CASE REPORT

Ultrasound-Guided Lumbar Plexus Block for Open Reduction and Internal Fixation of Hip Fracture

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■ **Abstract**

Purpose: Ultrasound technology has been applied to increase both efficacy and safety of certain peripheral nerve blocks. This case report describes the first successful ultrasound-guided lumber plexus block.

Clinical Features: We describe a 91-year-old woman with aortic stenosis who successfully underwent open reduction and internal fixation of a fractured right hip with a lumbar plexus block. Ultrasound provided direct visualization to help identify the anatomical structures and guide the block needle during performance of the block. Complete block of the lumbar plexus was attained within 15 min, and the surgical procedure was performed uneventfully.

Conclusion: The use of ultrasound has gained popularity to perform peripheral nerve blocks. In this case report, a successful lumbar plexus block was performed with ultrasound guidance. By direct visualization, using this technology may potentially reduce complications associated with lumbar plexus blocks. ■

Key Words: aortic stenosis, hip fracture, lumbar plexus block, psoas compartment block, ultrasound

INTRODUCTION

Lumbar plexus block is often performed for procedures involving hip and the anterolateral thigh. It is a preferred anesthetic technique over conventional neuraxial blocks for patients in whom hemodynamic stability is preferred.[1] Previous studies have examined ultrasound-guided approaches to the lumbar plexus in cadavers.[2,3] We report a case of successful lumbar plexus block with ultrasound guidance for open reduction and internal fixation of a hip.

CASE REPORT

A 91-year-old woman (150 cm, 47 kg) with aortic stenosis and hypertension presented with a right hip fracture. Open reduction and internal fixation of the hip was scheduled. Her hypertension was well-managed with atenolol and hydrochlorothiazide. No abnormalities were noted on her blood tests and chest X ray. Echocardiogram demonstrated normal ejection fraction, mild left ventricular hypertrophy, mild left atrial dilatation, and moderate aortic stenosis. An anesthetic plan was formulated, including a right-sided lumbar plexus block. An arterial line was placed. The patient was placed in the left decubitus position, and a lumbar plexus block was attempted using the conventional approach described by Winnie.[4] After two failed attempts at contacting the right L3 transverse process, we elected to apply ultrasound technology, utilizing a Sonosite Titan with C11 probe (Sonosite, Bothell, WA, U.S.A.). The patient was placed in the sitting position, and the area was prepped and draped in a sterile fashion. A 7 MHz curved array C11 ultrasound probe, draped in a sterile manner, was applied to the patient's lumbar area in a cross-sectional fashion. The L3 spinous

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process, which appeared as an enhancing ("hyperechoic") curved border with a darker shadow, was identified, and the probe was moved horizontally to locate the transverse process of L3, also a hyperechoic appearing structure (Figure 1). After local anesthetic skin infiltration, a 17-gauge 3.5″ Tuohy needle was introduced from the right side of the ultrasound probe along its long axis. The L3 transverse process was contacted at a depth of 5 cm (Figure 2). The Tuohy needle was then walked off superiorly and advanced slowly, while loss of resistance with air was being checked continuously. At 6 cm depth, a loss of resistance was felt. A total of 20 mL of lidocaine 2% with epinephrine 1:200,000 and 10 mL of bupivacaine 0.25% were injected in incremental doses in 5 min. Intermittently, small amounts of air were injected via the Tuohy needle to visualize the spread of the injectate in the psoas compartment. Complete motor and sensory anesthesia of the right lower extremity, extending from T11 to S2, was achieved within 15 min. The left lower extremity remained unaffected. Vital signs remained stable, and surgery was successfully completed 2.5 hours later. Diphenhydramine 25 mg and fentanyl 150 μg were the only additional medications that the patient received during the procedure.

