

Case Report

Spontaneous C1-2 Cerebrospinal Fluid Leak Treated with a Targeted Cervical Epidural Blood Patch Using a Cervical Epidural Racz Catheter

So-Young Kwon, MD¹, Yong-Shin Kim, MD, PhD¹, and Sung-Min Han, MD²

From: ¹Department of Anesthesiology and Pain Medicine, St. Vincent Hospital, Catholic University of Korea; ²Department of Anesthesiology and Pain Medicine, St. Mary's Hospital, Catholic University of Korea.

Address Correspondence:
Dr. Yong-Shin Kim
Department of Anesthesiology and Pain Medicine
St. Vincent Hospital
Catholic University of Korea
Ji-dong, Paldal-gu, Suwon
E-mail: aneskim@catholic.ac.kr

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A 39-year-old woman with no history of trauma or meningitis presented to the neurology department of our hospital with an occipital headache, neck pain, nausea, and dizziness that had worsened during the previous month. The headache worsened when sitting or standing and partially regressed when lying down. She was diagnosed with spontaneous intracranial hypotension (SIH) and received conservative management. After failing to respond to conservative management, she underwent an autologous epidural blood patch (EBP) at the T7-8 level. The headache and associated symptoms did not improve after the procedure. Magnetic resonance (MR) myelography suggested a cerebrospinal fluid leakage at the C1-2 level resulting in intracranial hypotension. An 18-gauge Tuohy needle was inserted at the T1-2 interlaminar level using a paramedian approach under fluoroscopic guidance. The cervical epidural Racz catheter was threaded through the Tuohy needle up to the cervical spine and the catheter tip was confirmed to be at the right cervical 1-2 site on an anteroposterior (AP) view. Five mL of autologous blood was injected into the epidural space through the cervical epidural Racz catheter.

Her occipital headache and associated symptoms gradually disappeared after the procedure. Seven days later the headache was largely resolved and she was discharged. Follow-up magnetic resonance imaging (MRI) showed the disappearance of abnormal radiological features associated with intracranial hypotension. She currently remains symptom free for 9 months. Delivery of autologous blood patch via a cervical epidural Racz catheter inserted from the upper thoracic spine can be a safe and effective method for patients with SIH due to cerebrospinal fluid (CSF) leakage in the upper cervical spine.

Key words: Cerebrospinal fluid leakage, epidural blood patch, intracranial hypotension, myelography, occipital headache

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Spontaneous intracranial hypotension (SIH) is a clinical syndrome in which a spontaneous cerebrospinal fluid (CSF) leak results in various neurologic symptoms (1). Clinically, it is characterized by orthostatic headache, neck pain, nausea, vomiting, and dizziness (2,3). Occasionally other neurological symptoms may also be present, including diplopia, memory loss, hearing deficits, and ataxia (4,5). SIH is

more predominant in women and the mean age of occurrence is 38 to 42 years in both genders (6,7). Neuroradiological imaging facilitates the diagnosis of SIH and helps to avoid invasive procedures (8). Magnetic resonance (MR) myelography with iodinated contrast is an important diagnostic tool for detecting the leakage site of CSF (9).

SIH is often treated conservatively with hydration,

bed rest, caffeine, and an abdominal binder. If the condition fails to resolve, treatment with an epidural blood patch (EBP) may be attempted.

We report a case in which a patient with CSF leakage at the C1-2 spinal level was successfully treated with a cervical EBP using a cervical epidural Racz catheter under fluoroscopic guidance.

CASE

A previously healthy 39-year-old woman presented to the neurology department of our hospital with a one-month history of progressively worsening occipital headache, posterior neck pain, nausea, vomiting, vertigo, and a tingling sensation in both arms.

The headache worsened when sitting or standing and partially regressed when lying down. Initially, the symptoms lasted one to 2 hours, but they gradually worsened and began to last the entire day. The pain intensity of the headache as measured on a visual analog scale (VAS) aggravated from 3 to 7 throughout the month prior to presentation. She had no trauma history, no relevant family history, and showed no neurologic signs. The patient used acetaminophen for pain control but without any symptomatic improvement. During the month of symptom development, the pain

became increasingly global, with worsening of an orthostatic headache, vertigo, nausea, and tinnitus. She was admitted to the neurology department of our hospital where we performed a lumbar puncture and CSF pressure was found to be 60 mmH₂O. CSF analysis revealed no abnormal findings. SIH was suspected clinically and brain magnetic resonance imaging (MRI) showed typical signs of intracranial hypotension with diffuse pachymeningeal enhancement and venous plexus engorgement (Fig. 1).

