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Intrathecal hematoma and sacral radiculitis following repeat epidural blood patch

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Abstract

Postdural puncture headache (PDPH) is an incapacitating complication that can occur following spinal anesthesia and with inadvertent dural puncture during epidural anesthesia. We present a case of a 32-year-old G2P1 female who was admitted for induction of labor and received epidural catheter placement for analgesia. After an inadvertent dural puncture and development of a PDPH, the patient was offered conservative measures for the first 48 hours without improvement. An epidural blood patch (EBP) was placed achieving only moderate relief. Two days later, a second EBP was performed and the patient developed severe back pain which radiated bilaterally to her buttocks. Magnetic resonance imaging (MRI) demonstrated the presence of blood in the intrathecal space. This could be the cause of sacral radiculitis, an uncommon complication of an EBP. This suggests that EBPs could potentially cause neurologic symptoms which may be more common than people previously thought. As complicated outcomes have followed both conservative and aggressive management, MRI can be an early diagnostic tool in such cases and a multidisciplinary approach should be taken.

Keywords: postdural puncture headache, epidural blood patch, intrathecal hematoma, sacral radiculitis

Introduction

Postdural puncture headache (PDPH) has been a known neuraxial complication since the first spinal anesthesia was performed in 1898 by Dr. August Bier[1]. Inadvertent dural puncture during epidural placement is a more common cause of PDPH. During epidural catheter placement, accidental puncture of the dura mater occurred in 1.5% of the obstetric patients, and more than half of them ultimately developed PDPH[2]. Although most PDPH has been treated successfully with bed rest, hydration, caffeine, and over-the-counter analgesics, some require more aggressive management with epidural blood patch (EBP). Here, we present a case where the patient developed PDPH after an inadvertent dural puncture and, after being treated with repeat EBPs developed sacral radiculitis, a rare complication of intrathecal hematoma.

Case report

A 32-year-old G2P1 female presented at gestational week 41 for induction of labor. A labor epidural catheter was placed for pain management which was complicated by an inadvertent dural puncture. The
Tuohy needle was immediately removed, followed by a second successful attempt at L3–4 interspace. An epidural catheter was threaded to 12 cm at the skin. A negative test dose of 3 mL of 1.5% lidocaine with 1:200 000 epinephrine, was followed by a continuous epidural infusion at a rate of 5 mL/hour using bupivacaine 0.1% and fentanyl 2 μg/mL. The epidural catheter was removed 2 hours after the delivery with no complications. On postdelivery day 2, the patient developed headache and stiff neck which was consistent with the diagnosis of PDPH. The patient was treated with bed rest, intravenous fluids, caffeine, and oral analgesics, but the symptoms were not relieved. Forty-eight hours later, the patient received an EBP with 20 mL autologous blood at L3–4 using a midline approach with loss of resistance to saline. She experienced neither back pain nor paresthesia during EBP procedure and achieved nearly immediate moderate relief of PDPH. Two days later, the patient developed recurrent severe headache with no associated neurological symptoms or fever. Her symptom was relieved with a second EBP of 20 mL autologous blood at L4–5 interspace. On postdelivery day 7, the patient complained of significantly worsening lower back pain that radiated to her buttocks bilaterally. She was afebrile and denied any motor, urinary, or gastrointestinal symptoms. A complete neurologic exam was performed, followed by an urgent lumbar spine magnetic resonance imaging (MRI) which demonstrated a small volume of layering blood within the intrathecal sac at the level of the sacrum (Fig. 1). A diagnosis of sacral radiculitis secondary to intrathecal hematoma was made. After consulting with neurological and neurosurgical teams, the patient was started on therapy of timed heating pads, transcutaneous electrical nerve stimulation unit, anti-inflammatory medication and acupuncture. She had a full recovery one month after delivery.

**Discussion**

Labor epidural analgesia is the routine form of pain management for obstetric patients. PDPH is one of the common complications of epidural catheter placement and can be extremely debilitating. Although EBP is the most effective procedure in treating PDPH, the procedure is not without risk. As serious complications have been reported, *i.e.* infection, subdural hematoma, epidural hematoma, and intrathecal hematoma[3–7] (*Table 1*), patients who received EBP and had neurologic symptoms or abnormal physical exam findings warrant imaging of the lumbar spine and a multidiscipline approach with neurological or neurosurgical consultation.

The PDPH tends to have classic symptoms among which a positional fronto-occipital throbbing headache is the cardinal feature accompanied by nausea, vomiting, tinnitus, hypoacusia, ocular disturbances, and neck stiffness[8–9]. Although PDPH has the potential to resolve spontaneously within 1 to 2 weeks, more than 85% of PDPH were resolved by treatments such as bedrest, intravenous hydration, caffeine, anti-inflammatory, and oral analgesics[10]. EBP is considered the gold standard for moderate to severe PDPH with success rates of 61% to 98% and should be used if treatments above failed within 48 hours. The mechanisms of EBP are 1) a physical "patch" effect, where injected blood directly forms a seal over the dural leak and 2) a "pressure" effect, in which epidural pressure is transmitted to the cerebrospinal fluid (CSF) to partially alleviate intracranial hypotension and to attenuate the reflex cerebral vasoconstriction[11]. The optimal volume of EBP varies between 15, 20, or even 30 mL[12].

