

Accidental dural puncture, postdural puncture headache, intrathecal catheters, and epidural blood patch: revisiting the old nemesis

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Abstract One of the controversial management options for accidental dural puncture in pregnant patients is the conversion of labor epidural analgesia to continuous spinal analgesia by threading the epidural catheter intrathecally. No clear consensus exists on how to best prevent severe headache from occurring after accidental dural puncture. To investigate whether the intrathecal placement of an epidural catheter following accidental dural puncture impacts the incidence of postdural puncture headache (PDPH) and the subsequent need for an epidural blood patch in parturients. A retrospective chart review of accidental dural puncture was performed at Hutzel Women's Hospital in Detroit, MI, USA for the years 2002–2010. Documented cases of accidental dural punctures ($N = 238$) were distributed into two groups based on their management: an intrathecal catheter (ITC) group in which the epidural catheter was inserted intrathecally and a non-intrathecal catheter (non-ITC) group that received the epidural catheter inserted at different levels of lumbar interspaces. The incidence of PDPH as well as the necessity for epidural blood patch was analyzed using two-tailed Fisher's exact test. In the non-ITC group, 99 (54 %) parturients developed PDPH in comparison to 20 (37 %) in the ITC [odds ratio (OR), 1.98; 95 % confidence interval (CI), 1.06–3.69; $P = 0.03$]. Fifty-seven (31 %) of 182 patients in the non-ITC group required an epidural

blood patch (EBP) (data for 2 patients of 184 were missing). In contrast, 7 (13 %) of parturients in the ITC group required an EBP. The incidence of EBP was calculated in parturients who actually developed headache to be 57 of 99 (57 %) in the non-ITC group versus 7 of 20 (35 %) in the ITC group (OR, 2.52; 95 % CI, 0.92–6.68; $P = 0.07$). The insertion of an intrathecal catheter following accidental dural puncture decreases the incidence of PDPH but not the need for epidural blood patch in parturients.

Keywords Accidental dural puncture · Intrathecal catheters · Postdural puncture headache · Epidural blood patch

Introduction

Accidental dural puncture (ADP) is not uncommon following placement of an epidural catheter for labor analgesia, with an incidence of 0.04–6 % [1], plus postdural puncture headache (PDPH) with an incidence of 50 % [2] and up to 81 % of parturients [3, 4]. The clinical symptoms of PDPH can be distressing and interfere with the immediate joy of childbirth.

Research has focused on treatment and prophylactic modalities of PDPH. In a meta-analysis of 41 randomized controlled trials (RCTs), no effect was found for maternal position, type of the catheter, needle size, bevel direction, operator experience, or use of ultrasound [5]. The puncture angle between 30° and 90° with an 18-gauge Tuohy needle produced nonstatistically significant leak reductions [6]. One of the methods of managing a PDPH is the insertion of epidural catheters intrathecally [7], but significant controversy exists in the literature regarding the safety [8] and efficacy [9] of this modality in preventing PDPH.

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The aim of this study was to investigate whether the intrathecal placement of an epidural catheter following ADP reduces the incidence of PDPH and the subsequent need for an epidural blood patch (EBP) in parturients.

Methods

A retrospective chart review of labor epidurals was performed at Hutzel Women's Hospital in Detroit, MI, USA for the time period 2002–2010 after approval of the Wayne State University Institutional Review Board. Exclusion criteria included patients with a past medical history of headache and preeclampsia or eclampsia. Patients with ADP were distributed into two groups based on their management. The non-intrathecal-catheter (non-ITC) group included patients who were managed by reinsertion of the epidural catheter at a different level of lumbar interspaces following ADP during first attempt using a 17 gauge Tuohy needle. Continuous labor epidural analgesia was achieved with an initial bolus dose of 10 ml bupivacaine (0.125 % with 10 µg/ml fentanyl) and bupivacaine (0.125 % with 2.5 µg/ml fentanyl). The intrathecal-catheter (ITC) group included patients who received immediate placement of a 20 gauge multiorifice epidural catheter into the intrathecal space following ADP at first attempt. Continuous intrathecal analgesia was achieved with an initial bolus dose of 2.5 mg 0.75 % bupivacaine (0.3 ml) with 25 µg fentanyl (0.5 ml) and 0.125 % bupivacaine with 2.5 µg/ml fentanyl at a rate of 1–3 ml/h. The selection of placing an intrathecal catheter or resiting the epidural was left to the discretion of the anesthesiologist who was comfortable performing either one of the techniques.

