Clinical Reports

Supine approach to the sciatic nerve in the popliteal fossa

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Purpose: Sciatic nerve block in the popliteal fossa (popliteal nerve block, PNB) is an anaesthetic technique well-suited for operations below the knee. However, difficulty with positioning the patient in the prone position often precludes the classical, posterior approach to the block. In this report, an alternative approach to PNB that can easily be performed with a patient in the supine position is described.

Clinical features: Three patients in whom the clinical circumstances precluded the use of the classical approach to PNB are described. In each case, PNB was performed using the alternative, supine approach. With a patient in the supine position, the leg is flexed at both the hip and knee, and supported by an assistant. After the anatomical landmarks of the popliteal fossa are identified, an insulated needle attached to a peripheral nerve stimulator is inserted 7 cm above the popliteal crease, 1 cm laterally to the midline and directed 45° cephalad. Upon obtaining either dorsal or plantar flexion of the foot at the output current of 0.5 mA or less, 30–40 ml of local anaesthetic solution are injected.

Conclusion: The supine approach to PNB allows the use of the block in patients that cannot be positioned in the prone position. Flexion of the leg at the knee greatly facilitates identification of the anatomical landmarks. When combined with a block of the femoral or saphenous nerve, this technique provides excellent anaesthesia for patients undergoing foot and ankle surgery.

Objectif: Le blocage du nerf sciatique par la fosse poplitée (bloc du nerf poplité: BNP) est une technique anesthésique

adaptée aux interventions pratiquées sous le genou. Cependant, lorsqu'il est difficile de placer le patient en décubitus ventral, l'approche postérieure classique du bloc est souvent impraticable. Ce travail décrit une approche différente facilement réalisable en décubitus dorsal.

Éléments cliniques: Trois patients dont la condition interdisait l'approche classique du BNP font l'objet de ce compte rendu. Dans chaque cas, le BNP était réalisé en décubitus dorsal. Le patient étant couché sur le dos, la jambe était fléchie à la fois au niveau de la hanche et du genou par un assistant. Après l'identification des repères anatomiques au creux poplité, une aiguille isolée reliée à un stimulateur nerveux était insérée sept cm au-dessus du pli poplité, un cm latéralement à la ligne médiane en direction céphalique à 45°. Une fois la flexion dorsale ou plantaire du pied provoquée par un courant de 0,5 mA ou moins, 30–40 ml d'une solution d'anesthésique local étaient injectés.

Conclusion: Chez des adultes l'approche dorsale du BNP permet l'usage de ce bloc chez des patients qui ne peuvent être mis en décubitus ventral. La flexion de la jambe au genou permet d'identifier facilement les repères anatomiques. En combinaison avec un bloc fémoral ou saphène, cette technique procure une excellente anesthésie pour la chirurgie du pied et de la cheville.

Key words

ANAESTHETIC TECHNIQUES: regional, sciatic nerve block.

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Sciatic nerve block in the popliteal fossa (also called popliteal nerve block, PNB) is an anaesthetic technique well-suited for operations below the knee.^{1–3} However, difficulty in positioning patients in the prone position for performance of the block often precludes its use in patients who are potentially the greatest beneficiaries of peripheral nerve blockade. In this report, we describe an alternative approach to PNB that can reliably be performed with a patient in the supine position.

Method of block

With a patient in the supine position, the leg is flexed at both the hip and knee joints, and supported by an assistant (Figure 1). The anatomical landmarks of the popliteal fossa (popliteal crease inferiorly, the semimembra-

FIGURE 1 The lateral aspect of the right leg during the performance of the popliteal nerve block with the patient in the supine (lithotomy) position.

nosus and semitendinosus muscles medially, and the long head of the biceps femoris muscle laterally) are readily identified in this position (Figure 2). An insulated needle, attached to a peripheral nerve stimulator, is inserted 7 cm above the popliteal crease, 1 cm laterally to the midline and directed 45 degrees cephalad. Upon obtaining either dorsal or plantar flexion of the foot, using an output current of 0.5 mAmp or less, 30–40 ml of solution of local anaesthetic are injected while intermittently aspirating for blood.

