Article published online: 2024-12-04

Epidural Blood Patch in Spontaneous Intracranial Hypotension and Role of Optic Nerve Sheath Diameter: A Case Report

Dimple Shah[1] Sanghita Layek[1] Bibhukalyani Das[1]

[1] Neuroanaesthesiology and Neurocritical Care, Institute of Neurosciences, Kolkata, West Bengal, India

J Neuroanaesthesiol Crit Care

Address for correspondence Dimple Shah, DNB, PDF (ISNACC), Neuroanaesthesiology and Neurocritical Care, Institute of Neurosciences, Kolkata, West Bengal, India (e-mail: drdimple10@gmail.com).

Abstract

Spontaneous intracranial hypotension (SIH) is caused by spinal leakage of cerebrospinal fluid (CSF) and it is characterized by an orthostatic headache without a history of trauma or dural puncture. Patients may present with headache, there may be low CSF pressure, or imaging evidence of CSF leak. Epidural blood patching (EBP) has been considered as the mainstay of therapy for SIH. We report a case of SIH with bilateral subdural hematoma in a 63-year-old female patient who presented with sudden-onset headache for 4 days without any history of loss of consciousness, vomiting, or seizures. Lumbar EBP was given and it resulted in improved clinical features, imaging findings, and increase in optic nerve sheath diameter (ONSD) when compared with ONSD before EBP administration. EBP produces a tamponade effect and its efficacy results from sealing the dural defect by the injected blood, thus stopping the CSF leak.

Keywords

- epidural blood patch
- optic nerve sheath diameter
- spontaneous intracranial hypotension

Introduction

Spontaneous intracranial hypotension (SIH) is caused by spinal leakage of cerebrospinal fluid (CSF) and is characterized by an orthostatic headache without a history of trauma or dural puncture.[1] Subdural hematoma (SDH) is a life-threatening complication in SIH and may lead to neurological deficits. Epidural blood patching (EBP) has been considered as the mainstay of therapy for SIH, it relieves symptoms almost instantaneously in 90% of cases regardless of the site of leak.[2] Lumbar EBP is preferred because of its low rate of recurrence. This report presents a case of bilateral SDH with SIH that was successfully treated with lumbar EBP.

Case Report

A 63-year-old female, Glasgow Coma Scale (GCS) 15, nondiabetic, nonhypertensive, known case of pulmonary tuberculosis on antitubercular drugs, presented on September 20, with complaints of sudden-onset headache for 4 days without any history of loss of consciousness, vomiting, or seizures. Neurological examination was within normal limits. Noncontrast computed tomography (CT) brain showed right-sided SDH of thickness 1.3 cm with mass effect, and left-sided SDH of thickness 1.1 cm (►**Fig. 1A**).

She underwent burr hole with evacuation of the hematoma (right side). But after 2 days, her GCS dropped and she developed bradycardia. CT brain showed increased subdural collection, pneumocephalus, obliteration of cisterns, and mild midline shift. All clinical and radiological features pointed toward SIH. The case was discussed with the anesthesia team for epidural blood patch. Thus, epidural blood patch was given at L3-L4 epidural space with 18 mL autologous blood derived from patient's brachial vein aseptically. Epidural space was identified by using loss of resistance technique. The patient was restricted to complete bed rest with flat head end. GCS improved in a few hours. Headache subsided to some extent.

DOI https://doi.org/10.1055/s-0044-1790253.
ISSN 2348-0548.

Thieme Medical and Scientific Publishers Pvt. Ltd., A-12, 2nd Floor, Sector 2, Noida-201301 UP, India

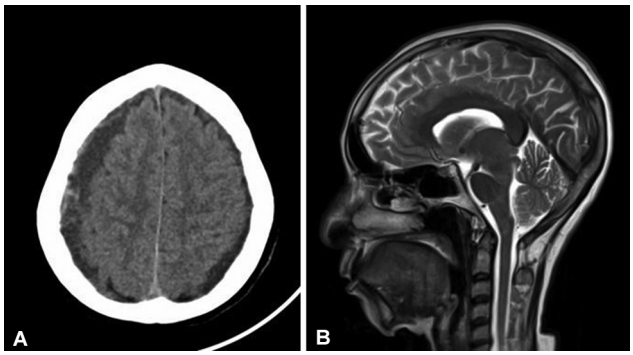

Fig. 1 (**A**) Initial computed tomography (CT) scan axial section showing bilateral subdural hematoma (SDH). (**B**) T2-weighted sagittal section showing sagging brainstem, diminished mamillopontine distance, and drooping splenium of corpus callosum.

But again she developed headache after 3 days and CT scan on the 28th revealed increase in subdural hygroma with effacement of basal cisterns. Epidural blood patch was repeated with 18 mL autologous blood in the lumbar region with the same technique. Headache subsided and recurred again after few days. Magnetic resonance (MR) imaging brain revealed right-sided subacute subdural hemorrhage with a maximum thickness of 3.6 cm and left-sided subdural hemorrhage with a maximum thickness of 1.4 cm, effacement of basal cisterns, and tonsillar herniation of approximately 3 mm below the foramen magnum (►**Fig. 1B**).

The case was discussed in our clinical meeting with all surgeons and radiologists. There was a confusion regarding cervical epidural patch under fluoroscopic guidance by the neuroradiologist and third repetition of lumbar epidural blood patch. After discussing the safety of both procedures, we decided to go for lumbar epidural blood patch once again.

