International Journal of Obstetric Anesthesia (2017) 29, 5–7
0959-289X/$ - see front matter © 2016 Elsevier Ltd. All rights reserved.
http://dx.doi.org/10.1016/j.ijoa.2016.12.009

ELSEVIER
www.obstetanesthesia.com

EDITORIAL

One patch or more? Defining success in treatment of post-dural puncture headache

Survey data indicate that 65% of women who deliver vaginally in the United States and 90% who deliver via cesarean, receive neuraxial anesthetics including epidural and combined spinal-epidural techniques.[1] Approximately 1.5% of women receiving an epidural-based technique experience unintentional dural puncture (UDP),[2] and 50–60% who have UDP will develop post-dural puncture headache (PDPH).[2,3] Headache pain may be severe and debilitating, interfere with activities of daily living, and increase hospital and emergency department visits, and hospital length of stay.[3,4] The pain may persist for longer than has previously been appreciated: Webb et al. demonstrated that patients who suffered UDP were more likely than a matched cohort without UDP to complain of headache (28% versus 5%) and backache (43% versus 15%) up to two years afterwards.[5] These results were confirmed by Ranganathan et al.[6] Unintentional dural puncture and PDPH remain vexing problems for the obstetric anesthesiologist, and epidural blood patch (EBP) represents the treatment of choice for severe symptoms. In this issue of the journal, D'Angelo et al. set out to clarify the clinical course and treatment of this iatrogenic complication.[7]

The authors retrospectively queried an institutional quality improvement database for information on UDP, PDPH, and EBP. The investigation included 753 obstetric patients who suffered UDP, and 394 patients who had 466 EBPs, making it the largest such study to date. The primary outcome was administration of only one (versus more than one) EBP. They investigated the effect of relevant patient characteristics, aspects of anesthetic technique, and EBP practices, including the blood volume used for the patch. Of note, standard practice at the authors' institution calls for administering blood during EBP until either the patient complains of pain or 30 mL has been given.

The investigators found that all 394 patients who received EBP experienced some relief of headache, although nearly 17% of patients received a second EBP, and 1.5% received a third. The mean volume administered was 20.5 ± 5.4 mL and only 8.9% of patients received the 30 mL maximum, indicating that most patients tolerate this volume poorly. Furthermore, blood volume was not predictive of the primary outcome, administration of a second patch. These findings support the authors' practice of limiting blood volume to that tolerated by the patient, especially since the vast majority of patients had symptom relief at less than the maximal volume.

Both time intervals studied (neuraxial procedure to EBP interval and PDPH to EBP interval) predicted the need for repeat EBP. An EBP within one day of the neuraxial procedure was associated with a higher rate of repeat EBP, compared to an EBP performed more than four days after the anesthetic. Similarly, repeat patching was used more often among patients with PDPH to EBP intervals of less than one day, compared to those with PDPH to EBP intervals greater than or equal to two days. These results mirror other retrospective data associating early EBP with repeat patching.[8,9] One could interpret these results to indicate that EBP should be avoided "too soon" after UDP or after PDPH symptoms first manifest. However, as the authors themselves point out, a plausible alternate interpretation could be that patients who develop intense discomfort soon after a dural puncture have a more severe syndrome than others, and are more likely to require two, or even three, EBPs to control symptoms.

D'Angelo's combination of a 100% success rate and an 18.5% re-patch rate raise the possibility of a new outcome metric for EBP. Rather than defining "successful" treatment as need for only one patch, perhaps we should judge therapeutic success by the area under a pain-time curve. Using such a measure, patients left to suffer for a day or more by their clinicians who fear having to perform more than one patch would fare less well than those treated early and repeatedly. In the figure we consider three hypothetical patients who develop severe headache shortly after dural puncture (Fig. 1). Patient A receives immediate patching, but her headache recurs, necessitating performance of another patch. Patient B's EBP is withheld until 24 h after dural puncture, and Patient C's, whose symptoms are not quite as severe, until 48 h post puncture. Neither requires repeat EBP and Patient C has a particularly good response, becoming pain-free 1 h after the procedure. However, the area under Patient A's pain-time curve is less than half that of Patient B, and less than one-third that of Patient C. Cumulative pain over time is least for Patient A.