Intrathecal catheters remained in situ for at least 24 h after delivery even though the intrathecal infusion was discontinued immediately after the delivery. In both groups, patients developing PDPH were initially treated conservatively for 24 h (intravenous or oral fluids, head-down nursing, nonsteroidal antiinflammatory agents, and caffeine). Only when the conservative treatment failed was EBP performed for the management of PDPH. The risk/benefit ratio of EBP was explained to all parturients who developed PDPH, after which the request for an EBP was left to the discretion of the parturient. This approach was similarly used in both groups. The incidence of PDPH as well as the need for EBP were reported as odds ratios (OR) with 95 % confidence intervals (CI) and were analyzed using the two-tailed Fisher's exact test. *P* values <0.05 were considered significant.

Results

We reviewed 275 cases of ADP. As we excluded 37 cases (past medical history of headache, preeclampsia/

eclampsia), 238 cases were included. After ADP at first attempt, the epidural was reinserted at different lumbar interspaces in 184 patients (non-ITC group) and the epidural catheter was inserted intrathecally in 54 patients (ITC group). In the non-ITC group, 99 (54 %) parturients developed PDPH in comparison to 20 (37 %) in the ITC (OR, 1.98; 95 % CI, 1.06–3.69; *P* = 0.03). Fifty-seven (31 %) of 182 patients in the non-ITC group required an EBP (data for 2 patients of 184 were missing). In contrast, 7 (13 %) of parturients in the ITC group required an EBP for pain relief. The incidence of EBP was calculated in parturients who actually developed headache to be 57 of 99 (57 %) in the non-ITC group versus 7 of 20 (35 %) in the ITC group (OR, 2.52; 95 % CI, 0.92–6.68; *P* = 0.07).

Discussion

Our results showed that an intrathecal catheter following ADP decreased the incidence of PDPH as compared to resiting the epidural catheter. Our results also showed that the most common action following ADP is still to resite the epidural catheter, similar to previous studies [1, 10–12]. The major concern with this modality is the need for a second invasive attempt to achieve labor analgesia and the possibility of a second wet tap [13]. The risk of PDPH increases with repetitive dural punctures [14]. Russell [15] did not show superiority of intrathecal catheter over catheter resiting in terms of PDPH. However, he showed a significantly greater requirement for two or more additional attempts to establish neuraxial analgesia associated with repeating the epidural and a 9 % risk of second dural puncture. The differences in the reported results may be explained by the fact that Russell included only 97 parturients compared to 238 parturients in our study. Therefore, large prospective studies are needed to confirm our findings.

The advantage of infusing intrathecal local anesthetics via the intrathecal catheter is that it provides more predictable, better controlled, and denser labor analgesia compared to a resited epidural catheter; therefore, many centers use routine combined spinal-epidural analgesia for labor [16, 17], with a very low risk of infection, especially if left for a short period of time [18]; furthermore, it allows immediate analgesia for labor [12]. Our study showed that the incidence of PDPH in the non-ITC group was 54 % compared to 37 % in the ITC group (OR, 1.98; 95 % CI, 1.06–3.69; *P* = 0.03). These results were comparable to the study conducted by Ayad et al. [7]. Also, our results showed the need of EBP was the same in patients developing headache in both groups. There have been some studies with equivocal results. A meta-analysis performed by Apfel et al. [19] showed that immediate placement of an

intrathecal catheter demonstrated the best risk/benefit ratio in terms of the development of PDPH, but failed statistical significance, and they concluded that large multicenter studies are needed. In another meta-analysis, inserting an intrathecal catheter significantly reduced the risk for an epidural blood patch, and the incidence of postdural puncture headache was reduced, but not significantly [20].

The mechanism of the prevention of PDPH by ITC is still open to investigation and interpretation. Butt [21] showed in monkeys, dogs, sheep, and rats that an inflammatory fibrosis reaction occurs along the intrathecal catheter track originating from the dura mater. In all our patients, the intrathecal catheter was removed after 24 h of placement as suggested by the literature [7] to allow the inflammatory response to occur and have a better outcome in decreasing PDPH.

Conclusion

This study demonstrates that insertion of an ITC following ADP decreases the incidence of PDPH but not the need for an epidural blood patch. One limitation of our study is that it is retrospective, which does not provide strong support to the supremacy of intrathecal catheter over resiting. However, it is one of the largest studies that could lead the way for future prospective studies in the field.

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Conflict of interest None.

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