

# Overcoming Anatomical Challenges: Epidural Blood Patch and Plica Mediana Dorsalis Case Report

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## Abstract

The efficacy of epidural blood patch (EBP) is highly variable, and often, clinicians are unable to identify the underlying reasons for treatment failure. A 36-year-old parturient underwent a "blind" epidural blood patch (EBP) without image guidance but failed to obtain relief from a postural headache related to the labor epidural. During the second EBP, an intact plica mediana dorsalis (PMD) was visualized in the anterior-posterior fluoroscopic view after injection of contrast, and autologous blood was injected on both sides of the PMD, leading to the complete resolution of headache symptoms. This case study presents a unique finding, potentially the first identification of an intact PMD as the etiology behind the failure of an EBP to provide symptomatic relief. The first EBP was performed without image guidance, which would have allowed the identification of an intact PMD. Fluoroscopic guidance, utilizing anterior-posterior and lateral views in combination with an adequate volume of contrast to confirm bilateral spread, enables the identification of anatomic variants such as an intact PMD.

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**Categories:** Anesthesiology, Pain Management

**Keywords:** case report, epidural blood patch, plica mediana dorsalis, post-dural puncture headache, spinal csf leak

## Introduction

Post-dural puncture headache (PDPH) is the most common serious complication resulting from lumbar punctures and neuraxial anesthesia. Its overall incidence is approximately 0.3% to 3% with typical obstetric anesthesiology practices [1-3]. Epidural blood patches are commonly indicated for the treatment of PDPH, particularly when conservative management (e.g., hydration, analgesics, and caffeine) fails, and the headache significantly impairs the patient's daily functioning. The procedure involves the injection of 7mL to 25mL of autologous blood into the epidural space to seal the dural hole and alleviate the headache [4].

Epidural blood patches (EBP) are often performed "blind" without the aid of imaging guidance. This procedure is conducted based on anatomic landmarks and clinician experience and typically has a success rate of around 69% for providing durable relief from severe headache symptoms [4].

Targeted or guided epidural blood patches use imaging techniques such as fluoroscopy or ultrasound to confirm the appropriate spread of contrast or blood injected into the epidural space over the area of cerebrospinal fluid (CSF) leak, typically corresponding to the spinal level where the neuraxial procedure was performed and offer a success rate as high as 87% [5,6]. Despite the increased precision of targeted EBP, there is limited discussion of the etiologies behind why targeted EBPs still fail, including the presence of anatomical landmarks.

## Case Presentation

A 36-year-old female, G4, P2, AB 2, experienced an uneventful normal vaginal delivery with epidural analgesia administered at the L2-L3 level, utilizing a 19-gauge catheter inserted through a 17-gauge Touhy needle. Several hours after discontinuation of epidural analgesia, she developed a severe positional headache consistent with PDPH. Neurological examination was otherwise grossly normal, with no visual changes, photophobia, tinnitus, or nuchal rigidity. Her headache persisted despite two days of conservative management with non-steroidal anti-inflammatory drugs and three liters of lactated ringers over a 24-hour period. The patient's consent was obtained for publication.

