

Peripheral Nerve and Plexus Blocks for Hip Surgery in a Nonagenarian with Severe Cardiac Disease

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ABSTRACT

The hemodynamic alterations and stress response associated with anesthesia and surgery are often poorly tolerated by elderly patients. Regional anesthesia techniques are useful in the elderly as they provide excellent perioperative analgesia with minimal hemodynamic perturbations. We report the case of a 90-year-old man with valvular heart disease and severe left ventricular systolic dysfunction, who underwent dynamic hip screw fixation of fractured femur neck under combined pericapsular nerve group block, lumbar plexus block, and para-sacral sciatic nerve block. We are not aware of any previous report of the combination of these blocks used for surgical anesthesia in hip fracture surgery.

Keywords: Geriatric; hip fracture; pericapsular nerve group block; regional anesthesia.

INTRODUCTION

Aging is a progressive physiological phenomenon associated with degenerative changes in the structural and functional capacity of all organ systems. Elderly patients can have several comorbid conditions that adversely affect perioperative outcomes. Clinicians need to be cognizant of these factors to provide safe anesthesia for the elderly. Peripheral nerve blocks and plexus blocks are useful to achieve favorable outcomes without compromising the airway or risking major hemodynamic perturbations. We used a combination of pericapsular nerve group (PENG), lumbar plexus, and sciatic nerve blocks to achieve excellent surgical anesthesia in a nonagenarian patient undergoing hip fracture surgery.

CASE REPORT

A 90-year-old man presented to the hospital with severe pain in the left hip region after trivial trauma. He had long-standing hypertension and was taking regular medications. He also had dyspnea and marked limitation of his daily activities even during less-than-ordinary exertion for a few years (New York Heart Association Class III symptoms). An x-ray of the hip joint revealed a fracture of the left neck of femur. Routine hematologic,

biochemical, and coagulation parameters were normal. Echocardiography revealed global hypokinesia of the left ventricle with severe left ventricular systolic dysfunction (ejection fraction: 25%) along with mild aortic stenosis and regurgitation.

Surgical fixation of the fractured femur was planned with dynamic hip screw. To assess pain scores, we used the numeric rating scale (NRS) on active and passive movement of the hip joint. During the pre-anesthesia visit, the patient and his relatives were explained his underlying medical conditions and age-related physiological constraints. We also explained the different techniques of anesthesia available in hip surgery including general anesthesia, neuraxial anesthesia, and peripheral nerve/plexus blocks. Written informed consent was obtained from the patient.

On the day of surgery, standard monitors (pulse oximetry, electrocardiography, and non-invasive blood pressure) were attached. The primary anesthetic plan was to conduct the case under regional anesthesia; general anesthesia with invasive arterial pressure monitoring was the backup plan. The baseline NRS was 8. Procedural sedation was achieved with fentanyl (50 µg) and midazolam (1 mg). With all aseptic precautions, left-sided PENG block was administered with 20 ml 0.1%

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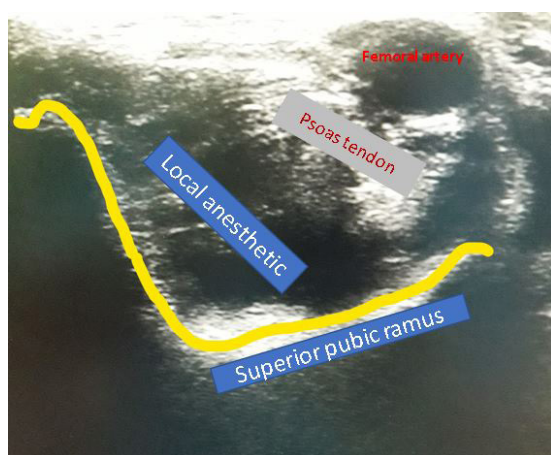


Figure 1. Ultrasound image after administration of the pericapsular nerve group block.

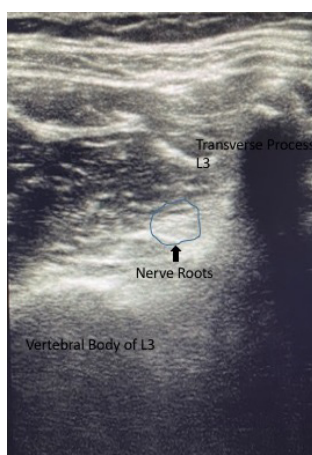


Figure 2. Lumbar plexus block at L3 vertebral body level after drug infiltration.