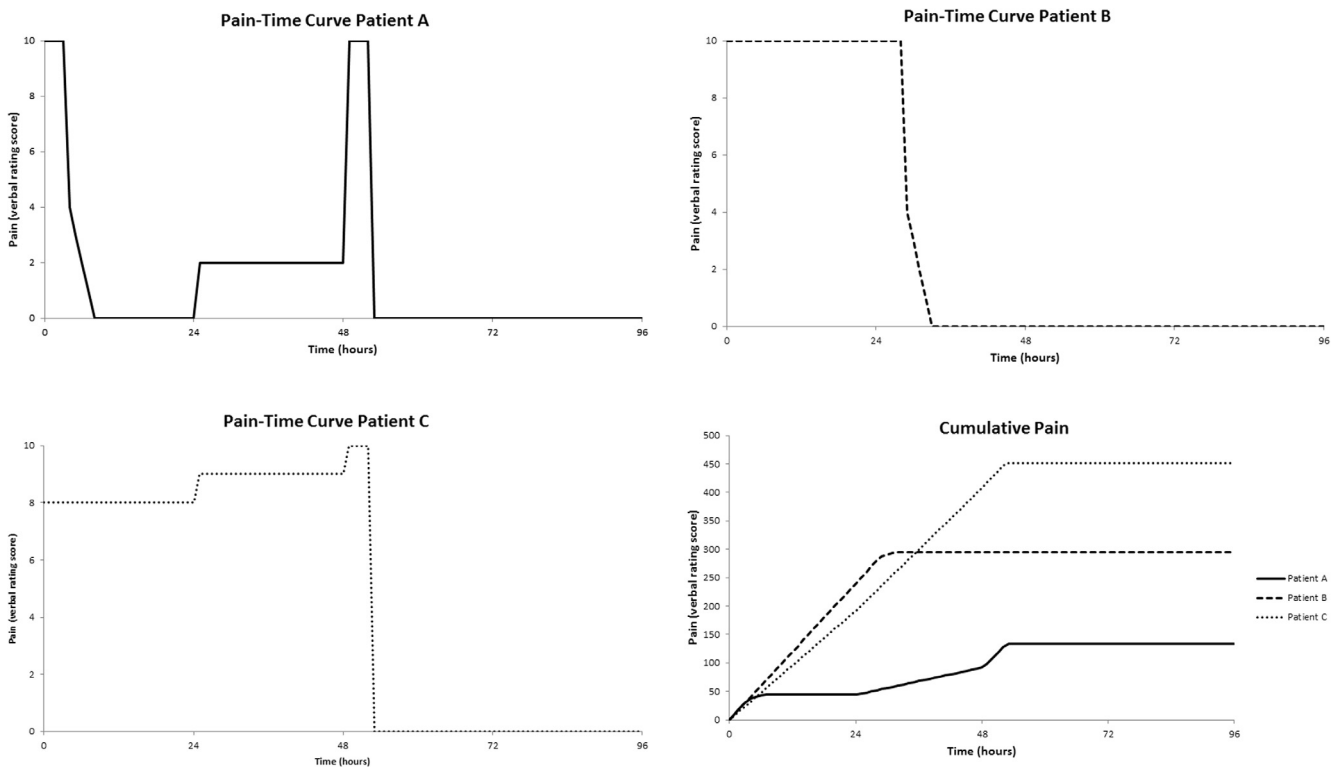

Fig. 1 Pain-time curves and cumulative pain curves. Graphs A, B, and C: Area under the pain-time curve of Patients A, B, and C, who all present with headache within 24 h of dural puncture. Time 0 is defined as time at which headache symptoms first surface. Patient A receives an epidural blood patch within 4 h of presentation. Symptoms lessen and then resolve 4 h after patch. Mild headache recurs the next day and severe headache recurs on post-patch day 2, warranting repeat patch, performed within 4 h of presentation. Symptoms then resolve completely. Calculated area under the curve = 133 pain-hours. Patient B's epidural blood patch is withheld until post-puncture day 2 (i.e., >24 h after dural puncture). Symptoms lessen and then resolve 4 h after patch. Calculated area under the curve = 295 pain-hours. Patient C's headache initially is not quite as severe; epidural blood patch is withheld until post-procedure day 3 (i.e., >48 h after dural puncture). Symptoms resolve completely immediately after patch. Calculated area under the curve = 452 pain-hours. Graph D: Cumulative pain over time for Patients A, B, and C. Time 0 is defined as time at which headache symptoms first surface

Moreover, in the aforementioned Webb study, EBP decreased the risk of developing chronic headache (40% versus 20% in patched versus non-patched patients) and backache (60% versus 32%) after UDP.[5] Although these differences were not statistically significant, the study was underpowered for this result. Although some patients with mild symptoms may benefit from a trial of conservative therapy, accumulating data, taken together, suggest that a policy of early, repeat patching in patients with very intense syndromes may produce a better patient experience than a delayed, single EBP.

