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Case Report

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Resolution of Spontaneous CSF Leak with Platelet Lysate Epidural Injection - A Case Report

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ABSTRACT

Spontaneous cerebrospinal fluid leakage is a rare event consisting of cerebrospinal fluid escaping through a dura mater defect without an identifiable cause. Cases commonly present with orthostatic headaches, however atypical presentations can delay diagnosis and complicate management. This case report describes a 66-year-old male who experienced left sided headaches, dizziness, decreased depth perception and visual changes beginning in 2017. Imaging demonstrated subdural hygromas, diffuse dural enhancement, brain sagging and intracranial hypotension without definitive localization of the leak. The patient was referred to neurology and neurosurgery specialists who recommended an epidural blood patch. Out of concern regarding the inflammatory properties of whole blood, along with the potential benefit of concentrated growth factors, an epidural injection using platelet lysate derived via apheresis was performed. The lysate was prepared by centrifugation, freezing, reconstitution in sterile water, and the addition of platelet-poor plasma, yielding a six-fold concentration of growth factors. The solution was injected in the epidural space of the lumbar spine under fluoroscopic guidance and use of Omnipaque dye. The patient experienced immediate relief of postural headaches which were consistent at a one month follow up without adverse events. This case report illustrates the potential role of platelet lysate in treating spontaneous cerebrospinal fluid leaks, particularly in cases with atypical presentation. Further studies are needed to determine the safety and efficacy in broader patient populations.

Keywords: Spontaneous Cerebrospinal Fluid Leakage, CSF Leak, Platelet Lysate, Intracranial Hypotension, Regenerative Medicine, Epidural Injection

Introduction

Cerebral spinal fluid (CSF) leaks are often caused by traumatic events or from a puncture of the subdural space resulting from procedures such as epidural injections, spinal anesthesia, or spinal or cranial surgery [1,2]. Spontaneous cerebrospinal fluid (SCSF) leaks which present without any known incidental causes are the least common, making up approximately 4% of patients presenting with a CSF leak [1]. Classically, CSF leaks present with orthostatic headaches, nausea, cervical pain, and visual changes. Orthostatic headaches are the most commonly reported symptom being present in approximately 87% to 96% of patients where headache symptoms are alleviated by lying supine [1,3]. Furthermore, atypical presentations can complicate and delay diagnosis as well as treatment. If left untreated, cerebral hypovolemia can lead to many neurological morbidities including superficial siderosis, bibrachial amyotrophy, and spinal cord herniation [4].

Spontaneous intracranial hypotension (SIH) is defined as postural headaches secondary to CSF hypovolemia caused by CSF leaks [2,3,5,6]. Magnetic resonance imaging (MRI) can often demonstrate characteristic features of intracranial hypotension.

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There are five common MRI findings for SIH, these include: engorgement of venous structures, subdural fluid collections, sagging of the brain, enlarged pituitary gland, and diffuse pachymeningeal enhancement [6,7]. Conservative treatments for SIH consist of bedrest, hydration, and caffeine. While conservative treatments can improve the patient's condition, due to the debilitating nature of the symptoms, patients move quickly to invasive alternatives [2,3,6]. Epidural blood patch (EBP) is considered standard interventional therapy, although a single treatment has shown to be successful in only 64% of patients [3]. Additionally, it has been reported that approximately one in five patients treated with EBPs or surgical intervention develop rebound intracranial hypertension [2,5].

Emerging therapies such as the use of platelet lysate (PL) in place of whole blood have been proposed due to their concentrated growth factors and potentially lower inflammatory profile [8-11]. Whole blood consists of plasma, red blood cells, white blood cells, platelets, and many proteins which play a role in the inflammatory response [12]. PL is collected through the lysis of platelets via a freeze-thaw cycle. Lysing releases growth factors and anti-inflammatory proteins, including alpha-2-macroglobulin, interleukin receptor antagonist, and tissue inhibitor of metalloproteinase previously contained within the platelet cells. This release of regulatory molecules provides a valuable benefit in regenerative medicine as injections using platelet lysate increases local concentrations of these proteins and impacts the inflammatory process [8-11].

This case describes a patient with a spontaneous cerebrospinal fluid leak presenting without orthostatic headaches who achieved sustained symptom resolution with interventional platelet lysate epidural injection after conventional therapy proved ineffective.