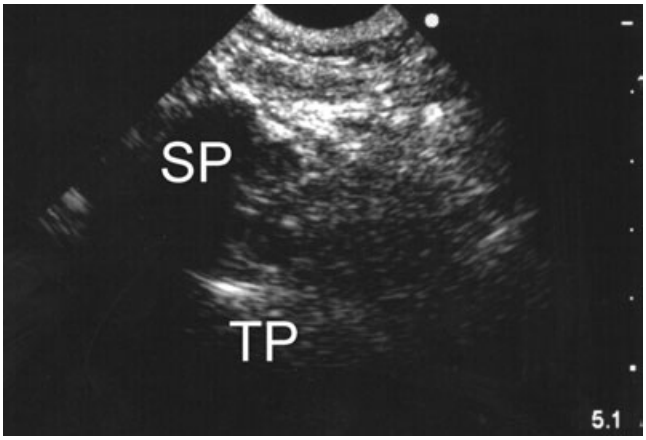

Figure 1. Ultrasound image of lumbar spine. SP, spinous process; TP, transverse process.

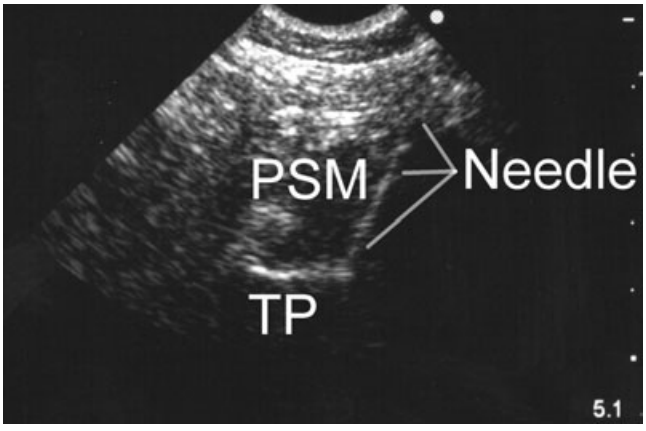

Figure 2. Ultrasound image of block needle contacting transverse process. TP, transverse process; PSM, paraspinous muscle.

DISCUSSION

Lumbar plexus block is an effective and safe anesthetic technique. The plexus is formed by the ventral rami of the first three lumbar nerves, and is located within the substance of the psoas major muscle. The block is traditionally performed by identifying surface anatomic landmarks and deciding on the needle entry point 4–5 cm lateral to one of the spinous processes. The needle is advanced blindly until contact is made with the transverse process of the vertebrae. It is then walked off, and the injection of local anesthetic is made after the loss of resistance is felt or the appropriate muscle group is stimulated by an insulated needle attached to a nerve stimulator. The lumbar plexus block is especially useful when hemodynamic stability is desired. Unlike neuraxial blockade, which can cause profound sympathectomy and preload reduction, lumbar plexus blocks cause only minor hemodynamic changes.[1] The cardiovascular system is minimally affected. Patients with aortic stenosis, in which a sympathectomy (with its resulting hypotension and tachycardia) can cause significant cardiovascular problems, represent a situation where lumbar plexus blocks may be advantageous over neuraxial blockade.[5,6] Complications reported from this technique include epidural or spinal extension of the block, intravenous local anesthetic injection, bleeding, and retroperitoneal hematoma.[7,8] These complications are usually associated with failed or multiple attempts, inability to contact the lumbar transverse process, or inadvertent vascular injuries.[9] In this case report, the patient maintained stable vital signs after having a successful ultrasound-guided lumbar plexus block.

This case report describes the first successful use of the ultrasound to perform a lumbar plexus block. By using ultrasound, we were able to visualize the spinous process, transverse process, and paraspinous muscles. Furthermore, the image provided real-time visualization of needle advancement and surrounding structures to allow the anesthesiologist to safely and successfully perform the lumbar plexus block. Only one attempt was needed to contact the transverse process. Paresthesia or

blood aspirations were not noted during the procedure, and there was no injury to surrounding structures.

The use of ultrasound technology has already been proved to increase accuracy and efficacy of certain peripheral nerve blocks.[10,11] Its advantages include actual identification of target organs, real-time visualization of advancing needle, directed deposition of local anesthetics, observation of injectate spread, and reducing the number of attempts. Despite this impressive profile, the application of the ultrasound for lumbar plexus blocks has not been studied extensively. Further prospective investigations are necessary to evaluate the comparative rate of success to the traditional techniques, and to assess the rate of adverse effects.

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