Spinal MR findings in a case of spontaneous intracranial hypotension

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Section: Neuroradiology
Area of Interest: Neuroradiology brain
Procedure: Diagnostic procedure
Imaging Technique: MR
Special Focus: Cerebrospinal fluid Case Type: Clinical Cases

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Patient: 37 years, male

Clinical History:

A 37-year-old male patient presented with history of headache for the past 1 month, worsening over the past week. The headache was supposedly most severe when he was erect, with partial relief in the supine position. No significant history of fever, neck rigidity, trauma or spinal symptoms was elicited.

Imaging Findings:

MRI of the brain revealed bilateral relatively symmetrical subdural collections along the cerebral convexities. The superior sagittal sinus, right transverse sinus and the right sigmoid sinus appeared prominent. Sagittal images revealed significant sagging of the brainstem structures and cerebellar tonsils. The prepontine cistern showed reduced anteroposterior dimension and the midbrain was noted to abut the dorsum sellae. Post contrast images showed extensive diffuse pachymeningeal enhancement along the cerebral/cerebellar hemispheres, falx cerebri and tentorium cerebelli. The imaging findings and characteristic history helped in confirming a diagnosis of spontaneous intracranial hypotension.

MRI of the spine performed for academic interest revealed an extradural collection along the anterior aspect of the thecal sac in cervico-dorsal spine with another thin extradural collection also noted along the dorsal aspect of the thecal sac in lower dorsal spine. No significant features of cord compression were seen. A note was also made of distended spinal epidural veins, most marked in the lower dorsal spine.

Discussion:

Spontaneous intracranial hypotension (SIH) is characterised by postural headache and low CSF pressure in the absence of previous spinal intervention [1, 2, 3]. The International Classification of Headache Disorders requires the presence of at least one of the following criteria for diagnosis of SIH, namely, low CSF pressure, diffuse pachymeningeal enhancement on MRI of brain or evidence of CSF leakage on conventional/CT myelography or radionuclide cisternography [2]. The underlying cause for low CSF pressure is usually an occult CSF leak commonly occurring through the spinal dural sac [1, 2].

The characteristic intracranial imaging findings of SIH include bilateral subdural collections, descent of the cerebellar tonsils, sagging of brainstem structures and engorgement of dural venous sinuses [2, 3]. The subdural collections and descent of cerebellar and brainstem structures are thought to arise from alterations in CSF hydrostatic pressure. The cause of dural enhancement in SIH is meningeal vascular dilatation and not inflammation. The Monro-Kellie rule
states that the CSF volume fluctuates in accordance with intracranial blood volume in an intact skull. The low CSF pressure/volume in SIH results in engorgement of dural vasculature and consequently diffuse dural enhancement [2]. Spinal MRI reveals a number of characteristic features in SIH, even though these features have not been commonly described in literature. The most common spinal abnormality detected was the presence of epidural fluid collections which commonly extended across five or more spinal segments [1, 2]. Direct leakage of CSF into the epidural space and transudation of fluid across engorged meninges or epidural veins have been postulated as possible causes for the epidural collections [1]. Dilatation of spinal epidural veins was another commonly described spinal abnormality in SIH and can again be explained based on the Monro-Kellie rule [1, 2]. An abnormal festooned or light-bulb appearance of the spinal epidural veins and spinal dural enhancement has also been described in relation to SIH [1]. Structural abnormalities like dural defects, nerve root cysts and arachnoid diverticula have been seen in some cases [1].

Initial treatment in SIH involves bed rest and hydration. An epidural blood patch is the next line of management with surgical repair of the site of leakage being required in unresponsive cases. The exact site of CSF leakage is better picked up on CT myelography and radionuclide cisternography [1]. It is necessary to be familiar with spinal findings in SIH as some cases may be directly referred for spinal MRI by clinicians who encountered a dry tap on lumbar puncture for headache [3]. Spinal MRI may also help in clinching the diagnosis in patients with equivocal intracranial findings [1].

