

Combined Psoas Compartment and Sciatic Nerve Block for Lower Limb Surgery: An Alternative Anesthetic Option in High-risk Geriatric Patients

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Abstract

Reported is a case series of high risk geriatric patients with multiple co-morbidities presenting for lower limb orthopaedic surgeries. Combined psoas compartment and sciatic nerve block proved useful as an alternative anaesthetic technique to central neuraxial blockade and general anaesthesia. We recommend the use of these peripheral nerve blocks as the sole anaesthetic option for lower limb surgeries in the emerging phase of easy accessibility of peripheral nerve stimulator and ultrasound in the operation theatres.

Key words: Geriatric patients, psoas compartment, sciatic nerve block

INTRODUCTION

In the era of development of new modalities such as ultrasound and peripheral nerve stimulator, the horizon of anesthesia has started shifting from general anesthesia and central neuraxial blockade to peripheral nerve blocks. Elderly patients frequently present for hip and knee surgeries and pose a challenge to the anesthetist due to their associated comorbid conditions like hypertension, diabetes mellitus, coronary artery disease, chronic obstructive pulmonary disease, and renal dysfunction.

Peripheral nerve blocks are especially advantageous in geriatric patients in whom general anesthesia can cause severe hemodynamic instability with doubtful pain control.^[1,2] Central neuraxial blockade can also result in unpredictable level of block and complications such as epidural hematoma, urinary retention, prolonged sympathetic block, and local anesthetic toxicity.^[3,4]

Apart from providing satisfactory postoperative analgesia for decades, a posterior psoas compartment block is an upcoming locoregional anesthetic technique for lower extremity surgeries. Previous studies have evaluated either psoas compartment block or sciatic nerve block alone for major orthopedic hip and knee surgeries^[5,6] but efficacy and effectiveness combining both are few.

In most of the previous cases, these peripheral nerve blocks were combined with general anesthesia but recent beneficial effects of these blocks in terms of avoiding adverse effects of general anesthesia and central neuraxial blockade in high-risk elderly patients, early initiation of physiotherapy, pain control, and reduced cost^[7] have led to a boon in the area of interest of using these blocks as a safe, sole anesthetic technique in major lower limb surgeries. This case series helps us to understand the efficacy of combined psoas and sciatic nerve block in high-risk geriatric patients with multiple comorbidities.

CASE REPORTS

Case 1

A 60-year-old nondiabetic, hypertensive male patient presented to our hospital with complaints of fractured hip and was scheduled for dynamic hip screw of the left hip. The patient was a chronic smoker and a known asthmatic on regular treatment (albuterol and budesonide inhaler three times a day, Deriphyllin tablet of dosage 200 mg twice daily) and had a known history of chronic kidney disease on thrice weekly maintenance by hemodialysis. On systemic examination, he was found to have pulse rate 90 bpm and blood pressure 150/90 mmHg. His respiratory findings revealed bilateral rhonchi. Readings of his cardiovascular, gastrointestinal, and central nervous systems were within normal limits. His laboratory investigations after dialysis showed his hemoglobin count to be 10.0 g/dL, total leukocyte count (TLC) 10,200/mm³,

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platelet count 1.60 lakhs, serum creatinine 7.67 milligrams per deciliter (mg/dl), prothrombin time 20.0 s, international normalized ratio (INR) of 1.42, serum sodium 132 meq/L, and serum potassium 4.47 meq/L. Echocardiography of his heart revealed an ejection fraction of 50%, no regional wall motion abnormality with grade I diastolic dysfunction, and left ventricular hypertrophy. Radiograph of his chest showed prominent bronchovascular markings with chronic obstructive pulmonary disease changes.