She was initially treated with conservative management, including bed rest, intravenous fluid administration, and analgesics for 3 days, which failed to relieve the symptoms. The patient was referred to our pain clinic with a diagnosis of SIH and we performed an EBP at the thoracic spine level, a common site of CSF leaks (10). The autologous EBP was performed under the guidance of fluoroscopy using a contrast agent and 15 mL of autologous blood at the T7-8 level. However, the headache and associated symptoms did not improve after the procedure and an MRI of the spine and MR myelography were performed to identify the site of the CSF leakage. On coronal T2-weighted images, CSF accumulation on the right side of the C1-2 extra-dural space was detected (Fig. 2).

The patient agreed to undergo an EBP therapy using the cervical epidural Racz catheter (VERSA-KATH®, Epimed Inc., NY, USA) after she was informed of the benefits and risks of the procedure. The patient was placed in prone position with a pillow under the chest. The skin was draped using the aseptic technique and the area was infiltrated with lidocaine. An 18-gauge RX-2 Coude® epidural needle was slowly inserted at the T1-2 interlaminar level using a paramedian approach under fluoroscopic guidance. The needle was advanced into the epidural space using a loss of resistance technique with saline. The epidural space was confirmed with visualization of the contrast agent in the target site using anteroposterior (AP) and lateral fluoroscopic views. The cervical epidural Racz catheter was threaded through the epidural needle up to the cervical spine and the catheter tip was confirmed to be at the right cervical 1-2 site on an AP view. We used one mL of contrast media to confirm the spread of contrast dye.

Next, blood was sterilely collected from the left popliteal superficial vein, and 5 mL of autologous blood was injected into the epidural space through the cervical epidural Racz catheter. No paresthesia was encountered during the injection of blood and the catheter was removed at the end of procedure. The injection re-

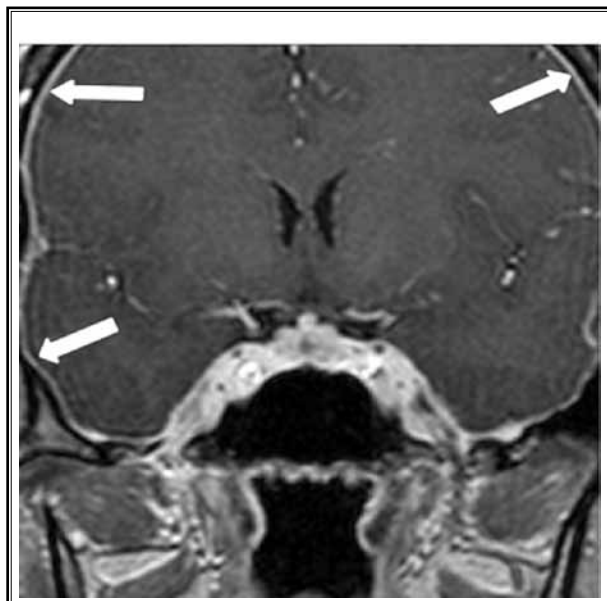


Fig. 1. Coronal dotarem-enhanced T1-weighted MRI revealing diffuse pachymeningeal enhancement (white arrows).

sulted in gradual improvement of the headache and associated symptoms. Seven days later the headache was almost resolved and she was discharged. Follow-up MRI showed the disappearance of abnormal radiological features associated with intracranial hypotension. She currently remains symptom free 9 months after the EBP via cervical epidural Racz catheter.

Discussion

SIH is a syndrome of low CSF pressure (less than 60 mmH₂O) characterized by postural headaches in patients without a previous history of dural puncture or trauma. The prevalence of SIH is low and is estimated at one out of 50,000 to 100,000 people in the general population (10,11). CSF leakage is the cause of SIH and the majority of CSF leaks occur in the thoracic spine or at the cervicothoracic junction. Although there is no universally accepted diagnostic criteria for SIH, the diagnosis of SIH is dependent on clinical history, neurologic examinations, imaging studies, and CSF studies (7,12). Imaging techniques have become a significant diagnostic tool of SIH due to their marked technological improvement. Miyazawa et al (13) suggested that the abnormal findings on computed tomography (CT) myelography and spinal MRI are important clues for diagnosing SIH.

While several modalities have been implemented for SIH patients, there is no definite standard treatment. Traditionally, treatment for SIH begins with conservative therapy including hydration, analgesics, abdominal binders, and caffeine (10). Some studies have demonstrated the effectiveness of theophylline and steroids, but this has not been fully established (14,15).

