
North American survey of the management of dural puncture occurring during labour epidural analgesia

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Purpose: To document the range and the most common strategies for the management of the parturient with inadvertent dural puncture (DP) during labour epidural analgesia.

Methods: A confidential survey form was mailed to 46 academic units in Canada and USA. The responses were compiled into Canadian, US and joint North American databases.

Results: Thirty-six centres (78%) responded, representing 137,250 annual deliveries. The reported incidence of DP was 0.04–6%. The most common initial response to DP was re-siting the catheter at another level. Most centres made little change in routine practice regarding epidural top-ups and infusion rates after DP. Unrestricted mobilisation was advocated by 86% of centres following delivery; enhanced oral hydration was encouraged by 61%. Prophylactic epidural blood patch (PEBP) was recommended by 37% of centres, with twice as many US as Canadian centres doing so. In the presence of PDPH, EBP was offered most commonly at or within 24 hr of diagnosis. Complications were common after EBP: 86% of centres reported patch failures; 44% reported persistent headache after ≥ 2 EBP. Despite this, centres remained optimistic about EBP success, quoting cure rates $>90\%$ in 58% of centres.

Conclusion: There is little difference between the practices reported by Canadian or US centres. The expressed optimism regarding the efficacy of EBP is not supported by the evidence available and may be unwarranted. More research is needed to define the issue better.

Objectif : Documenter l'étendue du problème et les stratégies les plus utilisées pour traiter la parturiente avec ponction accidentelle de la dure-mère (PDM) durant l'analgésie pour le travail.

Méthodes : Une enquête confidentielle a été adressée par la poste à 46 départements académiques au Canada et aux États-Unis. Les réponses ont été compilées dans les bases de données canadienne, américaine et nord-américaine conjointe.

Résultats : Trente-six centres (78%) ont répondu, ce qui représentait 137,250 accouchements. L'incidence rapportée de PDM était de 0,04–6%. La réaction initiale la plus fréquente à une PDM était de reprendre la technique à un autre niveau. La plupart des centres ne modifiaient pas leur routine concernant les vitesses d'infusion et les bolus après PDM. La mobilisation à volonté à la suite de l'accouchement était prônée par 86% des centres; 61% encourageaient une hydratation orale accrue. Le pansement de sang épidural (PSE) prophylactique était recommandé par 37% des centres, et ce deux fois plus souvent aux USA qu'au Canada. En présence de céphalée post-ponction de la dure-mère (CPPDM), le PSE était offert le plus souvent au moment du diagnostic ou dans les 24 heures subséquentes. Les complications sont fréquentes après PSE : 86% des centres rapportent des échecs; 44% rapportent des céphalées persistantes après ≥ 2 PSE. Malgré ceci, les centres demeurent optimistes quant au succès du PSE, 58% des centres rapportent des taux de succès de $>90\%$.

Conclusion : Il y a peu de différence entre la pratique au Canada et aux États-Unis. L'optimisme démontré quant à l'efficacité du PSE n'est pas corroboré par les données disponibles et est peut-être injustifié. Des recherches additionnelles pour quantifier ce problème sont nécessaires.

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Presented in part at the meeting of the Society for Obstetric Anesthesia and Perinatology, April 1997, Bermuda WI.

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Accepted for publication October 29, 1997.

INADVERTENT dural puncture (DP) and its sequelae may complicate labour epidural analgesia (LEA). The incidence of large needle dural puncture (LNDP) is commonly quoted as 1% to 2% in this setting.^{1,2} Following LNDP, up to 86% of patients experience post dural puncture headache (PDPH).² In 63% of these, the headache is characterised as severe and in these patients it can be incapacitating.² Despite the relative frequency and inevitability of DP, and the resulting incapacity, few of the myriad of prophylactic and therapeutic management options recommended for PDPH have been subjected to objective assessment. Thus, there is little evidence supporting various recommended interventions for PDPH occurring during LEA. Additionally, little is known about the frequency of application of these interventions. In order to determine both the range and most common management strategies currently in use in North America, we conducted a survey of a sample of academic departments of anaesthesia in Canada and the United States.

Methods

A mail survey of 46 selected tertiary care obstetrical centres in Canada and the US was conducted. The confidential and anonymous questionnaire was mailed to each University Department of Anaesthesia in Canada and to a random selection of geographically divergent academic centres in the United States. The survey was addressed to the physician in charge of obstetrical anaesthesia at the centre. If the name of that physician was unknown to the authors, the survey was directed to the Chief of the Department at the centre, with instructions to forward it to the physician deemed most responsible for obstetrical anaesthesia at that centre. The physician responding to the questionnaire was asked to complete it in a manner intended to reflect the practice of that institution. The questionnaire consisted of a series of both "single best response" and "fill-in-the-blank" type questions probing: the incidence of LNDP; labour analgesia and labour management after LNDP; PDPH prophylaxis and treatment and; the use, perceived efficacy and complications related to epidural blood patch (EBP). All surveys were mailed with a covering letter and a stamped, self-addressed envelope. Because the survey was anonymous, no follow-up could be made to centres that did not respond to the survey. Responses were then compiled into Canadian, American, and joint North American databases.

