Clinical Reports

Intrathecal catheter insertion during labour reduces the risk of post-dural puncture headache

Kevin C. Dennehy MB FFARCSI,
Ola P. Rosaeg MB FRCPC

Purpose: To describe the anaesthetic management and report the incidence of PDPH in three parturients who had experienced accidental dural puncture during labour and the subsequent deliberate intrathecal insertion of an epidural catheter.

Clinical features: Inadvertent dural puncture with a 16-gauge Tuohy needle occurred during the first stage of labour at 3–4 cm cervical dilatation in all three women. The 20-gauge epidural catheter was immediately inserted into the subarachnoid space after accidental dural penetration. Intermittent intrathecal injections of lidocaine or bupivacaine with fentanyl were administered to provide analgesia during labour and delivery. Two of the women had spontaneous vaginal deliveries, whereas Caesarean section was performed in one case due to acute fetal distress during the second stage of labour. The intrathecal catheter was left in-situ for 13–19 hr after delivery and the women were questioned daily for symptoms of PDPH. None of the three women developed PDPH after dural puncture and intrathecal catheterisation with the epidural catheter.

Conclusion: Immediate intrathecal insertion of the epidural catheter after accidental dural puncture during labour proved to be an effective prophylactic technique to prevent PDPH in these three parturients.

Objectif : Évoquer la conduite anesthésique et l'incidence de la céphalée postponction dure-mérienne (CPPDM) chez trois parturientes dont la dure-mère a été ponctionnée pendant le travail et chez qui on a inséré un cathéter sous-arachnoïdien.

Éléments cliniques : La dure-mère a été ponctionnée accidentellement avec une aiguille Tuohy 16G pendant le premier stage du travail alors que la dilatation était à 3–4 cm chez les trois femmes. Un cathéter épidural 20G a été introduit dans l'espace sous-arachnoïdien immédiatement après la ponction. Des injections sous-arachnoïdiennes de lidocaïne ou de bupivacaine avec du fentanyl ont été effectuées pour procurer l'anesthésie pendant le travail et l'accouchement. Deux des femmes ont accouché spontanément par voie vaginale, alors que la troisième a dû subir une césarienne à cause d'une détresse foetale survenue pendant le deuxième stage du travail. On a laissé le cathéter sous-arachnoïdien en place pendant 13 à 19 h après l'accouchement et recherché à chaque jour les symptômes de CPPDM. Aucune des trois femmes n'a développé de CPPDM après la ponction de la dure-mère et l'insertion du cathéter épidural.

Conclusion : L'insertion immédiate d'un cathéter épidural après une ponction accidentelle de la dure-mère pendant le travail s'est avérée une technique prophylactique efficace à prévenir la CPPDM chez ces trois parturientes.

From the Department of Anaesthesia, Ottawa Civic Hospital, University of Ottawa, 1053 Carling Ave., Ottawa, Ontario K1Y 4E9, Canada.
Address correspondence to: Dr. O.P. Rosaeg; Phone: 613-761-4169; Fax: 613-761-5209; E-mail: lmchardy@civich.ottawa.on.ca.
Accepted for publication September 28, 1997.

EPIDURAL analgesia is a common and popular method of pain relief during labour and delivery. The incidence of inadvertent dural puncture associated with attempts at identifying the epidural space is 1–2% in teaching hospitals.¹ The risk of developing post-dural puncture headache (PDPH) is approximately 75% after dural penetration with a 16–18-gauge epidural needle.^{1,2} The headache is often severe and is aggravated by assuming an upright posture. In addition, PDPH may be associated with nausea and vomiting as well as visual and hearing disturbances. Initial measures to prevent PDPH include adequate hydration and provision of analgesic medication. A prophylactic epidural injection of autologous blood may decrease the risk of developing PDPH after inadvertent dural puncture.^{3,4}

Cohen *et al.*⁵ found a decreased incidence of headache after inadvertent dural puncture at Caesarean section with continuous post-operative intrathecal analgesia. Therefore, we decided to insert the epidural catheter into the subarachnoid space in parturients where we accidentally penetrated dura mater. We provided pain relief during labour and delivery by intermittent intrathecal injections of opioid and local anaesthetic, and left the intrathecal catheter *in situ* until the following day when we again questioned the women for symptoms of PDPH. We report our findings in three parturients in whom we employed this technique to prevent PDPH.

Case reports

Patient #1

A healthy 32-yr-old gravida 4 para 1 parturient weighing 90 kg requested epidural pain relief during first stage of labour at 3 cm cervical dilatation. The epidural space was identified with loss of resistance to air technique at the L3-4 interspace with the parturient in the sitting position using a 16-gauge Tuohy epidural needle. However, the anaesthetist was unable to insert the epidural catheter. Therefore, the procedure was repeated at the same location with the same epidural needle and technique. During this attempt free-flowing cerebro-spinal fluid (CSF) was observed from the Tuohy needle. The epidural catheter (20-gauge, Portex) was immediately inserted 4 cm into the subarachnoid space. A total of 5.5 ml of bupivacaine 0.125% with 2 µg·ml⁻¹ fentanyl was administered intermittently in 1–2 ml increments via the intrathecal catheter to provide pain relief. The patient delivered a healthy female infant three hours after insertion of the intrathecal catheter. The catheter was left *in situ* for 19 hr after delivery, and she did not experience a headache during this period. The patient was seen by Anaesthesia for the next two

days until hospital discharge 42 hr after delivery. She did not complain of PDPH during her stay in hospital.

