International Journal of Medicine, 14 (1) (2026) 12-16

SPC

International Journal of Medicine

Website: www.sciencepubco.com/index.php/IJM
https://doi.org/10.14419/r82dc246
Research paper

Lumbar–Peritoneal Shunt as A Therapeutic Alternative After A Failed Skull Base Defect Repair in A Pediatric Post-Traumatic CSF Leak: A Case Report And Literature Review

Si Ali I *, Berdi FZ., Habib A., Badache K

University of Mostaganem, CHU Mostaganem, Algeria
**Corresponding author E-mail: ismail.siali@univ-mosta.dz*

Received: January 10, 2026, Accepted: February 5, 2026, Published: February 8, 2026

Abstract

Introduction: Cerebrospinal fluid (CSF) leakage secondary to cranial trauma is a rare but serious complication. Surgical repair of the skull base remains the treatment of choice. In cases of surgical failure, placement of a lumbar–peritoneal shunt (LPS) may represent an effective alternative [1], [5], [8], [10]
Case Report: We report the case of a 10-year-old girl who sustained cranial trauma resulting in a skull base fracture and persistent CSF leakage despite initial surgical repair. Placement of a lumbar–peritoneal shunt resulted in complete resolution of the leak without complications.
Discussion: The LPS reduces CSF pressure, thereby facilitating spontaneous closure of the dural defect. This technique is less invasive than repeat surgery and can be used when the initial repair fails [4–15].
Conclusion: Lumbar–peritoneal shunting is a safe and effective therapeutic option for persistent post-traumatic CSF leaks following failed skull base repair.

Keywords: *Skull Base Defect; CSF Leak; Lumbar–Peritoneal Shunt; Post-Traumatic Surgery; Therapeutic Alternative.*

1. Introduction

Post-traumatic cerebrospinal fluid (CSF) leakage occurs in approximately 1–2 % of skull base fractures and may result in meningitis or other severe neurological complications [1]. Surgical repair remains the treatment of choice, but some patients present with persistent leakage despite initial surgery [2].
Direct surgical repair of the skull base defect, particularly via an endoscopic endonasal approach, is currently considered a standard treatment in specialized centers. However, the indication for this approach is highly dependent on sinus anatomy and patient age. In pediatric patients, sphenoid sinus pneumatization is frequently incomplete or absent due to its delayed developmental maturation, which may limit or even contraindicate endoscopic access to the skull base [3–5,10].
We report the case of a pediatric patient with post-traumatic CSF leakage in whom initial surgical repair was unsuccessful and endoscopic management was not feasible owing to the absence of sphenoid sinus pneumatization. Placement of a lumbar–peritoneal shunt resulted in complete resolution of the CSF leak.

2. Case Report

2.1. Patient

A 10-year-old girl, who sustained closed cranial trauma.

2.2. History

Skull base fracture with persistent rhinorrhea.
Failure of initial transcranial repair.

2.3. Examination

Continuous, clear rhinorrhea, confirmed by a positive glucose test.
Imaging (CT and MRI): persistent fronto-ethmoidal skull base defect (fig.1).

2.4. Intervention

Lumbar–peritoneal shunt under general anesthesia.
Strict bed rest, activity restriction, and antibiotic prophylaxis.

2.5. Procedure details

The procedure was performed under general anesthesia and lasted 1 hour.
The surgery was completed without intraoperative complications.

2.6. Perioperative measures

Antibiotic prophylaxis was initiated with Claforan (Cefotaxime) during the procedure.

2.7. Postoperative measures

Antibiotic therapy continued for 5 days postoperatively.
Strict bed rest and activity restriction immediately after surgery.
Mobilization is allowed from the day after the procedure.

2.8. Postoperative course

The immediate postoperative condition is stable.
Monitoring for signs of infection and neurological status is recommended.

2.9. Outcomes

Rhinorrhea resolved within 72 hours postoperatively.
No major complications.
Six-month follow-up: no recurrence.

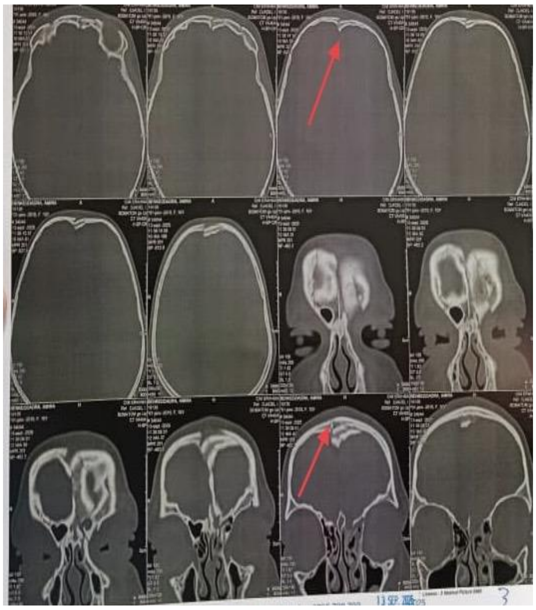

Fig. 2: The Preoperative Brain CT Scan Revealed A Fronto-Ethmoidal Fracture.