Case 2

A 64-year-old hypertensive male patient with a fractured patella due to a fall presented for tension band wiring. The patient had a known history of coronary artery disease with reduced effort tolerance. Echocardiography of his heart revealed an ejection fraction of 35% and global hypokinesia. He had been advised to undergo coronary bypass surgery by the treating physician but had refused the same and was on treatment with dual antiplatelets (aspirin of dosage 75 mg and clopidogrel of dosage 150 mg), beta blockers (metoprolol of dosage 25 mg administered twice daily) and Lasix tablet of dosage 20 mg taken once daily. On examination, he was found to have pulse rate 64 bpm and blood pressure 130/80 mmHg. Readings of his systemic examination were within the normal limits. Laboratory parameters showed his hemoglobin to be 11.2 g/dL, TLC 9600/mm³, and platelet count 92,000. His renal and liver function tests were within normal limits.

Method

After taking informed consent and checking all the resuscitation facilities in the operation theater, an intravenous (IV) access was established and standard monitors were attached. The patient (in both the cases) was sedated with IV administration of midazolam of dosage 1 mg, along with IV administration of fentanyl of dosage 30 µg and oxygen was applied via Hudson's mask.

Sciatic nerve block (classic posterior approach)^[8]

The patient was placed in the lateral decubitus position (Sim's position) with the operative extremity being nondependent. The following two lines were drawn: the first from the greater trochanter to the posterior superior iliac spine (PSIS) and the second from the greater trochanter to the sacral hiatus. From the midpoint of the greater trochanter-PSIS line, a perpendicular was drawn caudad that intersected the greater trochanter-sacral hiatus line, which conveyed to us the insertion point. After giving subcutaneous lignocaine at the entry point, we advanced a 4-inch, 21-gauge insulated stimulating needle just perpendicular to the skin. After encountering gluteal muscle stimulation, the needle was inserted further to elicit a motor response in the distal ankle or the foot. The stimulation was reduced to <0.5 mA and after witnessing a fade of motor activity after injection of 1 mL of local anesthetic; 20 mL of 0.5% bupivacaine was delivered after frequent checking for negative aspiration of blood.

Psoas compartment block (Posterior approach)^[9]

With the patient in the same lateral decubitus position, a line was drawn connecting both the iliac crests that crossed

the lumbar body of the fourth lumbar nerve (L4). Another line was drawn from the PSIS cephalad just parallel to the vertebral column. The intersection of these two lines denotes the most lateral portion of the lumbar plexus. The needle (4-in 21-gauge insulated stimulating needle) was inserted 3 cm caudad and 5 cm lateral to the L4 vertebrae and was angled slightly cranially to pass between the L4 and the fifth lumbar nerve (L5) transverse processes advancing a further 1-2 cm past the transverse process. The end point taken was twitching/contraction of the ipsilateral quadriceps. We reduced the stimulation to <0.5 mA and after observing a fade of motor activity after injection of 1 mL of local anesthetic, 20 mL of 0.375% bupivacaine was injected after confirming negative aspiration of blood.

DISCUSSION

This case series demonstrates the usefulness of combined psoas compartment and sciatic nerve block for geriatric high-risk patients scheduled for lower limb surgeries. Lumbar plexus can be blocked using anterior Winnie's approach but it has been reviewed that the psoas compartment block is superior in terms of analgesia as it is a true "3-in-1" block. This posterior approach to lumbar plexus was found to be a good choice in our patients as it has been previously postulated that blocking psoas compartment obstructs the three main components of lumbar plexus.^[3,8,10,11] Posterior approach to the psoas compartment is more effective in blocking the obturator nerve that supplies the anteromedial capsule of the hip joint. So, combining the two approaches from the posterior aspect helped us to conduct knee or hip surgeries as both components were blocked without changing the position of the patient.

Biboulet *et al.* and Touray *et al.* also speculated that psoas compartment block is superior to femoral nerve block for postoperative analgesia in hip surgeries as it results in more extensive anesthesia for blocking the ilioinguinal, iliohypogastric, and genitofemoral nerves.^[12,13] Previous studies have shown the benefits of psoas compartment block and sciatic nerve block for knee surgeries but it is believed that combining both these blocks can help perform surgeries on the entire lower limb as they block both the lumbar as well as the sacral components. Additionally, it allows tourniquet application that is frequently used in most of the lower limb orthopedic surgeries.

