

VARIATION IN CONTRAST DISTRIBUTION ON EPIDUROGRAM FOLLOWING INTERLAMINAR EPIDURAL INJECTIONS IN TWO PATIENTS WITH PLICA MEDIANA DORSALIS: A CASE REPORT

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Background: Unilateral spread of local anesthetics has been reported in approximately 21% of epidural blocks. Plica mediana dorsalis (PMD) is a connective tissue structure that divides the epidural space along the dorsal midline. While unilateral blocks are the most common complication observed in these cases, there have been a few instances involving PMD where a bilateral distribution of the contrast and injectate was visualized under fluoroscopy.

Case Report: We present 2 cases involving PMD, each showing different contrast distributions upon epidurography.

Conclusions: PMD is a potential cause of unilateral epidural blocks. It could present as a complete or partial membrane, resulting in variations in contrast/local anesthetic distributions. Repositioning the needle and bilateral blocks help achieve the desirable outcome in patients with an intact membrane. In contrast, a thin PMD membrane could result in a partial rupture and the spread of the medications bilaterally.

Key words: Plica mediana dorsalis, PMD, unilateral epidural block

BACKGROUND

The epidural space consists of the dural sac, blood vessels, nerves, fat, and connective tissue. It is bounded by the fusion of the spinal and periosteal layers of the dura mater at the foramen magnum superiorly and the sacrococcygeal membrane inferiorly. Anteriorly, it is confined by the posterior longitudinal ligament, while posteriorly, it is limited by the ligamentum flavum, the capsules of the facet joints, and the laminae. The lateral walls are shaped by the pedicles and intervertebral foramina (1).

The plica mediana dorsalis (PMD) is a connective tissue structure that divides the epidural space at the dorsal midline, which Luyendijk (2) initially described in 1963. Although the role of this membrane in unilateral anesthesia has been debatable, a few case reports (3,4) have described unilateral anesthesia in patients with PMD. Patients with unequal spread of the anesthetic

may experience heaviness and numbness on one side and an incomplete block on the other side, or even the absence of a sensory block, which can be detected by performing sensory testing (4).

This case report presents 2 instances of interlaminar lumbar epidural blockades demonstrating different patterns of contrast spread across the PMD.

Methodology

Sources were identified in PubMed without any date restrictions using keywords, including plica mediana dorsalis, PMD, and unilateral epidural block, without any date or language restrictions. The search was completed by 3 reviewers. Studies that included background information about the effect of PMD on epidural blocks were reviewed.

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CASE PRESENTATION

Patient 1

A 59-year-old woman with lumbar radiculopathy presented for an L5-S1 epidural steroid injection. The lumbar spine magnetic resonance imaging (MRI) indicated a focal left subarticular disc extrusion at L4-L5, which was compressing the left L5 nerve root and the subarticular recess, resulting in mild-to-moderate progressive spinal stenosis.

After obtaining consent, the patient was positioned prone on the fluoroscopy table. The skin entry point for accessing the L5-S1 epidural space was marked. Following thorough preparation with chlorhexidine and draping, 1% lidocaine was infiltrated into the skin and subcutaneous tissues at the entry point.

An 18G Tuohy needle was then placed and advanced into the L5-S1 epidural space under fluoroscopic guidance using the loss-of-resistance technique. The placement and depth of the needle tip were confirmed with fluoroscopy. There was no paresthesia or return of blood or cerebrospinal fluid through the needle.

Two milliliters of Omnipaque 240 contrast agent was injected, resulting in spread to the left and extraforaminal regions at this level, as observed on the anteroposterior (AP) and lateral views (Figs. 1 and 2). A band-like hypolucency was noted on the AP image (Fig. 1). The needle was then retracted and repositioned to

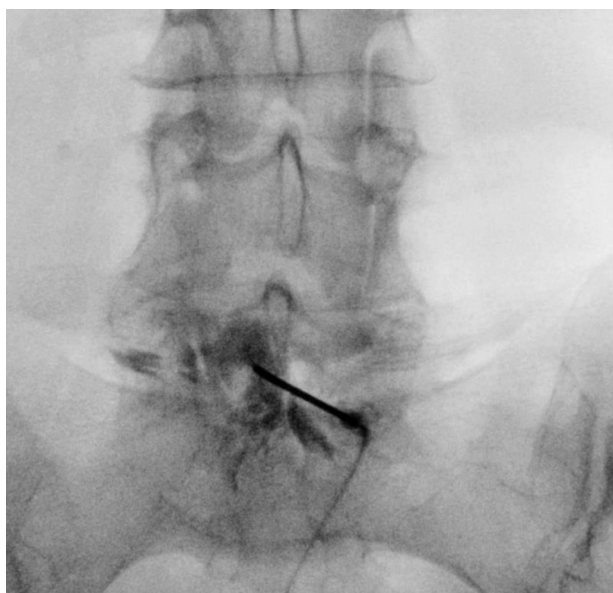


Fig. 1. A band-like hypolucency with unilateral spread of the contrast on the anteroposterior view.

the right before advancing to the ligamentum flavum. A clear loss of resistance to saline was achieved to the right of the midline, and 2 mL of contrast revealed bilateral spread (Fig. 3).