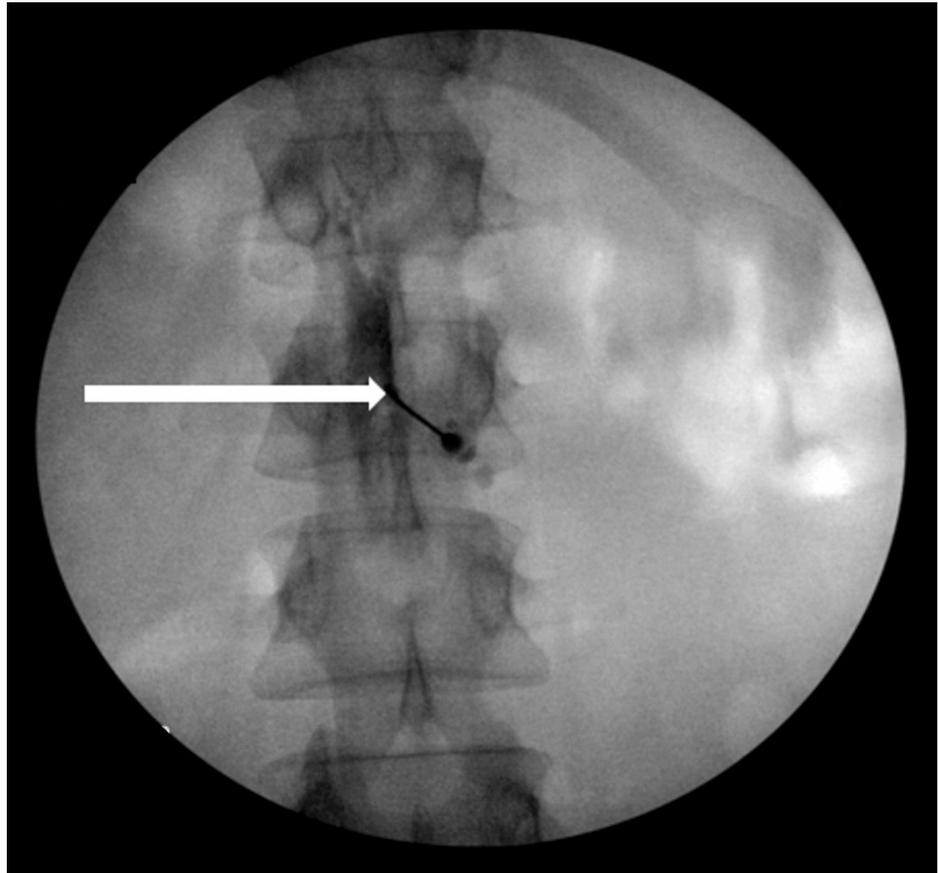
The first EBP was performed using fluoroscopic guidance at the level of L3-L4, with skin puncture sites providing guidance as to the level of CSF leakage. In the lateral fluoroscopic view, 0.5mL of Iopamidol M180 was injected to confirm entry into the epidural space. The bilateral spread could not be confirmed, as the anterior-posterior fluoroscopic view was not performed. 20mL of autologous blood was then injected, and the patient's headache immediately resolved. She was then discharged home.

The patient returned two days later, reporting recurrent headache symptoms identical to the initial

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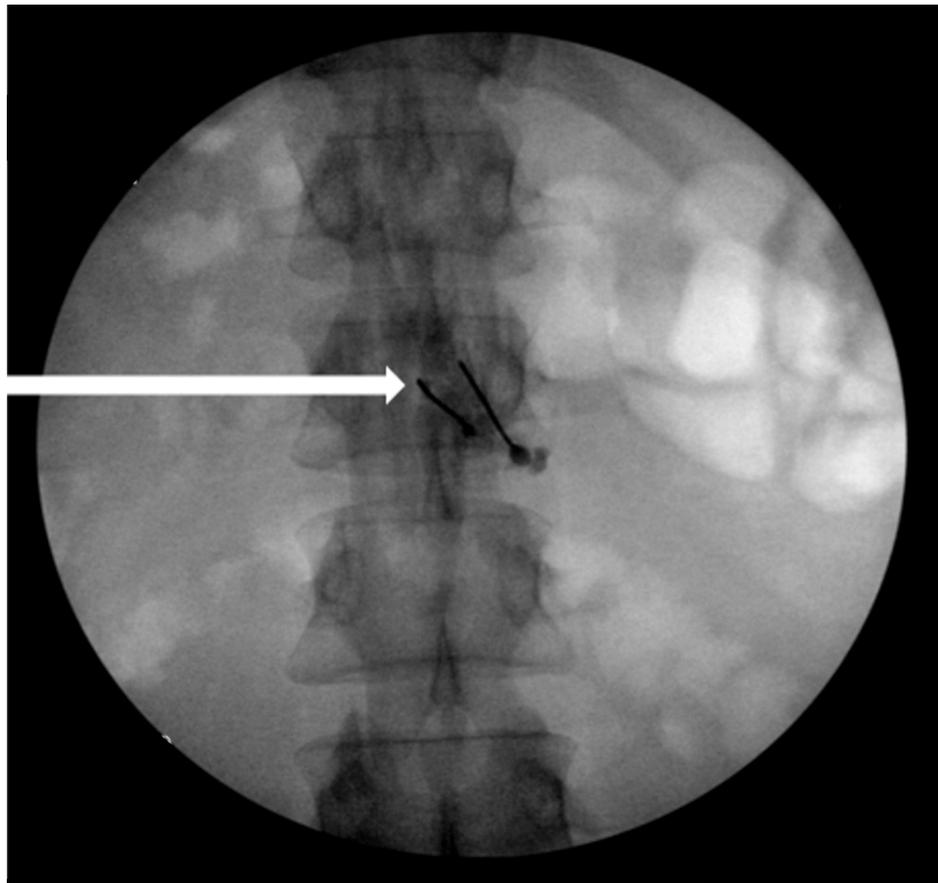
presentation. A second epidural blood patch was administered with a 20-gauge Touhy needle at the L2-L3 level using fluoroscopic guidance. Upon injection of 1cc of Iopamidol M180 contrast, it was noted that the patient had a plica mediana dorsalis (PMD) as the contrast flowed only to the left of the midline (Figure 1).



