MEDICAL FORUM

THE ROLE OF EPIDURAL BLOOD PATCH IN THE TREATMENT OF SPONTANEOUS INTRACRANIAL HYPOTENSION: TWO CASES REPORT

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SUMMARY

Spontaneous intracranial hypotension (SIH) is a rare but treatable condition characterized by postural headaches and imaging findings suggestive of cerebrospinal fluid (CSF) leakage [1–3]. This report highlights two cases of SIH diagnosed through clinical presentation, brain MRI, and CSF leak localization using myelography. Both patients underwent computed tomography (CT)-guided epidural blood patch (EBP) treatment. We inserted a needle into the epidural space near the cerebrospinal fluid leakage site and proceeded to inject autologous blood. The procedure was performed under CT guidance to ensure accurate injection and safety, thereby enhancing treatment efficacy and avoiding unnecessary complications. Following the treatment, our cases all showed positive outcomes. Significant clinical improvement, including resolution of postural headaches, was noted shortly after treatment. Follow-up MRI scans performed one week later demonstrated substantial recovery of imaging abnormalities. Sustained clinical improvement without recurrence was observed at 18 months of follow-up in the first patient and at 12 months in the second patient. Along with previously reported cases worldwide [4] and our cases, this demonstrates that CT-guided EBP is a minimally invasive method that provides high therapeutic efficacy and safety for patients.

Key words: *Spontaneous intracranial hypotension (SIH), cerebrospinal fluid (CSF) leakage, epidural blood patch (EBP).*

I. INTRODUCTION

SIH is a condition characterized by cerebrospinal fluid leakage, increasingly known to occur in approximately 1-2.5 per 50,000 population, with a peak age 40 years [5,6]. Treatment of this pathology can be with conservative therapies such as hydration and bed rest, but the success rate is not high [7,8]. Treatment with autologous blood injection is increasingly recognized as an effective method with minimal intervention [9]. EBP can be a targeted injection, at the exact location where the CSF leak is identified, or a blind injection. Targeted EBP may be riskier, but more effective than blind EBP [10]. In this report, we present two cases of SIH due to cerebrospinal fluid leakage in the neck, both treated with targeted EBP and both with positive outcomes.

II. CASE SERIES

Case 1:

A 45-year-old female presented with orthostatic headaches. Brain MRI revealed diffuse dural enhancement, venous sinus dilation, and a reduced mamillopontine distance, suggesting SIH. Further spinal imaging detected a CSF leak at C1/2, confirmed by CT myelography. The patient underwent a CT-guided epidural blood patch (EBP) at C1/2, resulting in significant symptom relief within a week. Follow-up imaging after one month showed complete resolution of the CSF leak and normalization of brain structures.

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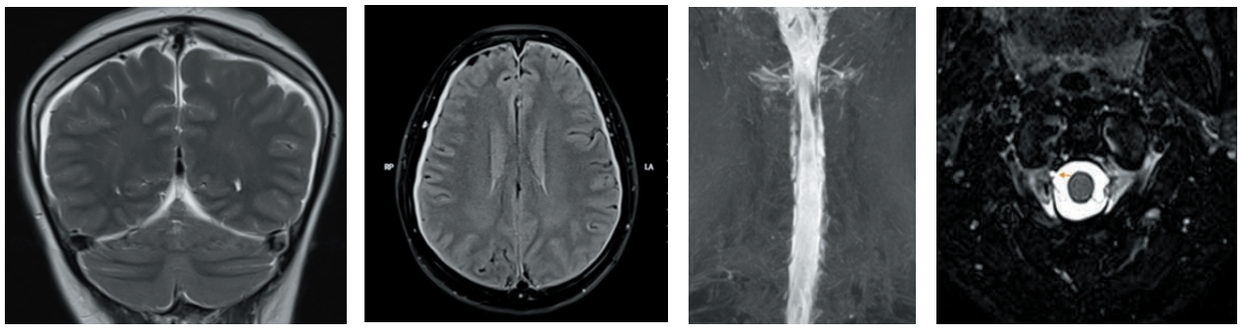

T2W coronal | T2W axial | MIP myelo | Heavily T2 axial

Figure 1. *Image before treatment, diffuse meningeal thickening, wide and round cerebral venous sinus, image of coronal cerebrospinal fluid (CSF) leak at C1/2 level.*

