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RESPONSIBLE EDITORS FOR THIS ISSUE
Production Editor: Jia-Hui Li; Production Department Director: Yu-Jie Ma; Editorial Office Director: Jin-Lei Wang.
Epidural analgesia followed by epidural hydroxyethyl starch prevented post-dural puncture headache: Twenty case reports and a review of the literature

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Author contributions: Song LL collected patient data and wrote the manuscript; Zhou Y contributed in writing the manuscript; Geng ZY contributed in revising the manuscript; all authors read and approved the final manuscript.

Informed consent statement: Informed written consent was obtained from the patients for publication of this report.

Conflict-of-interest statement: The authors declare that they have no conflict of interest.

CARE Checklist (2016) statement: The authors have read the CARE Checklist (2016), and the manuscript was prepared and revised according to the CARE Checklist (2016).

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Abstract

BACKGROUND
Accidental dural puncture (ADP) and subsequent post-dural puncture headache (PDPH) remain common complications of epidural procedures for obstetric anesthesia and analgesia. No clear consensus exists on the best way to prevent PDPH after ADP.

CASE SUMMARY
We report our findings in twenty parturients who underwent an incorporated strategy of epidural analgesia followed by epidural hydroxyethyl starch (HES) to prevent PDPH after ADP with a 16-gauge Tuohy needle during epidural procedures. ADP with a 16-gauge Tuohy needle occurred in nine parturients undergoing a cesarean section (CS) and in eleven parturients receiving labor analgesia. An epidural catheter was re-sited at the same or adjacent intervertebral space in all patients. After CS, the epidural catheter was used for postoperative pain relief over a 48-h period. After delivery in eleven cases, epidural infusion was maintained for 24 h. Thereafter, 15 mL of 6% HES 130/0.4 was administered via the epidural catheter immediately prior to catheter removal. None of the parturients developed PDPH or neurologic deficits over a follow-up period of at least two months to up to one year postpartum.

CONCLUSION
An incorporated strategy of epidural analgesia followed by epidural hydroxyethyl starch may have great efficacy in preventing PDPH after ADP.

Key Words: Epidural analgesia; Hydroxyethyl starch; Accidental dural puncture; Post-dural puncture headache; Prophylaxis; Case report

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Epidural analgesia and HES prevented PDPH

Core Tip: Accidental dural puncture (ADP) with a 16-gauge Tuohy needle occurred in nine parturients undergoing cesarean section (CS) and eleven parturients receiving labor analgesia. Through a re-sited epidural catheter, epidural analgesia was maintained at a rate of 4-5 mL/h over 48 h after CS or 24 h after labor. 15 mL of hydroxyethyl starch was administered via the epidural catheter prior to catheter removal. None of these parturients reported headache or any neurologic deficits postpartum. The incorporated strategy demonstrated great efficacy in preventing post-dural puncture headache after ADP in our case series.

INTRODUCTION

Accidental dural puncture (ADP) and subsequent post-dural puncture headache (PDPH) remain common complications of epidural procedures for obstetric anesthesia and analgesia. After ADP with a 16-gauge epidural needle, approximately 76%-85% of women may develop PDPH[1]. The headache can be extremely severe and can inhibit ambulation and the ability of a mother to care for herself or the newborn during the postpartum period. In addition, PDPH may substantially increase postpartum risks of severe morbidities including chronic headache, subdural hematoma, and cerebral thrombosis[2-5]. Expectant management of PDPH inevitably extends hospital length of stay. There is no universally established consensus on the most feasible way to prevent PDPH after ADP. We report our findings in twenty parturients who underwent an incorporated strategy of continuous epidural analgesia followed by epidural hydroxyethyl starch (HES) to prevent PDPH after ADP with a 16-gauge Tuohy needle during epidural procedures. The purpose of this study was to present our experience on the use of this incorporated prophylactic strategy for PDPH after ADP.

This retrospective study was conducted in the tertiary obstetric unit at Peking University First Hospital. From October 2017 to September 2018, a total of 5439 patients received epidural procedures during labor and delivery, of which 40 (0.74%) ADPs were reported. Among them, only 20 ADP parturients agreed to receive this incorporated prophylactic strategy. All parturients who had recognized ADPs during epidural procedures. The purpose of this study was to present our experience on the use of this incorporated prophylactic strategy for PDPH after ADP.

CASE PRESENTATION

Chief complaints

Nine parturients received elective or emergency cesarean sections (CS) under combined spinal-epidural anesthesia (CSEA). Eleven parturients were admitted for the induction of labor under epidural analgesia.

History of present illness

During CSEA for CS, a 16-gauge Tuohy needle (Tuoren, Henan, China) was advanced using the loss of resistance to saline technique at the L2-3 or L3-4 intervertebral space in the right decubitus position. ADP occurred during epidural needle placement. The epidural needle was withdrawn into the epidural space or re-sited at the adjacent intervertebral space. Four mL of plain bupivacaine 0.25% was administered via a 27-gauge Whitacre spinal needle to administer surgical anesthesia. Then, a 20-gauge epidural catheter was inserted 4 cm into the epidural space.
Table 1 Demographic data and clinical information

<table>
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<th>Pre-eclampsia</th>
<th>History of migraine</th>
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N: No; Y: Yes; NVD: Normal vaginal delivery; IVD: Instrumental vaginal delivery; CS: Cesarean section; CSEA: Combined spinal-epidural anesthesia; EA: Epidural analgesia.

