Editorial

Timing of epidural blood patch: clearing up the confusion

Accidental dural puncture with a large-bore epidural needle complicates approximately 1.5% of epidural insertions among parturients [1], and post-dural puncture headache (PDPH) follows in 50–60% of cases [1, 2]. Webb et al. documented that the adverse consequences of accidental dural puncture, including headache, backache and disability from either, may persist for two years or more after the initial event [3]. Devastating complications, such as permanent cranial nerve injury, subdural hematoma and death, are possible, but these occur much more rarely [4, 5]. Such headaches are frequently incapacitating, preventing childcare activities [2], increasing the length of hospitalisation and predisposing to visits to the emergency department [6]. Therapeutic epidural blood patch is the treatment of choice for severe headaches, and is used in approximately 40% of parturients who sustain an accidental dural puncture [2].

Questions remain regarding the optimal timing of this intervention, as two recent publications in *Anaesthesia* – one in this issue – make evident [7, 8]. In the first, Stein and colleagues randomly assigned obstetric patients with accidental dural puncture, who underwent subsequent epidural catheter placement at a different interspace, to receive a prophylactic blood patch through the indwelling catheter or not [7]. Considerably fewer patients in the prophylactic blood patch group experienced headache compared with control patients (18% vs 80%, respectively ($p < 0.0001$). In addition, only 10% of the subjects in the prophylactic group received a therapeutic blood patch, compared with 73% in the control group (p not reported but calculated to be < 0.0001). The authors concluded that prophylactic epidural blood patch reduces the incidence of PDPH after accidental dural puncture in obstetric patients.

In the second article, Armstrong et al. performed serial haemodilution of whole blood with cerebrospinal fluid (CSF) and then assessed samples using thromboelastography (TEG®) [8]. Addition of CSF shortened the r-time and k-time and increased the alpha angle, indicating a procoagulant effect; however, it reduced the maximum amplitude, suggesting a clot destabilising effect. The investigators hypothesise that the effectiveness of an epidural blood patch may decline when the CSF leak is greatest, such as soon after dural puncture. They also suggest that increasing the volume of blood injected may help to overcome dilutional effects of CSF.

Stein et al.'s study stands in contrast to a randomised controlled trial performed by myself and colleagues a decade ago, that found no difference in the incidence of PDPH, peak pain scores, or the need for therapeutic epidural blood patch in patients who received a prophylactic blood patch versus a sham procedure [2]. What should one make of this inconsistency? Differences between the two studies suggest possible explanations. In contrast to our 2004 methodology, Stein et al. left the therapeutic approach to headache to the discretion of the treating clinicians. This lack of protocolisation resulted in employment of a diversity of treatment modalities (caffeine, saline patch, patient-controlled epidural anaesthesia, various opioid- and non-opioid analgesics, etc) that no doubt influenced the decision to perform a therapeutic epidural blood patch (which was also administered at the practitioner's discretion rather than according to a standardised protocol). This lack of standardisation is problematic, especially considering that the treating clinician was unblinded to the study group, and it is likely that this absence of both standardisation and blinding induced bias that may partly explain the dramatic results, while probably not explaining all of the differences between the prophylactic blood patch and control groups.

Our 2004 study did demonstrate some benefit to prophylactic epidural blood patch, documenting

a shorter duration of headache, a smaller area under the time-pain curve, and a non-significant trend toward fewer therapeutic patches [2]. Together, these two studies suggest that some beneficial effect follows prophylactic epidural blood patch, although probably not of the magnitude reported by Stein et al.

Authors of clinical reviews struggle to make precise recommendations, owing to the heterogeneity of studies and the poor quality of some investigations; however, they generally advise against prophylactic patching [9–11]. The decision to administer a prophylactic epidural blood patch should consider the number needed to treat (NNT) to avoid a therapeutic epidural blood patch, which has been estimated to be 8 [2]. As Stein et al. suggest, certain high-risk patient groups may derive the most benefit, such as those who deliver vaginally or have prolonged pushing times, as their risk of headache risk is increased and their NNT is lower [2, 12]. This variable NNT must be weighed against the known risks of epidural blood patch [13] and concerns regarding infection [14].

