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Pericapsular Nerve Group Block (PENG Block) and Spinal Anesthesia as Multimodal Analgetic in Patient with Bipolar Hip Arthroplasty: A Case Report

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ABSTRACT

Introduction. Intertrochanteric fractures are defined as extracapsular fractures of the proximal femur that occur between the greater and lesser trochanter. Bipolar hip arthroplasty is one of the most common major orthopaedic procedures to improve patient's functional status and quality of life. Spinal anesthesia is a regional anesthetic technique that is performed by injecting local anesthetic drugs into the subarachnoid space to obtain dermatome-level analgesia and skeletal muscle relaxation. Pain after hip replacement originates mainly from the anterior pelvic capsule. The main target for pelvic analgesia is the anterior capsule which is the most richly innervated part of the joint. PENG block is used to block the articular branches to the pelvis. The patient was assessed with an NRS (numeric rating scale) instrument pre and post operative.

Case presentation. A-74 years old woman admitted with complaints of pain in the right hip and diagnosed with a closed fracture of the right intertrochanter and planned for bipolar hip arthroplasty with PENG block and spinal anesthesia. Preoperatively the patient was assessed with an NRS (numeric rating scale) instrument with a score of 6. After the procedure, we reevaluated the pain score using NRS was 2 post operative.

Conclusion. Patients receiving a PENG block and spinal anesthesia for intraoperative and postoperative analgesia during hip fracture surgery. Prior to spinal anesthesia, PENG block can be performed as a multimodal analgesia in the patient, PENG block expected to facilitate a sitting position during spinal anesthesia and for postoperative pain management

Keywords: Pericapsular nerve group block, PENG block, Spinal anesthesia, Bipolar hip arthroplasty

Introduction

Bipolar hip arthroplasty is one of the most common major orthopaedic procedures to improve patient's functional status and quality of life. PENG (pericapsular nerve group block) is used to block the articular branches to the pelvis. the majority of PENG blocks have been performed for hip-related analgesia (hip fractures, pelvic fractures, hip surgery). Regarding hip fracture, the main indication reasonably appears to be the one located to the head or neck of the femur. This injection anesthetizes most of the nociceptive fibers into the hip joint capsule originating from the lumbar plexus. In addition, this injection can prevent or reduce postoperative iliac muscle spasm which is a common cause of postoperative pain after hip arthroplasty. In addition, prior to spinal anesthesia, PENG block can be performed as a multimodal analgesia in the patient so that the patient can sit during spinal anesthesia and experience less postoperative pain.[1,2] Spinal anesthesia is anesthesia for surgery below the umbilicus, procedures on the lower extremities, perineum, pelvic girdle, urological, gynecological, obstetric, and lower abdominal and perineal surgery. A local anesthetic is injected directly into the subarachnoid space during spinal anesthesia, the spinal cord has two mechanisms for uptake.[7] The patient was assessed with an NRS (numeric rating scale) instrument pre and post operative. Patients were asked to indicate perceived pain using a 0–10 NRS (0 no pain, 10 worst imaginable pain).[5]

Case Presentation

A-74 years old woman admitted with complaints of pain in the right hip since 10 days ago and had affected her daily living activity with history of progressively worsening pain and stiff, the patient had difficulty and pain when sitting. After x-ray examination, the woman diagnosed with a closed fracture of the right intertrochanter and planned for bipolar hip arthroplasty with PENG block and spinal anesthesia. Preoperatively the patient was assessed with an NRS (numeric rating scale) instrument with a score of 6 and had difficulty and pain when sitting. The purpose of PENG block anesthesia in the patient is to facilitate a sitting position during spinal anesthesia and for postoperative pain management. The pericapsular PENG block is an ultrasound-guided approach and the anatomical landmarks of the lacuna musculorum that are visible with ultrasound (US) are the asis, the anterior inferior iliac spine (AIIS), the pubic ramus and the iliopubic eminence (IPE) (these landmarks outline the lacuna musculorum together with the arcus iliopectineous and the inguinal ligament, and allows the passage of the iliopsoas muscle, the FN and the LFCN. The woman injected with 0.2% ropivacaine 15 ml with a 22 gauge needle in the iliopsoas notch.

