Fluoroscopically-guided epidural blood patch for spontaneous intracranial hypotension

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Abstract
We present three patients with spontaneous intracranial hypotension who failed conservative treatment and were treated with image-guided epidural blood patch close to the cerebrospinal fluid (CSF) leak site. Each patient achieved significant long-term improvement of clinical symptoms and CSF leak related image findings.

Key words: Cerebrospinal spinal fluid leak, connective tissue, epidural blood patch, fluoroscopy, headache, intracranial hypotension, magnetic resonance imaging, myelography

Introduction
Spontaneous intracranial hypotension (SIH) is rare, often misdiagnosed, as a cause of postural headaches.1 SIH is caused by an atraumatic cerebrospinal fluid (CSF) leak usually secondary to structural dural weakness.2 Treatment of choice is epidural blood patch (EBP).3 Previously, EBPs were performed using anatomical landmarks. With radiographic imaging guidance, treatment can be better targeted and theoretically achieve a more precise sealant effect with a lower volume. We present three SIH patients that failed conservative management and underwent image-guided EBP for which clinical symptoms and image findings resolved after obtaining ethical clearance.

Case Report

Patient 1
A 35-year-old healthy female presented with 3 weeks of postural headache. Physical examination was unremarkable. Cervical magnetic resonance imaging (MRI) showed a CSF leak with fluid in the extra-cranial and paravertebral tissues at the C1-C2 level. Initially, she underwent an unsuccessful fluoroscopic guided C7-T1 EBP. After repeat EBP at C6-C7, her symptoms and image findings resolved after 1-month follow-up.

Patient 2
A 48-year-old gentleman presented with 10 weeks of a postural headache. Physical examination was unremarkable. Computed tomography (CT) myelography showed a dural CSF leak between C1-C2 [Figure 1a]. He received two unsuccessful EBPs at C6-C7 and C7-T1 levels. After a C1-C2 EBP under CT guidance using 10 ml of blood, the patient’s symptoms and MRI findings had resolved [Figure 1b].

Patient 3
A 43-year-old female presented with 5 weeks of a postural headache. Physical examination and laboratory investigations were unremarkable. MRI showed a CSF leak in the cervical, thoracic spine, and brain, as well as osteophyte complexes throughout multiple cervical levels [Figure 2a]. After a fluoroscopic-EBP, at the T5-T6 level with 10 ml of blood,
she had significant symptom reduction and improvement of the imaging findings on follow-up [Figure 2b].

Discussion

SIH is an uncommon cause of headaches with an incidence of \( \sim 5/100,000/\text{year} \). Patients with SIH usually present with postural headaches. SIH is hypothesized to be due to dural weakness leading to CSF extravasation. Although the literature has shown patients with connective tissue disorders to be at risk, structural dural abnormalities may be the cause of SIH. A few case reports have shown SIH may be linked to osteophytes purportedly causing dural tears as evidenced in patient 3. MRI and CT myelography have improved the diagnosis of SIH with CT myelography detecting the specific leak location and extent of CSF leak. The intracranial MRI characteristic findings include pachymeningeal thickening and enhancement, engorgement of venous structure, subdural fluid collection, sagging of the brain, and pituitary hyperemia.

If conservative management fails, EBPs have shown to be effective. The cases above were patients that were treated with image-guided EBP near the suspected leak site. The patients reported significant immediate symptomatic and long-term relief after one or two image guided EBPs. All three cases had EBP with low volume autologous blood (6-10 ml). In a prior study, 50-80% less volume was used with image guided versus blind technique. This decrease may be attributed to the closer proximity to the leak, with less blood to achieve an effective seal. There is limited comparison studies between image guided and landmark-based EBPs; according to a comparison study, the results \( (n = 56) \) had shown 87.1% improved with image guided versus 52% with landmark-based \( (P < 0.05) \).

The three cases presented represent patients with known cases of SIH with clinical symptoms and radiographic evidence of CSF leak. After receiving targeted image-guided EBP with a lower volume of autologous blood, the patients had significant long-term relief and resolution of imaging findings.

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Conflicts of interest
There are no conflicts of interest.

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