For labor epidural analgesia, epidural puncture was performed at the L2-3 or L3-4 intervertebral space with a 16-gauge Tuohy needle and ADP occurred. The epidural needle was withdrawn into the epidural space or re-sited at the adjacent intervertebral space. Pain relief during labor was achieved using a patient-controlled epidural analgesia (PCEA) device set to deliver a basal infusion of 0.07% ropivacaine and sufentanil 0.4 μg/mL at a basal rate of 4 mL/h (6 mL of bolus on demand and a lock-out interval of 30 min).

**History of past illness**
Prior to delivery, no patients reported existing headaches except for two patients with a history of migraine.

**Personal and family history**
No significant personal and family histories were noted.

**Physical examination**
Prior to delivery, the patients were alert and quickly responsive to commands. Clinical neurological examination revealed no significant results.

**Laboratory examinations**
Prior to the epidural procedure, coagulopathy was excluded with acceptable routine blood tests, biochemical tests, and coagulation parameter results in these patients.

**Imaging examinations**
No imaging examinations were available.
FINAL DIAGNOSIS

The final diagnosis of the presented case series was ADP with a large-bore epidural needle.

TREATMENT

After CS, a detailed explanation of the possibility of PDPH and its possible consequences were provided to the patients. These nine patients refused analgesics and prophylactic epidural blood patch (EBP) but agreed to the administration of epidural HES. No conservative strategies including bed rest, hydration, oral analgesics and caffeine were used. The epidural catheter was connected to a PCEA device postoperatively, which was set to deliver a continuous infusion of ropivacaine 0.1% and sufentanil 0.4 μg/mL at a rate of 5 mL/h. The patient was freely ambulated. The epidural catheter was left in situ for 48 h postoperatively according to the department’s routine. Immediately before removal of the catheter, 15 mL of 6% HES 130/0.4 (Voluven®, Fresenius Kabi, China) was slowly administered via the epidural catheter.

After vaginal delivery, epidural infusion was maintained using the same PCEA device at a basal rate of 4 mL/h for 24 h. Thereafter, 15 mL of voluven was slowly administered into the epidural space immediately prior to catheter withdrawal.

OUTCOME AND FOLLOW-UP

These patients were assessed daily by research personnel while in the hospital. Headache was assessed on a numeric rating scale ranging from 0 to 10, where 0 represents no pain and 10 represents the worst pain imaginable. After discharge, telephone follow-up was carried out one week later to ensure the absence of headache symptoms. Patients were instructed to contact the obstetric unit if headache or any neurologic deficits developed postpartum. PDPH and neurologic deficits (nuchal rigidity, mental status change, motor deficit, paresthesia) were not reported during the patients’ stay in the hospital. They were discharged as per the obstetric routine. They remained free of headache and neurologic symptoms for at least two months to up to one year.

DISCUSSION

We report that an incorporated strategy of continuous epidural analgesia at a rate of 4-5 mL/h (over 24 h after labor or 48 h after CS) followed by 15 mL of epidural HES successfully prevented PDPH after ADP with a 16-gauge Tuohy needle in twenty parturients. In October 2017, it was first observed that an ADP parturient remained free of PDPH following this incorporated prophylactic strategy. In this case series, this strategy had a 100% success rate in preventing PDPH after ADP, compared with a success rate of approximately 50%-75% reported in the existing literature for various other prophylactic strategies\[^{15,16}\]. The excellent efficacy of our incorporated strategy might be attributed to the presence of the epidural catheter in the epidural space for the duration of 24-48 h, which may have promoted spontaneous healing in some way. The healing process was further facilitated by epidural HES following epidural infusion. Further prospective studies will be conducted at our hospital to establish the validity and reliability of the results obtained.

Various prophylactic interventions after ADP have been evaluated during obstetric procedures. The existing literature yielded no evidence to support the benefit of conservative management strategies including bed rest, oral/intravenous hydration, and analgesics for preventing PDPH after ADP\[^{15,16}\]. Medications, including caffeine, gabapentin, cosyntropin, and theophylline showed some prophylactic benefit; however, there is still a lack of reliable evidence to support these benefits\[^{17-19}\]. Epidural/intrathecal infusion of saline or morphine after ADP may decrease the risk of developing PDPH with various success rates, or at least alleviate the severity\[^{14-18}\]. Prophylactic EBP has been attempted with conflicting results. Two systemic reviews failed to show a significant reduction in PDPH after ADP with regard to prophylactic EBP\[^{6,7}\]. Furthermore, EBP is an invasive intervention with minor symptoms (transient back and radicular pain) and potentially severe complications (chemical/infectious...
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CONCLUSION

This case series of twenty parturients described an incorporated strategy that might have great efficacy in preventing PDPH after ADP with a 16-gauge Tuohy needle. The strategy involved continuous epidural analgesia over 24 h after labor or 48 h after CS followed by epidural HES prior to catheter removal. However, the safety and efficacy of this strategy should be further investigated in subsequent clinical studies.

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