Local anesthetic spread in the plane between the iliopsoas muscle and pubic ramus, and anterior capsule of the hip cranially to the acetabular rim. This injection anesthetizes most of the nociceptive fibers to the hip joint capsule which emanate from the lumbar plexus. In addition, this injection may prevent or decrease the postoperative spasm of the iliacus muscle, which is a common cause of postoperative pain after anterior hip arthroplasty. Spinal anesthesia is local anesthetic spread in the subarachnoid space.[2,6] When the procedure is over, the patient assessed using a numeric rating scale (NRS).[5] Motor recovery of the hip joint was assessed using range of motion. Post operative analgesic using multimodal analgesia Paracetamol 500 mg and Gabapentin 100 every 8 hours orally, and ketorolac 30 mg IV every 8 hours. Secondary outcomes included postoperative opioid consumption; patient mobilisation; length of stay; and presence of any adverse effects. When the procedure is over, the patient assessed using a numeric rating scale (NRS) at all postoperative time-points (24 and 48 hours), patients were asked to indicate perceived pain using NRS instrument, the patient's current static NRS after 24 hours was 4. After 48 hours, the patient reported reduction in pain with static NRS scale of 3 and for dynamic, patient can move and shift legs with NRS scale of 4. Patient was discharged from the hospital.[5,8]

Post operative care

The patient was advised to undertake training involving gentle flexion and extension of the leg and consumed oral analgesia (paracetamol and gabapentin).

Discussion

Intertrochanteric fractures are defined as extracapsular fractures of the proximal femur that occur between the greater and lesser trochanter. The greater trochanter serves as an insertion site for the gluteus medius, gluteus minimus, obturator internus, piriformis, and site of origin for the vastus lateralis for hip extension and abduction. The lesser trochanter serves as an insertion site for the iliacus and psoas major, commonly referred to as the iliopsoas for hip flexion.[3] In this patient's Bipolar Hip Arthropasty surgery, the types of anesthesia used were spinal anesthesia and PENG block. The patient had difficulty and pain in sitting. The PENG Block expected to reduce the pain in patient’s hip and difficulty in sitting, after PENG block, the patient expected can sit and spinal anesthesia can be performed in a sitting position.[2,6] PENG block (pericapsular nerve group block) is performed using 15 ml of Ropivacaine 0.2%. Pericapsular nerve block (PENG) is an ultrasound-guided regional anesthetic technique that targets the sensitive nerves of the anterior pelvic articular capsule (obturator articular branch, accessory obturator nerve and articular branch

of the femoral nerve), thereby limiting the potential for mixed nerve block and weakness of quadriceps femoris and adductor muscles. This procedure is a technique of providing pelvic analgesia for pelvic fractures with the help of ultrasound that targets the pelvic rim (superior pubis ramus) near the iliopectineal crest to the fascia of the iliopsoas muscle. The goal is to spread local anesthetic in the plane between the iliopsoas muscle and the pubic ramus, and the anterior capsule of the hip cranial to the acetabular edge. This injection anesthetizes most of the nociceptive fibers into the hip joint capsule originating from the lumbar plexus. In addition, this injection can prevent or reduce postoperative iliac muscle spasm, which is a common cause of postoperative pain after anterior hip arthroplasty. Pain after hip replacement originates mainly from the anterior pelvic capsule, which is innervated by the lumbar plexus nerve terminals. When performing a PENG block, ultrasound with a curved transducer is used (can use linear in smaller patients with a 22, 80-100 mm needle, the volume of local anesthetic used is 15 ml. When the PENG block is performed, the patient is in the supine position or supination with the leg fully supine and slightly turned outward. The external landmarks used are the femoral crease, and the anterior inferior iliac spine. The procedure of the PENG block procedure is that the patient is in a supine position, perform antiseptic, the ultrasound probe is placed in a transverse plane over the anterior superior iliac spine. Once the ASIS is identified, the transducer is aligned with the pubic ramus and rotated approximately 45 degrees. The transducer is then shifted medially along the axis until a anterior inferior iliac spine (AIIS), iliopubic eminens (IPE), and psoas tendon are clearly identified which serve as anatomic markers. The probe is moved distally or gently to the visible part of the femoral head. Returning to the starting position, a standard 20-22 100mm needle is inserted into the plane, from lateral to medial, in the plane between the psoas tendon and the pubic ramus. 15 ml Rapovacaine 0,2% is injected into this plane slowly by repeated aspiration to avoid intravascular injection. Correct needle position can be confirmed by spreading the drug under the iliopsoas muscle.[1,2,6]