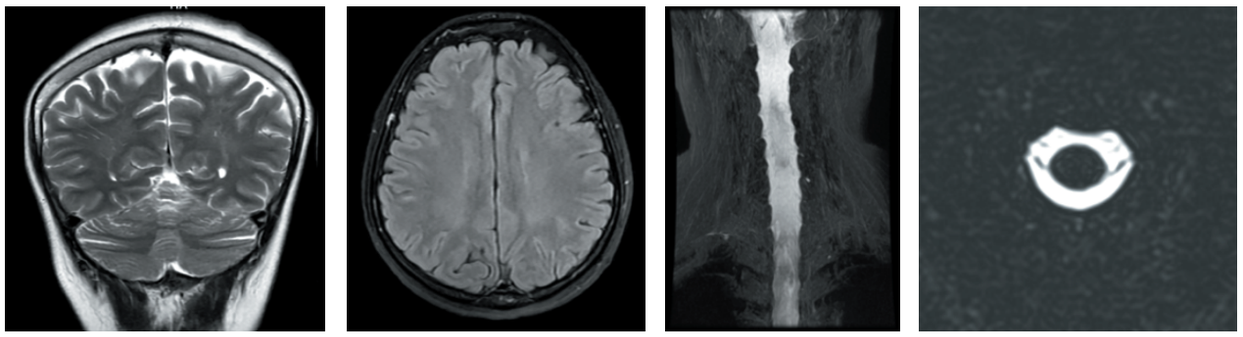

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Figure 2. *Image 1 month after treatment, meningeal thickening has resolved, the cerebral venous sinuses are normal with a triangular shape, and no CSF leakage is observed in the cervical spine.*

Case 2:

A 39-year-old female experienced two months of positional headaches unresponsive to analgesics. Brain MRI suggested SIH, and cervical MRI identified a CSF leak at the right C1/2 level. During CT-guided EBP, an extensive venous plexus was encountered, requiring careful needle repositioning before injecting autologous blood. The patient reported near-total symptom resolution within two weeks. Follow-up MRI confirmed the absence of CSF leakage and normalization of affected structures.

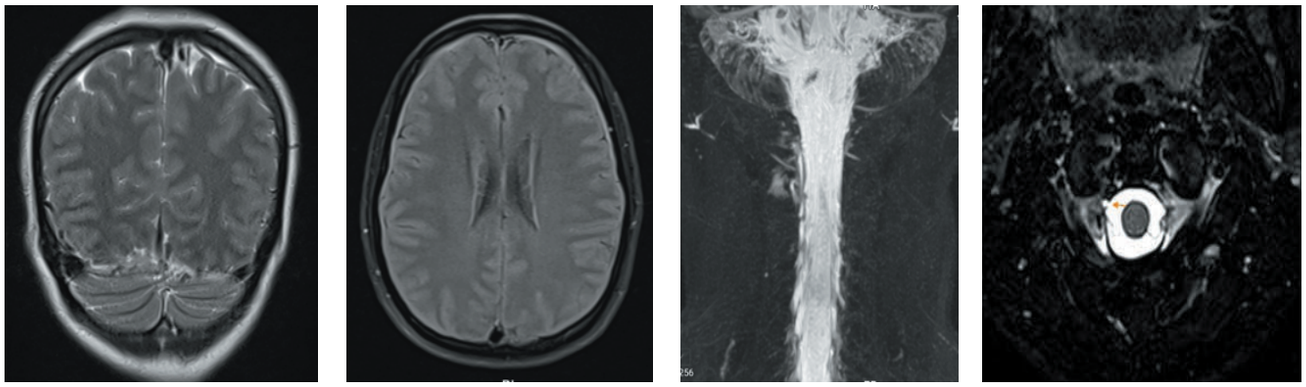

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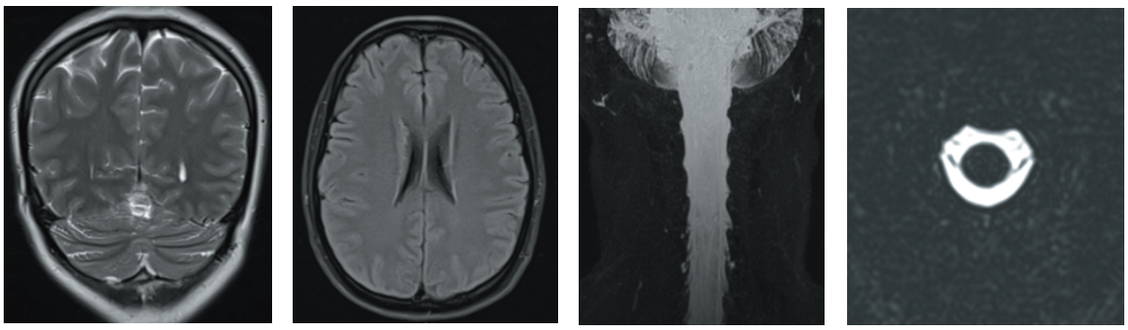
Figure 3. *Initial images before treatment, diffuse meningeal thickening, wide and round cerebral venous sinus, image of coronal cerebrospinal fluid (CSF) leak at C1/2 level.*



T2W coronal | T2W axial | MIP myelo | Heavily T2 axial

Figure 4. *Two weeks after treatment, meningeal thickening has completely regressed, the cerebral venous sinus has returned to its normal shape, and no CSF leakage is observed in the cervical spine.*