Patient #2

An obese 36-yr-old patient with chronic essential hypertension and gestational diabetes requested epidural analgesia at 3 cm cervical dilatation. She was treated with labetalol *po* and *sc* insulin. She was gravida 2 para 1 at 39-wk gestation. Her weight was 134 kg. Identification of the epidural space at L3-4 was technically difficult and inadvertent dural puncture occurred on the first attempt using a 16-gauge Tuohy needle with the patient in the sitting position. A 20-gauge epidural catheter was inserted 4 cm into the subarachnoid space. Six ml of bupivacaine 0.125% with 2 µg·ml⁻¹ fentanyl were administered in 1–2 ml doses via the intrathecal catheter to provide pain relief during labour. Four hours after insertion of the intrathecal catheter it was decided to proceed to Caesarean section because of signs of fetal distress. The cervix was fully dilated at that time. Two ml hyperbaric bupivacaine 0.75% with 0.3 mg preservative free morphine were administered via the intrathecal catheter to provide surgical anaesthesia for Caesarean section. The intrathecal catheter was left *in situ* for 13 hr after surgery. The patient did not complain of PDPH during this period or during her post-operative stay and was discharged four days after delivery.

Patient #3

A healthy gravida 4 para 1 parturient at 36-wk gestation and 35 yr of age requested pain relief during spontaneous labour at 4 cm cervical dilatation. The anaesthetist was unable to locate the epidural space at L4-5, but obtained loss of resistance to air on the second attempt at L3-4 interspace with the patient in the sitting position. There was no apparent free flow of CSF from the Tuohy needle. The 20-gauge epidural catheter was inserted 5.5 cm and the epidural needle was withdrawn. However, prior to administration of local anaesthetic it was noted that CSF (confirmed by glucose testing) was easily aspirated into the syringe via the catheter. A total of 3 ml lidocaine 2% with 1: 200 000 epinephrine was administered in two increments prior to spontaneous vaginal delivery 1 hr 40 min after intrathecal catheter insertion. The intrathecal catheter was left *in situ* for 18 hr after delivery. No further medication was administered via the intrathecal catheter after delivery of the infant. The patient was seen daily by Anaesthesia but did not develop PDPH and was discharged from hospital two days after delivery.

Discussion

Post-dural puncture headache is a distressing condition, especially for women who have just given birth. The cephalalgia typically worsens when the patient assumes

the upright position, thus inhibiting ambulation and the ability to care for the newborn. The headache may also require treatment, including an epidural blood patch procedure, which can result in prolonged hospital stay. None of the three women in our report who experienced accidental dural puncture with subsequent intrathecal catheterisation during labour and early postpartum period developed symptoms of PDPH.

Symptoms that may be associated with PDPH include: neck stiffness, nausea and vomiting, visual changes (photophobia, diplopia and difficulty with accommodation), and auditory changes such as tinnitus, vertigo and temporary hearing loss.⁶ Subdural haematoma⁷ and seizures⁸ have occasionally been reported in association with PDPH.

Prophylactic measures have been attempted after accidental dural puncture with an epidural needle during labour because of the high risk of developing PDPH and the severity of associated symptoms, which may be incapacitating for the mother. Conservative management usually includes hydration with *iv* or oral fluids and oral analgesic medication. Bed rest does not prevent PDPH after dural puncture.⁹ The pathophysiological mechanism of PDPH is leakage of CSF from the subarachnoid space into the epidural compartment, thus causing intrathecal hypotension resulting in traction on pain-sensitive intracranial structures. Epidural infusion of saline after accidental dural puncture may decrease the risk of developing PDPH, or at least decrease the severity of headache.^{10,11} However, Bart *et al.*¹² suggest that this may be ineffective in patients where the dura was penetrated with a large bore epidural needle. An epidural blood patch is effective in more than 90% of patients in relieving the symptoms of PDPH. However, the efficacy of prophylactic epidural blood patch is controversial. Palahniuk and Cumming¹³ did not find that pre-emptive epidural administration of autologous blood reduced the risk of PDPH. In contrast, recent investigations using larger volumes of blood found a reduced incidence of PDPH after prophylactic epidural blood patch procedure.^{3,4}