The timing of therapeutic epidural blood patch also remains mired in confusion. Several studies have suggested increased 'failure' rates when practitioners administer therapeutic patches within 24 [15], 48 [16], and 96 [17] hours of the dural puncture. However, all of these investigations described observational, non-randomised case series, and included a mix of patient populations (obstetric and non-obstetric, male and female), needle size (large-bore epidural versus small-bore spinal) and type (cutting and pencil-point), and procedure (vaginal delivery, caesarean section, orthopaedic, etc) – variables that contribute to the incidence and severity of headache. Although one might assume that the timing of the therapeutic epidural blood patch per se might 'cause' the patch to fail, it seems just as likely – or even more likely – that patients who develop symptoms severe enough to warrant epidural blood patch within 24 hours of puncture represent a patient population at increased risk of a suboptimal response to an epidural blood patch (e.g. obstetric patients with accidental dural puncture undergoing vaginal delivery with long pushing times). Correlation between the size of the puncture and a poor response to epidural blood patch in these reports [16, 17] supports this contention. Additionally, the need for a second blood patch is classified as 'failure' in these investigations [15, 17], but obstetric patients commonly have an initial response to a blood patch followed by recurrence of symptoms after several days, and up to 28% of parturients undergoing therapeutic epidural blood patch after accidental dural puncture with a large-bore epidural needle require more than one patch [18]. Withholding safe, efficacious treatment from a patient who is suffering because she may need that treatment more than once is unjustified. This is akin to denying analgesics because a second dose may become necessary when the first one wears off. Furthermore, the previously mentioned report by Webb et al. suggested that epidural blood patch may protect against chronic symptoms, although the study was underpowered for that outcome and the differences were not statistically significant [3].

It remains unclear how to synthesise the findings of Armstrong et al. [8] into the controversy. The possibility that rapid CSF leak may decrease the effectiveness of epidural blood patch does not necessarily indicate that early blood patching should be avoided, especially when symptoms are severe. The effect that increasing the patch volume might have in this situation is uncertain, as few clinical trials have addressed the optimal volume. Peach and colleagues randomly assigned obstetric patients who suffered accidental dural puncture to receive 15, 20 or 30 ml blood during therapeutic blood patch [19]. Complete or partial response to therapy was equal among the groups, but subjects in the 15-ml group had a larger area under the time-pain curve during the first 48 hours. On this basis, the authors recommended administration of 20 ml blood, but acknowledged that the question remains unresolved due to small sample size and other unavoidable weaknesses in a multinational multicentre trial. Perhaps one should consider using greater than 20 ml blood for early patches, limiting the volume of the injectate if the patient complains of back discomfort.

Clearly, we need more research to clarify these issues. Careful study of prophylactic blood patching must include protocol-driven assessment and treatment. To investigate the effect of timing on response to ther-

apeutic epidural blood patch, studies should randomly assign patients who develop symptoms severe enough to warrant epidural blood patch within a defined timeframe after accidental dural puncture to immediate versus delayed blood patch, standardise the therapeutic approach, and measure a meaningful primary outcome such as total area under a time-pain score curve. Unfortunately, such studies present challenges because of the small proportion of patients who meet the inclusion criteria. In the meantime, clinicians may consider prophylactic patching for very high-risk patients, but should not expect the degree of effect to match that of Stein et al. Furthermore, practitioners should offer patients a therapeutic epidural blood patch whenever severe symptoms occur, and include information regarding the common need for additional patching during the informed consent process.

Competing interests

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B. M. Scavone
Professor
Department of Anesthesia & Critical Care and Department of Obstetrics and Gynecology,
University of Chicago
Chicago
IL USA
Email: bscavone@dacc.uchicago.edu

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