PAIN MEDICINE CASE REPORTS

ISSN 2768-5152

Volume 7, Number 2, pp. 69-72

Management of Persistent Cerebrospinal Fluid Leak With an Epidural Blood Patch Following Removal of Lumbar Drain and Failed Neurosurgical Intervention: Case Report

Leah Tharian[1], Antony R. Tharian, MD[1,2], and Nebojsa Nick Knezevic, MD, PhD[1-3]

Background: Persistent cerebrospinal fluid (CSF) leak is a complication of a dural puncture that can be idiopathic, traumatic, or iatrogenic in nature.

Case Report: We present a case of a 43-year-old woman, diagnosed with a spontaneous CSF rhinorrhea that was treated with temporary placement of a lumbar drain. Upon discharge, the patient experienced a persistent CSF leak from the lumbar drain site, as well as a positional headache and vertigo that persisted even after application of reinforcement sutures at the lumbar drain site by the neurosurgery team. The patient was subsequently treated with an epidural blood patch (EBP) at L3-L4 interspace with autologous venous blood injected into the epidural space. During the follow-up 2 weeks after the intervention, there was a complete resolution of her symptoms, as well as the CSF leakage.

Conclusions: A CSF leak after lumbar drain removal that persists even after neurosurgical intervention can be successfully treated with an EBP.

Key words: CSF leak, rhinorrhea, epidural blood patch, lumbar drain, case report

BACKGROUND

A cerebrospinal fluid (CSF) leak around a dural puncture site following the removal of a lumbar drain is typically self-limiting. However, a persistent leak, despite conservative and interventional neurosurgical therapy, can significantly increase morbidity and mortality. Complications include postdural puncture headache, arachnoiditis, meningitis, epidural abscess, deterioration of neurologic status, or a cutaneous dural fistula creating a nidus for infection (1).

We present a unique case of a persistent CSF leak following the removal of a lumbar drain treated with an epidural blood patch (EBP) after failed neurosurgical intervention. There have been very few case reports of persistent CSF leaks following thoracolumbar surgery, but none describing a CSF leak after lumbar drain removal that persisted even after neurosurgical intervention, which was treated successfully with an EBP (6). A written consent was obtained from the patient to publish this case report.

From: [1]Department of Anesthesiology, Advocate Illinois Masonic Medical Center, Chicago, IL; [2]Department of Anesthesiology, University of Illinois, Chicago, IL; [3]Department of Surgery, University of Illinois, Chicago, IL

Corresponding Author: Nebojsa Nick Knezevic, MD, PhD, E-mail: nick.knezevic@gmail.com
Disclaimer: There was no external funding in the preparation of this manuscript.
Conflict of interest: Each author certifies that he or she, or a member of his or her immediate family, has no commercial association (i.e., consultancies, stock ownership, equity interest, patent/licensing arrangements, etc.) that might pose a conflict of interest in connection with the submitted manuscript.
Patient consent for publication: Consent obtained directly from patient(s).
Authors adhere to the CARE Guidlines for writing case reports and have provided the CARE Checklist to the journal editor.
Accepted: 2023-01-11, Published: 2023-03-31

CASE PRESENTATION

A 43-year-old woman with a past medical history of hypothyroidism was referred to the pain clinic for the management of a persistent lumbar CSF leakage following the removal of a lumbar drain. She had a spontaneous CSF rhinorrhea 2 weeks prior without any traumatic inciting event. A computed tomography of the paranasal sinuses demonstrated a small amount of low-density fluid in the right sphenoid sinus and an enlarged sella turcica with low-density fluid, suspicious for a CSF leak. The patient was hospitalized, and a lumbar CSF drain was placed uneventfully by neurosurgery service at the L2/L3 level. The lumbar drain was placed by an experienced neurosurgeon uneventfully and on the first attempt. A landmark-based approach assuming the spinous process bisecting the intercristal line as L4 was used for the procedure. The CSF rhinorrhea resolved over the course of 4 days, and the lumbar drain was removed. After discharge, she noticed that the surgical dressing became soaking wet during her daily dressing change. She was reevaluated by the neurosurgery team for the persistent spinal fluid leak and had reinforcement sutures placed at the site of the skin puncture and a pressure dressing was applied. A lab analysis of the leaked fluid confirmed it as CSF. She was discharged home with advice to stay hydrated, bed rest for 24-48 hours, as well as oral Fioricet (butalbital-acetaminophen-caffeine) capsules to be taken every 6 hours for 72 hours. However, she continued to have a persistent CSF leak from her lumbar drain site, despite her compliance with these conservative measures, which brought about the referral to the pain clinic.

