

A case report of ventral dural puncture: a potential cause of failed epidural blood patch

RD Chung², J Leou¹, J Griffiths¹, PCF Tan¹

1. The Royal Women’s Hospital, 20 Flemington Road, Parkville, VIC 3050
2. Austin Health, 145 Studley Road, Heidelberg, VIC 3084

Introduction

Post-dural puncture headache (PDPH) is one of the most common complications of neuraxial anaesthesia. In the obstetric population, it can be particularly debilitating as it may affect the mother’s ability to breastfeed, interact, and care for her newborn. An epidural blood patch (EBP) is used to treat PDPHs that have failed to resolve with conservative management.¹ There is low evidence for the number of EBPs that should be trialed to treat a PDPH, the level or position at which to attempt the EBP, or the volume of blood that should be injected. Current evidence suggest that the success rates of one EBP may vary between 60-98% and is generally higher post the second EBP.² It is still unclear as to the causes of a failed EBP. We present a case of PDPH with imaging demonstrating evidence of a ventral CSF leak which required three EBPs for effective symptom management.

Case Presentation

A 35-year-old pregnant primigravida female had an epidural sited for labour analgesia 8 hours after artificial rupture of membranes and commencement of syntocinon. The epidural was sited in the sitting position with a 18G Braun Perifix Complete Set, and described as difficult by the proceduralist. An initial attempt was made at L3-L4 interspinous level to a depth of 7 centimeters (cm) without loss of resistance (LOR) or contact with bone. The attempt was aborted and the Tuohy needle removed and flushed with 0.9% sodium chloride which revealed a blood clot lodged within the needle. A second attempt was made at the L2-3 interspinous space with LOR to saline at 4cm. The epidural catheter was inserted without further complication and the patient received good analgesia throughout her labour. However, day 1 post-partum, patient developed PDPH.

Summary of events post-partum

- Day 1: PDPH symptoms begin, conservatively managed
- Day 4: 1st EBP, unsuccessful.
- Day 5: 2nd EBP unsuccessful. CT Brain showed evidence of craniospinal hypotension. Neurology consulted, patient commenced on caffeine and MRI Spine recommended.
- Day 7 : MRI spine shows CSF leak into anterior extradural space (Fig 1 and 2). Neurosurgery consulted, recommended another attempt at EBP otherwise would be for consideration of surgical intervention.
- 3rd EBP successful.

Table 1: Characteristics of each EBP

Patch No.	Day	Position	Level	LOR to saline at (cm)	Volume of blood injected (mL)
1	4	Lateral	L3/4	4	26
2	5	Lateral	L3/4	4.5	31
3	7	Sitting	L2/3	4.5	25



Figure 1: T2-weighted MRI of the lumbosacral spine, sagittal section, showing CSF collection anterior to the dura (white arrow) that tracts cephalad towards the thoracic spine.

