Jurnal Ventilator: Jurnal riset ilmu kesehatan dan Keperawatan
Volume 4, Nomor 1, Maret 2026
e-ISSN: 2986-7088; p-ISSN: 2986-786X, Hal. 405-414
DOI: https://doi.org/10.59680/ventilator.v4i1.2495
Tersedia: https://jurnal.stikeskesdam4dip.ac.id/index.php/Ventilator

Epidural Blood Patch for Severe Post-Dural Puncture Headache in a Hypertensive Patient Following Spinal Anesthesia: A Case Report

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Abstract. Post-dural puncture headache (PDPH) is a frequent complication following neuraxial anesthesia, resulting from cerebrospinal fluid (CSF) leakage and intracranial hypotension. Although typically self-limiting, severe PDPH can significantly impair patient function and delay recovery. Epidural blood patch (EBP) is considered the gold standard treatment for refractory cases; however, optimal volume and clinical considerations in patients with comorbidities such as hypertension remain underreported. We report a 45-year-old female with a history of hypertension who developed severe PDPH following spinal anesthesia for lymphadenectomy. The procedure required multiple attempts using a 25G Quincke needle. Within hours postoperatively, the patient experienced a classic orthostatic headache accompanied by photophobia, nausea, and inability to tolerate an upright position. Conservative management failed to provide improvement after 48 hours. An epidural blood patch using 10 mL of autologous blood was subsequently performed, resulting in rapid and significant symptom relief within one hour, followed by progressive clinical recovery over the next two days. This case highlights the importance of early recognition and timely intervention in PDPH, particularly in patients with overlapping symptoms such as hypertension. Notably, a lower-volume EBP (10 mL) demonstrated effective clinical outcomes, suggesting that individualized approaches may be sufficient in selected patients. Epidural blood patch remains a safe and effective definitive treatment for refractory PDPH.

Keywords*:* Cerebrospinal Fluid; Epidural Blood Patch; Hypertension; Post-Dural Puncture Headache; Spinal Snesthesia.

1. INTRODUCTION

Post-dural puncture headache (PDPH) is a well-recognized complication following neuraxial anesthesia, particularly spinal anesthesia, and results from cerebrospinal fluid (CSF) leakage through a dural defect. The subsequent reduction in CSF volume leads to intracranial hypotension and traction on pain-sensitive structures, producing a characteristic orthostatic headache that worsens in the upright position and improves when supine. Associated symptoms may include nausea, photophobia, dizziness, neck stiffness, and visual disturbances (Kwak, 2017; Kuczkowski, 2020).

The incidence and severity of PDPH are influenced by multiple factors, including patient-related and procedural variables. Established risk factors include female sex, younger age, low body mass index, and pregnancy. Procedural factors such as needle size, needle type, and the number of puncture attempts play a critical role. In particular, cutting needles such as Quincke needles are associated with a higher risk of PDPH due to the larger dural defect created, and repeated attempts further increase the likelihood of persistent CSF leakage (Apfel et al., 2010; Uppal et al., 2021).

Naskah Masuk: 18 Januari 2026; Revisi: 20 Februari 2026; Diterima: 24 Maret 2026; Terbit: 31 Maret 2026

Initial management of PDPH is typically conservative, consisting of bed rest, adequate hydration, analgesics, and caffeine. However, in patients who fail to respond within 24–48 hours or experience severe functional limitation, epidural blood patch (EBP) is considered the gold standard treatment. EBP acts by sealing the dural defect and restoring intracranial pressure, resulting in rapid symptom relief in most cases (Boonmak & Boonmak, 2010; Uppal et al., 2021).

Despite its established efficacy, several clinical aspects of PDPH management remain underreported. In particular, the presentation of PDPH in patients with comorbid conditions such as hypertension may pose diagnostic challenges, as headache is a common symptom in both conditions. Furthermore, although a blood volume of 15–20 mL is commonly recommended for EBP, the effectiveness of lower volumes in real-world clinical settings has not been extensively discussed (Patel et al., 2020). This case report aims to highlight the clinical presentation and management of severe PDPH in a hypertensive patient following spinal anesthesia and to demonstrate the effectiveness of a low-volume epidural blood patch in achieving significant symptom resolution.