Upon review of systems, she endorsed vertigo exacerbated by standing, as well as an orthostatic headache. She denied photophobia, nausea, or vomiting. Physical exam findings revealed clear fluid slowly leaking through the skin puncture at the site of the lumbar drain placement (Fig. 1). An EBP was performed uneventfully under fluoroscopic guidance at the L3-L4 interspace with a total of 15 mL of autologous venous blood injected incrementally into the epidural space (Fig. 2). The patient did verbalize a sensation of tightness in her lower back at the conclusion of the injection. After a 30-minute observation period, the patient was discharged home in a satisfactory condition. A 2-week follow-up demonstrated complete resolution of her symptoms, as well as a complete cessation of CSF leakage at the skin puncture site.

DISCUSSION

Spinal CSF leaks can be traumatic, idiopathic, or iatrogenic. Idiopathic leaks (also called spontaneous intracranial hypotension) can occur in the context of the ruptured arachnoid membrane due to an underlying connective tissue disorder or meningeal diverticula (2). Minor trauma, such as a fall, sudden twist or stretch, and sports activity, can be a potential contributing factor to the rupture of spinal epidural cysts or the formation of tears in the dural nerve sheath (3). Iatrogenic CSF leaks, caused by inadvertent durotomy during thoracolumbar surgery or lumbar drain placement, range from 1% to 17% and can cause persistent CSF leaks that can lead to the formation of CSF fistulas and predispose to chronic pain disorders associated with cranial nerve palsies, radiculopathy, nausea, vomiting, photophobia, and postural headaches (3,4). Headaches occur secondary to the decrease in intracranial pressure and resultant traction on the meninges and surrounding vasculature, resulting in pain (3,4).

Complications of lumbar drain placement include those related to the lumbar puncture, the presence of an indwelling catheter, and the drainage of CSF. Direct nerve root injuries, as well as neuraxial hematomas, have been reported, as have symptomatic intracranial hypotension, abducens nerve palsy, intracranial hemorrhage (stretching and tearing of dural veins), local infection/meningitis, and catheter fractures (3,5-7). As demonstrated in our case, a rare complication of lumbar drain placement is a persistent spinal CSF leak following the removal of the drain.

There have been reports in the literature highlighting different etiologies and interventions used for the treatment of iatrogenic spinal CSF leaks, including conservative therapy, lumbar drain placement, hydrogel dural sealant, and various surgical repair techniques, such as the placement of reinforcement sutures (8,9). The use of an EBP has also been described as the primary management of iatrogenic CSF leaks. Goodman et al (10) reported 2 cases involving postsurgical dural leaks following an anterior cervical discectomy and lumbar hemilaminectomy with the discectomy treated with a transforaminal EBP and lumbar EBP, respectively. Hershman et al (11) reported success using an EBP in a patient who presented nearly 4 weeks after a neurosurgical procedure. However, to our knowledge, no studies have described the use of an EBP as a rescue treatment after failed neurosurgical intervention for a persistent CSF leak, which is not uncommon.

Fig. 1. CSF leak overlying L3/L4 interspace.
CSF, cerebrospinal fluid.

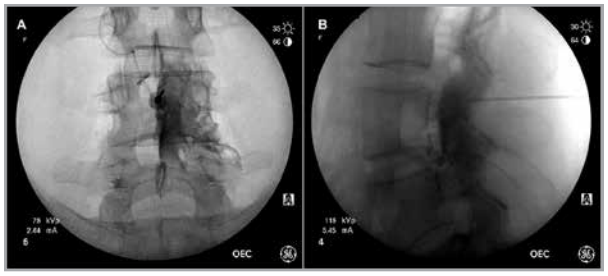

Fig. 2. A) Anteroposterior fluoroscopic view demonstrating contrast dye spread in epidural space and B) Lateral fluoroscopic view demonstrating contrast dye spread in the epidural space.

Schievink et al (12) highlighted the recurrence of CSF leaks and intracranial hypotension despite surgical repair, in which 5 of their 13 patients (38%) developed a recurrent leak. Khazim et al (4) demonstrated that 3 out of 10 patients (30%) developed a recurrent CSF leak despite surgical intervention, and required further surgery in addition to lumbar drain placement. Interestingly, 30% developed a perioperative infection marked by severe low back pain, which resolved with a long course of antibiotics. This elucidates the fact that surgical repair may not be the answer to all new and recurrent CSF leaks, and that further neurosurgical exploration and repair can predispose a patient to infection, hospitalization, and increased health care costs.