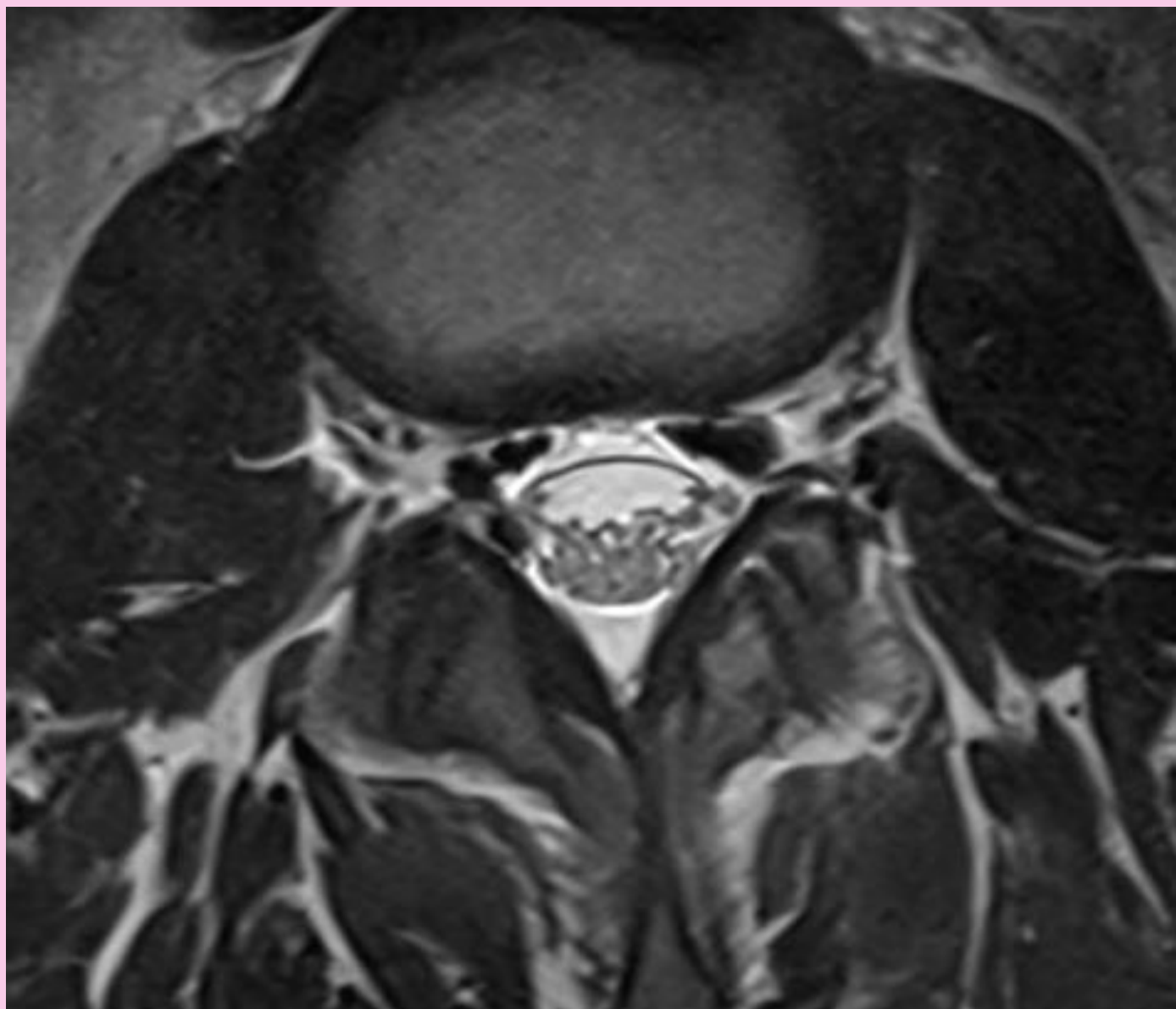


Figure 2: T2-weighted axial image at L2 level showing the "floating dural sac" sign, indicative of ongoing CSF leak.

Discussion

To our knowledge this is the first case report that shows a ventral CSF collection post-dural puncture for epidural analgesia. Whilst a discreet dural tear could not be appreciated on the MRI, there was evidence of a large ventral collection of CSF outside the dura, spanning more than five vertebral levels.

Given the initial pass of the Tuohy needle to 7 cm was much deeper than the subsequent successful punctures, we hypothesize that there may have been two dural punctures, one on the dorsal surface and another on the ventral surface of her dural sac. This may explain why there was no resolution of symptoms after two EBPs.

Theoretically, blood administered via a Tuohy needle into the posterior epidural space should spread anteriorly given the epidural space is continuous. However, it is unknown what volumes of blood and what level should be targeted if there is a ventral dural puncture. The third epidural blood patch alleviated symptoms and this may have been due to the cumulative large volume of blood injected into the epidural space (total 82ml in the span of 5 days), with that being enough to allow spread of the blood anteriorly.

The entry point for the needle may also play a part in the success of the EBP. Usually this is determined by the known or assumed location of the dural tear. The third EBP was at a higher level than previous attempts. Previous studies have shown that cephalad spread of the EBP is more extensive than caudal spread^{3,4}, but perhaps for ventral dural punctures, access to the epidural space should be at the level of the puncture site, as it possibly may aide with spread anteriorly.

MRI studies have demonstrated cephalad spread of epidural fluid to similar extents in both sitting and lateral positions^{6,7}. Thus, the position change for the 3rd EBP is unlikely to have contributed to the success of the EBP.

Finally, CT-guided epidural blood patches by radiologists have been used in patients with spontaneous intracranial hypotension and in patients who had more than two failed EBP.^{4,5} Hence, it may be that for proven anterior dural punctures, a referral for CT guided epidural blood patch may be prudent.

Learning points

- Ventral dural puncture is possible, especially in the case of an unrecognised “through and through” puncture, and hence could be suspected if the first two EBPs are unsuccessful.
- MRI is clinically indicated if the headache persists.
- Consider a third EBP or referral to radiology for a CT guided EBP or a neurosurgical consult for consideration of a surgical repair.

References

1. Patel R, et al. A Comprehensive Update on the Treatment and Management of Postdural Puncture Headache. Curr Pain Headache Rep. 2020 Apr 22;24(6):24.

2. Turnbull DK, Shepherd DB. Post-dural puncture headache: pathogenesis, prevention and treatment. Br J Anaesth. 2003 Nov;91(5):718-29.

3. Chhabra A, et al. Spinal epidural space: Anatomy, normal variations and pathological lesions on MR Imaging. *Neurographics*. Volume 2005 (Issue 1:26):1–13.

4. D’souza G, Seidel FG, Krane EJ. Management of a Ventral Cerebrospinal Fluid Leak With a Lumbar Transforaminal Epidural Blood Patch in a Child With Persistent Postdural Puncture Headache: A Case Report. Reg Anesth Pain Med. 2017 Mar/Apr;42(2):263-266.

5. Ho KY, Gan TJ. (2007), Management of persistent post-dural puncture headache after repeated epidural blood patch. Acta Anaesthesiologica Scandinavica, 51: 633-636.

6. Giess R, Landwehr P, Heidenreich F. MRI after thoracic epidural blood patch. Neurology Nov 2003, 61 (10) 1449

7. Vakharia SB, et al. Magnetic resonance imaging of cerebrospinal fluid leak and tamponade effect of blood patch in postdural puncture headache. Anesth Analg. 1997 Mar;84(3):585-90.