2. THEORETICAL REVIEW

Post-dural puncture headache (PDPH) is a well-recognized complication of neuraxial anesthesia, particularly spinal anesthesia. It results from cerebrospinal fluid (CSF) leakage through a dural defect, leading to a reduction in CSF volume and intracranial hypotension. This causes traction on pain-sensitive intracranial structures, including the dura mater and bridging veins, producing the characteristic orthostatic headache that worsens in the upright position and improves when supine. Associated symptoms may include nausea, photophobia, dizziness, neck stiffness, and visual disturbances (Kwak, 2017; Turnbull and Shepherd, 2003). This pathophysiological mechanism is consistent with the Monro–Kellie doctrine, which describes the dynamic equilibrium among intracranial components (Uppal et al., 2021).

The incidence and severity of PDPH are influenced by both patient-related and procedural factors. Established patient-related risk factors include female sex, younger age, low body mass index, and pregnancy. Procedural factors, particularly needle size, needle type, and the number of puncture attempts, play a critical role. Cutting-type needles such as the Quincke needle are associated with a higher risk of PDPH due to the larger dural defect created compared to pencil-point needles, while repeated puncture attempts further increase the likelihood of persistent CSF leakage (Apfel et al., 2010; Katz, Beilin and Cohen, 2010).

The diagnosis of PDPH is primarily clinical, based on the criteria set forth in the *International Classification of Headache Disorders*, 3rd edition (ICHD-3), which requires the development of an orthostatic headache within five days of dural puncture that improves in the recumbent position and is not better accounted for by another diagnosis. The presence of comorbid hypertension may complicate the differential diagnosis, as headache is also a common symptom of hypertensive conditions. Therefore, careful clinical evaluation of the positional characteristics of the headache, hemodynamic stability, and the absence of signs of hypertensive emergency is essential (Headache Classification Committee of the International Headache Society, 2018).

Initial management of PDPH is generally conservative, consisting of bed rest, adequate hydration, analgesics, and caffeine. When symptoms fail to resolve within 24–48 hours or result in significant functional limitation, epidural blood patch (EBP) is considered the gold standard treatment. EBP works by injecting autologous blood into the epidural space, forming a clot that seals the dural defect, reduces CSF leakage, and restores intracranial pressure (Boonmak and Boonmak, 2010). EBP has a reported success rate of approximately 70–90%, with symptom improvement typically observed within 24–48 hours following the procedure (Boonmak and Boonmak, 2010; Uppal et al., 2021).

Despite the well-established efficacy of EBP, several clinical aspects remain underreported in the literature. While a blood volume of 15–20 mL is commonly recommended, the effectiveness of lower volumes in real-world clinical practice has not been extensively evaluated. Furthermore, clinical considerations for EBP in patients with comorbidities such as hypertension are rarely discussed (Patel et al., 2020). These evidence gaps provide the rationale and foundation for the present case report.

3. RESEARCH METHOD

This study employed a descriptive case report design. The subject was a 45-year-old female with ASA physical status II and a history of untreated hypertension, who underwent lymphadenectomy under spinal anesthesia at dr. Soediran Mangun Sumarso Regional General Hospital, Wonogiri, Indonesia, and subsequently developed severe PDPH in the postoperative period. Data were collected through the patient's medical records, direct clinical observation throughout the hospitalization period, and procedural documentation of the EBP intervention. Headache severity was assessed serially using the Visual Analogue Scale (VAS), scored from 0 (no pain) to 10 (worst imaginable pain). The diagnosis of PDPH was established based on ICHD-3 clinical criteria, with particular attention to the orthostatic nature of the headache,

associated symptoms, and hemodynamic stability to exclude hypertensive emergency as a differential diagnosis.

The patient's clinical course was analyzed using a descriptive-narrative approach and presented chronologically. Clinical findings were compared with evidence from relevant scientific literature retrieved from PubMed and Google Scholar using the search terms *post-dural puncture headache*, *epidural blood patch*, *spinal anesthesia*, and *hypertension*, as well as standard anesthesiology reference texts. This case report was prepared in accordance with the ethical principles of medical research, including the anonymization of patient-identifying information to protect confidentiality.