Results

Thirty-six responses (78%) were received representing the annual obstetrical management of over 137,000 cases. The reported incidence of inadvertent dural puncture varied widely (range 0.4–6%) and was estimated by most centres. Five responders were either unaware of the incidence at their institution or chose not to respond to the question. Three centres had a written management protocol for LEA after DP.

The most common intervention following DP was re-siting of the epidural catheter at another level (90%) although 38% considered continuous subarachnoid catheters an acceptable option. This was a management option advocated primarily by US centres, most often when unusual difficulties were encountered in placement of the epidural catheter. In 11 of 17 (65%) Canadian centres and 15 of 17 (88%) US centres, anaesthetists provided routine epidural top-up doses; nurses did not provide top-ups at any time. No centre changed its practice related to top-ups; centres allowing nurses to administer top-ups continued to do so after DP. The majority of responders (34 of 36 centres, 96%) routinely used continuous infusions; 25% of centres reduced infusion rates after DP. Only one centre avoided the use of epidural infusions entirely after DP.

One centre discouraged the mother from pushing after DP and encouraged interventions to assist delivery. Unrestricted mobilisation following delivery was advocated by 86% of centres. Those centres advocating bedrest generally did so for brief periods (\leq six hours) although one US centre routinely advocated 12 to 24 hr of bedrest after DP. Enhanced oral hydration was the most commonly recurrent recommendation for PDPH prophylaxis, encouraged by 61% of centres (Table I). Prophylactic epidural blood patch (PEBP) was routinely recommended and performed at 37% of centres. Interestingly, 80% of these expressed limited expectations for the efficacy of PEBP, selecting "work some of the time" or "work rarely" as representing their anticipated outcome of PEBP. Epidural saline boluses or infusions were employed at 17% of centres. Eight centres (22%) rou-

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TABLE I PDPH prophylactic measures employed

<i>Prophylactic measure</i>	<i>Number of centers</i>
Prophylactic epidural blood patch employed (PEBP)	16 (46%)
<i>routinely</i> recommended after LNDP	9 (25%)
<i>routinely</i> done through catheter in situ	9 (25%)
PEBP regarded as effective	
most of the time	7 (24%)
some of the time	17 (55%)
rarely	4 (13%)
aggressive oral hydration	22 (62%)
epidural saline infusion	9 (25%)
abdominal binder	5 (14%)
caffeine infusion	6 (16%)

tinely prescribed caffeine *po* or *iv* for PDPH prophylaxis. Nine reported routine past use of caffeine but had abandoned it because of a perceived lack of efficacy.

In the presence of PDPH, epidural blood patch (EBP) was most often recommended within 24 hr of the diagnosis (47%) although 35% of centres waited for up to 48 hr (Table II). A WBC was done in 11% of centres and the blood used for EBP cultured in apyrexial patients at only one institution. After EBP, the majority of centres kept patients recumbent for two hours or less and then discharged them home on the same day. Eleven percent of centres delayed discharge until the day after blood patch. Eighty-six percent of centres reported patch failures in the last year, defined as a patient needing more than one patch to achieve persistent relief from PDPH. If a repeat PDPH was felt to be indicated, 36% of centres would perform it within 24 hr and 50% would do so at 24–48 hr after the diagnosis of return of headache. The remainder would wait beyond 48 hr. Forty-four percent of centres reported patients with persistent headache despite two or more EBP in the last year. These cases were most commonly managed conservatively although neurological referral was recommended by some. Finally, a third of US centres recommended computed tomography or magnetic resonance imaging to evaluate these patients. Most centres were optimistic about the efficacy of EBP in relieving PDPH; 5% of centres advised patients of an expected cure rate of 70% or less; 5% quoted 70 to 80%; 28% quoted 80 to 90%; and the remainder quoted a cure rate of >90%. Complications were commonly associated with EBP and although typically transient, more persistent neck or back pain was reported by 17% of centres (Table III). With respect to consent discussions, back pain was the complication most commonly alluded to (Table IV).