General anesthesia was avoided as one of our patients was aged with deranged renal function, along with recent exacerbation of asthma. Frequent dialysis with residual heparinization made conditions difficult for us to perform spinal or epidural anesthesia. In our other patient, we avoided general anesthesia as he had history of previous coronary artery disease with low ejection fraction and was on antiplatelet agents, relatively contraindicating central neuraxial blockade. Combined psoas compartment and sciatic nerve block was chosen as the safe anesthetic option to perform these lower limb surgeries.

Many authors have utilized psoas compartment block for providing postoperative analgesia in hip arthroplasty but we

combined it with sciatic nerve block as in our cases, these peripheral nerve blocks were chosen as the sole anesthetic option and it has been previously noted that the posteromedial section of the hip joint capsule is partially innervated by a branch of the sciatic nerve.^[14] Psoas compartment block is thought to be an insufficient block when used as a single-shot technique, leading to substantial usage of the supplemental opioids, sedatives, or general anesthetic. However, Buckenmaier *et al.* and Vincent *et al.*, after conducting their studies on hip and knee arthroplasties concluded that by using a perineural catheter in lumbar plexus block or additionally blocking the sciatic nerve, the need for perioperative sedation and general anesthesia is reduced to the minimal.^[15,16] In the above two cases, we also made use of minimal perioperative sedation that was, however, needed to overcome the discomfort in view of traction on the contralateral limb as combined psoas compartment and sciatic nerve block provide unilateral anesthesia and analgesia.

Although combining psoas compartment and sciatic nerve block in our severely comorbid elderly patients facilitated to conduct surgeries without the need of additional general anesthesia, the queries raised by Bosch *et al.* regarding contralateral hip pain due to hip abduction required to prevent prosthesis dislocation still remained a dilemma to the anesthetist.^[17]

Our patients were spared the hemodynamic instability consequent upon spinal/epidural anesthesia as validated by the study of Marcel *et al.* who concluded that a combined psoas compartment and sciatic nerve block did not affect the cardiac index and the hemodynamic parameters, if affected, remained within an acceptable range <10% variability.^[18]

While they appear technically easier, these combined blocks are not without complications. A common complication is the diffusion of local anesthetic from psoas compartment into the epidural space; this can be reduced by decreasing the local anesthetic concentration. However, decreasing the concentration or volume of the local anesthetic to prevent local anesthetic toxicity may compromise the quality of the block. Different concentrations of bupivacaine/ropivacaine have been used in the past, including a minimum concentration of 0.25%.^[19,20] We successfully used 0.375% and 0.5% bupivacaine for psoas compartment block and sciatic nerve block, respectively, without any demonstrable complications.

Sim and Webb *et al.* in their cadaveric study demonstrated the cause of inadequate block. They concluded that an accessory obturator nerve arises from the third lumbar nerve (L3)-L4 roots that do not lie in the proximity of the obturator nerve.^[21] This can be partly solved by the use of ultrasonography but requires additional training to visualize the lumbar plexus because it is deep-seated and posterior shadow of the bony elements makes its visualization difficult. So, we recommend the use of combined psoas compartment and sciatic nerve block as an upcoming anesthetic technique in frail elderly patients with multiple comorbidities in whom using spinal, epidural, or

general anesthesia is not without risk. This combined approach of the two blocks allowed us to safely fast-track those patients with significant systemic disease through lower limb surgeries. These patients, with their multifarious medical issues, would have taken a significantly long time in the ordinary course to be optimized for the conduct of anesthesia. They were successfully managed using this combined technique enabling early ambulation, decrease in the cost, and prevention of perioperative morbidity due to delayed surgery and prolonged hospital stay.

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