4. RESULTS AND DISCUSSION

Case Description

A 45-year-old female (ASA II) with a history of untreated hypertension underwent lymphadenectomy under spinal anesthesia. Preoperative evaluation revealed no neurological deficits, and baseline hemodynamic status was stable, with blood pressure measurements ranging between approximately 130–150/80–95 mmHg throughout hospitalization, without evidence of hypertensive crisis. Spinal anesthesia was performed at the L4–L5 interspace using a 25G Quincke (cutting-type) needle. The procedure required four attempts before successful entry into the subarachnoid space was achieved. No immediate intraoperative complications were reported, and the patient remained hemodynamically stable throughout the surgery.

Within several hours postoperatively, after transfer to the ward, the patient developed a severe bilateral headache accompanied by dizziness. The headache was clearly orthostatic in nature, worsening when sitting or standing and improving when lying supine. Initial management included analgesics (metamizole/antalgin) and routine postoperative therapy; however, symptoms progressively worsened. On postoperative day one, the patient reported persistent headache (VAS 6), nausea, insomnia, and a sensation of heaviness in the head. No focal neurological deficits or altered level of consciousness were observed. Conservative management was continued but failed to provide significant relief.

On postoperative day two, the headache intensified (VAS 8), accompanied by photophobia, inability to open her eyes, and intolerance to upright positioning. The patient was unable to sit or stand for more than a few minutes. Escalated therapy was initiated, including intravenous metamizole, caffeine, ondansetron, and betahistine, but symptoms remained refractory. By postoperative day three, the patient experienced worsening symptoms, including severe orthostatic headache, visual darkening, and marked limitation in mobility. Given the

persistence of symptoms despite more than 48 hours of conservative management, a diagnosis of severe post-dural puncture headache (PDPH) was established, supported by the characteristic orthostatic nature of the pain and the absence of signs suggestive of hypertensive emergency, and an epidural blood patch (EBP) was planned.

The EBP procedure was performed under sterile conditions in the operating room. A total of 10 mL of autologous blood was obtained from the brachial vein and injected into the epidural space in two divided doses of 5 mL. Immediately after the procedure, the patient reported significant improvement, including the ability to open her eyes and reduced headache intensity. On the first day after EBP, residual symptoms persisted but were significantly milder and occurred only after maintaining a sitting position for 5–10 minutes. By the second day after EBP, headache intensity further decreased (VAS 3), photophobia resolved, and symptoms were only triggered by prolonged standing.

Table 1. Clinical timeline and management of the patient.

Day	Clinical Findings	VAS	Trigger	Management
Post-op (2–3 hours)	Headache, dizziness	4	Sitting (5 min)	Asering 20 tpm Antalgine 500mg/12 jam Cefixime 2 x 100 mg
Day 1	Headache, nausea, insomnia	6	Sitting	Asering 20 tpm Antalgine 500mg/12 jam Cefixime 2 x 100 mg
Day 2	Severe headache, photophobia	8	Minimal activity	Asering 20 tpm Antalgine 500mg/12 jam Cefixime 2 x 100 mg
Day 3 (pre-EBP)	Severe orthostatic headache, visual disturbance	8	Standing	Planned EBP Asering 20 tpm Metamizol 1gr/8 jam Metoclopramide 10 mg / 8 jam Omeprazole 40mg/24 jam Caffein 3 x 50 mg Cefixime 2x100 mg Sucralfat 3 x 2 cth Curcuma 2 x 1 tab Vit B complex 1 x 1 tab
Day 3 (post-EBP)	Improved symptoms	6	Sitting (5 min)	Post-EBP care Asering 20 tpm Metamizol 1gr/8 jam Metoclopramide 10 mg / 8 jam Omeprazole 40mg/24 jam Caffein 3 x 50 mg Cefixime 2x100 mg Sucralfat 3 x 2 cth Curcuma 2 x 1 tab

				Vit B complex 1 x 1 tab
Day 4	Mild headache	3	Prolonged standing	Supportive therapy Paracetamol 3x1 gram PO Caffein 3x50 mg PO Dexamethason 3x0.5 mg PO Omeprazol 2x20 mg PO Metoclopramid 3x10 mg PO jika mual Caviplex 1x1 tablet PO

Figure 1. Epidural catheter used for the Epidural Blood Patch (EBP) procedure.

