



Spine Surgery Complicated by an Engorged Lumbar Epidural Venous Plexus from Cerebrospinal Fluid Overshunting: A Case Report and Review of the Literature

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Key words

- Disc herniation
- Epidural veins
- Intracranial hypotension
- Lumbar fusion
- Overshunting
- Radiculopathy

Abbreviations and Acronyms

CSF: Cerebrospinal fluid

MRI: Magnetic resonance imaging

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INTRODUCTION

Cerebrospinal fluid (CSF) overdrainage is seen in approximately 10%–12% of patients with ventriculoperitoneal shunts.¹ Spinal manifestations (myelopathy and radiculopathy) of intracranial hypotension may occur in approximately 6% of patients.² Furthermore, intracranial hypotension leading to radiculopathy is most frequently observed in the cervical spine followed by the thoracic and lumbosacral spine. In accordance with the Monro-Kellie doctrine, intracranial hypotension causes an increase in venous blood volume in both the intracranial cavity and the spinal canal.^{3,7} A dilated epidural venous plexus can cause radiculopathy and may be mistaken for a herniated disc on imaging.^{2,7,8} We present a case of intracranial hypotension in a patient with lumbar radiculopathy and a dilated lumbar epidural venous plexus and L4-5 disk bulge in contact with the right L5 nerve root. The operation was complicated by intraoperative hemorrhage secondary to violation of the epidural venous plexus.

■ **BACKGROUND:** Overshunting of cerebrospinal fluid may lead to intracranial hypotension and dilation of spinal epidural veins. Radiculopathy may rarely occur secondary to engorged spinal epidural veins. In addition, the cause of radiculopathy may be obscured by concomitant spinal degenerative changes. We present a case and review the pathogenesis as well as the current clinical literature.

■ **CASE DESCRIPTION:** A 29-year-old woman presented with positional headaches from intracranial hypotension in the setting of cerebrospinal fluid overshunting. The patient also had back pain and lumbar radiculopathy, which became more severe after lumboperitoneal shunt placement. On radiographic work-up, there was evidence of right L5 nerve root impingement secondary to a disc bulge and an engorged lumbar epidural venous plexus secondary to overshunting. The patient underwent surgery for a planned L4-5 decompression with a transforaminal lumbar interbody fusion. The operation was complicated by rapid blood loss originating from the epidural venous plexus, and we were unable to safely place the interbody graft.

■ **CONCLUSIONS:** Spinal surgeons need to be aware of the rare diagnosis of radiculopathy secondary to epidural venous plexus engorgement, as it may change the treatment approach or lead to deleterious intraoperative consequences, such as hemorrhage.

CASE DESCRIPTION

A 29-year-old Hispanic woman presented to the clinic with nonpositional diffuse headaches associated with subjective vision loss. She had a past medical history significant for morbid obesity, diabetes mellitus type 2, hypertension, asthma, obstructive sleep apnea, endometriosis, bipolar disorder, and communicating hydrocephalus. At the age of 3 years, she had 2 right posterior parieto-occipital lobe ventriculoperitoneal shunts placed at an outside hospital. Work-up of her headaches included a computed tomography scan of the head, which showed no significant change in her slit ventricles (Figure 1). A nuclear medicine shunt flow study showed distal patency; however, proximal patency could not be determined. A lumbar puncture was performed with 28 mL of CSF removed; this reduced her headaches. She was admitted for a 24-hour lumbar drain trial and reported marked improvement in her

headaches and vision with drainage of additional CSF. A lumboperitoneal shunt was subsequently placed, and she was discharged with improvement in symptoms.

She returned to the clinic 2 weeks later complaining of positional headaches and neck pain (increased severity with standing and near-complete resolution when supine). Her symptoms were thought to be secondary to intracranial hypotension from overdrainage of CSF. She was admitted for placement of a Codman antisiphon device, which was placed in series with the lumboperitoneal shunt valve. At the time of discharge, she noted marked improvement in positional headaches and complete resolution of neck pain.

At a follow-up clinic appointment approximately 1.5 months later, the patient reported occasional mild positional headaches, abdominal pain, and increased severity of low back pain that radiated to

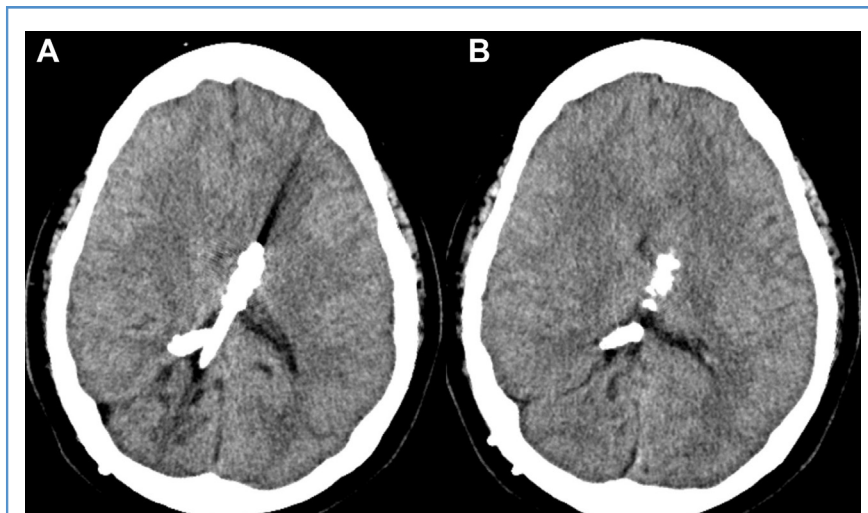


Figure 1. (A and B) Noncontrast head computed tomography axial cuts showing slit ventricles and 2 right parieto-occipital ventriculoperitoneal proximal shunt catheters. Imaging was obtained before lumbar puncture.

