze were applied to reinforce the closure.

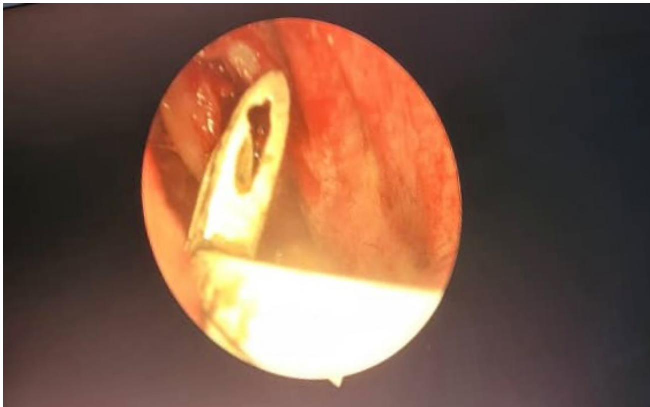

Figure 3. Removing the uncinate process to expose the posterior rim of the maxillary-ostium and the medial pterygoid plate to access proximity to the lateral wall of the sphenoid. (Credit: Dr Justin Rubena Luamaya)

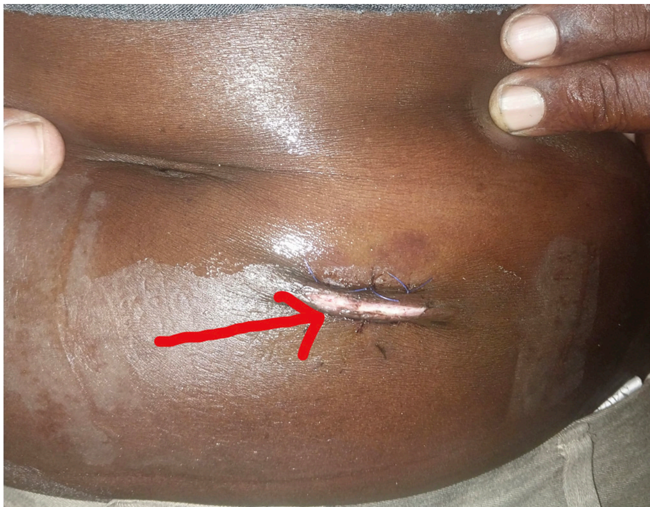

Figure 4. Horizontal incisional site (6cm) to harvest the abdominal fat graft after seven postoperative days. (Credit: Dr Justin Rubena Luamaya)

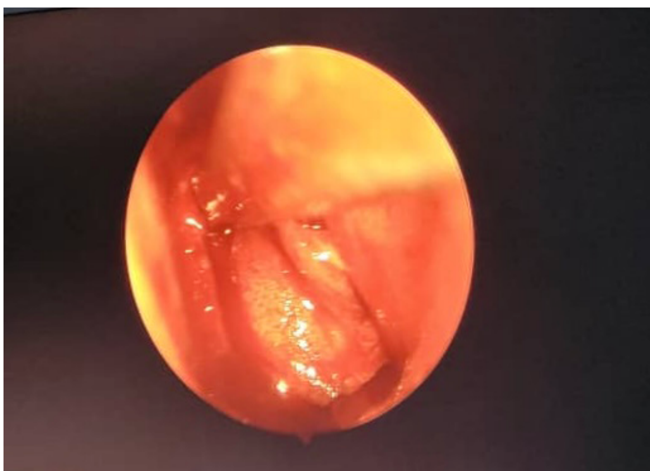

Figure 5. Placement of the vascularized naso-septal flap into the sphenoid defect. (Credit: Dr Justin Rubena Luamaya)

The bone wax and tetracycline gauze were removed four weeks post-operatively.

Post-operative recovery was uneventful. There was a complete cessation of CSF rhinorrhoea, without recurrence during follow-up, and no development of meningitis or pneumocephalus.

Discussion

Traumatic CSF leaks of the sphenoid sinus are rare but potentially life-threatening because of the risks of central nervous system complications like meningitis, recurrent pneumocephalus, and neurological deficits.[5] Initial conservative management is the standard management in selected cases. However, persistent CSF leaks of more than 2-3 weeks require surgical intervention.[6] The endoscopic endonasal approach is superior to transcranial methods because it provides a direct view of the skull base and, furthermore, is associated with lower morbidity and higher success rates.[7] To ensure a watertight seal after reconstruction, a multilayer technique using autologous cartilage, fat, and vascularized mucosal flaps is preferred. This approach also minimizes recurrence.[8,9,10]

In our case, the initial neurosurgical intervention involved burr-hole decompression with a drain. This resolved the pneumocephalus and stabilized the patient for safe endoscopic repair. This staged, collaborative strategy demonstrates that even in resource-limited environments, advanced skull-base surgery can be successfully achieved with appropriate expertise and teamwork.

Conclusion

Persistent post-traumatic CSF rhinorrhoea of the sphenoid sinus requires timely multidisciplinary management. The combination of neurosurgical decompression and endoscopic multilayer closure provides an effective, safe, and feasible solution, even in low-resourced African contexts. This case emphasizes the importance of enhancing ENT and neurosurgical collaboration and infrastructure in sub-Saharan Africa to manage complex skull base pathologies and prevent severe complications, such as meningitis and recurrent pneumocephalus.

Authors' contributions: RJ performed the endoscopic endonasal repair and drafted the manuscript. KC performed the initial neurosurgical evaluation and burr-hole decompression, and contributed to multidisciplinary planning. Others assisted during the surgical procedures.

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