Surgical anaesthesia for Caesarean section with a subdural catheter

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Purpose: This case report describes a radiologically proven subdural catheter placed in a term parturient, which consistently performed as an epidural catheter for both labour analgesia as well as surgical anaesthesia.

Clinical features: The patient was a 26-yr-old, 52.7 kg, 140 cm healthy woman with a 39 wk intrauterine pregnancy. At initiation of epidural blockade, and for many hours throughout labour, an appropriate volume and concentration of local anaesthetic achieved an appropriate analgesic sensory level (10 ml bupivacaine 0.25%, bilateral T₁₀ sensory level). However, for Caesarean section, while an appropriate volume and concentration of local anaesthetic achieved an appropriate surgical anaesthetic sensory level (15 ml bupivacaine 0.5%, bilateral T₄ sensory level), there was no demonstrable motor blockade (0 on the Bromage scale). The Caesarean section was performed without incident, and without the need for supplemental intravenous opioids or anxiolytics.

Conclusion: We report the case to question the commonly held beliefs of subdural catheter presentation. We questioned the catheter position, and proved its subdural placement, only after larger volumes of higher concentration local anaesthetic did not achieve expected goals. It is possible that a high percentage of epidural catheters may be subdural, unbeknownst to the practitioner.

Objectif: Cette observation décrit l'insertion prouvée par radiologie d'un cathéter dans l'espace sous-dural chez une parturiente à terme. Ce cathéter s'est comporté comme s'il était épidural aussi bien pendant le travail que pendant la chirurgie.

Caractéristiques cliniques: La patiente était âgée de 26 ans, pesait 52,7 kg, mesurait 140 cm et en était à sa 39^e semaine de grossesse. Dès l'induction du bloc épidural, et pendant plusieurs heures de travail, le volume et la concentration usuels d'anesthésique local a produit une analgésie satisfaisante (bupivacaine 0,25% 20 ml, niveau sensitif T₁₀ bilatéral). Cependant, pour la césarienne, alors que le volume et la concentration appropriés d'anesthésique local procuraient un niveau d'anesthésie adéquat pour la chirurgie (bupivacaine 0,5% 10 ml, niveau sensitif T₄ bilatéral), le bloc moteur était absent (0 sur l'échelle de Bromage). La césarienne a été réalisée sans incident et sans nécessiter de morphiniques ou d'anxiolytiques.

Conclusion: Cette observation illustre l'incertitude qui peut subsister quant à la position sous-durale d'un cathéter. Les auteurs ont eu un doute sur la position du cathéter et prouvé qu'il était sous-dural, seulement après que l'injection de plus grands volumes d'une plus forte concentration n'aient pas produit les effets attendus. Il est possible qu'un pourcentage élevé de cathéters soit dans l'espace sous-dural sans que le praticien ne la sache.

Key words

ANAESTHETIC TECHNIQUE: epidural, subdural;

ANAESTHESIA: obstetric.

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There is a 7% incidence of partial subdural injection of local anaesthetic during performance of a subarachnoid block.^{1,2} This may explain some cases of "failed spinal." However, the partial subdural injection of local anaesthetic during regional anaesthesia under epidural is much lower, 0.5% to 1.0%. This widely quoted statistic is based on a large retrospective review by Lubenow, *et al.*³ They classified clinical findings of subdural block into major and minor criteria. Major criteria were: (1) a negative aspiration test, or (2) unexpected widespread sensory block after epidural injection. The three minor criteria were: (1) delayed onset of 10 min or more of a sensory or motor nerve block, (2) variable motor blockade, despite the use of low doses of bupivacaine, or (3) sympatholysis out of proportion to the administered

dose of local anaesthetic. A positive subdural injection was judged to have occurred if both of the major criteria and at least one of the minor criteria were present.

We present a case of a safely managed, radiographically identified, subdural catheter only after completion of a Caesarean section, during which an appropriate amount of local anaesthetic achieved sensory anaesthesia but without discernable motor blockade.

Case report

A 26-yr-old, 52.7 kg, 140 cm healthy woman with a 39 wk intrauterine pregnancy presented at 1:30 am to the labour and delivery unit in latent phase labour. After 12 hr of labour, vaginal examination revealed 4 cm cervical dilation, complete effacement, vertex presentation and -2 station as measured from the cervix. Fetal heart tones were in the 140 bpm range with good variability. The obstetric anaesthesia service was consulted for management of labour pain before artificial rupture of membranes and oxytocin augmentation.