We also planned to measure the optic nerve sheath diameter (ONSD) pre- and postprocedure to monitor the desired rise in intracranial pressure (ICP). ONSD was seen before giving the patch. It was 5.2 mm. After administration of the epidural blood patch, ONSD was found to be 6.4 mm (►**Fig. 2**). On the following days ONSD was 6.8, 7.1, and 7.2 mm, respectively. The patient improved clinically and CT brain revealed decreased subdural collection and significant decrease in effacement of ventricles. The patient was discharged after 5 days and was doing well with no recurrence of headache.

Fig. 2 Optic nerve sheath diameter (ONSD) after administration of epidural blood patch.

Discussion

CSF leakage mainly occurs in weak areas around nerve root sheaths and the dura mater, as a result of small defects due to trivial trauma caused by severe exercise or a bout of cough.

Orthostatic headache is regarded as the most common presenting symptom of SIH,[1] although there may be other symptoms like nausea, diplopia, neck pain and stiffness, dizziness, tinnitus, photophobia, and blurred vision.

CSF volume loss might cause engorgement of cerebral pain—sensitive venous sinuses that lead to headaches. A downward shift of the brain due to loss of CSF volume may tear the bridging veins causing them to rupture and resulting in subdural hemorrhage.[1] In this case, the patient presented with orthostatic headache for 4 days and subsequent SDH.

MR myelography is the most common mode to detect the site of CSF leak.[3]

In this case, radiological imaging showed evidence of SDH and SIH. When conservative management fails, EBP is the modality of choice.[2] Note that 10 to 20 mL of blood, collected from the patient's brachial vein, is injected into the lumbar epidural space. It has been reported previously that EBP has been successful in 80 to 95% cases.[4] If lumbar EBP fails to relieve the symptoms, it can be repeated multiple times, usually three times but have been reported up to five times.[5] SDH may be managed by safely sealing the CSF leak without evacuating the SDH.[6] There has been no specification regarding the exact volume of subdural collections which have been managed by EBP.

The intraorbital subarachnoid space which surrounds the optic nerve is subject to similar pressure changes to those in the intracranial and lumbar compartments. The retrobulbar part of the perioptic subarachnoid space is distensible and can therefore inflate as pressure increases. Recent studies have shown that ONSD correlates with ICP in different clinical situations.[7]

Dubost et al showed that in 9 out of 10 subjects suffering from postdural puncture headache, the optic nerve sheath enlarged early after successful EBP.[8] In one subject, in whom EBP failed, ONSD did not increase after EBP.[8]

EBP produces a tamponade effect and its efficacy results from sealing the dural defect by the injected blood, thus stopping the CSF leak. This tamponade effect produces transient increase in ONSD and the sustained increase is due to the progressive correction of ICP with CSF production within the first 20 hours. Epidural blood patch can be given in the cervical region if there is a CSF leak at this region which has its own advantages and disadvantages, the advantage being targeted EBP at the cervical level for sealing the leak has been shown to have higher success rates than EBP at the lumbar level for sealing a cervical leak.[9] But it is technically difficult because of anatomical complexities. It is challenging due to its proximity to important neural structures.[10] There is an increased risk of complications (spinal cord and nerve root compression, cervical radiculopathy, dural puncture, chemical meningitis, neck stiffness, and transient bradycardia).[10]

In this case, ONSD increased progressively after the EBP and the symptoms were relieved.

Conclusion

In this case report, the patient had bilateral SDH and SIH, on administration of EBP her symptoms were relieved and ONSD increased gradually, thus implying CSF leak being sealed and increasing ICP as reflected in ONSD.

Conflict of Interest
None declared.

References

1 Schievink WI. Spontaneous spinal cerebrospinal fluid leaks and intracranial hypotension. JAMA 2006;295(19):2286–2296
2 Ferrante E, Rubino GF, Passarani S, Arpino I. Spontaneous intracranial hypotension. J Neurosurg 2010;113(02):397–398, author reply 398–399
3 Shima K, Ishihara S, Tomura S. Pathophysiology and diagnosis of spontaneous intracranial hypotension. Acta Neurochir Suppl (Wien) 2008;102:153–156
4 Schievink WI. Spontaneous spinal cerebrospinal fluid leaks: a review. Neurosurg Focus 2000;9(01):e8–e8
5 Rozec B, Guillon B, Desal H, Blanloeil Y. Value of epidural blood-patches for the treatment of spontaneous intracranial hypotension [in French]. Ann Fr Anesth Réanim 2004;23(12): 1144–1148
6 Schievink WI, Maya MM, Moser FG, Tourje J. Spectrum of subdural fluid collections in spontaneous intracranial hypotension. J Neurosurg 2005;103(04):608–613
7 Blaivas M, Theodoro D, Sierzenski PR. Elevated intracranial pressure detected by bedside emergency ultrasonography of the optic nerve sheath. Acad Emerg Med 2003;10(04):376–381
8 Dubost C, Le Gouez A, Zetlaoui PJ, Benhamou D, Mercier FJ, Geeraerts T. Increase in optic nerve sheath diameter induced by epidural blood patch: a preliminary report. Br J Anaesth 2011; 107(04):627–630
9 Rettenmaier LA, Park BJ, Holland MT, et al. Value of targeted epidural blood patch and management of subdural hematoma in spontaneous intracranial hypotension: case report and review of the literature. World Neurosurg 2017;97:27–38
10 Cho KI, Moon HS, Jeon HJ, Park K, Kong DS. Spontaneous intracranial hypotension: efficacy of radiologic targeting vs blind blood patch. Neurology 2011;76(13):1139–1144

