



Combination of ultrasound-guided lumbosacral plexus block with anterior quadratus lumborum block in supine position for hip surgery: a case report

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Abstract

It was widely recognized that the procedure of ultrasound-guided lumbar and sacral plexus block is required to be performed in a lateral decubitus position that patients' hips and knees were bended. It is difficult, however, for patients with hip fractures to change position because of severe pain and confined movements. We here reported a new modified combination of ultrasound-guided lumbosacral plexus block with anterior quadratus lumborum block in supine position that had been successfully applied in one elderly patient who underwent hip surgery.

Keywords Lumbosacral plexus block · Quadratus lumborum block · Ultrasound · Total hip arthroplasty

Introduction

Both central neuraxial blockade and peripheral nerve blockade can be applied to provide anesthesia for hip arthroplasty. Combination of L1 paravertebral block with lumbar plexus and sciatic nerve block had been validated to have similar hemodynamic efficiency with unilateral spinal anesthesia in partial hip prosthesis for high-risk geriatric patients [1]. However, these two methods require the patients to lie on lateral decubitus position with flexed knee and hip joints. While in this report, given the fact that the elderly patient could not cooperate with changing position like that because of severe pain and confined movements, we developed a new

blockade scheme of ultrasound-guided lumbosacral plexus block combined with anterior lumbar quadratus block to allow the patient to receive all the blocks just in supine position.

Case report

The patient was a 75 years old female (body weight 40 kg, ASA status III) with hip fracture to undergo total hip arthroplasty, who had been diagnosed as bronchiectasis for more than 8 years. The patient also had a history of open lower lumbar spine surgery for lumbar disc herniation more than 20 years ago, and occasionally had symptoms of backache. However, the patient refused to change position because of severe pain from the fracture site and had intermittent cough with sputum. Considering the potential respiratory complications after general anesthesia and potential difficulties and problems during and after spinal anesthesia, we applied a combination of ultrasound-guided lumbosacral plexus block with anterior quadratus lumborum block in a complete supine position. About 30 min later, the sensory block of the incision was confirmed by prick test. After that the surgery began and lasted for 85 min with blood loss of 200 ml. The patient during the operation was under moderate sedation by continuous infusion of propofol (2 mg/kg/h) and required no opioids. After operation, the patient had a

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NRS (Numerical rating scale, NRS) score of 0 for rest pain in the PACU.

Ultrasound-guided lumbosacral plexus block with anterior quadratus lumborum block in supine position

In the operating room, the patient was set in supine position and monitored by ECG, NIBP and SpO₂. Prior to block, the patient was given 2 l/min oxygen through a face mask. We performed all of the peripheral nerve blocks under real-time ultrasound guidance (M-Turbo, Sonostie, USA) with lumbar and sacral plexus confirmed by nerve stimulator (Stimuplex HNS12, Braun, USA) induced target muscles twitch. A 10 cm 22G blocking needle (Sonoplex, Pajunk, Germany) and convex array probe (2–5 MHz) were used.

For lumbar plexus, the probe was placed axially between costal margin and iliac crest at the midaxillary line (Fig. 1a). The lumbar plexus was then identified as a hyperechoic structure along the lateral border of the vertebral body within the psoas muscle, which was also called as shamrock lumbar plexus [2] (Fig. 1b). The blocking needle was inserted with out-of-plane technique, in a lateral-to-medial direction passing through the quadratus lumborum muscle and psoas muscle and advanced to the target of lumbar plexus (Fig. 1b). When the needle tip reached the target, lumbar plexus was confirmed by the quadriceps femoris twitch induced by 0.5 mA stimulating current (as shown in Online Resource 1). Then 20 ml 0.35% ropivacaine was slowly injected in 5 ml increments with negative aspiration. After that, the needle was retreated and adjusted to the fascia plane between the psoas muscle and quadratus lumborum

