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Case Report

Dural diverticulum with a symptomatic cerebrospinal fluid leak

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ABSTRACT

A case report of a 63-year-old female patient with a cervical spinal dural diverticulum and intracranial hypotension secondary to a symptomatic CSF leak after minor trauma. The patient responded well after the cervical approach epidural blood patch procedure.
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Introduction

Spontaneous intracranial hypotension may have an insidious onset, even after minor trauma or interventions, leading to a delay in diagnosis. Imaging findings may be nonspecific, and given insidious onset and nonspecific history the diagnosis of intracranial hypotension may be misdiagnosed or, in the event of a subtle case, may be missed [1].

Case report

A 63-year-old woman presented with low-grade headaches during the summer of 2014 after involvement in a minor motor vehicle collision. The patient was involved in another low-level motor vehicle collision shortly after, which resulted in a hyperextension and/or hyperflexion (whiplash) injury.

No conflicts of interest.

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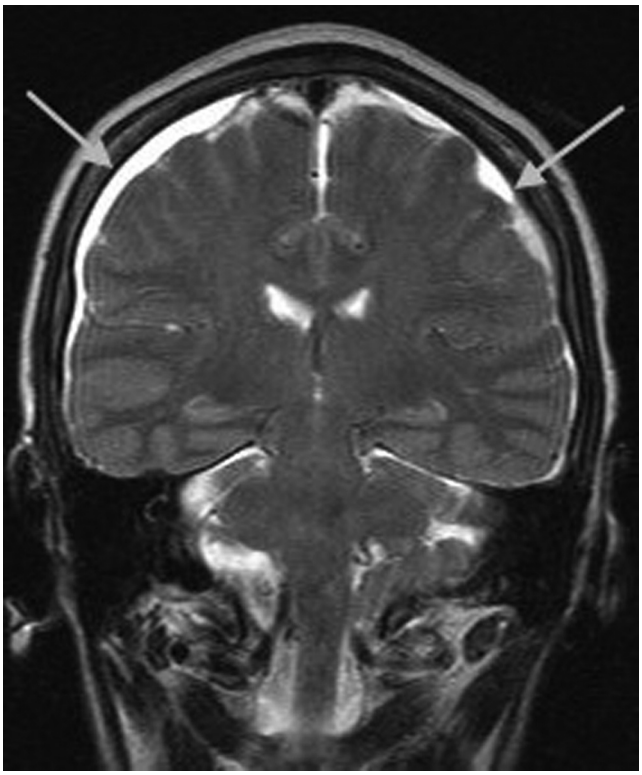

Fig. 1 – T2 hyperintense subdural fluid collections involve both cerebral convexities (arrows).

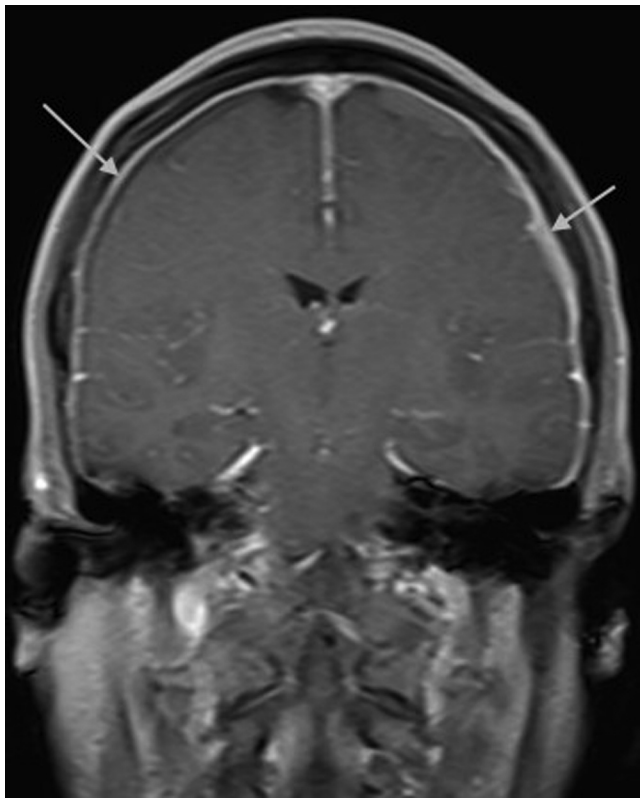

Fig. 3 – Diffuse pachymeningeal enhancement on the coronal T1 postcontrast images (arrows).