Review of Literature

Platelet lysate has emerged as a regenerative treatment alternative in various clinical contexts, including soft tissue injuries, spinal and joint interventions. In contrast to platelet rich plasma, PL is produced by lysing platelets through freeze-thaw cycles, resulting in a growth factor-rich solution with a decreased concentration of intact platelets. Growth factors released include PDGF, TGF-β, and VEGF, among others, which have been shown to promote tissue repair [8,9].

PL has also been employed in pain management as an alternative to epidural steroid injections (ESIs). A case series involving 470 patients treated with PL for lumbar radicular pain demonstrated significant and sustained improvements in pain scores (NPS) and functional rating index (FRI) with mild adverse events occurring in 6.3% of patients. Additionally, the average modified single assessment numeric evaluation (SANE) rating showed a 49.7% improvement at 24 months post-treatment. PL notably avoids some risks associated with PRP and steroid injectates, such as platelet aggregation and systemic disruption of the endocrine system [10].

Despite its growing clinical prevalence, PL production lacks standardization. PL production derived via apheresis contains large variations as each individual has variable makeup of protein concentrations in each milliliter of blood. Other variations lie in freeze/thaw cycles influencing the percentage of platelets that are fully lysed [9].

Although PL has not been adopted for treating cerebrospinal fluid leaks, its anti-inflammatory and regenerative properties have potential to make PL an alternative in cases where traditional therapies such as epidural blood patches (EBPs) fail or are contraindicated. EBPs remain the first-line intervention for spontaneous intracranial hypotension (SIH), but their success varies depending on the volume used and the underlying cause of a leak. A systematic review of 144 studies found that a single EBP was successful in 56%-72% of patients, where larger-volume EBPs (>20 mL) generally yield better outcomes, compared to smaller-volume EBPs with success among 63%–91% of patients. Yet long-term resolution often remains elusive, especially in cases involving complex dural defects or unidentified leak sites [3,5].

Case Report

Patient History

A 66-year-old male presented with persistent headaches and dizziness beginning in 2017. The pain was described at the posterior aspect of the head as a range of 2/10 - 8/10 on the Visual Analog Scale (VAS). Symptoms were accompanied by fatigue, decreased depth perception, confusion and neck pain. Neurologic examination was non-focal. The patient has comorbidities including: Fatty Liver Disease, GERD without esophagitis, Type two Diabetes, Essential Hypertension, Hypothyroidism, and Class one obesity. Magnetic resonance imaging (MRI) conducted between 2017 and 2025 of the Brain, Cervical Spine, Thoracic Spine, and Lumbar Spine demonstrated: Subdural hygromas, brainstem sagging, enlargement of the pituitary gland and diffuse dural enhancement of cervical, thoracic, and lumbar spine. After dealing with these symptoms for over half a decade, the patient sought out definitive treatment. During the month of March 2022, he received an updated MRI brain. Additionally, in the month of March 2025, he had a cervical, thoracic, and lumbar MRI. After these scans came back inconclusive, a neurosurgeon raised the possibility of an occult CSF leak. Once conservative treatments of rest and increasing hydration had failed, an EBP was recommended as the best treatment option by neurosurgery. Due to the chronic nature of patient symptoms and concern over the inflammatory properties of whole blood, platelet lysate was selected as an alternative [3,7].

Epidural Procedure

Intravenous (IV) access was obtained. Patient was taken to the procedure room and placed in the prone position with a pillow under their abdomen to reduce lumbar lordosis. Routine vital monitors were placed which included continuous monitoring of heart rate, oxygen saturation, and intermittent monitoring of blood pressure, temperature, and mental status. 0.1 mg Fentanyl Citrate and 1 mg Midazolam HCl were given IV to induce conscious sedation, alleviate anxiety, and provide patient comfort. The patient remained conversant throughout the entire procedure. A face mask and hat were worn throughout the procedure. The lumbar/thoracic area was prepped with betadine solution and draped in the usual sterile fashion. Fluoroscopy was placed in the anterior-posterior (AP) position to identify the L1-L2 interspace. 3 mL of 1% Lidocaine was used to anesthetize the skin using a 25-gauge 1 inch needle. Using fluoroscopy, an 18-gauge epidural Touhy needle was advanced to the L4-L5 interspace using loss of resistance technique to air X1 attempt. After negative aspiration for cerebral spinal fluid (CSF) and

heme, via an extension catheter, 3 mL of Omnipaque 250 mg/mL was injected demonstrating appropriate epidural spread. No intrathecal or intravascular uptake. Lateral and AP fluoroscopic views were obtained as seen in Figure 1 and Figure 2; soft copies were made for the chart. 15 mL of platelet lysate was injected incrementally. There was no paresthesia during needle placement or during injection. Patient tolerated the procedure and was taken to the recovery room in good condition. There were no new motor or sensory deficits immediately post-procedure. The patient was given post op discharge instructions. The patient reported resolution of the headache after discharge.