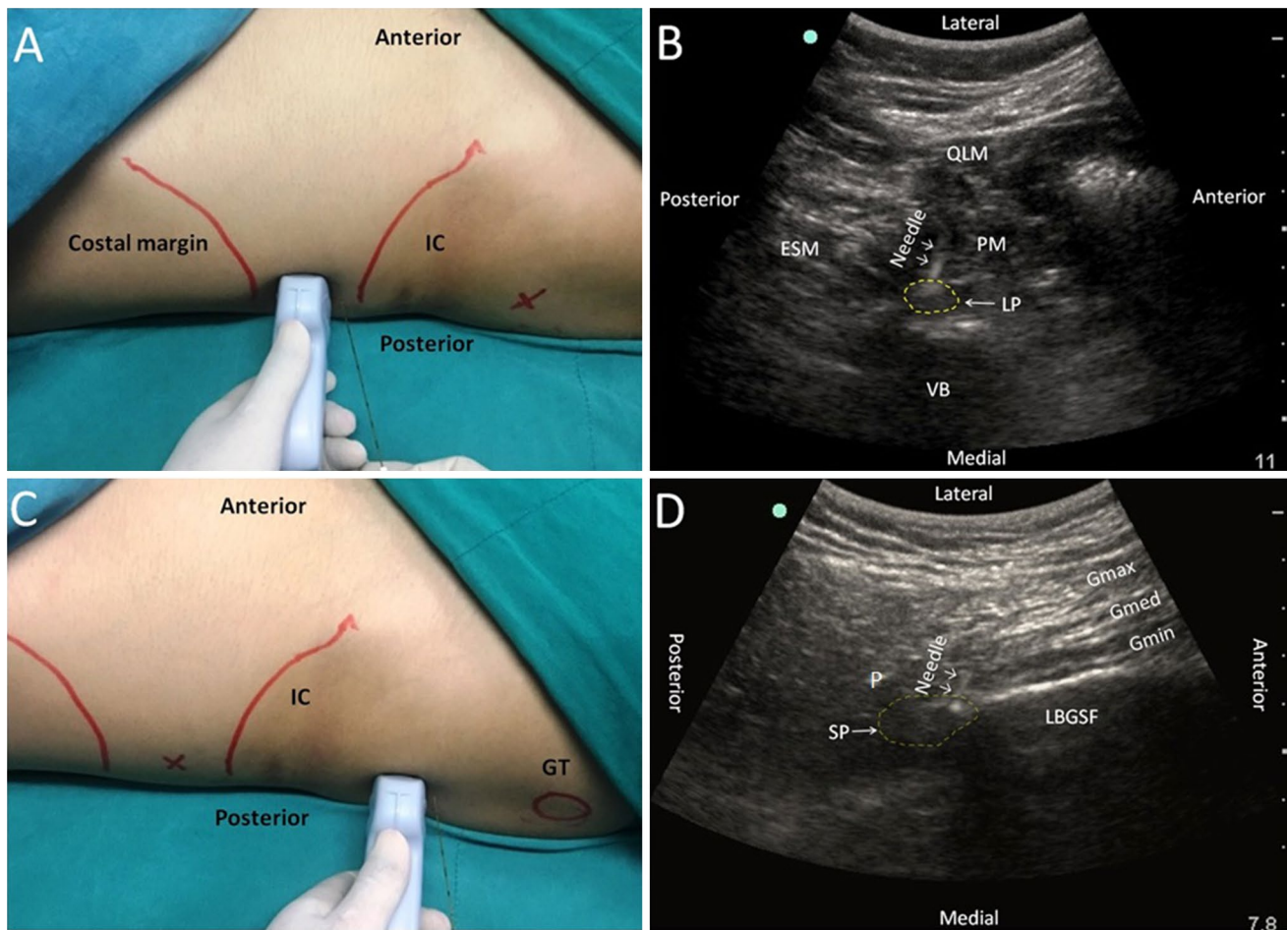


Fig. 1 Position of probe and ultrasound image for anterior quadratus lumborum block combined with lumbosacral plexus block in supine position. **a** Position of probe for lumbar plexus and anterior quadratus lumborum block. *IC* iliac crest. **b** Ultrasound image of lumbar plexus block. *QLM* quadratus lumborum muscle, *ESM* erector spinae muscle, *PM* psoas muscle, *VB* vertebral body, *LP* lumbar plexus. **c** Posi-