Patient 2

A 52-year-old female patient with lumbar radiculopathy presented for an L4-L5 epidural steroid injection. The lumbar MRI revealed a small broad-based disc osteophyte complex at the L4-L5 level, but no associated spinal canal or foraminal stenosis was noted.

After obtaining consent, the patient was positioned prone on the fluoroscopy table. The entry point for accessing the L4-L5 epidural space for the injection was marked. Following thorough preparation of the skin with chlorhexidine and draping, 1% lidocaine was infiltrated at the entry point and subcutaneous tissues.

An 18G Tuohy needle was then placed and advanced into the L4-L5 epidural space using fluoroscopic guidance and the loss-of-resistance technique. The needle tip placement and depth were verified using fluoroscopy. Two milliliters of Omnipaque 240 contrast agent was injected, and a clear epidural spread was confirmed with fluoroscopy on the AP and lateral views (Figs. 4 and 5). The AP epidurogram view indicated a hypoluculent membrane in the epidural space, which appeared to be the PMD (Fig. 4).

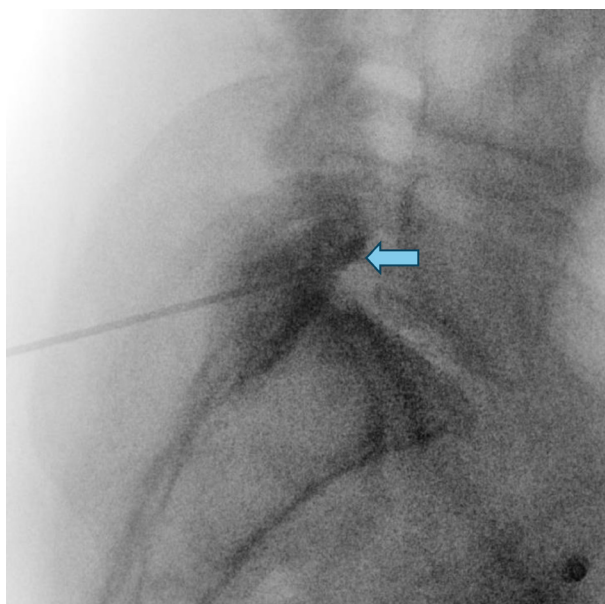


Fig. 2. Contrast spread on the lateral view.

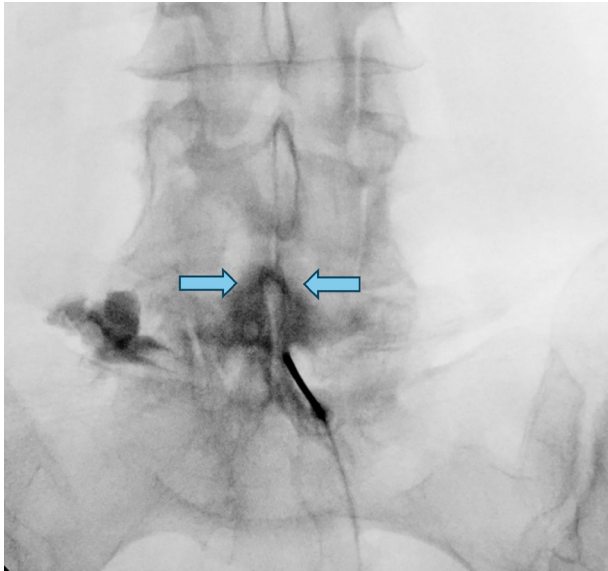


Fig. 3. Bilateral spread of the contrast after needle adjustment on the anteroposterior view.

DISCUSSION

The distribution of sensory blockade after a local anesthetic injection can differ significantly between patients, and the factors influencing this variation remain a topic of debate. A 2008 study (10) identified the total volume of anesthetic used as the most critical factor in determining the extent of sensory, sympathetic, and motor nerve blockade. Furthermore, the positioning of the epidural needle or catheter plays a role in how the blockade spreads relative to the injection site (10).