**Differential Diagnosis List:** Spontaneous intracranial hypotension, Idiopathic hypertrophic pachymeningitis, Chronic subdural haematomas, Infective meningitis

**Final Diagnosis:** Spontaneous intracranial hypotension

**References:**


**Description:** T2W Axial MR image shows bilateral subdural collections along the frontal and parietal cerebral convexities. **Origin:** Department of Radiology and Imaging Sciences, Billroth Hospitals, Chennai, India.
Description: T1W axial image shows relatively symmetrical bilateral subdural collections which appear slightly hyperintense in comparison to CSF signal. Origin: Department of Radiology and Imaging Sciences, Billroth Hospitals, Chennai, India.
Description: FLAIR axial image shows bilateral subdural collections which appear hyperintense in comparison to CSF signal. Origin: Department of Radiology and Imaging Sciences, Billroth Hospitals, Chennai, India.
Description: Coronal FLAIR image reveals the craniocaudal extent of the bilateral subdural collections.
Origin: Department of Radiology and Imaging Sciences, Billroth Hospitals, Chennai, India.
**Description:** T1W sagittal image shows sagging of midbrain, pons and cerebellar tonsils with decreased anteroposterior dimension of the pre pontine cistern. **Origin:** Department of Radiology and Imaging Sciences, Billroth Hospitals, Chennai, India.
Description: Diffuse pachymeningeal enhancement is seen surrounding the cerebral and cerebellar hemispheres. Note the large size of the right sigmoid sinus. **Origin:** Department of Radiology and Imaging Sciences, Billroth Hospitals, Chennai, India.
Description: A higher section demonstrates diffuse enhancement of the dura surrounding the cerebral hemispheres and in the region of the falx cerebri. Bilateral subdural collections are also faintly visualised. Origin: Department of Radiology and Imaging Sciences, Billroth Hospitals, Chennai, India.
Description: Coronal image shows diffuse dural enhancement along the cerebral convexities and along the falx cerebri. Origin: Department of Radiology and Imaging Sciences, Billroth Hospitals, Chennai, India.
Description: Diffuse dural enhancement is seen along the cerebral/ cerebellar convexities and along the tentorium cerebelli. The superior sagittal sinus and right transverse sinus appear prominent. Origin: Department of Radiology and Imaging Sciences, Billroth Hospitals, Chennai, India.
Description: A thin T2W hyperintense extradural collection (arrows) is noted anterior to the thecal sac in the cervical and upper dorsal region, abutting the cervical spinal cord. No abnormal cord signal changes are seen. **Origin:** Department of Radiology and Imaging Sciences, Billroth Hospitals, Chennai, India.
Description: The well defined extradural collection (arrow) located anteriorly in the spinal canal is better seen in this parasagittal image. Origin: Department of Radiology and Imaging Sciences, Billroth Hospitals, Chennai, India.
Description: A thin rim of extradural fluid (arrow) is noted dorsal to the thecal sac in lower dorsal spine.

Origin: Department of Radiology and Imaging Sciences, Billroth Hospitals, Chennai, India.
Description: An extradural collection (arrow) is noted anterior to the thecal sac in upper cervical spine. Prominent epidural veins are also seen along the anterolateral aspect of the spinal cord bilaterally.

Origin: Department of Radiology and Imaging Sciences, Billroth Hospitals, Chennai, India.
**Description:** Axial image at the level of lower cervical spine reveals the anterior extradural collection (arrow) within spinal canal. A small osteophyte from the posterior margin of the vertebral body is seen abutting this collection. **Origin:** Department of Radiology and Imaging Sciences, Billroth Hospitals, Chennai, India.
Description: A thin rim of extradural fluid (arrow) is noted posterior to the thecal sac in lower dorsal spine. Origin: Department of Radiology and Imaging Sciences, Billroth Hospitals, Chennai, India.
**Description:** Bilateral prominent epidural veins (arrows) are seen at lower dorsal spine level. A thin rim of extradural fluid is also seen dorsal to the thecal sac. **Origin:** Department of Radiology and Imaging Sciences, Billroth Hospitals, Chennai, India.