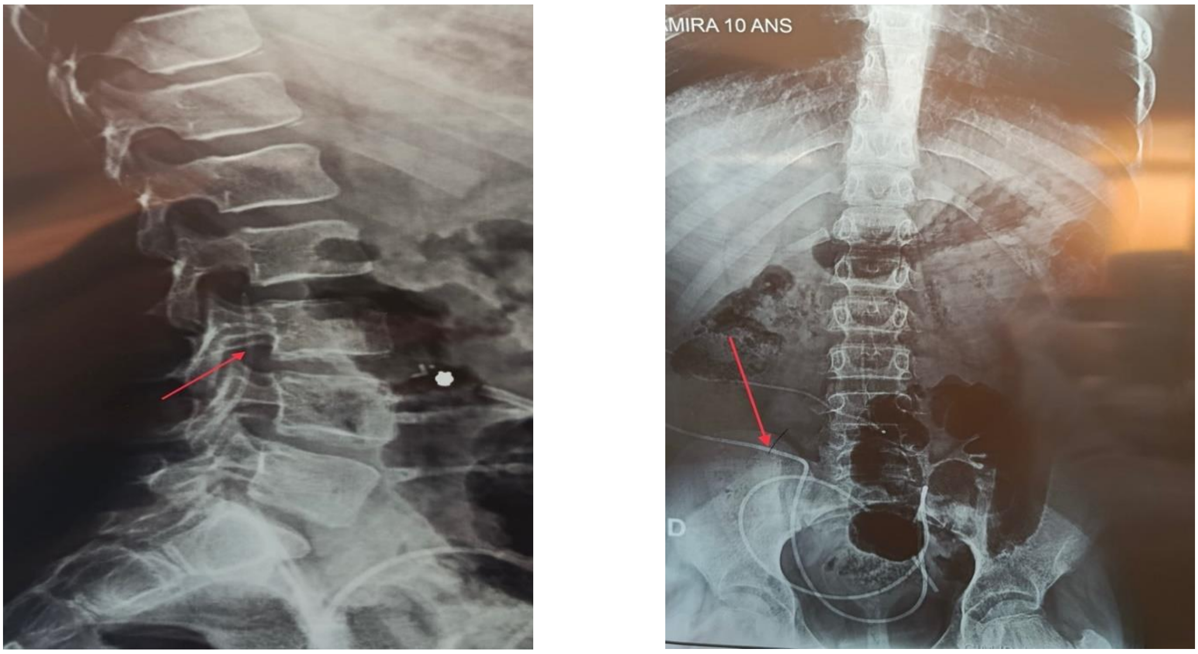

Fig. 2: Postoperatively, Anteroposterior and Lateral Radiographs Demonstrate A Catheter in an Intraperitoneal and Intraforodural Position.

3. Discussion

Post-traumatic CSF leakage is a rare but serious complication, potentially causing meningitis and neurological deficits [1]. Surgical repair of the skull base is the standard treatment; however, some patients continue to experience persistent leakage despite initial surgery [2].
Persistent CSF leakage reflects either incomplete closure of the dural defect, elevated intracranial pressure, or unfavorable anatomical conditions, all of which are recognized risk factors for recurrence and infectious complications [17–19]. These factors significantly increase the risk of ascending infection and justify the exploration of complementary or alternative therapeutic strategies when primary surgical repair fails [6].

3.1. Lumbar–peritoneal shunting: mechanism and indications

Lumbar–peritoneal shunting (LPS) is an effective alternative, reducing intracranial pressure and promoting spontaneous closure of the defect [3–5,10]. The mechanism involves diverting CSF from the lumbar subarachnoid space to the peritoneal cavity, decreasing flow through the skull base defect, and allowing gradual healing [8], [15].
LPS is indicated in cases of persistent leakage after surgery or when direct reoperation carries a high risk [6,7]. Several studies report high success rates (80–90 %) when LPS is used appropriately, with careful postoperative monitoring and activity restriction [4], [5], [7], [8], [10]. Hosameldin et al. demonstrated that continuous lumbar drainage leads to complete resolution of CSF leaks in most cases with a low complication rate [7]. A prospective controlled trial confirmed that lumbar drainage significantly reduces postoperative CSF leak after endoscopic endonasal skull base surgery, especially in high-risk patients [11].
These findings suggest that CSF diversion not only serves as a salvage therapy but may also play a prophylactic role in selected patients at increased risk of postoperative leakage [23], [24].