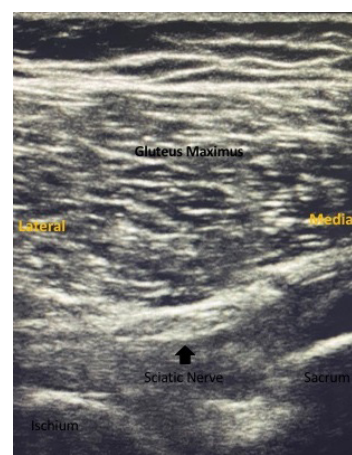


Figure 3. Sciatic nerve block (parasacral approach).

bupivacaine using a 4-inch stimulating needle (Stimuplex, B. Braun, Germany) under ultrasound (USG) guidance (Figure 1). The patient's pain was again assessed after 20 minutes. The patient reported an NRS score of only 4. We were then able to comfortably position the patient in the right lateral decubitus position. A low-frequency curvilinear probe (Siemens ACUSON NX3 ELITE, CH5-2, Germany) was then placed transversely on the left flank above the iliac crest (Shamrock technique). The lumbar plexus was blocked using 20 ml 0.3% bupivacaine using USG and peripheral nerve stimulation (PNS) (Figure 2). The sciatic nerve was then blocked with 20 ml 0.3% bupivacaine under combined USG and PNS guidance with a para-sacral approach (Figure 3). After about 20 minutes, the effect of the blocks was assessed by limb movements and sensation to pinprick. After confirming satisfactory anesthesia, the patient was shifted to the operating room.

The surgery lasted for two-and-a-half hours during which he did not require any supplemental analgesia, sedation, or vasoactive agents. The patient was calm and asleep during most of the surgery. After the surgery, he was transferred to the high-dependency unit for hemodynamic monitoring. He did not report any pain or discomfort in the immediate postoperative period and did not require any analgesia for another five hours.

DISCUSSION

Perioperative complications are common in elderly patients. When managing elderly patients, the anesthesiologist has to be mindful of the nature of the surgery, associated risks, and the patient's functional reserves and comorbidities. In the elderly, the functional capacity of organs declines, and co-existing diseases further contribute to this decline.

Neuraxial block and general anesthesia (GA) are the two most common anesthetic techniques in hip surgery. The use of neuraxial block minimizes blood loss, reduces surgical stress, and provides better postoperative analgesia compared with GA.¹ Several studies have found fewer in-hospital complications in patients who receive spinal anesthesia compared with GA for hip surgery.^{2,3} Furthermore, GA is associated with a greater risk of postoperative cognitive dysfunction in the elderly.⁴ In a recent study, patients undergoing limb amputation under GA had a significantly higher risk of postoperative delirium compared with regional anesthesia.⁵

In the elderly, many studies have been done on neuraxial anesthesia techniques for hip surgery, but information on peripheral nerve blocks (PNBs) is lacking. Mei et al⁶ found that patients who underwent hip arthroplasty under lumbosacral plexus block with sedation were ready for discharge earlier than those who received GA. The use of PNBs minimize the risk of hemodynamic instability often seen with neuraxial blockade, which makes PNBs an excellent option for the elderly. However, most of the published literature on hip fracture describe PNBs for postoperative analgesia rather than for surgical anesthesia.

The combined femoral, obturator, lateral femoral cutaneous, and sciatic nerve blocks, along with local-site infiltration, have been described to provide reliable anesthesia in hip surgeries.⁷ However, it is time-consuming to individually block all these nerves and there are added concerns of local anesthetic toxicity. In our experience, the simpler combination of PENG, lumbar plexus, and para-sacral sciatic nerve blocks provide excellent surgical anesthesia for hip surgeries. The lumbar plexus block reliably blocks the lateral cutaneous nerve of the thigh, femoral, and obturator

nerves. To block the lumbar plexus, we used the Shamrock technique, which provides an excellent view of the plexus and surrounding anatomy.⁸ The sciatic nerve was blocked using the parasacral approach.

Proper lateral decubitus positioning is important while performing the lumbar plexus and sciatic nerve blocks. This is one of the most challenging aspects of managing patients with hip fractures. The PENG block was first described in 2018 to reduce pain and facilitate positioning for neuraxial block in patients with hip fractures.⁹ Other modifications of the originally-described PENG block technique, like high-volume PENG block, and continuous catheter techniques are also being explored.¹⁰

CONCLUSIONS

To the best of our knowledge, the use of the PENG block in combination with lumbar plexus block, and sciatic nerve block to achieve surgical anesthesia for hip fracture surgery has not been reported previously in mainstream literature. This technique can be extremely useful in elderly patients with underlying cardiopulmonary conditions.

CONFLICT OF INTEREST

None

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