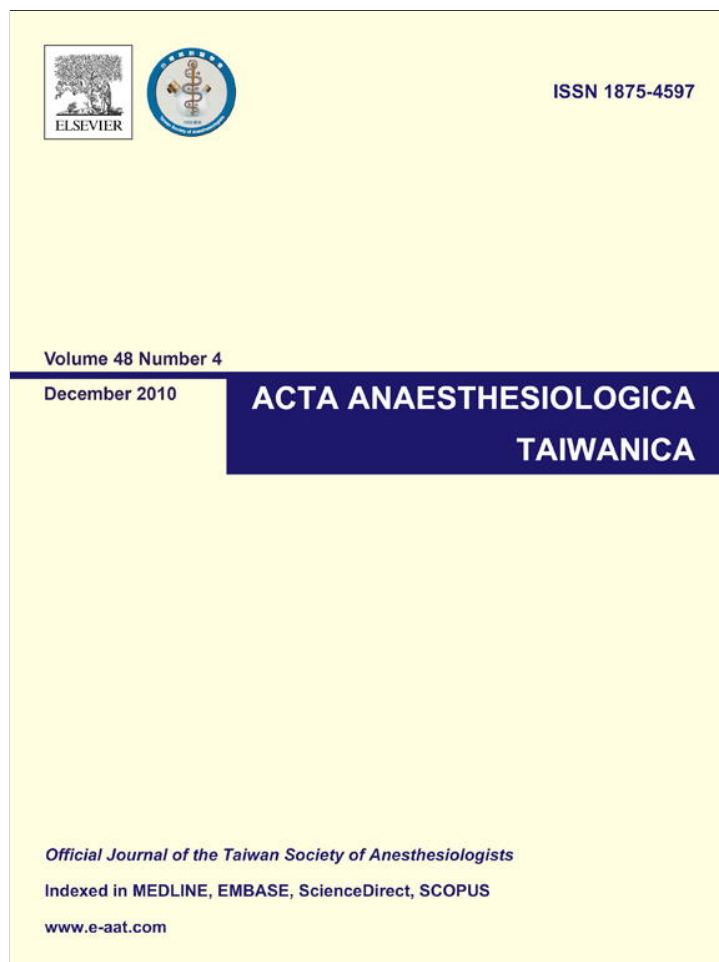


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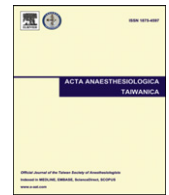
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Case Report

Sudden transient paraplegia shortly after preoperative thoracic epidural catheterization—A case report

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ABSTRACT

We report a case of sudden onset of paraplegia shortly after thoracic epidural catheterization for postoperative analgesia and discuss the possible causes of this event. A 38-year-old woman was scheduled to receive right lobectomy of liver because of hepatocellular carcinoma. Thoracic epidural catheterization for postoperative analgesia was performed before the induction of anesthesia. After skin disinfection and local anesthetic skin infiltration with lidocaine, epidural catheterization through T_{10–11} interspace was performed. Dural puncture without any neurological symptoms was noticed in the attempt and the epidural space was successfully identified through T_{9–10} interspace in the second attempt. However, acute motor weakness and sensory impairment were met as the epidural catheter was being threaded into the epidural space. Magnetic resonance imaging (MRI) revealed no abnormal findings and the neurological deficits resolved spontaneously within 2 h without any sequela. Finally, it was supposed that the transient neurological deficits were resultant from accidental subarachnoid injection of the local anesthetics used for skin infiltration. Preoperative image studies of the spine revealed a relatively short skin-to-dura distance either from median or paramedian approach, which might be the cause of the inadvertent intrathecal injection of local anesthetic during skin infiltration.

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1. Introduction

Thoracic epidural analgesia has been proved to provide better postoperative analgesia than intravenous analgesia after thoracic and major abdominal surgeries.¹ It also decreases postoperative morbidity and mortality because it can provide better dynamic analgesia, early mobilization, milder response to stress, early extubation, less pulmonary complications, and earlier return of bowel function.² However, epidural analgesia can occasionally lead to severe complications, including spinal hematoma formation, spinal cord injury, infection, cauda equina syndrome or paraplegia.³ We report a patient who experienced a sudden onset of paraplegia in the act of thoracic epidural catheterization. The possible etiologies of this complication and its prevention are discussed.

2. Case report

A 38-year-old woman (weight, 44 kg; height, 160 cm) was scheduled to undergo a right lobectomy of the liver for hepatocellular carcinoma (7.6 × 8.0 cm) in segment 4. Her medical history and physical examination results were generally unremarkable, except for being a hepatitis B carrier for more than 10 years. She had no history of back pain or any problems of the spine. Liver function profiles including GOT, GPT, or bilirubin were all within normal limits. No metastasis to other organs was noticed. Evaluation of the coagulation profiles, including prothrombin time, activated partial thromboplastin time and platelet count was normal. With the patient's consent, we performed epidural catheterization for postoperative pain control before induction of anesthesia. The patient was placed in the left lateral decubitus position and T_{10–11} interspace was chosen for needle entry. After skin disinfection, 3 mL of 2% lidocaine was infiltrated subcutaneously for a paramedian approach (1 cm lateral to the midline) and a 22-gauge needle was chosen for puncture. The needle was left to penetrate deep along the proposed paramedian track at an angle of about 15° slightly inward to the sagittal plane and upward 60° to the long axis

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Fig. 1. Thoracic MRI and measured distance (black line) from the skin-to-epidural spaces at the level of T₁₀ (2.5 cm).

