Ultrasound Guided Combined Peripheral Nerve Blocks in a High-Risk Patient: A Case Report

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INTRODUCTION

Anesthesiologists and pain physicians always try to choose the optimal anesthetic technique in everyday operation theaters after taking into account surgical requirements, operating room status, patient medical conditions, patient preferences, and technical skills. A main concern is to make hemodynamics stable. Even a small amount of sedation can cause hemodynamic and respiratory compromise in a patient with poor cardiovascular status. Therefore, careful dosing of sedatives or local anesthetics is required during induction of general anesthesia or neuraxial block.

Although lower-extremity surgeries are mainly performed under general or central neuraxial anesthesia, ultrasound-guided combined peripheral nerve block (PNB) can be a good alternative anesthetic technique, especially for high-risk patients who require continuous anticoagulation treatment and present with poor cardiovascular conditions.

We successfully performed an ultrasound combined guided peripheral nerve block, while maintaining hemodynamic stability and preventing other complications in a patient who was scheduled to undergo lower limb amputation.

CASE REPORT

A 63-year-old male patient (168 cm; 64 kg; American Society of Anesthesiologists physical status IV) was admitted for treatment of shortness of breath with a gangrenous lesion of the left leg. There was necrosis in the 1st, 2nd, and 3rd toes of the patient and a wound with signs of infection in the anterior region. Furthermore, the wound infection was spreading upward. The patient had a past history
of moderate rheumatic mitral stenosis and regurgitation and congestive heart failure with type 2 diabetes mellitus and chronic obstructive pulmonary disease. Investigation showed haemoglobin of 12.5 g% with a total leukocyte count of 9,400/ml, platelets-283000 cells/cumm, fasting blood sugar 146mg/dl postprandial blood sugar 181mg/dl, and Hba1c 7.4. Results of serum electrolytes, renal and liver functions were within normal values prothrombin time 14sec, international normalized ratio 1.4, bleeding time and clotting time 2.3 and 5.0 minutes, respectively, chest radiography showed diffuse emphysematous changes in both lungs. Electrocardiogram revealed normal sinus tachycardia. Transthoracic echocardiography confirmed moderate mitral stenosis and regurgitation, and severe LV dysfunction (37% LV ejection fraction). The patient also had poor pulmonary function with a room air saturation of 91%.

On examination, his pulse was regular with 96 beats per minute, blood pressure 140/90 mmHg, and respiratory rate 22 per minute. On auscultation, there was bilateral decreased air entry. His airway was mallampati grade II.

A high-risk informed and written consent was obtained. Two units of blood were made available for the surgery. On arrival in the operating room, intravenous access was established with an 18 G cannula.

The patient was placed in the supine position, and the thigh was slightly abducted and externally rotated. Standard monitoring was performed (e.g. electrocardiography, pulse oximetry, and noninvasive blood pressure), and 2L/min oxygen was delivered via nasal prong. A 15 to 6MHz high-frequency linear array transducer and ultrasound (Sonosite) were used to trace the femoral, lateral femoral cutaneous, and obturator nerve. For sciatic nerve blockage, the patient was placed prone, and the sciatic nerve was traced using a 5 to 2MHz low-frequency curved array transducer (Sonosite) (Fig. Using real-time ultrasound guidance, a 22-gauge 60mm stimulating needle (for femoral, lateral femoral cutaneous, and obturator nerve block) and a 22-gauge 100mm stimulating needle (for sciatic nerve block) were advanced within the proximity of each targeted nerve.

A 45ml volume of local anesthetic (an equal mix of 1% lidocaine and 0.375% ropivacaine) was slowly injected with intermittent aspiration after final confirmation. A sciatic nerve block (20ml) was administered via the trans gluteal approach, a femoral nerve block (15 ml) was administered just under the inguinal fossa, a lateral femoral cutaneous nerve block (5ml) was administered at the origin of the sartorius, and the anterior branch of the obturator nerve (5ml) was blocked between the adductor brevis and longus. Surgery was started after adequate sensory and motor blockade was achieved. Below-knee amputation was initially performed, and the patient obtained sufficient sensory block at the area of amputation without further analgesia. The surgery required 2hours and vital signs were stable throughout the operation.

The postoperative course of the patient was uneventful and was discharged after his condition improved.

**DISCUSSION**

In managing critically ill and hemodynamically unstable patients, choosing a reliable anesthetic technique that results in minimal hemodynamic effects is crucial. High-risk patients with sepsis, multi-organ dysfunction, cellulitis, coagulopathy, and other significant comorbid conditions serve a particular challenge in peri-operative anaesthetic management. Neuraxial blocks can be catastrophic due to the instability of haemodynamic parameters and coagulopathy. General anaesthesia can result in high morbidity with significant hypotension, myocardial depression, and mechanical ventilation-related complications.

An ultrasound-guided peripheral nerve block can provide perioperative hemodynamic stability to patients known to have poor cardiovascular conditions. Furthermore, ultrasound guidance enables the anesthesiologist to visualize the vascular structures.

According to a propensity score-matched observational study, the 30-day mortality is higher among patients who receive major lower-extremity amputations under general anesthesia in comparison with regional anesthesia (central neuraxial and peripheral nerve block). Moreover, PNB is associated with better functional recovery and superior postoperative pain control. It is also associated with a reduced risk of acute postoperative confusion and deep venous thrombosis.

Compared with central neuraxial anesthesia, PNB demonstrates several advantages. PNB minimizes pruritus, urinary retention, and hypotension, and reduces the risk of spinal
hematoma and infection. In addition, patients with antiplatelet or anticoagulant therapy can undergo certain PNB procedures without significant risk. However, PNB also demonstrates several complications including direct nerve trauma, incomplete nerve blockade, infection, local hematoma, ischemic injury, and requires the systemic IV injection of local anesthetic agents.\(^\text{10}\)

Ultrasound can visualize the target and adjacent neural anatomical structures including vascular structures. In addition, ultrasound allows the use of smaller volumes of local anesthetics. Ultrasound-guided PNB also demonstrates faster onset time, shorter block performance time, and a higher block success rate.\(^\text{11}\)

Comparing the peripheral nerve block with general and neuraxial anesthetic techniques, we decided to use ultrasound-guided peripheral nerve block for above-knee amputation in our patient with poor cardiovascular conditions. We performed nerve blocks to the sciatic, femoral, lateral femoral cutaneous nerves, and anterior branch of the obturator nerve. We did not block posterior branch of the obturator nerve which mainly innervates the adductor magnus as amputation was planned below the knee. A total dose of local anesthetic used was in the recommended doses.

Furthermore, in patients at high risk of thromboembolism, prompt detection of the event during surgery is possible. Therefore, ultrasound-guided PNB is an excellent anesthetic technique, and especially useful for treating critically ill, high-risk patients. Further studies are needed to evaluate the perioperative outcomes and complications of ultrasound-guided Peripheral nerve block for radical proximal lower-extremity surgery.\(^\text{12}\)

**CONCLUSIONS**

In conclusion, an ultrasound-guided peripheral nerve block can be an excellent anesthetic technique for patients receiving radical surgery at the proximal lower extremities, especially patients who are critically ill and considered high-risk.

**REFERENCES**