After administration of 30 ml bicitra *po*, and 1000 ml bolus of lactated Ringer's solution iv, the patient was placed in the sitting position, her back prepared with betadine and draped in the usual sterile fashion. Lidocaine 1% was used for a skin wheal at the L₂₋₃ interspace and an 18 g Hustead epidural needle was inserted resulting in inadvertent dural puncture with CSF flow. After withdrawal of the needle a second skin wheal was performed, and the L₃₋₄ epidural interspace was located with loss of resistance to air. Aspiration was negative for both blood and CSF, the epidural needle was subsequently turned from cephalad to caudad and a 20 g multi orifice catheter was passed 3 cm into the epidural space. After needle withdrawal, the epidural catheter was tested with 3 ml lidocaine 1.5% with 1:200,000 epinephrine. After a negative aspiration and no signs or symptoms of intravenous or subarachnoid injection, an additional 2 ml of test solution were injected without incident. The catheter was secured and the patient was positioned with left uterine displacement. A total of 10 ml bupivacaine 0.25% was injected over the next 15 min in incremental doses, achieving a bilateral T₁₀ sensory level to pinprick. Maternal blood pressure decreased from 130/80 to 120/70 mmHg with no change in heart rate. Fetal heart rate and variability remained unchanged. The mother reported good analgesia with no motor blockade.

Upon checking the patient 90 min later at 3:30 am a T₁₂ bilateral level was noted and bupivacaine 0.25% in incremental dosing to a total of 10 ml was given, and a continuous infusion of bupivacaine 0.125% with 2 µg·ml⁻¹ fentanyl at 8 ml·hr⁻¹ was started. The sensory

level remained unchanged with good maternal analgesia and no motor blockade. At 5:30 am, examination revealed a T₁₂ bilateral level, but with maternal complaints of abdominal pain an additional dose of 10 ml bupivacaine 0.25% was administered and a T₁₀ bilateral sensory level achieved. The infusion was increased to 10 ml·hr⁻¹. For the next six hours the patient remained comfortable with a stable T₁₀ bilateral sensory level and no motor blockade. After complete cervical dilatation and adequate pushing with good analgesia for three hours, it was decided to proceed to Caesarean section due to arrest of descent and cephalopelvic disproportion. At 11:30 am, bupivacaine 0.5% was administered over 20 min in 3 ml increments to a total of 15 ml, achieving a T₄ bilateral sensory level, and the patient was taken to the operating room.

After the patient moved herself without any difficulty to the operating table the anaesthesiology attending berated the resident for the "inadequate surgical anaesthetic," and administered an additional 10 ml of lidocaine 2% with 1:200,000 epinephrine in incremental doses over five minutes. Ten minutes later, sensory level increased to T₁ bilateral, and examination revealed a motor blockade of 0 on the Bromage Scale (voluntary movement of the hip, knee and ankle). The patient was preoxygenated in anticipation of inducing general anaesthesia. After the patient tolerated, without complaint, forceps skin pinching above the umbilicus, the operation was allowed to proceed. The patient tolerated the 75 min procedure, including both uterine exteriorization and internalization, in complete comfort without the aid of any analgesics or anxiolytics. Upon completion, the patient moved herself from the operating table to her transport bed without any difficulty.

Block regression to T₁₀ occurred 100 min after her final dose and the patient was taken to the radiology suite for catheter examination. Two ml radiopaque dye were injected to achieve the appearances in the Figure.

Discussion

Inadvertent injection of local anaesthetic into the subdural space may vary in presentation. With a low volume, 2–10 ml, of local anaesthetic the presentation may include: (1) an extensive but patchy asymmetric sensory blockade, with variable motor penetrance,^{4,5} (2) intracranial extension with relative sacral sparing,⁶ (3) respiratory depression including apnea and unconsciousness,⁷ and (4) a delay in blockade onset with a prolonged time until complete recovery.^{8,9} Rarely, have reports described injections of large volumes of local anaesthetic since, theoretically, the fluid pressure from larger volume injections may rupture the arachnoid membrane

FIGURE Radiograph taken after injection of 2 ml radio-opaque contrast medium into the catheter. Contrast is visualized both anterior and posterior to the thecal sac extending from L₁ through L₄ vertebral bodies. Contrast is not visualized either intrathecally or in the epidural space.

and produce a total spinal anaesthetic.¹⁰ Listed risk factors for subdural catheter placement include: (1) previous back surgery,³ (2) dural puncture at the same or an adjacent interspace,¹¹ and (3) rotation of the needle 180° after finding the epidural space.¹² While we did achieve two of the three enumerated risk factors for subdural placement, our presentation is notable because of the volume of local anaesthetic that was used without untoward sequelae, which produced surgical anaesthesia without motor blockade.