Case 1

A 32-yr-old, 72 kg, 170 cm man presented for emergency open reduction and internal fixation (ORIF) of an open fracture of his left tibial malleolus. The patient was injured in a high speed automobile accident 48 hr before the surgery. Pre-anaesthetic evaluation revealed an alert

FIGURE 2 Surface anatomy of the popliteal fossa in the lithotomy position. (1) Popliteal crease; (2) Long head of biceps femoris muscle; (3) Semitendinosus and semimembranosus muscles; (4) Insertion of the needle 7 cm proximally from popliteal crease, 1 cm laterally to the midline (5).

and oriented, mentally retarded black man. He answered all questions appropriately, but with difficulty due to the pain from the extensive soft tissue trauma on the right side of his face. His airway was judged to be Mallampati IV, and the cervical spine was stabilized with a hard collar. Examination of the heart and lungs was normal. The severe pain caused by any body movement limited examination of the back. The x-ray survey revealed multiple pelvic injuries including a comminuted fracture of the right iliac wing with extension into the acetabulum, fracture of both pubic rami on the right, and fracture of the right ischium with involvement of the right hip joint. Computed tomography (CT) revealed a large pelvic haematoma, that considerably decreased intrapelvic volume, as well as an extensive haematoma extending from the left iliac crest into the region of the

gluteal muscles and both thighs. Computed tomography of the cervical spine showed multiple fractures of cervical vertebrae C₆ and C₇, and subluxation of C₆ on C₇. The orthopaedic surgeons were concerned that the pelvic injuries might be extended, and the right hip joint disrupted, during the transfer and positioning of the patient on the operating room table.

The unstable cervical spine injury and potentially difficult airway raised concerns about the use of general anaesthesia. Inability to place the patient in the supine or lateral position and extensive haematoma on his back precluded the use of neuraxial anaesthesia. Sciatic nerve block was considered, but the extensive trauma to the buttocks and pelvis contraindicated the approaches at the level of the pelvis. Inability to position the patient in the prone position precluded the use of the classical approach to PNB. Thus, while minimizing rotation of the right thigh, the alternative approach to PNB in the supine position was employed. After obtaining rhythmic dorsiflexion of the foot with a stimulating current of 0.5 mA, 40 ml bupivacaine 0.375% were injected. Then, a left femoral nerve block was performed using 15 ml bupivacaine 0.375%.⁴ Twenty-five minutes after block placement, adequate anaesthesia was confirmed in the femoral and sciatic nerve distributions, and the surgeons proceeded with the ORIF of the left medial malleolar fracture. Supplemental sedation was achieved with midazolam 1 mg and fentanyl 150 µg *iv*. A tourniquet was not used. The intraoperative and the postoperative course were uneventful.

Case 2

A 33-yr-old, 88 kg, 168 cm hispanic woman in her 28th week of pregnancy was scheduled for open reduction and internal fixation of an open fracture of her right ankle. Her vital signs were: BP 90/50 mmHg, HR 80 bpm, RR 16. Cardiopulmonary and laboratory examinations were normal. The x-ray of the right ankle was diagnostic of a trimalleolar fracture. The patient refused general anaesthesia and expressed extreme reluctance in receiving either spinal, or epidural anaesthesia. She readily consented to peripheral nerve block anaesthesia. The patient was positioned in the supine position with a wedge under her right hip and the supine approach to PNB was used. Using an output current of 0.5 mA, rhythmic dorsiflexion of the foot was obtained and 40 ml mepivacaine 1.5% were injected. Additionally, 5 ml mepivacaine 1.5% were injected subcutaneously in the medial aspect of the leg at the level of the tibial tuberosity to block the saphenous nerve. Thirty minutes later, anaesthesia was confirmed and the surgery proceeded uneventfully. A tourniquet was applied below the knee. There was no need for supplemental intravenous analge-

sia or sedation during the surgery. The postoperative course was uncomplicated.

Case 3

A 62-yr-old, 60 kg, 175 cm man with gangrene of his right foot was scheduled for emergency amputation of the affected leg below the knee. The patient had a history of poorly controlled diabetes mellitus and severe ischaemic cardiomyopathy requiring frequent hospitalizations for congestive heart failure. Eleven months before this admission, he had suffered a myocardial infarction. After an above-knee amputation of his left leg under general anaesthesia during the current admission, the patient's postoperative course was complicated by myocardial infarction and pulmonary edema.