Our case report sheds light on a very important principle of treating CSF leaks effectively without subjecting patients to unnecessary risks and stress of surgery. It also highlights the utility of an EBP as a rescue treatment for a refractory CSF leak that persists even after neurosurgical intervention. The proposed mechanism by which an EBP works is through tamponade of the leak with a later deposition of fibrin and scar formation. Success rates can be as high as 90% (13). Bearing this in mind, an EBP could represent a good and effective modality for postsurgical CSF leaks and should be considered if neurosurgical interventions, such as the application of reinforcement sutures fail to resolve the leakage.

Although placement of a lumbar drain is a treatment modality for cranial CSF leaks, providers must be aware of the complications of lumbar drain removal, notably persistent spinal CSF leaks. The extradural accumulation of CSF in the soft tissue as a result of a dural puncture can cause an orthostatic headache and subsequent intracranial hypotension (14).

CONCLUSIONS

Treatment of a CSF leak after removal of a lumbar drain involves conservative therapy, surgical intervention, or an EBP, although an algorithmic approach to treating persistent CSF leaks does not exist. Nevertheless, a recurrent CSF leak after lumbar drain removal that persists even after neurosurgical intervention can be successfully treated with an EBP.

REFERENCES

1. Friedberg SR. Surgical management of cerebrospinal fluid leakage after spinal surgery. In: Schmidek HH, Sweet WH (eds). *Operative Neurosurgical Techniques*. Third Edition. Grune & Stratton, New York, NY, 2000, pp 2265-2270.
2. Lay CL, Campbell JK, Mokri B. Low cerebrospinal fluid pressure headache. In: Goadsby PJ, Silberstein SD (eds). *Headache*. Butterworth-Heinemann, Boston, MA, 1997, p 355.
3. Lasater GM. Primary intracranial hypotension. The low spinal fluid pressure syndrome. *Headache* 1970; 10:63-66.
4. Khazim R, Dannawi Z, Spacey K, et al. Incidence and treatment of delayed symptoms of CSF leak following lumbar spinal surgery. *Eur Spine J* 2015; 24:2069-2076.
5. Puchakalaya MR, Tremper KK. Brown-Sequard syndrome following removal of a cerebrospinal fluid drainage catheter after thoracic aortic surgery. *Anesth Analg* 2005; 101:322-324.
6. Weaver KD, Wiseman DB, Farber M, Ewend MG, Marston W, Keagy BA. Complications of lumbar drainage after thoracoabdominal aortic aneurysm repair. *J Vasc Surg* 2001; 34:623-627.
7. Dardik A, Perler BA, Roseborough GS, Williams GM. Subdural hematoma after thoracoabdominal aortic aneurysm repair: An underreported complication of spinal fluid drainage? *J Vasc Surg* 2002; 36:47-50.
8. Pereira E, Grandidge C, Nowak V, Cudlip S. Cerebrospinal fluid leaks after transsphenoidal surgery – effect of a polyethylene glycol hydrogel dural sealant. *J Clin Neurosci* 2017; 44:6-10.
9. Lobo BC, Baumanis MM, Nelson RF. Surgical repair of spontane-

ous cerebrospinal fluid (CSF) leaks: A systematic review. Laryngoscope Investig *Otolaryngol* 2017; 2:215-224.

10. Goodman B, Vallabhaneni S, Cubitt B, Mallempati S. Transforaminal epidural blood patches for the treatment of postsurgical dural leaks: Two case reports. *PM R* 2017; 9:83-87.
11. Hershman S, Cuellar VG, Bendo JA. Delayed presentation of incidental durotomy. *Bull Hosp Jt Dis* 2013; 71:231-234.
12. Schievink WI, Maya MM, Riedinger M. Recurrent spontaneous spinal cerebrospinal fluid leaks and intracranial hypotension: A prospective study. *J Neurosurg* 2003; 99:840-842.
13. Marcelis J, Silberstein SD. Spontaneous low cerebrospinal fluid pressure headache. *Headache* 1990; 30:192-196.
14. Tosun B, Ilbay K, Kim MS, Selek O. Management of persistent cerebrospinal fluid leakage following thoraco-lumbar surgery. *Asian Spine J* 2012; 6:157-162.