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Case Report

Combination of Femoral and Parasacral Sciatic Nerve Block as Multimodal Pain Management in Post Hemiarthroplasty Surgery Patient

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ABSTRACT

Background: The prevalence of femoral neck fractures is high in geriatric patients with a high mortality rate. Many geriatric patients have comorbidities and find it difficult to tolerate general or neuraxial anesthesia during hip hemiarthroplasty. A more safe technique in lower extremities using peripheral nerve blocks is preferred. The combination of sciatic nerve blocks and psoas compartments can supply adequate anesthesia for hip surgery thus reducing mortality. Femoral nerve blocks decrease the incidence of complications than psoas compartment blocks.
Case: A 88-year-old female patient, 70 kg, with distal femoral subtrochanteric fracture accompanied by dislocation, hypertension emergency, hyperplasia heart disease (HHD), and heart failure stage B Fc II were undergoing hemiarthroplasty with regional anesthesia sciatic nerve block and femoral block After surgery, a block was performed using regional anesthesia sub-arachnoid block bupivacaine 0,5% 7mg + fentanyl 25 µg + Morphin 0,1 µg, post-operative pain with ultrasound, the patient received 0.375% naropin and 50 mg trilac total volume 20 cm^3. Then femoral block was done with 0.375% and 50 mg trilac total volume 20 cm^3. Patients were observed for pain scale during hospitalization, time of mobilization, and length of stay. Post-operative hemodynamic was stable, the pain scale using VAS assessment was 0-1 during hospitalization without additional opioid analgesia, active mobilization began on the 2nd day, and the length of stay was 3 days.
Conclusion: The combination of a femoral and sciatic nerve block to the proximal part of the skin incision can supply adequate pain compliance for hip hemiarthroplasty**.**

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INTRODUCTION

Femoral neck fractures is having a high prevalence in geriatric patients with an elevated mortality rate. The treatment needs a replacement of the cap of the femur (*hip hemiarthroplasty*) to delay the rise in mortality rate. Many geriatric patients have comorbidities and find it difficult to tolerate general or neuraxial anesthesia. A safer technique in lower extremities using peripheral nerve blocks is preferred. The combination of sciatic nerve blocks and psoas compartments can supply adequate anesthesia for hip surgery thus reducing mortality. Femoral nerve blocks decrease the incidence of complications than psoas compartment blocks. However, the effectiveness of hip hemiarthroplasty is not yet known.[1]

The risk of mortality due to the administration of general and central neuraxial anesthesia can be avoided by having regional block anesthesia as an option because this technique does not need special preparation, preoperative optimization, and fasting. Additionally, this technique can approach better cardiorespiratory stability rather than central neuraxial blockade by using peripheral nerve blocks for surgical anesthesia. This technique avoids the side effects of meningitis, hypotension, postural headaches, bradycardia, hematomas, and neurological deficits. The growth of new techniques of ultrasound and peripheral nerve stimulators has shifted the area of anesthesia for isolated limb surgery from general anesthesia (GA) and central neuraxial blockade to peripheral nerve blocks. The most useful but commonly ignored technique for anesthesia for lower limb surgery is the combination of sciatic and femoral nerve blocks (3:1). However, it is important to emphasize that the drug's maximum dose should be carefully monitored because both blocks create double volume. [2]

The high consumption of opioids to relieve pain in femoral fractures leads to gastrointestinal problems, impaired cognitive functions such as delirium, urinary problems, and respiratory arrest. The theory of Henrik Kehlet in 1997 about improved recovery after surgery (ERAS) was the first concept that commonly used in the orthopedic area to aim for functional recovery. [3]

Peripheral nerve block (PNB) is an endorsed anesthesia technique with the ERAS protocol used by patients undergoing joint arthroplasty. GNP provides enough analgesia effect with lower side effects, such as nausea, hypotension, and neurological complications than analgesia in patients with epidural or intravenous administration (PCA) with opioids. The effectiveness of GNP in arthroplasty has been proved by many studies that show PNB as a critical factor in the ERAS protocol.[3]

CASE

The 88-year-old female patient came in with complaints after falling in the bathroom 3 days before coming to the hospital. The patient explained about her pain in the right waist and immovable. From the physical examination, glasgow coma scale (GCS) 456 was obtained with a free airway, there were missing teeth, and adequate spontaneous breathing with 98% SpO_2 in room air. The patient's weight is 70 kg. In the cardiac examination, a shift in the apex of the heart was obtained in ICS III mid-clavicula sinistra and no abnormalities were found in the pulmonary examination. The pulse frequency is 100-120 times/min, regular pulse, and blood pressure is 160/90 mmHg. On the examination of the pain scale, a visual analog scale (VAS) pain value was 6-7. On examination of localist status, the right limb was asymmetrical, ROM (Range of Motion) decreased, pain in *the hip joint dextra*, there was edema, crepitation, passive active motion pain, no agulation was found, and distal saturation was 96%. The diagnosis established is a distal femoral subtrochanteric fracture accompanied by dislocation, emergency hypertension, hyperplasia heart disease (HHD), and Heart Failure stage B Fc II. From the orthopedics department, patients have been educated to perform surgery and collaborate with the consul of cardiology and anesthesia. Patients get a 30 mg ketorolac injection three times a day and a 50 mg ranitidine injection. Before the surgical procedure, an x-ray radiological examination of the Thorax and Pelvis was performed. The results of the examination are shown in Figure 1 and Figure 2.