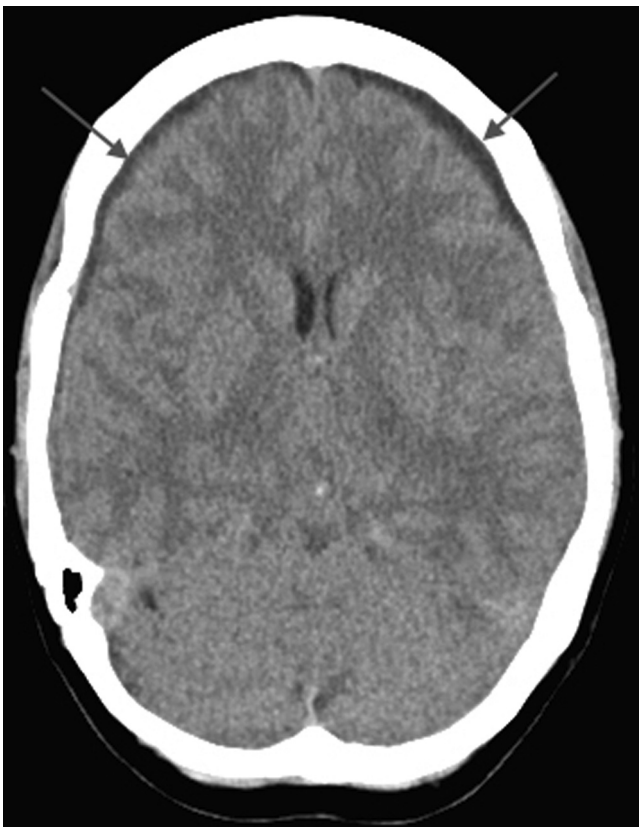

Fig. 2 – Unenhanced CT image of the brain shows hypodense subdural fluid collections involving both frontal convexities (arrows).

Fig. 4 – Sagittal T2 MR image of the cervical spine shows the dural diverticulum between the posterior elements of C1 and C2 (arrow).

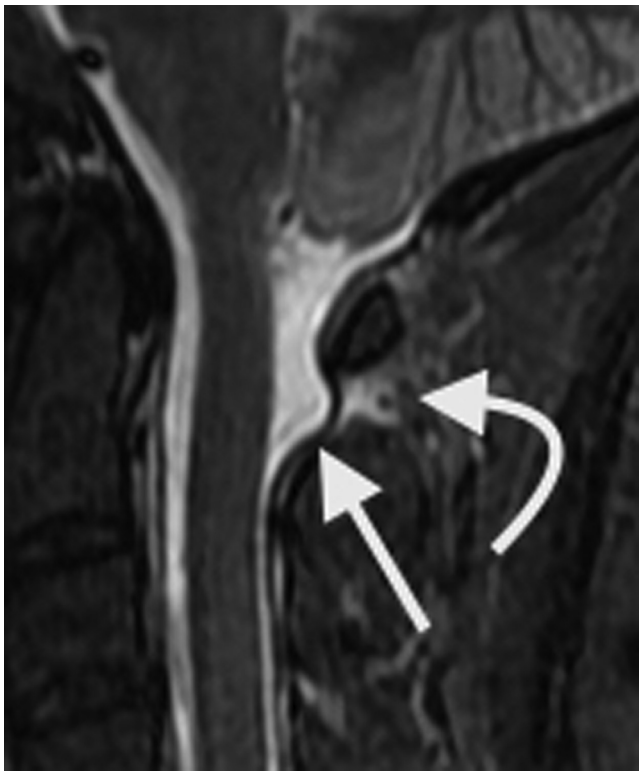

Fig. 5 – Sagittal short tau inversion recovery MR image of the cervical spine shows the dural diverticulum between the posterior elements of C1 and C2 (straight arrow). There is associated fluid signal (curved arrow).

Approximately 6 weeks later, the patient reported headaches centered at the base of the skull, photophobia, ataxia, fatigue, and confusion. When sitting or standing from a laying or sitting position, the patient would have severe pain over both cerebral convexities with associated emesis.

Care was sought at an emergency department where the patient underwent unenhanced computed tomography (CT) examination and contrast enhanced magnetic resonance imaging (MRI) examinations of the head. Both demonstrated subdural fluid collections (Figs. 1 and 2) and the enhanced MRI of the brain showed diffuse pachymeningeal enhancement (Fig. 3).