of the spine. A total volume of 3 mL lidocaine was infiltrated periosteally and subcutaneously. After skin infiltration, an 18-gauge epidural Tuohy needle (B. Braun, Melsungen, Germany) was inserted to a depth of 3 cm from the skin, but some clear fluid was seen dripping out from the Tuohy needle. The needle was removed immediately on account of inadvertent dural puncture and the patient was evaluated for neurological impairments. Since there were no shooting pain, paresthesia, headache or other neurological symptoms, the procedure was reattempted at another intervertebral space (T_{9–10}) after subcutaneous infiltration of local anesthetic. Meanwhile the vital signs were closely watched. The epidural space (T_{9–10}) was then successfully identified at a depth of 3 cm from the skin by loss of resistance to air. As the epidural catheter was being threaded cephalad (approximately 5 min after the previous dural puncture), the patient suddenly experienced nausea and bilateral numbness below the thighs. Physical examination revealed a decrease of cold sensation below the level of T₁₀, bilateral lower extremity motor weakness (muscle power 1/5) and slight fall of blood pressure (BP of 90/45 mmHg). There was no respiratory or consciousness impairment. The epidural catheter was removed and the patient was placed in the Trendelenburg position immediately. After fluid challenge and administration of intravenous ephedrine, the blood pressure was restored to 103/60 mmHg. Surgery was postponed and neurologist consultation revealed no deep tendon hyper-reflexia or Babinski's sign. Magnetic resonance imaging (MRI) study of the thoracic spine revealed no evidence of spinal cord injury, epidural hematoma, ischemic changes, or spinal stenosis. (Fig. 1) About 2 h after the dural puncture, the muscle power of lower extremities, sensations to pinprick and light touch were fully recovered. Although neurological symptoms and signs were improved, intravenous dexamethasone 4 mg was still given every 8 h for 1 day to prevent possible delayed spinal cord edema. The operation was postponed for 1 week. Right hepatic lobectomy was then performed and the patient was discharged uneventfully 1 week later.

3. Discussions

Neurological injury is a rare but serious complication of thoracic epidural catheterization.^{4,5} Acute injury caused by the puncturing

epidural needle is usually heralded by significant symptoms and signs such as sharp radiating pain or paresthesia of the involved dermatomes as the nerve root or spinal cord was substantially hurt. Furthermore, such a cord-root damage induced pain or paresthesia often remains for a considerable period of time. MRI is used widely for diagnosis for such neurologic injuries.^{6,7} In our case, MRI study revealed no significant abnormalities at the involved thoracic levels, such as cord or nerve edema, trace of hematoma formation. This implied that the original neurological deficits could be resultant from other sources rather than mechanical injuries caused by the Tuohy needle or the epidural catheter. On the other hand, the neurological deficits namely, sensory and motor blocks below T₁₀ which arose with a relatively quick onset and wore off 2 h later signified the unlikelihood of mechanical injury. Hypotension was also noticed to resemble that of a classical sympathetic block. Upon reviewing the MRI, a 2.5 cm skin-to-dura distance in median approach was noted (Fig. 1) and the estimated trigonometric depth from the skin-to-epidural space in paramedian approach was about 3 cm ($2.5/\cos 15^\circ \times \cos 30^\circ$).⁸ Both the median and paramedian distances were much shorter than those in the report by Lai et al.,⁹ in which the average thoracic epidural depth in the Chinese population via the paramedian approach was 5.11 ± 0.94 cm (mean \pm SD), with the shorter distance at the lower thoracic levels (T_{10–12}: 4.86 cm vs. T_{6–9}: 5.20 cm). In our case, the length of the 22-gauge needle used for local infiltration was 3.2 cm which was longer than the measured skin-to-dura distance. Based on the above findings, we hypothesized that a portion of the lidocaine used for local skin infiltration might have been unintentionally injected into the subarachnoid space causing a symmetrical sensory-motor-sympathetic blockade below T₁₀.

Furthermore, we did not have direct evidences to show that the patient's transient sensory-motor-sympathetic neurological deficits were induced by a subarachnoid lidocaine blockade as the patient refused to accept a diagnostic spinal tap for CSF sampling to prove the existence of any local anesthetic. However, it was logically to suppose the unintentional subarachnoid blockade was caused by a needle about the same length, which overshot the dura and delivered some lidocaine into the subarachnoid space during skin local infiltration. Moreover, the neurological findings also matched those of a subarachnoid neurological blockade.

In summary, we reported a patient who developed neurological deficits during thoracic epidural catheterization. Unintentional subarachnoid injection of local anesthetic used for local skin infiltration was highly suspected to be the culprit of this complication. To avoid this, we advise using an injection needle with shorter length

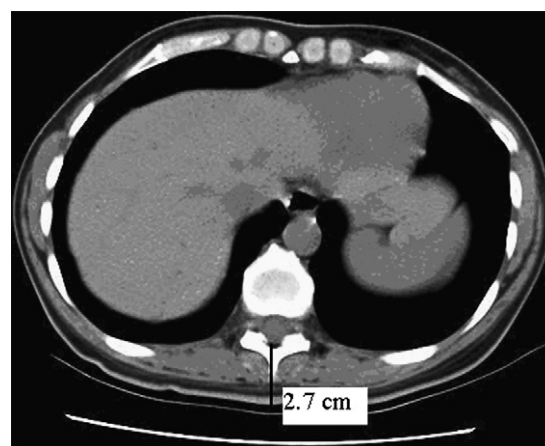


Fig. 2. The preoperative CT scan and measured distance (black line) from the skin-to-epidural space at the level of T₁₀ (2.7 cm).

for skin local infiltration and confine the injection not deeper than the subcutaneous layer. Reconfirmation of the needle position before administering the local anesthetics is also mandatory. Furthermore, to take advantage of imaging studies to estimate the skin-to-dura distance before the procedure might be helpful before thoracic epidural catheterization is performed (Fig. 2).⁸

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