Clinical Reports

Failure of a lidocaine test dose to identify subdural placement of an epidural catheter

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We report the failure of a test dose of 3 ml lidocaine 1.5 per cent with 15 µg epinephrine to identify subdural placement of an epidural catheter in a parturient. Thirty-five minutes after injection of 13 ml lidocaine 1.5 per cent, intended to provide epidural analgesia, the patient developed an extensive sensory neural blockade. Some motor control was maintained and sympathetic block was incomplete. Blood pressure and oxygenation were easily supported with optimum positioning, fluids, ephedrine and oxygen by mask. The patient remained alert. The duration of neural blockade was approximately two hours. The patient underwent a second epidural for labour analgesia that was uneventful. There were no sequelae. Subdural injections are uncommon and unpredictable in their occurrence. Test doses do not consistently identify misplaced catheters. A negative response to a test dose does not guarantee that extensive neural blockade will not occur during epidural analgesia.

Key words

ANAESTHESIA: obstetrical; ANAESTHETIC TECHNIQUES: epidural, lumbar; ANAESTHETICS, LOCAL: lidocaine, bupivacaine; COMPLICATIONS: subdural injection.

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The rationale behind administration of a test dose in epidural anaesthesia is to detect misplaced catheters prior to injection of the main drug bolus. Excessively high dermatomal levels may result from accidental intrathecal or subdural injection of the large drug mass used in epidural anaesthesia. The use of lidocaine as a test dose to detect intrathecal placement of epidural catheters has been advocated because of its rapid and predictable onset of action when used for subarachnoid blockade in parturients.¹

We report a case where a lidocaine test dose failed to identify probable subdural placement of an epidural catheter.

Case report

The patient was a healthy 34-year-old, 71 kg primigravida presenting with a term gestation following an uncomplicated pregnancy. Epidural analgesia was requested for relief of labour pain.

Following IV hydration with 750 ml of Ringer's lactate, the epidural was performed with the patient in the sitting position, at the L₃₋₄ interspace, with a 17 ga Tuohy needle. The epidural space was easily identified with loss of resistance to air and the needle was not manipulated once the space was entered. The catheter was passed, eliciting transient right-sided paraesthesia. Aspiration of the catheter revealed no blood or cerebrospinal fluid (CSF). Three ml lidocaine 1.5 per cent containing 15 µg of epinephrine was then administered through the catheter. After five minutes there had been no change in HR or BP, no evidence of sensorimotor blockade and no other signs or symptoms to suggest either an intravascular or subarachnoid injection. Two further five ml aliquots of lidocaine 1.5 per cent were then administered.

Ten minutes after administration of the final aliquot the patient was comfortable. Thirty-five minutes after the final aliquot, she complained of tingling and increasing weakness in both arms. She was turned to the full lateral position, oxygen was provided by facemask and she was

transported to an adjacent delivery room, to which anaesthetic and obstetrical personnel were summoned.

Maternal systolic blood pressure was 90 mmHg and heart rate was 110 bpm. Fetal heart rate (FHR) was 90 bpm. She was treated promptly with IV fluids and 10 mg ephedrine. Maternal blood pressure was quickly restored to 110/70 and FHR returned to the normal range with good beat-to-beat variability. The patient was maintained in full lateral position and oxygen was provided via a Hudson mask. Monitors included an automatic blood pressure cuff, an electrocardiogram and a pulse oximeter. The FHR was continuously monitored with a scalp electrode.

She was profoundly weak in four extremities but able to grip with both hands. Sensation to pinprick was decreased over her entire body with only her face being spared. She was alert, talking and able to cough, albeit weakly. Oxygen saturation, as measured by pulse oximetry, was 100 per cent. An additional 15 mg ephedrine, in divided doses, maintained the systolic blood pressure above 100 mmHg. Two ml of clear fluid were aspirated from the epidural catheter. The fluid was tested with Labstix (Miles Laboratories) reagent strips and was positive for both protein and glucose and formed an interface when mixed with lidocaine. The fluid was deemed to be CSF and the catheter was removed.

Eighty minutes after the last administered aliquot, the motor block began to regress. Grip strength was improved but the patient still complained of tingling in her arms. After an additional 30 minutes she had recovered sufficiently to return to her room in the delivery suite.

One hour later a second epidural was requested and administered, without incident. Four hours later she delivered a healthy male infant. Both mother and child were discharged home on the fourth postpartum day. There were no adverse sequelae.