**FIGURE 1: AP view showing unilateral spread of contrast with linear flow obstruction at the midline**

AP - anterior-to-posterior

A second 20-gauge Touhy needle was then placed at the L2 lumbar level on the right side of the midline, and a repeat injection of 1mL of Iopamidol M180 contrast filled the deficit on the right side of the epidural space (Figure 2).



**FIGURE 2: Placement of two Touhy needles demonstrating bilateral contrast spread in epidural space**

10cc of autologous blood was injected through each needle. The patient was discharged without a headache, and she expressed satisfaction with no recurrence of headache symptoms or side effects during two years of follow-up.

## Discussion

The mechanism by which EBPs relieve PDPH symptoms is likely multifactorial [7-10]. In the initial hours after the procedure, the injected blood compresses the thecal sac, increasing intracranial pressure and causing reflex vasoconstriction. A sustained therapeutic response is believed to result from the formation of a blood clot at the site of the dural puncture, effectively sealing the tear or hole and allowing CSF pressure to normalize.

Blind EBPs are associated with relatively higher failure rates of 30% to 56% [5,11]. Targeted EBPs, guided with fluoroscopy and injection of contrast, have been shown to significantly improve efficacy, with success rates between 84.8 and 87% [5,6]. This improvement is attributed to epidural placement at the intended level with contrast spread in the epidural space. Additionally, fluoroscopic visualization of blood spread in the epidural space over the suspected dural puncture site, achieved by injecting a 4:1 mixture of autologous blood and contrast under fluoroscopic guidance, may further enhance the success rate [12]. Lastly, this case report highlights the importance of performing an anterior-posterior fluoroscopy view to confirm the bilateral spread of contrast.

This case highlights a rare finding wherein fluoroscopy and contrast injection were utilized to identify an intact PMD [13], which may have significantly contributed to the failure of the initial EBP to provide relief. It also emphasizes the importance of obtaining an anterior-posterior view to visualize the contrast spread within the epidural space, along with the necessity of injecting an adequate volume of contrast to further enhance the success rate of targeted EBPs. The use of fluoroscopic guidance facilitated the identification of a midline raphe that would have hindered the even distribution of the blood patch bilaterally in the epidural space. Consequently, it required the use of two different injection sites on both sides of the PMD to overcome this anatomical barrier. Limitations may include the possibility that the PMD may not have been the cause of failure of the first EBP, as the spread of blood can exhibit nonspecific variations between patients. However, this is unlikely, considering the unusually linear blockage of contrast spread.

## Conclusions

This case illustrates the value of fluoroscopy and contrast injection in identifying an intact PMD, which may have contributed to the failure of the initial epidural blood patch (EBP) to provide relief. Fluoroscopy helped reveal a midline raphe, likely caused by Hoffman's ligament, that impeded the even distribution of the blood patch. To overcome this barrier, two different injection sites were used on either side of the raphe. While the role of the PMD in the failure of the first EBP is uncertain, the findings emphasize the importance of contrast spread and fluoroscopic guidance for improving EBP success rates.

## Additional Information

### Author Contributions

All authors have reviewed the final version to be published and agreed to be accountable for all aspects of the work.

**Concept and design:** Steven Yap, Isaiah Florence, Ram Manchandani, Artem Babayan

**Drafting of the manuscript:** Steven Yap, Isaiah Florence, Ram Manchandani, Artem Babayan

**Critical review of the manuscript for important intellectual content:** Steven Yap, Isaiah Florence, Ram Manchandani, Artem Babayan

**Acquisition, analysis, or interpretation of data:** Isaiah Florence

### Disclosures

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