Although rare, serious complications affecting different meningeal layers have been reported after EBP[3–7,13–16] (*Table 1 and Table 2*), the specific role of EBP in the meningeal layers is unclear. One of the explanations was that the high pressure during injection caused blood flow across the initial dural puncture site. This theory is supported by MRI studies completed in five patients at 30 minutes, 3 hours, and 18 hours after EBP. In 2 of the 5 patients, blood was noted to translocate into the intrathecal space over the course of the 3 MRIs[17]. Large volume of EBP could...
contribute to the movement of blood across the dural hole. Another explanation is that autologous blood is delivered to either the intrathecal or subdural space due to an incorrectly placed needle. This is supported by the MRI that showed blood in the intrathecal space and not in the epidural space (Table 2). Entering the subarachnoid space without free flow of CSF through the Tuohy needle could be potentially related to the blood clot preventing backflow. A needle placed in the subdural space without piercing the arachnoid matter could also explain subdural hematomas. The third explanation for blood within the intrathecal space is that blood may come from an epidural venous or arterial perforation during the original placement of the epidural catheter and before EBP placement. It is important to follow the proper technique, use the appropriate amount of autologous blood and avoid high injection pressure to minimize the potential risk of neurological complications.

Another option in managing PDPH following inadvertent dural puncture is to leave the catheter in the intrathecal space. It is suggested that inflammatory cells will accumulate near the entry of catheter and close to dural puncture hole. Fibrin formation around the intrathecal catheter at the dural tear has also been suggested as one mechanism. Sphenopalatine ganglion block and bilateral greater occipital nerve block are other treatment options for PDPH. In summary, serious complications can be caused by EBP placement and some have caused permanent disabilities. The outcome of patients with neurologic symptoms and abnormal physical exam findings after EBP is difficult to predict. Therefore, we recommend prompt imaging of the lumbar spine to further elucidate the complication. If abnormalities are found, neurological and neurosurgical teams should be consulted for a multidisciplinary approach to further management as outcomes have varied greatly.

**Table 1  Reports of serious EBP complications limited to the extrathecal spaces**

| Reference        | Complication and neurological symptoms                                                                 | MRI findings                        | Treatment and outcome                                                                 |
|------------------|--------------------------------------------------------------------------------------------------------|-------------------------------------|---------------------------------------------------------------------------------------|
| Collis et al.    | Infection and septicemia. Sacral radiculitis to right buttock. Decreased sensation to cold and pinprick over multiple dermatomes. | Large deep subcutaneous abscess     | IV antibiotics. Full recovery at 6 months.                                             |
| Diaz et al.      | Permanent paraparesis and cauda equina syndrome.                                                      | Subdural hematoma                   | Neurosurgical laminectomy and hematoma evacuation. Permanent paraparesis.             |
| Tekkök et al.    | Bladder dysfunction and hypooactive reflexes.                                                          | Subdural hematoma                   | Neurosurgical laminectomy and hematoma evacuation. Full recovery at 7 months.         |
| Mehta et al.     | Cauda equina syndrome.                                                                                  | Epidural hematoma                   | Neurosurgical laminectomy and hematoma evacuation. Recovery of most motor function at one year. |
| Willner et al.   | Low back pain with radiculopathy                                                                      | Epidural hematoma                   | Neurosurgical laminectomy and hematoma evacuation. Full recovery at 2 months.         |

EBP: epidural blood patch; MRI: magnetic resonance imaging; IV: intravenous.

**Table 2  Reports of serious EBP complications within the intrathecal space**

| Reference        | Complication and neurological symptoms                                                                 | MRI findings                        | Treatment and outcome                                                                 |
|------------------|--------------------------------------------------------------------------------------------------------|-------------------------------------|---------------------------------------------------------------------------------------|
| Roy-Gash et al.  | Arachnoiditis. Lower back pain, leg pain, persistent headache.                                        | Intrathecal hematoma. No blood in epidural space demonstrated. | Conservative management. Full recovery at 1 month.                                     |
| Kalina et al.    | Progressive low back pain with radicular symptoms.                                                    | Intrathecal hematoma                | Conservative management. Improvement over several months.                              |
| Hudman et al.    | Severe low back pain radiating to left buttock.                                                        | Intrathecal hematoma                | Conservative management. Resolution of symptoms over 10 days.                         |
| Aldrete et al.   | Arachnoiditis with photophobia and phonophobia, diminished Achilles and patellar reflexes.           | Intrathecal hematoma                | Conservative management. Persistent low back pain and burning sensation in feet at 18 months. |

EBP: epidural blood patch.
Acknowledgments

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