Dry Tap and Ultrasound-assisted Combined Spinal Epidural Anaesthesia

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ABSTRACT

Use of ultrasonography to identify the anatomical structures during central neuraxial blockade is becoming increasingly common. Ultrasound-assistance and its real-time guidance have been used to gauge the depth of the dura-ligamentum-flavum complex. Successful spinal anaesthetic blocks following dry taps have rarely been reported. We report two cases of successful subarachnoid blocks despite dry taps where pre-procedure ultrasonography of the vertebral column helped in decision making process.

Keywords: Ultrasound, Dry tap, Combined spinal epidural, Anaesthesia.

INTRODUCTION

Successful spinal anaesthetic blocks following ‘dry taps’ have rarely been reported. Although ultrasound guidance is used to define the anatomy and gauge depth of the epidural space, its usefulness in ‘dry taps’ has not been described. We report two cases of successful ultrasound assisted spinal anaesthetic blocks following dry taps.

CASE REPORTS

Case 1

A 63-year-old Afro-Caribbean male patient was scheduled to have an elective total knee replacement under combined spinal epidural (CSE) anaesthesia. The patient weighed 110 kg and had a body mass index of 32. His medical history included essential hypertension and sickle cell trait. The patient had no past history of spinal pathology and had never undergone any spinal surgery.

In the anaesthetic room, ultrasonography of the lumbar vertebral region was carried out with the patient in sitting position. This revealed a dura ligamentum flavum (DLF) complex distance of 5.78 and 5.70 cm from skin at L3-4 and L2-3 intervertebral spaces respectively (Figs 1A and B) in the transverse midline view. This depth was 5.52 and 5.62 cm respectively in the longitudinal paramedian view (Figs 2A and B). Following this, under strict aseptic conditions, midline approach was used to insert 16 G Tuohy needle of a CSE kit (Portex® Combined Spinal/Epidural Minipack with Lock Pencil Point Spinal Needle 27G/16G, Smith’s Medical International Ltd., Hythe, Kent, UK) into the L3-4 intervertebral space. Loss of resistance to air was used to identify the epidural space successfully in the first attempt at predetermined depth. Subsequently 27 G pencil point spinal needle was inserted through the Tuohy needle into the subarachnoid space, but there was no CSF flow on withdrawal of the stylet. Further advancement and withdrawal of the spinal needle did not yield any CSF flow. The Tuohy needle along with spinal needle was withdrawn and a second attempt was made to insert the needles into the same space. Once again the epidural space was identified easily with loss of resistance to air at same depth; however there was no CSF flow through the spinal needle.

We then attempted to do the block through L2-3 intervertebral space. This time, a new CSE kit was used and epidural space was located using loss of resistance to air at predetermined depth by midline approach, however, there was again a dry tap on insertion of spinal needle. After three unsuccessful attempts to get CSF flow using midline approach in L3-4 and L2-3 spaces, we then resorted to using a para median approach which resulted in a dry tap for the fourth time. Aspiration using a syringe also failed to reveal any CSF flow through the spinal needle.

At this point, we decided to give a ‘test dose’ through the spinal needle despite a dry tap and proceed with the spinal anaesthetic if that was positive. Immediately after injection of 1 ml of the mixture (2.6 ml heavy bupivacaine 0.5% and 20 mcg fentanyl, a total volume of 3 ml), the patient reported warm and numb sensation in the gluteal region. Remaining volume of bupivacaine-fentanyl mixture was then injected into the intrathecal space. Subsequently epidural catheter was also inserted with ease and secured at 10 cm to skin and patient positioned supine. The patient had excellent sensory and motor block below T12 dermatome. He was pain free and comfortable through out the procedure which lasted around 90 minutes. He did not require any top up through the epidural catheter for the surgery. The epidural catheter was removed at the end of surgery and the post-operative recovery period was uneventful.

Case 2

Six weeks after the first case, a 64-year-old Caucasian male patient was posted to have an elective total hip replacement. He weighed 115 kg and had a body mass index of 34. His...
past medical history included well-controlled diabetes mellitus and hypertension. On further questioning, he revealed a history of blunt trauma to lumbar spine area more than 20 years ago and being in plaster cast for around 8 weeks.