Figure 2. Epidural Blood Patch (EBP) procedure.

Given the marked clinical improvement and restoration of functional capacity, the patient was discharged in stable condition with instructions for outpatient follow-up. No immediate complications such as back pain, neurological deficits, or signs of infection were observed following the procedure. No recurrence of symptoms was reported during short-term follow-up.

Discussion

Post-dural puncture headache (PDPH) is a well-recognized complication following neuraxial procedures and is primarily caused by cerebrospinal fluid (CSF) leakage through a dural defect. The resulting decrease in CSF volume leads to intracranial hypotension and traction on pain-sensitive structures, including the dura mater and bridging veins, producing the characteristic orthostatic headache. This mechanism is consistent with the Monro–Kellie doctrine, which describes the dynamic balance between intracranial components (Uppal et al., 2021; Patel et al., 2020).

In the present case, several procedural factors likely contributed to the development of PDPH. The use of a cutting-type needle (Quincke) and multiple puncture attempts (four attempts) are well-established risk factors associated with increased incidence of PDPH due to larger dural defects and persistent CSF leakage (Katz, Beilin and Cohen, 2010; Uppal et al., 2021). Although patient-related factors such as low body mass index are commonly implicated, this case highlights that procedural factors may play a more dominant role, even in patients without classical risk profiles.

The diagnosis of PDPH in this patient was primarily clinical and supported by the typical orthostatic nature of the headache, associated symptoms (photophobia, nausea), and temporal relationship with spinal anesthesia. Notably, the presence of hypertension posed a potential diagnostic challenge, as headache is also a common symptom in hypertensive patients. However, the absence of neurological deficits, stable hemodynamic parameters, and the clear positional component of the pain strongly supported PDPH as the primary diagnosis (Headache Classification Committee of the International Headache Society, 2018).

Initial management of PDPH is generally conservative, including bed rest, hydration, analgesics, and caffeine. However, in cases that do not respond within 24–48 hours, epidural blood patch (EBP) is considered the gold standard treatment (Uppal et al., 2021). EBP acts by creating a mass effect within the epidural space and forming a clot that seals the dural defect, thereby reducing CSF leakage and restoring intracranial pressure (Patel et al., 2020).

Epidural blood patch has a reported success rate of approximately 70–90% (Boonmak and Boonmak, 2010; Uppal et al., 2021; Patel et al., 2020), with rapid symptom improvement typically observed within 24–48 hours (Boonmak and Boonmak, 2010; Uppal et al., 2021). In this case, a relatively low volume of autologous blood (10 mL) was used, compared to the commonly recommended volume of 15–20 mL. Despite this, the patient demonstrated rapid and sustained clinical improvement, with significant symptom relief within one hour and progressive recovery over the following days. This finding suggests that lower volumes of EBP

may still be effective in selected patients, particularly when guided by clinical response and patient tolerance (Patel et al., 2020).

The rapid clinical response following EBP in this case further supports its dual diagnostic and therapeutic role in PDPH. Additionally, no complications were observed, reinforcing the safety profile of EBP when performed under appropriate sterile conditions and clinical indications (Uppal et al., 2021). This case has several limitations. Objective measurement of CSF pressure and neuroimaging were not performed. However, the clinical presentation and characteristic response to EBP strongly support the diagnosis of PDPH. Further studies are required to determine the optimal volume of epidural blood patch across different clinical settings and patient populations, particularly to evaluate the effectiveness of lower-volume approaches.

5. CONCLUSION

Post-dural puncture headache (PDPH) should be promptly recognized in patients presenting with orthostatic headache following neuraxial anesthesia, even in the presence of comorbid conditions such as hypertension that may obscure the diagnosis. This case highlights the significant role of procedural factors, including the use of a cutting-type needle and multiple puncture attempts, in the development of PDPH.

Epidural blood patch (EBP) remains the definitive treatment for PDPH refractory to conservative management. Notably, this case demonstrates that a lower volume of autologous blood (10 mL) can still provide rapid and sustained clinical improvement, suggesting that individualized approaches based on patient response may be sufficient in selected cases. Early diagnosis and timely intervention are essential to reduce patient morbidity and improve functional recovery.

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