Discussion

The subdural space is a potential space, bounded by the dura and pia-arachnoid membranes and containing a small amount of serous fluid.² The space extends laterally over the nerve roots and ganglia and the potential space is greater over the dorsal root ganglia.³ The subdural space is entered in 2–13 per cent of contrast myelographic procedures and injection into the subdural space during attempted subarachnoid anaesthesia may account for the occasional inadequate block.⁴

Subdural blockade is said to be a rare complication of epidural anaesthesia. Collier has reported an incidence of 1/2000 epidurals.⁵ However, a recent review of 2182 lumbar epidurals for steroid injection reported an incidence of 0.82 per cent subdural injections.⁶ Bromage has attributed the event to unskilled practitioners causing

trauma to the dura with excessive manipulation of the Tuohy needle.⁷ Case reports, however, typically document the occurrence of subdural blockade after apparently uncomplicated catheter insertion, with no manipulation of the needle once the epidural space was entered.^{8–11}

Local anaesthetics injected into the subdural space produce bizarre neural blockade unlike that produced by either epidural or subarachnoid injections. The differential diagnosis includes both massive epidural and total spinal block. Definitive diagnosis is by dye injection with demonstration of subdural placement of the catheter or needle. Four characteristics that aid in the clinical diagnosis of subdural blockade have been identified.^{5,12} Symptoms tend to be slow in onset, initially apparent over 15–30 minutes. Moderate hypotension is seen with systolic blood pressure rarely below 80 mmHg. Blood pressure is usually easily supported. Respiratory incoordination is gradually manifested but sudden apnoea does not occur. Finally, complete recovery generally occurs over two hours or less.

Despite the extensive sensory blockade, patients often maintain limited motor control. Our patient was able to grip weakly, but was unaware of her ability to do so. Pearson has previously reported a similar finding.³ This may be due to the pooling of the local anaesthetic in the larger dorsal subdural space, exerting a more profound effect on the dorsal sensory roots and leading to both the relative motor sparing and the incomplete sympathetic blockade. The sympathetic efferents accompanying the anterior spinal roots may be exposed to smaller volumes of local anaesthetic.⁵

The ability to withdraw CSF through the catheter after an apparent subdural injection is unusual but has been reported.^{5,11,12} It is possible that our catheter migrated through the thin pia-arachnoid membrane into the subarachnoid space after injection. Blomberg has shown that a catheter placed subdurally in human autopsy specimens may migrate into the subarachnoid space.¹³ Further, Philips has demonstrated that in labouring parturients, 54 per cent of catheters migrate from their original position with more than half migrating inwards.¹⁴ In this case the resultant blockade is not explained by the subarachnoid injection of all or part of 195 mg of lidocaine. The slow onset of anaesthesia and the relative motor and sympathetic sparing, in the setting of profound sensory analgesia, are more characteristic of a subdural injection than of a near-total spinal.

In previous case reports, test doses were either not used or bupivacaine was employed.^{3,8–11} The use of bupivacaine test doses in obstetrical anaesthesia is not advised because of the variable latent period to onset of blockade and because of the extensive subarachnoid block that might arise.^{1,15} In a survey of 3500 obstetrical epidurals,

a 2 ml test dose of 0.375 per cent bupivacaine did not produce evidence of subarachnoid injection in seven of 21 apparent dural punctures during epidural analgesia for obstetrics.¹⁶ Lidocaine 1.5 per cent with 7.5 per cent dextrose and epinephrine has been recommended as an effective test dose in obstetrics for the detection of subarachnoid catheters.¹ Although it has been shown that time to maximum sensory analgesia tends to be less using hyperbaric, dextrose containing solutions in subarachnoid anaesthesia, the difference is not great.¹⁷ It is therefore unlikely that the addition of dextrose to the test dose would have prevented the problem in our patient.

Summary

In summary, this case illustrates failure of a test dose of lidocaine 1.5 per cent with epinephrine to identify the subdural placement of an epidural catheter. Test doses designed for detection of subarachnoid placement of epidural catheters do not appear to identify subdural positioning. A negative test dose with lidocaine does not ensure that an extensive neural blockade will not result following administration of local anaesthetics. This emphasizes the need for vigilance and for full-time availability of experienced anaesthetists in settings where epidural analgesia is administered to labouring parturients.

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Résumé

Malgré une dose test de 3 ml de lidocaïne 1.5 pour cent avec adrénaline, nous n'avons pas décelé la position sous-durale d'un cathéter "péridural" chez une de nos parturientes. Ainsi, 35 minutes après l'injection de 13 ml de lidocaïne 1.5 pour cent, la patiente présentait un bloc sensitif très étendu avec préservation partielle de la motricité et du tonus sympathique. Elle demeura consciente et nous avons pu facilement assurer son oxygénation et maintenir une pression artérielle suffisante en modifiant sa position et en utilisant des liquides, de l'éphédrine et de l'oxygène. Le bloc dura à peu près deux heures et une deuxième péridurale assura l'analésie du reste du travail; il n'y eut aucune séquelle. Les injections sous-durales sont rares et imprévisibles. Aux fins de l'analésie péridurale, les doses-test ne peuvent pas toujours identifier un cathéter mal placé. Une réponse négative au test ne garantit pas que le bloc sera circonscrit.