During the pre-anaesthetic evaluation, the patient appeared to be in distress due to the severe pain in his leg. Blood pressure was 150/90 mmHg, HR 75, RR 20. Airway evaluation revealed Mallampati 2, multiple loose teeth and neck extension was severely limited. Bilateral râles were present at the lung bases. His heart rate was regular with audible S3/S4 gallops. His entire skin, including lower back, was covered with extensive psoriatic, scaling lesions. Large decubiti were present on his sacrum and buttocks. An echocardiography report was indicative of multi segmental wall motion abnormalities, severe mitral regurgitation, and an estimated ejection fraction of 20%. His medications included insulin, lopressor 50 mg bid, captopril 25 mg tid, digoxin 0.125 mg qd, isosorbide dinitrate 10 mg qid, and furosemide 40 mg qd.

Because of his fragile cardiovascular status, we decided to perform the amputation of the involved leg under regional anaesthesia. However, his skin condition and extensive decubiti contraindicated both neuroaxial anaesthesia and a sciatic nerve block at the level of the pelvis. Since the patient was unable to assume the prone position due to weakness and extreme pain in his right foot and the stump of his left leg, the supine approach to PNB was used. After the right popliteal nerve was identified using the output current of 0.5 mA, 40 ml mepivacaine 1.5% were injected. Additionally, the saphenous nerve was blocked using 5 ml mepivacaine 1.5%. Twenty-five minutes later the surgeon proceeded with the operation. A tourniquet was not used during the operation. His intraoperative and postoperative course were uneventful.

Discussion

Sciatic nerve block has been successfully used for surgical anaesthesia and postoperative pain control for various operations below the knee. The common techniques of sciatic nerve blockade include approaches at the

pelvis level: (anterior⁵ lateral,⁶ posterior⁷ and supine position⁸ approaches) and the classical approach at the knee level with the patient in the prone position.⁹ In this report we presented three cases where the sciatic nerve block in the popliteal fossa was judged to be the most suitable anaesthetic technique, but the inability to position the patients in an optimal position for the performance of the block precluded the use of the classical approach. In each case, the PNB was successfully performed in the supine position using the described technique. We routinely use a peripheral nerve stimulator when performing the PNB, seeking either dorsal or plantar flexion of the foot at the output current of 0.5 mA or less. Upon obtaining a desired response, 30–40 ml of solution of local anaesthetic are injected whilst intermittently aspirating for blood.

A volume of 30 to 45 ml of local anaesthetic solution is used in popliteal nerve blockade by many authors.^{1,9} We also favour larger volumes of local anaesthetics for this block, because the large content of fat in the popliteal fossa and a thick epineurium of the sciatic nerve¹⁰ may decrease the amount of LA that reaches the nerve and thus adversely affect the success of popliteal nerve block.¹¹ Additionally, larger volumes of local anaesthetic also may extend the duration of action of the block and play a role in optimizing postoperative pain relief. When anaesthesia of the medial foot and leg is required, PNB is supplemented with either the saphenous or femoral nerve block,¹² depending on the planned surgical procedure.

Recently, a lateral approach to PNB has been described.^{13,14} However, the lateral technique is still poorly defined, and its use for surgical anaesthesia has not been yet reported. When used for postoperative analgesia, the lateral technique resulted in a relatively high failure rate.¹³ Thus, we opted to utilize the familiar landmarks, but in the supine position. Another advantage of this approach is that flexion of the knee accentuates all important anatomical landmarks of the popliteal fossa (Figure 2). This may be particularly advantageous in patients who have an increased deposition of adipose tissue, which can obscure the landmarks whose identification is important for the performance of the block. We believe that failure to prevent the inadvertent internal or external rotation of the leg during the performance of the PNB in the prone position is frequently responsible for difficulty in localizing the nerve. With the patient in the lithotomy position, the leg is easily maintained in the optimal position, since the lower part of the leg is perpendicular to the popliteal fossa plane.

In summary, we described an alternative approach to PNB with patients in the supine position. In our experi-

ence, this approach to PNB is convenient and reliable, and has become a routine technique in our clinical practice in patients that have difficulty in assuming the prone position.

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