The patient continued to have similar symptoms and underwent an unenhanced MR examination of the cervical spine, which demonstrated a 7-mm posterior dural diverticulum at the level of C1-C2 with surrounding T2 hyperintensity suggesting CSF leakage at the level of C1-C2 posteriorly (Figs. 4-8).

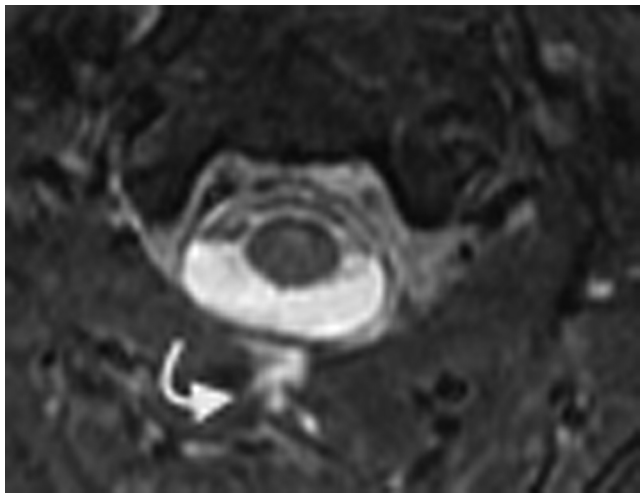

Fig. 7 – Axial short tau inversion recovery image of the cervical spine shows abnormal T2 signal in the interspinous soft tissues in the C1-C2 level (curved arrow).

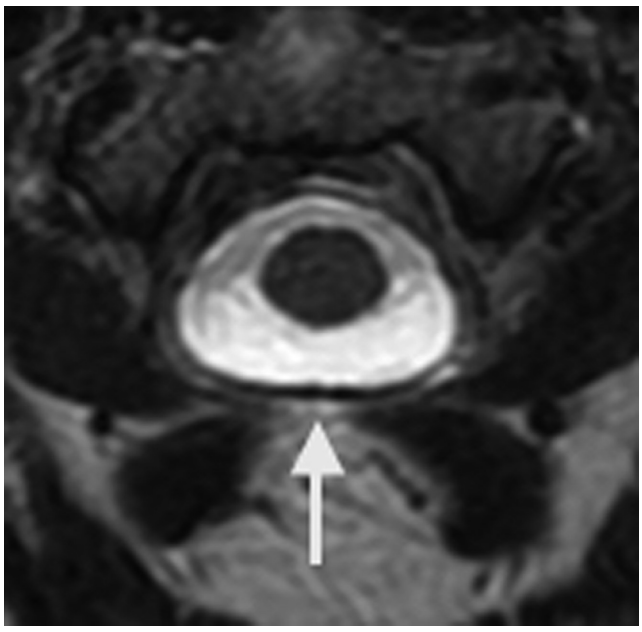

Fig. 6 – Axial T2 MR image of the cervical spine at the level of C1-C2 shows ectasia of the thecal sac (arrow).

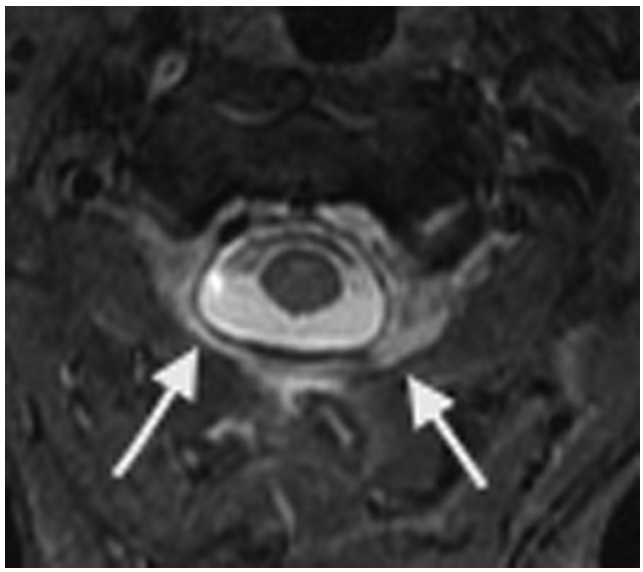

Fig. 8 – Axial short tau inversion recovery MR image of the cervical spine shows abnormal T2 signal in the paraspinous soft tissues (arrows).