Despite the inherent weaknesses in retrospective data, several recommendations emerge from D'Angelo's work. First, practitioners may limit EBP volume to that which the patient tolerates without pain, without fear of reducing patch efficacy. Second, patients with symptoms severe enough to warrant EBP soon after UDP or PDPH should be advised that they may need a second or even a third, EBP to fully control the syndrome. Those cases requiring two or more patches should not be considered treatment "failures." Rather, our focus should be on limiting painful symptoms, optimizing the patient experience, and possibly even preventing chronic effects.

Barbara M. Scavone
Department of Anesthesia and Critical Care
Department of Obstetrics and Gynecology
University of Chicago
Chicago, IL, USA
E-mail address: bscavone@dacc.uchicago.edu

References

1. Bucklin BA, Hawkins JL, Anderson JR, Ullrich FA. Obstetric anesthesia workforce survey. *Anesthesiology* 2005;**103**:645–53.
2. Choi PT, Galinski SE, Takeuchi L, Lucas S, Tamayo C, Jadad AR. PDPH is a common complication of neuraxial blockade in parturients: a meta-analysis of obstetrical studies. *Can J Anesth* 2003;**50**:460–9.

3. Scavone BM, Wong CA, Sullivan JT, Yaghmour E, Sherwani SS, McCarthy RJ. Efficacy of a prophylactic epidural blood patch in preventing post dural puncture headache in parturients after inadvertent dural puncture. *Anesthesiology* 2004;**101**:1422–7.
4. Angle P, Tang SL, Thompson D, Szalai JP. Expectant management of postdural puncture headache increases hospital length of stay and emergency room visits. *Can J Anesth* 2005;**52**:397–402.
5. Webb CA, Weyker PD, Zhang L, et al. Unintentional dural puncture with a tuohy needle increases risk of chronic headache. *Anesth Analg* 2012;**115**:124–32.
6. Ranganathan P, Golfeiz C, Phelps AL. *J Clin Anesth* 2015;**27**:201–6.
7. D'Angelo R, Booth JL, Pan PH, Thomas JA, Harris LC. A retrospective review of an epidural blood patch database: the incidence of epidural blood patch associated with obstetric neuraxial anesthetic techniques and the effect of blood volume on efficacy. *Int J Obstet Anesth* 2017;**29**:10–7.
8. Loeser EA, Hill GE, Bennett GM, Sederberg JH. Time vs success rate for epidural blood patch. *Anesthesiology* 1978;**49**:147–8.
9. Safa-Tisseront V, Thormann F, Malassiné P. *Anesthesiology* 2001;**95**:334–9.