Figure 1: Lateral View of Epidural Needle Placement Under Fluoroscopy.

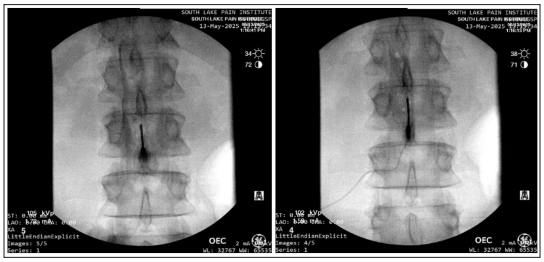

Figure 2: Anterior-Posterior View of Epidural Needle Placement Under Fluoroscopy.

Discussion

Spontaneous CSF leak is an underdiagnosed cause of intracranial hypotension, often presenting with orthostatic headache and other neurologic symptoms. First line management is conservative. This includes bed rest, hydration, caffeine, and sometimes corticosteroids. However, a significant proportion of patients with spontaneous intracranial hypotension (SIH) require interventional therapies, most commonly, epidural blood patches. While EBPs are used with success, failure and recurrence are still common problems. This is particularly true in patients with underlying connective tissue disease or complex dural defects [3,5]. The therapeutic effect of the EBP is believed to occur through two primary mechanisms: mechanical tamponade and biologic sealing of the dural tear. Initially, the injected blood forms a mass that compresses the dura. This increases epidural pressure and reduces the transdural CSF gradient. This tamponade effect helps to immediately reduce CSF leakage and can provide rapid relief of symptoms [5,6]. Subsequently, the blood coagulates and triggers an inflammatory and fibrotic response. Platelets and clotting factors within the injected blood contribute to the formation of a fibrin clot that seals the dural defect. Over time, fibroblasts infiltrate the area and produce collagen and extracellular matrix proteins, which may reinforce the dural closure and promote tissue healing [8,9]. The volume of blood injected typically ranges from 10 to 20 mL but may vary based on patient response and procedural technique.

With this patient, a persistent spontaneous CSF leak demonstrated complete resolution of symptoms following a platelet lysate epidural injection. The mechanism of repair may involve a mass effect to tamponade the leak as a similar amount of volume is used compared to a traditional EBP. A second mechanism may also be present as the platelet lysate helps to promote active tissue regeneration and sealing of the dural defect. This is because platelet lysate is derived from autologous platelets and created through a freeze-thaw lysis process that concentrates regenerative cytokines and growth factors. The main products that are concentrated are platelet-derived growth factor (PDGF), transforming growth factor-beta (TGF-β), and vascular endothelial growth factor (VEGF) [9]. These factors specifically promote angiogenesis, fibroblast activation, and extracellular matrix remodeling. This combination of similar volume and a less inflammatory healing process makes platelet lysate a possible regenerative solution to spontaneous CSF leaks [11].

Findings

Though literature on platelet lysate for CSF leaks is limited, its use in spinal interventions, particularly for discogenic and radicular pain, has demonstrated safety and efficacy in promoting healing and reducing inflammation. The case presented here builds on this foundation and suggests that platelet lysate may serve as a regenerative alternative to EBP as it is similarly invasive but also promotes less inflammation than the current standard of care. Importantly, this case adds to the body of anecdotal and early observational evidence that suggests the use of platelet lysate may improve outcomes in patients with SIH by promoting dural healing and potentially lowering the rate of recurrence. Despite these promising findings, there remain limitations. This is a single case, and causality cannot be definitively established. Larger studies are required to validate the efficacy, durability, and optimal delivery technique of platelet lysate in this setting. Moreover, rigorous comparisons between platelet lysate and traditional EBP are needed to better define the patient populations who may benefit most from either treatment.

In conclusion, platelet lysate epidural injection may represent a safe and effective alternative for patients with spontaneous CSF leaks, particularly as a second option when conventional treatments fail or when a lower-inflammatory option is desired. Given its regenerative potential and biologically active properties, platelet lysate may offer not only symptomatic relief but also durable repair of any underlying dural pathology.

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