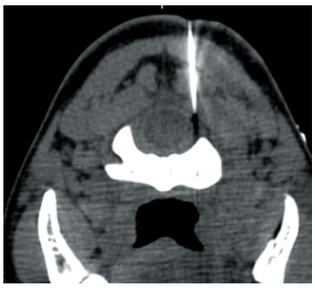


Figure 5. *The needle approached the epidural space at the level of C1-2.*

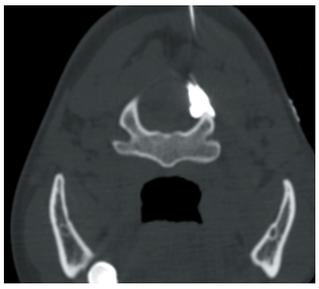


Figure 6. *Autologous blood mixed with contrast was injected into the epidural space at the level of C1-2.*

Follow-up and outcome assessment:

During mid- and long-term follow-up, both patients remained clinically stable. No recurrence of orthostatic headache or neurological symptoms was observed. Follow-up MRI showed no evidence of recurrent CSF leakage or intracranial hypotension. Importantly, no procedure-related complications, including spinal cord compression, epidural hematoma, or infection, were detected throughout the follow-up period.

III. DISCUSION

Spontaneous intracranial hypotension (SIH) is a syndrome caused by cerebrospinal fluid (CSF) leakage, leading to a reduction in intracranial pressure and a classic presentation of orthostatic headaches [5]. The condition often results from spontaneous or idiopathic dural tears, which may be associated with underlying connective tissue disorders or minor trauma [8]. The typical imaging findings include diffuse pachymeningeal enhancement, venous sinus engorgement, brain sagging, and decreased pontomamillary distance, all of which help establish the diagnosis [11]. Advanced imaging modalities such as spinal MRI with heavily T2-weighted sequences and CT myelography are crucial for detecting the site of CSF leakage, which is essential for targeted treatment [12].

Epidural blood patch (EBP) is a cornerstone in the treatment of SIH, acting by sealing the dural tear and restoring normal intracranial pressure [13]. Studies have demonstrated that EBP provides rapid and effective symptom relief, with success rates reaching up to 90% in targeted applications [10], [14]. The mechanism of action includes both the immediate tamponade effect and the long-term induction of fibrin-mediated sealing of the dural defect [15].

The volume of blood injected plays a critical role in the efficacy of EBP. While smaller volumes (2.5-10 mL) are typically used in cervical leaks to minimize the risk of brainstem compression, larger volumes (20-30 mL) are often preferred for thoracic and lumbar leaks to maximize clot formation and coverage [13]. In some cases, repeat EBP may be necessary, particularly when symptoms persist or when imaging suggests incomplete sealing of the leak [16].

EBP is generally safe, with minimal complications. The most common side effects include transient radicular pain and mild back discomfort, which typically resolve within a few days [17]. Serious complications, such as spinal hematoma or infection, are rare, particularly when the procedure is performed under imaging guidance [9]. In cases where EBP fails, alternative strategies such as surgical dural repair may be required [18].

The two presented cases highlight the importance of accurate imaging for localizing the CSF leak and optimizing

EBP outcomes. Both patients experienced significant clinical and radiological improvement following targeted EBP, reinforcing its role as a first-line intervention for SIH. As imaging techniques and procedural refinements continue to evolve, EBP remains a highly effective and minimally invasive treatment for this condition.

In the second case, a significant procedural challenge was encountered during the targeted epidural blood patch due to the presence of a prominent cervical epidural venous plexus. The interventional radiologist had to carefully reposition the needle to avoid vascular injury and ensure safe access to the epidural space. This underscores the complexity and potential risks associated with cervical-level interventions. Fortunately, heavily T2-weighted fast spin-echo (HFSE) MRI sequences proved invaluable in this scenario. These sequences allowed clear visualization of the CSF leak and, crucially, delineated the surrounding venous plexus, providing essential anatomical landmarks that guided safe needle placement (Figure 3, heavily T2 axial). By identifying a safe trajectory, HFSE imaging enhanced procedural precision, minimized complications, and contributed to the overall success of the intervention.

Mid- and long-term outcomes and safety

While epidural blood patch is well known for providing rapid symptom relief in SIH, data regarding its mid- and long-term durability remain limited, particularly for cervical-level targeted procedures [19], [20]. In our cases, sustained clinical recovery was observed at 12 and 18 months of follow-up, respectively, which corresponds to mid- to long-term outcome evaluation reported in previous studies. The absence of symptom recurrence and persistent resolution of imaging abnormalities suggest durable sealing of the dural defect.

Furthermore, no long-term complications such as spinal cord compression, epidural infection, or delayed neurological deterioration were observed. These findings support the long-term safety of CT-guided targeted epidural blood patch when performed with careful imaging guidance and appropriate blood volume selection, even at high cervical levels.

IV. CONCLUSION

Epidural blood patching is a valuable intervention in the management of spontaneous intracranial hypotension. The presented cases highlight the importance of accurate diagnosis, precise localization of CSF leaks, and careful procedural technique to ensure successful outcomes. EBP offers a minimally invasive solution with rapid symptom relief and demonstrates high efficacy at mid- and long-term follow-up, with no significant complications observed in the sealing of CSF leaks associated with SIH.

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