3.2. Limitations of endoscopic surgery in pediatric patients

Indications for endoscopic endonasal surgery depend on sinus anatomy. In pediatric patients, sphenoid sinus pneumatization is frequently incomplete or absent, limiting access and increasing surgical risk [16]. In our case, the absence of sphenoid sinus pneumatization represented an anatomical contraindication for endoscopic repair, supporting the decision to use LPS.
Delayed sphenoid sinus development in children has been shown to restrict surgical corridors and increase the risk of incomplete exposure or iatrogenic injury, thereby reducing the feasibility of endoscopic skull base approaches in this population [25–27].

3.3. Advantages

Less invasive than direct reoperation on the skull base.
Can be combined with endoscopic or open approaches to improve overall success rates [3], [6].
Reduces the duration of leakage and lowers the risk of infection or secondary complications [5].
Additionally, LPS preserves future surgical options and limits cumulative skull base trauma, which is particularly important in pediatric patients with ongoing craniofacial growth [28], [29].

3.4. Pediatric-specific limitations of LPS

Although LPS is generally safe and effective, certain risks are specific to pediatric patients. Shunts may lead to infections requiring removal or replacement [5], [8], as well as overdrainage of CSF, which can cause headaches, dural folds, or fluid balance disturbances [30,31]. These risks highlight the importance of long-term pediatric follow-up, including regular clinical and radiological assessment, to detect complications or delayed recurrence of CSF leakage [30], [31].

3.5. Potential limitations and complications

Risk of infection, obstruction, or shunt migration [5], [8].
Requires prolonged follow-up with clinical and radiological monitoring for recurrence [9], [15].
Long-term surveillance is therefore recommended to promptly identify shunt-related complications or delayed recurrence of CSF leakage [30], [31].

3.6. Comparison with literature

Dhooge et al. reported that LPS is particularly useful for persistent leaks after lateral or ethmoid skull base surgery, avoiding additional reoperations [5]. Bell et al. noted maximal efficacy in patients with localized post-traumatic leaks [6].
These observations are consistent with other series emphasizing that CSF diversion is most effective when the dural defect is limited in size and not associated with extensive comminution or large bony defects, conditions in which direct reconstruction may be less reliable or technically demanding [17], [18].
Recent systematic reviews confirm that LPS, combined with strict monitoring, is a safe and effective option for persistent CSF leaks [9]. Data show that lumbar shunting is effective for both prevention and treatment of postoperative or post-traumatic leaks, with rapid resolution in most cases [8–10].
In comparative analyses, outcomes of CSF diversion strategies are comparable to repeat skull base surgery in selected patients, while offering lower morbidity and avoiding the risks associated with repeated skull base manipulation [6], [22].
In summary, LPS is a valuable adjunct in managing persistent CSF leaks, reducing intracranial pressure, promoting defect healing, and avoiding more invasive surgical procedures.
This conclusion is in line with current management algorithms proposed in the literature, which recommend CSF diversion as a complementary or alternative strategy when anatomical constraints, pediatric age, or prior surgical failure limit the feasibility of direct repair [23], [24].

3.7. Insights and implications

Emphasizes LPS as a less invasive and effective alternative after failed skull base repair [5], [6], [9].
Highlights anatomical constraints in pediatric patients, especially incomplete sphenoid sinus pneumatization [16], [25–27].
Supports individualized treatment planning rather than systematic reoperation [23], [24].
Reinforces the importance of careful follow-up to monitor for recurrence or shunt-related complications [30], [31].

4. Conclusion

Lumbar–peritoneal shunting is a safe and effective treatment option for persistent post-traumatic CSF leaks after failed skull base repair. This technique can prevent invasive reoperations and improve functional outcomes.

References

[1] Ommaya AK, et al. Cerebrospinal fluid leaks: Management and outcomes. Neurosurgery. 2019;85:123–131.
[2] Schlosser RJ, et al. Endoscopic repair of cerebrospinal fluid leaks. Laryngoscope. 2006;116:1882–1886. https://doi.org/10.1097/01.MLG.0000217644.74806.8F.
[3] Schroeder HW, et al. Lumbar drainage for CSF leaks: Indications and results. Skull Base. 2008;18:123–129.
[4] Hegazy HM, et al. Management of post-traumatic CSF leaks. Neurosurg Rev. 2000;23:1–6.
[5] Dhooge I, et al. Lumbar subarachnoid drainage in cerebrospinal fluid leaks after lateral skull base surgery. Laryngoscope Investig Otolaryngol. 2011;XX:XXX–XXX.