Autologous EBP is considered to be the treatment of choice for patients who have failed initial conservative treatments. Many studies have suggested the technical details of EBP (3,16,17). Shima et al (12) reported that autologous EBP was effective in 48% of patients who could not be treated effectively with initial conservative treatment. Ferrante et al (18) demonstrated that a patient with SIH, due to an upper cervical CSF leakage, could be successfully treated with an autologous lumbar EBP at the L2-3 level. The mechanism of the blood patch is thought to be due to the covering of the meningeal tear site with a blood clot (7). Therefore, autologous EBP procedures are performed as close to the leakage site as possible in order to increase the efficacy and success rates of this treatment.

Due to anatomical complexities, EBP in the upper cervical spine is technically difficult and this procedure carries a greater risk of complications than a lumbar

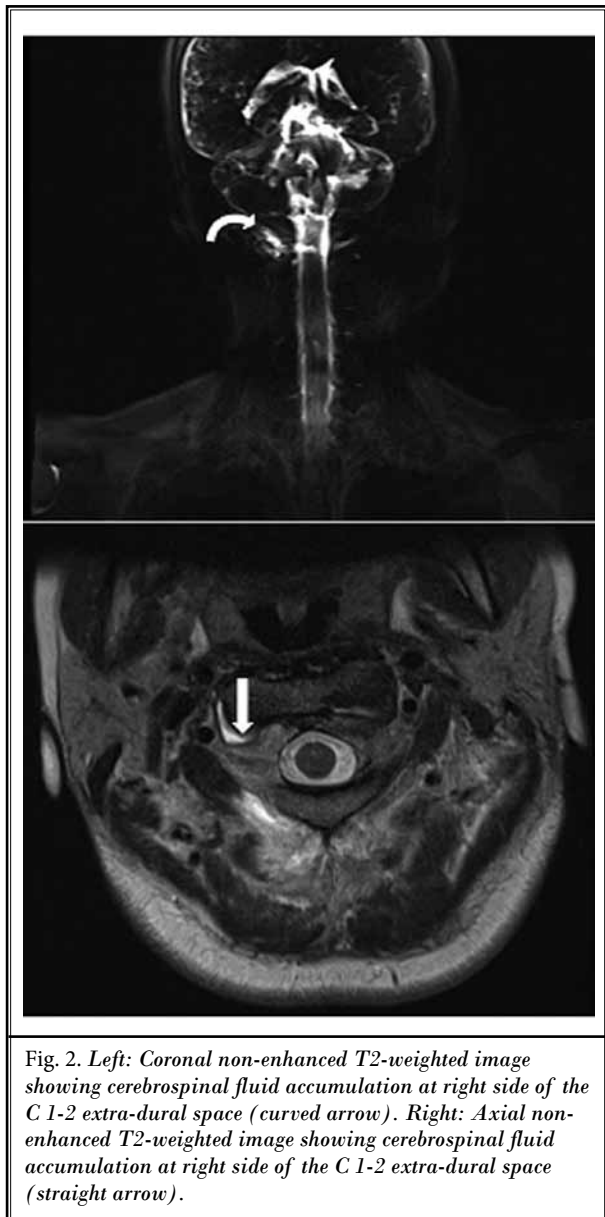


Fig. 2. Left: Coronal non-enhanced T2-weighted image showing cerebrospinal fluid accumulation at right side of the C 1-2 extra-dural space (curved arrow). Right: Axial non-enhanced T2-weighted image showing cerebrospinal fluid accumulation at right side of the C 1-2 extra-dural space (straight arrow).

EBP. The upper cervical EBP has potentially hazardous side effects of spinal cord compression, chemical meningitis, intrathecal injection of blood, and seizures. Inamasu and Nakatsukasa (19) performed a targeted EBP for a C 1-2 leakage with an epidural catheter technique from a lower cervical spine level.

In the present case, the EBP was delivered to the C1-2 level via a cervical epidural Racz catheter inserted at the level of T1-2 and advanced cephalad under fluoroscopic guidance. It is easier to localize the cervical epidural Racz catheter at the target site, compared to

previous epidural catheters, as it does not have a propensity to kink (20). Because the cervical epidural Racz catheter, which is made of spiral stainless steel coils coated with fluoropolymers, allows for more accurate targeting of EBP, a smaller amount of autologous blood for EBP can be used with good effect while avoiding major complications in the narrow cervical epidural space. This is the first report to document such successful delivery of an EBP at the C1-2 using a cervical epidural Racz catheter.

We suggest that the cervical epidural Racz catheter is an alternative method for treating SIH due to CSF leakage at an upper cervical site.

CONCLUSION

An EBP with a small volume of blood via a cervical epidural Racz catheter inserted from the upper thoracic spine under fluoroscopic guidance can be an alternative method of treatment for patients with SIH due to CSF leakage in the upper cervical spine.

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