Abouleish¹³ suggested that a low volume subdural catheter may result in a less intense motor blockade than occurs with a high or total spinal because of limited spread of local anaesthetic within the subdural space, which spares the anterior motor fibers. Our catheter functioned for hours seemingly as an epidural catheter, with an appropriate volume of local anaesthetic produc-

ing an appropriate analgesic sensory level. For the Caesarean section, an appropriate volume of local anaesthetic achieved an appropriate surgical anaesthetic sensory level. The local anaesthetic volumes did not produce total spinal anaesthesia. Yet the injection of 2 ml radiopaque dye achieved both posterior and anterior subdural spread extending over 4–5 laminae, the classical radiological finding for subdural injection. One may argue that partial epidural/subdural placement of our multiorifice catheter occurred, however, dye was not evident in the epidural space. Furthermore, the “path of least resistance” rule would dictate preferential epidural spread rather than subdural. While catheter migration may occur at any point in time, our catheter performed consistently to the volume of local anaesthetic injected.

We present our case to question the commonly held beliefs of subdural catheter presentation. We achieved only one of the major criteria (negative aspiration), and no minor criteria as described by Lubenow *et al.* Throughout labour our catheter performed as an “epidural catheter.” We determined subdural placement only after larger volumes of higher concentration local anaesthetic did not achieve expected goals. It is possible that many “epidural” catheters may be positioned subdurally unbeknownst to the practitioner.

References

- 1 Shultz EH, Brogdon BG. The problem of subdural placement in myelography. *Radiology* 1962; 79: 91–6.
- 2 Jones MD, Newton TH. Inadvertent extra-arachnoid injections in myelography. *Radiology* 1963; 80: 818–22.
- 3 Lubenow T, Keh-Wong E, Kristof K, Ivankovich O, Ivankovich AD. Inadvertent subdural injection: a complication of an epidural block. *Anesth Analg* 1988; 67: 175–9.
- 4 Brindle Smith G, Barton FL, Watt JH. Extensive spread of local anaesthetic solution following subdural insertion of an epidural catheter during labor. *Anaesthesia* 1984; 39: 355–8.
- 5 Lee A, Dodd KW. Accidental subdural catheterisation. *Anaesthesia* 1986; 41: 847–9.
- 6 Katz JA, Lukin R, Bridenbaugh PO, Gunzenhauser L. Subdural intracranial air: an unusual cause of headache after epidural steroid injection. *Anesthesiology* 1991; 74: 615–8.
- 7 Glosten B. Local anaesthetic techniques. In: Chestnut DH (Ed.). *Obstetric Anesthesia, Principles and Practice*. St. Louis, MO: Mosby Yearbook Inc., 1994: 370–1.
- 8 Morgan B. Unexpectedly extensive conduction blocks in obstetric epidural analgesia. *Anaesthesia* 1990; 45: 148–52.
- 9 Maycock E. An epidural anaesthetic with unusual complications. *Anaesth Intensive Care* 1978; 6:263–4.

- 10 *Leighton BL*. Anaesthetic complications: intraoperative.
In: Norris MC (Ed.). Obstetric Anesthesia. Philadelphia: J.B. Lippincott, 1993: 623.
- 11 *Stevens RA, D'Arcy Stanton-Hicks M*. Subdural injection of local anesthetic: a complication of epidural anesthesia. *Anesthesiology* 1985; 63: 323–6.
- 12 *Mehta M, Maher R*. Injection into the extra-arachnoid subdural space. Experience in the treatment of intractable cervical pain and in the conduct of extradural (epidural) analgesia. *Anaesthesia* 1977; 32: 760–6.
- 13 *Abouleish E, Goldstein M*. Migration of an extradural catheter into the subdural space. *Br J Anaesth* 1986; 58: 1194–7.