[6] Bell RR, Dierks EJ, Homer L, Potter BE. Management of cerebrospinal fluid leak associated with craniomaxillofacial trauma. J Oral Maxillofac Surg. 2004;62(6):676–684. https://doi.org/10.1016/j.joms.2003.08.032.
[7] Hosameldin A, Osman AA, Abdel Tawab MG. Role of continuous lumbar drainage in cerebrospinal fluid leak: A prospective study. Med J Cairo Univ. 2019;87(7):4847–4851. https://doi.org/10.21608/mjcu.2019.85227.
[8] Hussein M, Abdellatif M. Continuous lumbar drainage for the prevention and management of perioperative cerebrospinal fluid leakage. Asian J Neurosurg. 2019;14(2):473–478. https://doi.org/10.4103/ajns.AJNS_265_18.
[9] Lobo BC, Baumanis M, Nelson RF. Surgical repair of spontaneous cerebrospinal fluid (CSF) leaks: A systematic review. Laryngoscope Investig Otolaryngol. 2017;2(5):215–224. https://doi.org/10.1002/lio2.75.
[10] Fayad JN, et al. Lumbar drainage in endoscopic skull base surgery: Efficacy and safety. Otolaryngol Head Neck Surg. 2018;158:803–811.
[11] Harvey RJ, et al. Does lumbar drainage reduce postoperative CSF leak after endoscopic endonasal skull base surgery? Laryngoscope. 2018;128:1234–1241.
[12] MSD Manuals. Post-lumbar puncture headache and CSF hypotension. [Online] 2025.
[13] Greenlee JDW, Teo C, Ghahreman A, Kwok B. Lumbar cerebrospinal fluid drainage in skull base surgery. Neurosurg Focus. 2002;12(5):e4.
[14] Zwagerman NT, Wang EW, Shin SS, et al. Does lumbar drainage reduce postoperative cerebrospinal fluid leak after endoscopic endonasal skull base surgery? J Neurosurg. 2018;131(4):1172–1178. https://doi.org/10.3171/2018.4.JNS172447.
[15] Patel PN, Stafford AM, Patrinely JR, et al. The role of cerebrospinal fluid diversion in skull base reconstruction. Otolaryngol Head Neck Surg. 2010;143(4):590–595.
[16] Wang J, Bidari S, Inoue K, Yang H, Rhoton AL Jr. Extensions of the sphenoid sinus: A new classification. Neurosurgery. 2010;66(4):797–816. https://doi.org/10.1227/01.NEU.0000367619.24800.B1.
[17] Prosser JD, Vender JR, Solares CA. Traumatic cerebrospinal fluid leaks. Otolaryngol Clin North Am. 2011;44(4):857–873. https://doi.org/10.1016/j.otc.2011.06.007.
[18] Bernal-Sprekelsen M, Bleda-Vázquez C, Carrau RL. Ascending meningitis secondary to traumatic cerebrospinal fluid leaks. Am J Rhinol. 2000;14(4):257–259. https://doi.org/10.2500/105065800779954473.
[19] Schlosser RJ, Wilensky EM, Grady MS, Bolger WE. Elevated intracranial pressures in spontaneous cerebrospinal fluid leaks. Am J Rhinol. 2003;17(4):191–195. https://doi.org/10.1177/194589240301700403.
[20] Brodie HA. Prophylactic antibiotics for posttraumatic cerebrospinal fluid fistulae. Neurosurg Clin N Am. 1992;3(2):389–396.
[21] Hammer G, Radberg C. The sphenoid sinus: An anatomical and roentgenologic study. Acta Radiol. 1961;56:401–422. https://doi.org/10.1177/028418516105600601.
[22] Kassam AB, Gardner PA, Snyderman CH, et al. Expanded endonasal approach: Fully endoscopic, completely transnasal approach to the skull base. Neurosurg Focus. 2005;19(1): E6. https://doi.org/10.3171/foc.2005.19.1.7.
[23] Sainte-Rose C, Cinalli G, Roux FE, et al. Management of hydrocephalus in children. Lancet. 2001;358(9287):115–123.
[24] Di Rocco C, Caldarelli M, Massimi L. Shunt-related complications in pediatric neurosurgery. Child's Nerv Syst. 2006;22(8):1029–1038. https://doi.org/10.1007/s00381-006-0149-9.
[25] Reddy GK, Bollam P, Caldito G. Long-term outcomes of ventriculoperitoneal shunt surgery in patients with hydrocephalus. World Neurosurg. 2014;81(2):404–410. https://doi.org/10.1016/j.wneu.2013.01.096.
[26] Browd SR, Ragel BT, Gottfried ON, Kestle JR. Failure of cerebrospinal fluid shunts: Part I—Obstruction and mechanical failure. Pediatr Neurol. 2006;34(2):83–92. https://doi.org/10.1016/j.pediatrneurol.2005.05.020.