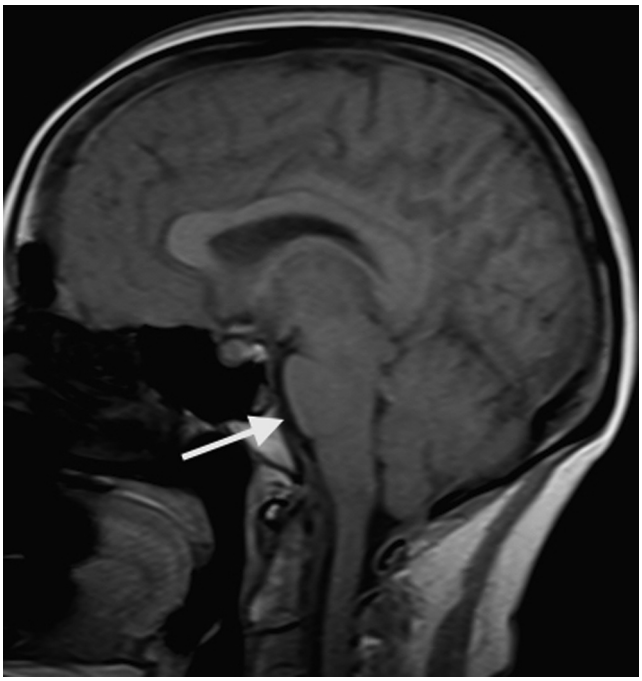

Fig. 9 – Sagittal T1WI shows sagging of the pons and close proximity of the pons to the clivus (arrow).

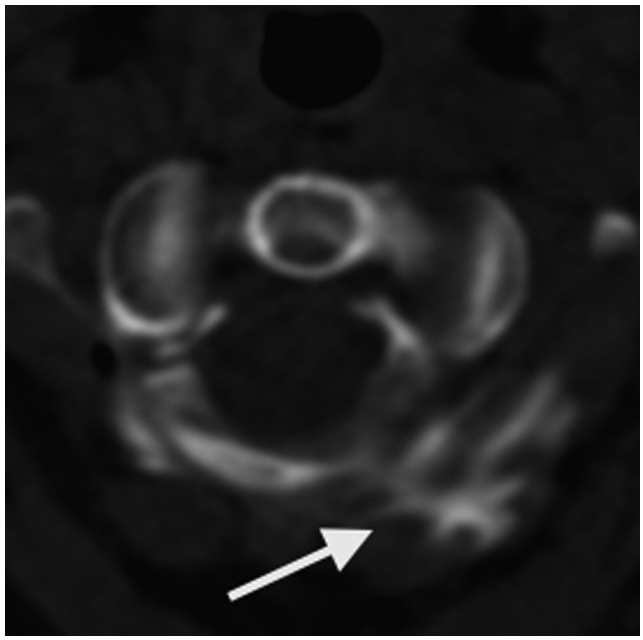

Fig. 11 – Postepidural blood patch administration axial CT image with extravasated contrast in the surrounding paraspinous soft tissues (arrow).

The patient then underwent an autologous epidural blood patch procedure, which ameliorated symptoms successfully.

Discussion

Spinal meningeal diverticula have been shown as a potential source of spontaneous intracranial hypotension [1,2] and have been associated with orthostatic headaches, which initially may be misdiagnosed [1]. Peak incidence of the symptoms of spontaneous intracranial hypotension is 40-50 years of age and has a female predominance, with a female to male ratio of 2:1. In 2008, Schievink et al reported the new diagnostic criteria for spontaneous spinal CSF leaks and intracranial hypotension using its radiographic and clinical manifestations. The reported diagnostic criteria are [3]:

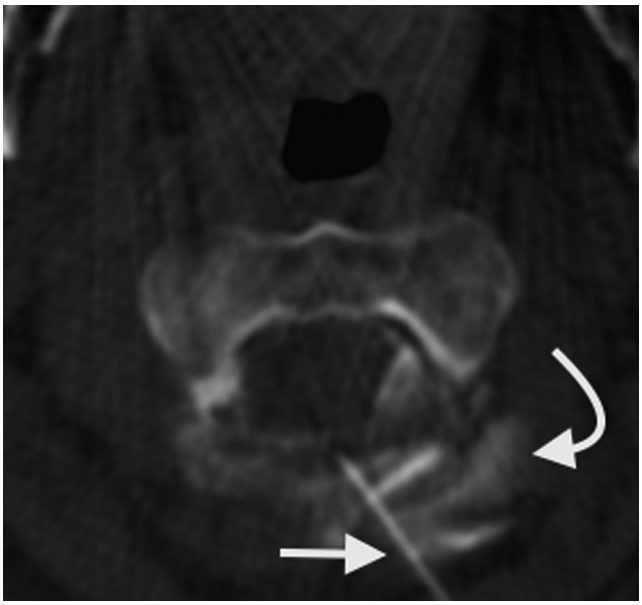

Fig. 10 – Axial CT image of the C1-C2 level shows advancement of spinal needle (straight arrow) with epidural contrast extravisation into the paraspinous soft tissues (curved arrow).

Criterion A

Demonstration of spinal CSF leak on spinal imaging (including CT myelography, MR, MR myelography, or radionuclide cisternography), which demonstrates extrathecal CSF.

Criterion B (if A not met)

MRI changes of spontaneous intracranial hypotension and at least one of the following; low opening pressure on lumbar puncture, spinal meningeal diverticulum, or improvement of symptoms after epidural blood patch.

Criterion C (if A and B not met)

The presence of all of the following or at least two of the following if typical orthostatic headaches are present: low opening pressure on lumbar puncture, spinal meningeal diverticulum, and improvement of symptoms after epidural blood patch.

Imaging findings of intracranial hypotension generally follow the Monroe-Kellie doctrine, which simply states that the volume of the CSF, intracranial blood, and parenchyma should maintain a constant total volume. Therefore, when

CSF volumes are low, dural venous sinuses become engorged, pituitary hyperemia, and subdural effusions and/or hematomas may be seen [3,4]. Also, dural, leptomeningeal, and pial enhancement may be present and should clue the radiologist in as to the possible etiology. Additional findings may include sagging brainstem (Fig. 9) and cerebellar tonsillar herniation.

Epidural blood patch procedure is a relatively common, safe, and simple procedure with a relatively high success rate for patients with spontaneous cerebrospinal fluid leakage. The success rate has been quoted as high 85% first pass success rate. In our case, a cervical approach was used. A fluoroscopic approach may be used for lumbar approach blood patch procedures. However, for a cervical approach epidural blood patch procedure, CT guidance is preferred if the CSF leak is suspected at a cervical level, and is used as a precautionary measure to precisely and safely enter the epidural space. Generally, a lumbar approach is used if the CSF leak site is unknown or at the lumbar level. Using CT guidance, the needle is advanced into the epidural space. Contrast is injected into the epidural space to confirm epidural location (Figs. 10 and 11). Using a sterile technique, 10 mL of blood is obtained from the patient's IV site and then injected into the epidural space with relative urgency as to not let the blood clot while in the syringe. [5]

In conclusion, our patient met the diagnostic criteria [3] for spontaneous intracranial hypotension secondary to CSF leakage from a dural diverticulum localized to the cervical spine and showed marked improvement after the epidural blood patch procedure. The blood patch procedure is a safe and simple procedure with a relatively high success rate. With the ever increasing usage of high quality diagnostic imaging capabilities of MRI and CT, the delay of diagnosis and misdiagnosis rates of spontaneous intracranial hypotension secondary to CSF leakage can be decreased and ameliorated using the image-guided blood patch procedure.

REFERENCES

[1] Schievink WI. Spontaneous spinal cerebrospinal fluid leaks and intracranial hypotension. JAMA 2006;295(19):2286–96.
[2] Kranz PG, Stinnett SS, Huang KT, Gray L. Spinal meningeal diverticula in spontaneous intracranial hypotension: analysis of prevalence and myelographic appearance. AJNR Am J Neuroradiol 2013;34(6):1284–9.
[3] Schievink WI, Maya MM, Louy C, Moser FG, Tourje J. Diagnostic criteria for spontaneous spinal CSF leaks and intracranial hypotension. AJNR Am J Neuroradiol 2008;29(5):853–6.
[4] Beck J, Gralla J, Fung C, et al. Spinal cerebrospinal fluid leak as the cause of chronic subdural hematomas in nongeriatric patients. J Neurosurg 2014;121(6):1380–7.
[5] Gottschalk A. Cerebrospinal fluid leakage. Indications, technique and results of treatment with a blood patch. Radiologe 2015;55(6):471–8.