tion of probe for sacral plexus block. *GT* greater trochanter. **d** Ultrasound image of sacral plexus block. *SP* sacral plexus, *Gmax* gluteus maximus muscle, *Gmed* gluteus medius muscle, *Gmin* gluteus minimus muscle, *LBGSF* lateral border of the greater sciatic foramen, *P* piriformis muscle

muscle, which was also called anterior quadratus lumborum block. 10 ml 0.35% ropivacaine was injected.

For sacral plexus, the probe was axially placed at the middle point between the iliac crest and greater trochanter, and was adjusted to show the iliac bone line that demonstrated as a hyperechoic line. Then probe was moved caudally until the medial half of the hyperechoic line disappeared, which showed the gluteus maxmus muscle, gluteus medius muscle, gluteus minimus muscle and the lateral border of the greater sciatic foramen (LBGSF) (Fig. 1d). The actual position of the probe to the skin is presented in Fig. 1c. The sacral plexus was identified as a hyperechoic cluster posterior and medial to LBGSF (Fig. 1d). The needle was also inserted with out-of-plane technique, in a lateral-to-medial direction passing through the gluteus muscles to reach the target (Fig. 1d). Also, when the needle tip reached the target, sacral plexus was confirmed again by the leg or foot twitch elicited by 0.5 mA stimulating current (as shown in Online Resource 2). Then 10 ml 0.35% ropivacaine was slowly injected.

Discussion

Cadaver studies suggested that both the subcostal nerve and the iliohypogastric nerve were stained steadily and even diffused to the lower thoracic paravertebral space after anterior quadratus lumborum block, which indicated that the anterior quadratus lumborum block was appropriate for incision analgesia of hip prosthesis [3]. Furthermore, when the ultrasound probe was placed at the imaging site of shamrock lumbar plexus, the injection point of anterior lumbar quadratus block was also displayed; two blocks can be performed with one needle insertion. In 2017, Sato applied this method to an 8-year-old child with hip dysplasia in supine position and achieved satisfied postoperative analgesia, in which the needle was inserted in-plane from the anterolateral side of abdomen [4]. Since most patients with hip fractures were elderly adult, we adopted this method with an out-of-plane technique mainly to reach the lumbar plexus deeper than that in children.

Usually, ultrasound guided a parasacral or modified parasacral parallel shift approach is performed to block the sciatic nerve and the superior gluteal nerve at the same time as possible in hip arthroplasty [5, 6]. In 2011, Le Corroller had reported a cadaver study of the parasacral sciatic nerve block through lateral approach, and designed the initial insertion point and angle based on CT images, but still depended on blind needling and did not provide reliable basis about how to adjust the needle and when to stop advancing [7]. Recently, Wang clearly described the lateral approach of ultrasound-guided sacral plexus block in supine position using an in-plane technique, which finally made it practicable for clinical anesthesia [8]. But

in our experience, it's difficult to insert the needle in plane in most patients with supine position, because the probe is confined by surgery table surface and the needle is often hindered by LBGSF. Finally, an out-of-plane technique was preferred again in our case.

The application of short-axis scanning and out-of-plane puncture provided a wider view of adjacent structures and more space to adjust the needle. However, to avoid possible lumbar artery and superior gluteal artery injury, the color Doppler imaging should be routinely used to explore vascular structures around the lumbar and sacral plexus target area before needle insertion. The needle should also be inserted slowly to avoid organ injury caused by accidental penetration into abdominal or pelvic cavity. When the needle tip approaching lumbar and sacral plexus, the nerve stimulator should be set up with an initial current of no less than 1 mA to keep from nerve injury. Finally, this modified technique may represent an alternative analgesic technique for hip surgery in patients who are not suitable for lateral position, and an operation by experienced anesthesiologist is suggested.

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Compliance with ethical standards

Conflict of interest All authors have no conflict of interest.

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