her bilateral lower extremities, more pronounced on the right side. Review of lumbar spine magnetic resonance imaging (MRI) from approximately 1 year prior revealed diffuse spondylosis with disc protrusions at L2-3, L3-4, and L4-5. A computed tomography scan of the abdomen with intravenous contrast enhancement did not show evidence of abdominal pathology; however, it did show prominence of the lumbar epidural venous plexus (Figure 2). Repeat lumbar spine MRI demonstrated prominence of

the ventral epidural plexus and an L4-5 level disc bulge contacting the right L5 nerve root (Figures 3 and 4). The patient's headaches remained well controlled, but her back and lower extremity pain were not amenable to conservative measures. An L4-5 level microdiscectomy was considered to address her radiculopathy; however, a decompression and fusion operation was chosen, as the patient also had severe axial low back pain, which was attributed to her lumbar spondylosis. Approximately 1 year after placement of

the antisiphon device, she was admitted for L4-5 transforaminal lumbar interbody fusion. Intraoperatively, pedicle screws were placed at L4 and L5 on the patient's left side, and pedicle screw holes were tapped on the right at L4 and L5. Next, a laminectomy, right-sided facetectomy, and left-sided foraminotomy were performed at the L4-5 level. On exposing the right-sided disc space in preparation for placement of the interbody graft, large epidural veins were encountered. Significant bleeding occurred (approximately 600 mL over 3 minutes) causing a brief episode of hypotension, which responded to fluids and vasopressors. The interbody portion of the procedure was aborted to avoid further hemorrhage, and hemostasis was instead achieved. The remainder of the operation was completed as an L4-5 posterior spinal fusion without complication. The patient recovered well postoperatively and was discharged home with near-complete resolution of radiculopathy. At the 3-month clinic follow-up appointment, she no longer had radicular pain, and her axial low back pain was minimal.

DISCUSSION

Intracranial hypotension was first described by Schaltenbrand in 1938.⁹ It is caused by a reduction in CSF pressure, which may occur from overshunting of CSF, spontaneous dural tear, lumbar puncture, spinal surgery, trauma, severe dehydration, diabetic coma, or uremia.^{10,11} Intracranial hypotension syndrome is characterized by orthostatic headaches (headache increased when upright and decreased when recumbent) and may be associated with other neurologic symptoms. Headaches seen with intracranial hypotension syndrome are typically bilateral and may be accentuated by head movement and Valsalva maneuvers. Headaches are thought to result from downward descent of the brain from loss of CSF-mediated buoyancy causing traction on the dura mater innervated by sensory cranial nerves V, IX, and X and upper cervical nerves.^{12,13} Other symptoms include nausea, vomiting, photophobia, and neck stiffness, which likely result from meningeal irritation secondary to venous engorgement, including the venous sinuses.^{9,14} Less commonly, diplopia, tinnitus, and vertigo are experienced; these are thought to result from

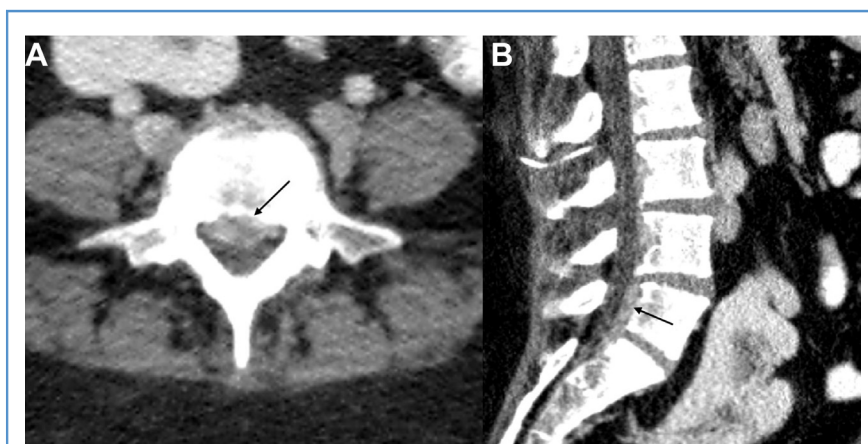


Figure 2. Computed tomography of the lumbar spine with intravenous contrast enhancement. (A) Axial cut showing dilation of the epidural venous plexus most prominent posterior to the L5 vertebral body (arrow). (B) Sagittal cut showing dilation of the epidural venous plexus most prominent in the anterior spinal canal adjacent to the L5 vertebral body (arrow). Imaging was performed 1 month after placement of the lumboperitoneal shunt and 2 weeks after placement of the antisiphon device.

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