Discussion

Little difference existed between the practices reported by Canadian and US responders. Although resiting of the catheter was the most common initial step after DP, some centres advocated a continuous subarachnoid catheter, typically after difficult catheter insertions. Centres did not change their practice regarding administration of top-ups and the routine use of the infusions. When epidural anaesthesia has been established after inadvertent dural puncture, there have been reports of subarachnoid spread of local anaesthetic although this is not common and does not seem to have influenced practice patterns.³⁻⁵

Unrestricted mobilisation, as recommended by the majority of centres, is consistent with the demonstrated lack of efficacy of prophylactic bedrest in preventing

TABLE II Therapeutic epidural blood patch

Item	Number of centres
Therapeutic EBP recommended	
immediately after diagnosis	5 (14%)
within 24 hr of diagnosis	11 (30%)
after 24 hr of diagnosis	14 (39%)
after 48 hr of diagnosis	2 (6%)
WBC done before performing EBP	4 (12%)
Blood taken for C&S in an apyrexial patient	1 (3%)

TABLE III Complications of epidural blood patch

Item	Number of centres
transient neck or back pain	32 (88%)
persistent neck or back pain	6 (17%)
radicular symptoms	14 (39%)
irritative meningeal symptoms	10 (28%)
problems with subsequent epidural anaesthetic	4 (11%)

TABLE IV Complications cited in informed consent discussion for epidural blood patch

Complications of EBP mentioned in consent	Number of centres
septic complications	18 (36%)
short term back pain	35 (97%)
radicular symptoms	26 (72%)
long term backache	9 (25%)
Bell's palsy	2 (6%)

PDPH.⁶⁻⁸ Early patient ambulation, as soon as motor function permits, results in better patient acceptance of regional anaesthesia. It also reduces the need for prolonged confinement, a common complaint in a recent survey among patients experiencing PDPH.⁹ Although there is no prophylactic role for forced bedrest, once headache occurs, recumbency aids in pain relief. Enhanced hydration, advocated by 61% of centres either *po* or *iv*, ostensibly to increase CSF production, has not been shown to decrease the risk of PDPH but may lessen its severity and is unlikely to have a deleterious effect.¹⁰ Most centres did not discourage patients from pushing during expulsion nor did they advocate interventions for delivery; neither has been shown to reduce the incidence of subsequent PDPH.

The prophylactic and therapeutic role of caffeine in the setting of larger (16–18-gauge needle) dural tears remains poorly defined. Most reports of caffeine treatment for PDPH do not stratify patients according to size of needle puncture, duration of headache or severity of the headache.¹¹⁻¹³ The absence of group

stratification and control groups makes it difficult to evaluate reports of relief of PDPH following caffeine treatment. An additional confounding variable in many reports is the effect of concurrent therapy (i.e., bedrest) that were utilised in conjunction with caffeine and that are known to be efficacious in ameliorating PDPH. Finally, the few reports which address duration of headache relief after caffeine therapy found that recurrence was frequent.^{10,13} An interesting finding in our survey was the number of centres that had abandoned the use of caffeine, either prophylactically or therapeutically because practitioners deemed it to be ineffective.

The use of prophylactic EBP in our survey was higher than that noted in a survey of British anaesthetists.¹⁴ Conservative management strategies have been encouraged by the work of Loeser and coworkers¹⁵ in 1979 who demonstrated a failure rate of 71% for EBP performed in the first 24 hr, and Palahniuk and Cumming¹⁶ who failed to prevent PDPH with smaller PEPP volumes in non-randomised obstetrical patients with DP. However, the practice of PEPP is supported by the practice of others reporting that early PEPP with an adequate volume of autologous blood is effective in reducing the incidence of PDPH.¹⁷⁻²⁰ The limited follow-up in some of these studies may not have accounted for latent PDPH and thus overestimate efficacy. Analysis of studies regarding the efficacy of PEPP is made difficult given the lack of randomisation and controls in some, different injectate volumes, and varying degrees of follow up. The routine use of PEPP is not universally accepted and its role in the PDPH prophylaxis is still in evolution.

The use of epidural colloid and crystalloid infusions was routinely utilised by few centres. This is in conspicuous contrast to a recent British survey where epidural crystalloid infusion was the principal prophylactic technique in 77% of hospitals surveyed.¹⁴ Although some early studies showed no benefit of saline bolus administration for 17-gauge dural punctures,²¹ more recent work has demonstrated effectiveness of larger bolus and infusate volumes.²² Headache onset or recurrence after termination of infusion is a common problem.^{2,21}

Finally, participating centres expressed considerable optimism regarding EBP success with 86% quoting cure rates of 80-100%. Although Abouleish²³ in a widely cited text, reported a cure rate of 97% with EBP, the study was non-randomised and without controls, and only 10% of the study population suffered PDPH as a result of large needle dural puncture. More recent work suggests that this degree of optimism may be unwarranted as the incidence of incomplete cure obtained over a four week follow up period may be as high as 36%.^{2,24}

Conclusion

Overall, the practice in most centres is consistent with the limited evidence available to guide management after DP during LEA. Little difference exists between the practices reported from Canadian and US centres. More research is needed to define the efficacy of both prophylactic and therapeutic interventions as well as to define those subgroups who would derive the most benefit from specific, individualised treatment.

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