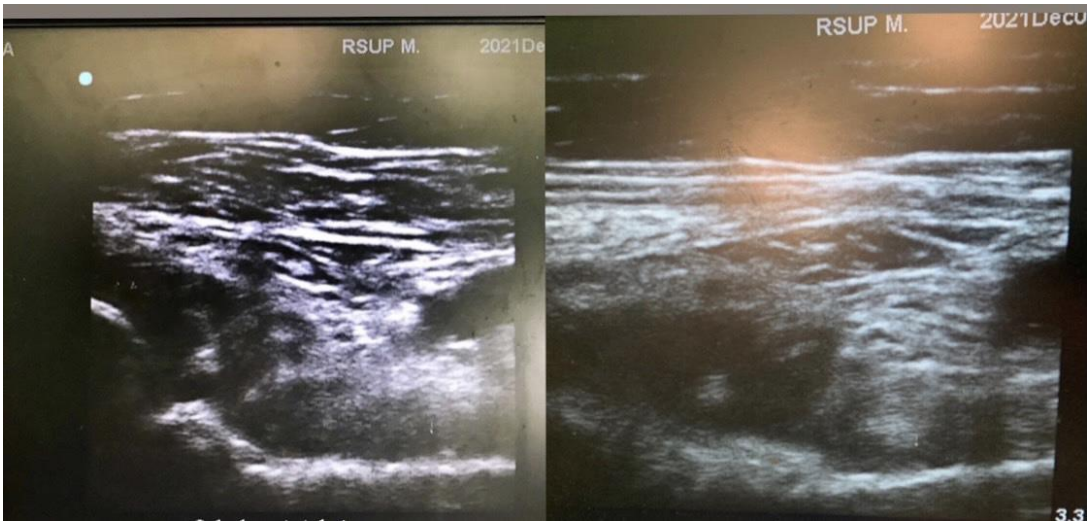

Figure 1. The left image: before the injection. The right image: after the injection, showing the spread of the local anesthetic after the injection

After PENG Block performed, the patient can sit and spinal anesthesia can be performed in a sitting position. Spinal anesthesia is a regional anesthetic technique that is performed by injecting local anesthetic drugs or adjuvant into the subarachnoid space to obtain dermatome-level analgesia and skeletal muscle relaxation for surgery below the umbilicus, procedures on the lower extremities, perineum, pelvic girdle, urological, gynecological, obstetric, and lower abdominal and perineal surgery. The patient is positioned sitting. The midline is easier to identify using the sitting position. The sitting position is done by hugging a pillow or placing the elbows on the thighs, while flexing the spine. The goal is to make the spine position closer to the skin. Furthermore, after the patient is positioned, find the interspace gap by palpating the spinous process. In cases where the spinous processes are not palpable, ultrasound can be helpful in determining the midline. After the spinous process is palpated, neuraxial block needle insertion can be used in two approaches, the midline and the paramedian. For spinal anesthesia, the needle is inserted through the epidural space and through the dura-subarachnoid membrane.[3,7] For patients with lower extremity surgery, the needle was inserted at the L3-4 interspace and initially 2,5ml hyperbaric bupivacaine 0,5% and 25 mcg fentanyl adjuvant was injected. A T10 dermatomal level of sensory block was targeted to proceed to surgery. When a local anesthetic is injected directly into the subarachnoid space during spinal anesthesia, the spinal cord has two mechanisms for absorption. The first mechanism is by diffusion from the CSF to the pia mater and to the spinal cord. This is a slow process. Only the most superficial part of the spinal cord is affected by the diffusion of local anesthetics. The second mechanism is by extension into the Virchow-

Robin space which is the pia mater area surrounding the blood vessels that penetrate the central nervous system. The Virchow-Robin space connects with the perineuronal cleft that surrounds the nerve cell bodies in the spinal cord and penetrates into deeper areas of the spinal cord.[7]

When the operation is over, the patient regains consciousness and observed in the recovery room. Hemodinamically stable, NRS score 2. There are no complication both during and after the procedure. The patient assessed using a numeric rating scale (NRS) at all postoperative time-points (24 and 48 hours), patients were asked to indicate perceived pain using NRS instrument, the patient's current static NRS after 24 hours was 4. After 48 hours, the patient reported reduction in pain with static NRS scale of 3 and for dynamic, patient can move and shift legs with NRS scale of 4.[5]

Conclusion

Prior to spinal anesthesia, PENG block can be performed as a multimodal analgesia in the patient, After PENG block performed, PENG block reduces the pain in patient's hip, the patient can sit and spinal anesthesia can be performed in a sitting position. The PENG block is a new and promising ultrasound-guided regional anaesthesia technique, aiming to block the branches of femoral nerve, obturator nerve and accessory obturator nerve innervating the anterior hip capsule. PENG block anesthesia facilitates a sitting position during spinal anesthesia and the patient experience less postoperative pain.

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