This patient was also willing to have the operation done under a combined spinal epidural anaesthesia; hence we proceeded with an ultrasound-assisted technique. The same ultrasound enthusiast consultant anaesthetist performed the blockade. Pre-puncture ultrasonography using a transverse midline view of the lumbar region revealed DLF complex to skin depth of 6.07 and 5.43 cm at L3-4 and L2-3 intervertebral spaces respectively (Figs 3A and B).

A CSE kit from the same manufacturer was used this time as well. There were dry taps on insertion of spinal needle through the Tuohy needle both at L3-4 and L2-3 intervertebral spaces. On both occasions, the epidural space was identified easily using loss of resistance to air technique at pre-determined depth.

At the second attempt, we elicited a positive response to ‘test dose’ to confirm intrathecal placement of the spinal needle tip and carried on with further injection (mixture of 2.6 ml heavy bupivacaine 0.5% and 20 mcg fentanyl, a total volume of 3 ml). The patient had excellent motor and sensory block below T10 dermatome. Although the epidural catheter was inserted after intrathecal injection, it was not used either to extend or prolong the block intra-operatively. He had an uneventful postoperative and recovery period.

DISCUSSION

Combined spinal epidural anaesthesia is a common technique used in patients undergoing total knee and hip replacement surgeries. The possibility of experiencing technical difficulties in the elderly and obese cohort of patients is greater.2,4 Studies have demonstrated that an ultrasound assisted technique of administering spinal anaesthesia where a pre-procedural ultrasound is carried...
out to delineate neuraxial anatomy may be useful. A pre-procedure ultrasound at lumbar region can help to locate a specific intervertebral space, predict skin to dural space accurately and may lower the number of attempts to block. Ultrasound study also provides accurate information on the skin to dura distance for epidural blocks in the cervical and thoracic regions. Ultrasound can be used with central neuraxial blockade for either pre-procedure assistance alone or real-time guidance.

A complete dry tap is rarely seen and reported. The figures quoted from relatively old published data for incidences of ‘dry taps’ during CSE vary between 3 and 24.5% depending on the type of needle used. The commonest reason for ‘dry tap’ proposed in these studies is inadequate protrusion of the spinal needle tip through the Tuohy needle. Clearly these numbers do not correlate well with day to day clinical practice. There are various causes of dry tap which include a blocked needle, needle in the incorrect space, spinal surgery and low CSF pressures. It can also be due to congenital or acquired lumbar canal stenosis or adhesive arachnoiditis.

There is no clear definition for a ‘dry tap’ in the literature. It can be logically defined as ‘failure to obtain flow of CSF despite tip of the needle being correctly placed in subarachnoid space’. This can be clinically confirmed by successful ‘spinal blockade’ after injection of appropriate volume of local anaesthetic. Presence of tip of the needle in incorrect space per se is not a reason for dry tap, it merely is failure to do dural puncture.

In our first case a blocked needle is unlikely to be the cause as the needle was flushed after each attempt and furthermore a new kit was used after the second attempt. We feel that dry taps were not due to needle tips being in incorrect spaces in both of our cases, as loss of resistance were obtained at pre-measured depth of DLF complex on ultrasound and successful blocks were achieved with injectate volumes of 3 ml. The first patient was nil by mouth for over 24 hours before the scheduled surgery so the question arises whether dehydration had led to low CSF pressure leading to the dry tap observed. Dry tap in our second case may be attributable to the spinal trauma he had long ago the mechanism of which is not very clear. Successful spinal anaesthesia following dry tap with multiple attempts is very rarely reported. To our knowledge, no cases of dry tap have been reported when spinal anaesthesia is attempted with pre-procedure ultrasound assistance. In both of our cases pre-determining the depth of epidural space using ultrasound and feeling of classical loss of resistance encouraged us to give a small ‘test dose’ without subjecting the patients to any undue risk. After eliciting positive response from the patient, further injection was made in to the ‘subarachnoid space’ resulting in successful blockade.

This experience suggests the usefulness of ultrasound guidance along with a ‘test dose’ in cases of ‘dry taps’ during attempted spinal or combined spinal epidural anaesthesia.

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REFERENCES


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