Consequently, there is a lack of simple, effective measures to prevent PDPH after accidental dural puncture during labour. There is some evidence that continuous spinal anaesthesia with an intrathecal catheter may be associated with a lower incidence of PDPH than one-shot spinal anaesthesia with spinal needles of similar size. Denny *et al.*¹⁴ used an 18-gauge Husted needle and a 20-gauge nylon epidural catheter in the subarachnoid space for various types of non-obstetric surgery. He described an incidence of PDPH of less than 1% with this technique in young and old male and female patients. Cohen *et al.*⁵ studied the incidence of PDPH

after accidental dural puncture at Caesarean section who received continuous intrathecal analgesia for more than 24 hr after surgery. None of the 13 patients in their retrospective review experienced PDPH following this treatment. Our findings from a small case series of intrathecal catheterisation during labour concur with their results that insertion of an epidural catheter after accidental dural puncture may provide effective PDPH prophylaxis. This procedure "plugs" the dural tear, decreasing or stopping efflux of CSF from the subarachnoid space. This may be particularly important during second stage of labour when the parturient performs frequent Valsalva manoeuvres. The effect of Valsalva manoeuvres on the flow of CSF exiting the subarachnoid space is unknown. However, Nath *et al.*¹⁵ have observed transient increases in CSF pressure during Valsalva manoeuvres in patients during surgery. Formation of fibrin around the intrathecal catheter at the dural tear has also been described in an experimental study using cats.¹⁶ This may be an additional factor in reducing the rate at which CSF is lost from the subarachnoid compartment with an *in situ* intrathecal catheter.

In summary, we have described an easy and practical technique to reduce the incidence of PDPH after accidental dural puncture during labour. However, the safety and efficacy of this technique should be confirmed by a larger, controlled (e.g., duration of intrathecal catheterisation) prospective study. The intrathecal catheter provides a conduit for administration of effective pain relief during labour. This procedure also avoids the risks associated with a repeat attempt at epidural analgesia. In addition, administration of appropriate local anaesthetic via the intrathecal catheter will provide rapid onset of surgical anaesthesia for emergency Caesarean delivery if there is evidence of acute fetal distress during labour.

References

- 1 Lambert DH, Hurley RJ, Hertwig L, Datta S. Role of needle gauge and tip configuration in the production of lumbar puncture headache. *Reg Anesth* 1997; 22: 66-72.
- 2 Crawford JS. The prevention of headache consequent upon dural puncture. *Br J Anaesth* 1972; 44: 598-9.
- 3 Quaynor H, Corbey M. Extradural blood patch - why delay? *Br J Anaesth* 1985; 57: 538-40.
- 4 Cheek TG, Banner R, Sauter J, Gutsche BB. Prophylactic extradural blood patch is effective. *Br J Anaesth* 1988; 61: 340-2.
- 5 Cohen S, Amar D, Pantuck EJ, Singer N, Divon M. Decreased incidence of headache after accidental dural puncture in Caesarean delivery patients receiving continuous postoperative intrathecal analgesia. *Acta Anaesthesiol Scand* 1994; 38: 716-8.

- 6 *Lybecker H, Djernes M, Schmidt JF.* Postdural puncture headache (PDPH): onset, duration, severity, and associated symptoms. An analysis of 75 consecutive patients with PDPH. *Acta Anaesthesiol Scand* 1995; 39: 605–12.
- 7 *Edelman JD, Wingard DW.* Subdural hematomas after lumbar dural puncture. *Anesthesiology* 1980; 52: 166–7.
- 8 *Shearer VE, Jhaveri HS, Cunningham FG.* Puerperal seizures after post-dural puncture headache. *Obstet Gynecol* 1995; 85: 255–60.
- 9 *Carbaat PAT, van Crevel H.* Lumbar puncture headache: controlled study on the preventive effect of 24 hours' bed rest. *Lancet* 1981; 1: 1133–5.
- 10 *Stride PC, Cooper GM.* Dural taps revisited. A 20-year survey from Birmingham Maternity Hospital. *Anaesthesia* 1993; 48: 247–55.
- 11 *Craft JB, Epstein BS, Coakley CS.* Prophylaxis of dural-puncture headache with epidural saline. *Anesth Analg* 1973; 52: 228–31.
- 12 *Bart AJ, Wheeler AS.* Comparison of epidural saline placement and epidural blood placement in the treatment of post-lumbar-puncture headache. *Anesthesiology* 1978; 48: 221–3.
- 13 *Palakniuk RJ, Cumming M.* Prophylactic blood patch does not prevent post lumbar puncture headache. *Can Anaesth Soc J* 1979; 26: 132–3.
- 14 *Denny N, Masters R, Pearson D, Read J, Sihota M, Selander D.* Postdural puncture headache after continuous spinal anesthesia. *Anesth Analg* 1987; 66: 791–4.
- 15 *Nath, Korula G, Chandy MJ.* Effect of intrathecal saline injection and Valsalva maneuver on cerebral perfusion pressure during transsphenoidal surgery for pituitary macroadenoma. *J Neurosurg Anesth* 1995; 7: 1–6.
- 16 *Yaksh TL, Noueihed RY, Durant PAC.* Studies of the pharmacology and pathology of intrathecally administered 4-anilinopiperidine analogues and morphine in the rat and cat. *Anesthesiology* 1986; 64: 54–66.