Unilateral spread of local anesthetics has been reported in about 21% of epidural blocks (4). Several possible causes for unilateral epidural anesthesia have been proposed, including the insertion of the catheter into the intervertebral foramen, slow injection of small volumes in the lateral decubitus position, congenital malformations, adhesion bands from previous surgeries, blood patches or trauma, improper placement of the catheter tip into the ventral epidural space, and the presence of a PMD (9). Ventral and dorsolateral aspects of the dural sac expand following the epidural injection. As a result, the sac takes on a triangular cross-section due to the dorsomedian membrane (5). In a 1997 case report, Fukushima et al (5) described a 33-year-old man treated with 3 rounds of epidural blocks at the L5-S1 level. The unilateral block was confirmed using the cold and pinprick tests. Although lumbar MRI and radiography were inconclusive, computed tomography

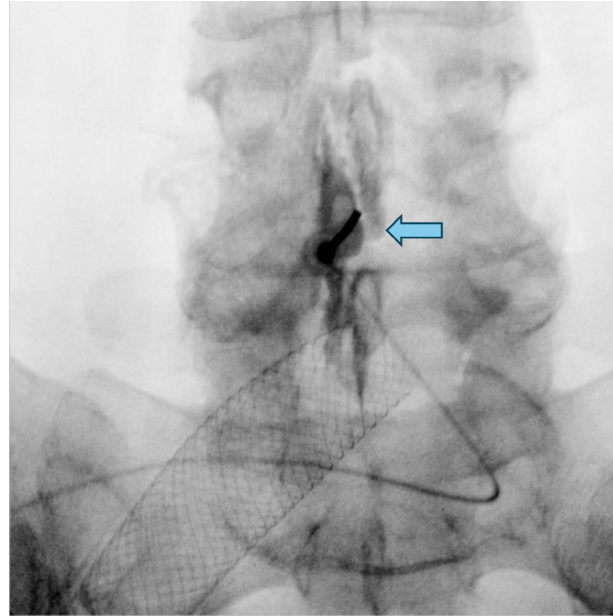


Fig. 4. A hypolucent membrane with unilateral spread of the contrast on the anteroposterior view.

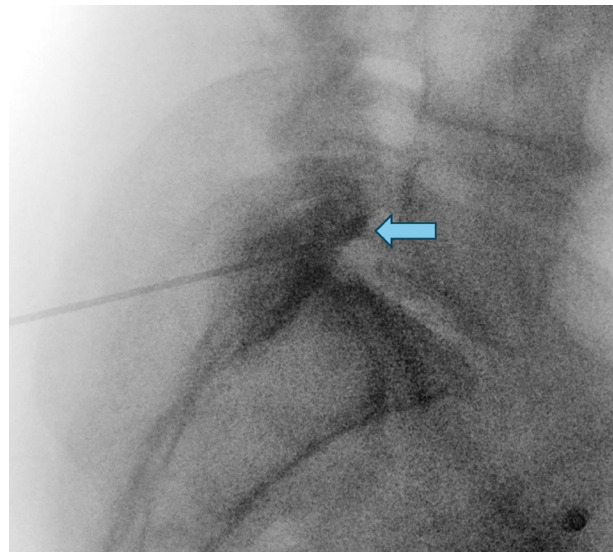


Fig. 5. Contrast spread on the lateral view.

epidurography disclosed the spread of the contrast to the left posterior part of the epidural space. The authors concluded that the presence of PMD and the deformation of the dural sac after epidural injection resulted in the unilateral epidural block (5).

In another case report published in 2016, Ginosar et al (6) reported a case of unilateral epidural anesthesia

due to the PMD. Conversely, Stevens et al (7), in 2006, presented a 47-year-old man who underwent a left-sided L5-S1 interlaminar epidural steroid injection. An epidurogram following the injection of 2 mL Omnipaque 240 contrast was performed to verify the needle position, which outlined a linear contrast void in the sagittal midline. Based on the anatomical position and appearance of the structure, the authors related the appearance to the PMD (7).

Interestingly, the contrast flow was seen on both sides of the PMD. This result was in accordance with our findings on our second patient, which, despite the appearance of a midline layer, the contrast spilled over on both sides. Although PMD is believed to divide the posterior part of the epidural space into 2 spaces, this layer could be incomplete, resulting in spreading the contrast into both sides. Furthermore, the membrane's thickness could play a role in the distribution of the contrast and local anesthetic (4,9).

The autopsy results of the epiduroscopy on 48 cases (8), in 1986, confirmed a connective tissue band in the epidural space, splitting it into 2 sides posteriorly. The band's appearance varied from strands of connective

tissue to a complete membrane (8). On the other hand, a thin PMD membrane could also result in a partial rupture and the spread of the medications bilaterally (9).

The uneven spread of the contrast in our first case was most likely secondary to an intact plica membrane, causing the flow of the contrast to the left. The catheter had to be pulled back and repositioned before advancing further to the right. However, the normal distribution of the contrast despite the visualization of a presumed plica membrane on the epidurogram could be due to an incomplete or thin PMD (9).

CONCLUSIONS

PMD is considered a potential cause of unilateral epidural blocks. It could present as a complete or partial membrane, resulting in variations in contrast/local anesthetic distribution. Repositioning the needle and bilateral blocks on both sides of the membrane help achieve the desirable outcome in patients with an intact membrane. However, this may not be true in all cases with PMD since patients with thin or partial membranes may achieve the normal contrast/local anesthetic spread with a single injection.

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