The patient is then consulted with the cardiology department and determined that the surgery plan was approved with high risk. Patients received captopril 3x25 mg, amlodipine 1x5mg, and spironolactone. From the Anesthesia department, the patient received ERAS surgery and peripheral nerve block (femoral nerve and sciatic nerve) procedures. Patients received informed consent regarding surgical procedures and the possibility of air embolism during surgery and postoperatively after 24 hours. The patient was treated in the intensive care unit (ICU) for postoperative observation. The patient was asked to fast 6 hours before surgery and during fasting rehydrating with 500 cm^3 HES (Hydroxyethyl starch solutions) infusion fluid within 6 hours before surgery. Premedication of ondansetron injection 4mg, ranitidine 50mg, and paracetamol infusion 1 gr administered.

In the pre-induction period before surgery, GCS 456 was obtained with a blood pressure of 129/66 mmHg, a pulse of 114 times/min, and SpO_2 of 99% with a nasal cannula. The patient then gets an intravenous injection of ketamine 10mg and fentanyl 50µg. Then, a mixture of Bupivacaine 10mg, Fentanyl 50 µg, and Morphine 0.1 µg in lumbar 4 was performed. Once the hemodynamics was confirmed to be stable, the patient was then positioned laterally left decubitus and the operation begins.

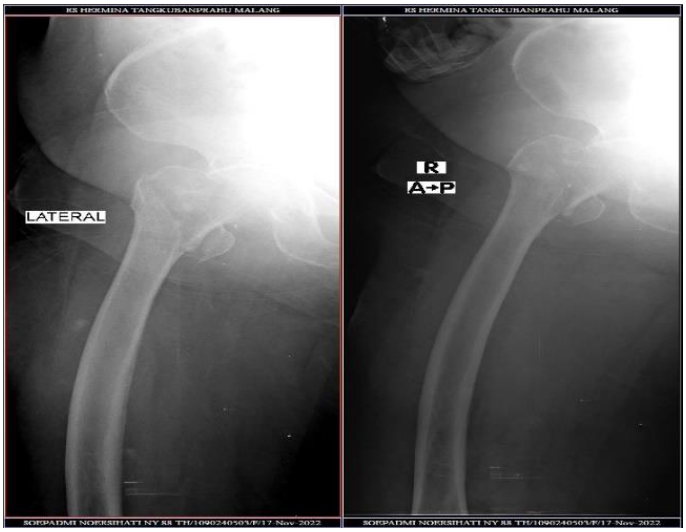

Figure 1. Intertrochanter fracture of columna os femur dextra accompanied by partial displacement of fracture fragments to the medial side according to type A2 2 (AO Foundation/Orthopaedic Trauma Association classification).

The operation goes with stable hemodynamics. Blood pressure is obtained at 110-120/80-90 mmHg, the pulse is 80 times/min, and SpO_2 is 99%. The operation went 1 hour and 50 minutes and the patient was given an injection of midazolam 1 mg and ketorolac 30mg. Postoperatively, patient receive sciatic nerve block with ultrasound and parasacral approach. The patient received naropin drug 0.5% TV 20 cm^3 and then performed a femoral nerve block (Figure 2).

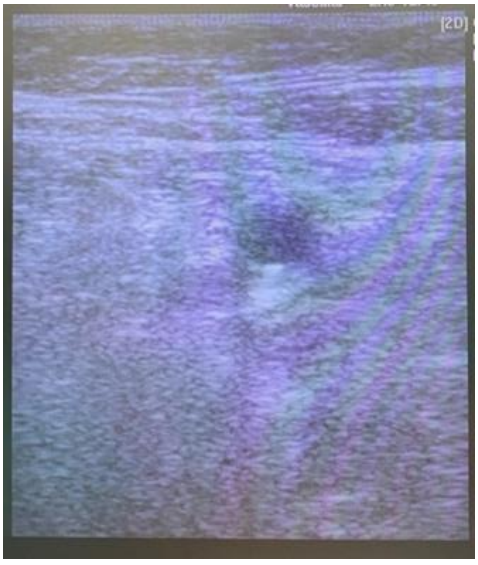

Figure 2. The block needle already ascends the femoral nerve on the femoral block

After the first day of surgical procedures, the patient complained of minimal pain and was already able to do bed rest. Complaints such as nausea and vomiting were not found, but patients complained of difficulty defecating from the first day of admission. From the physical examination, GCS 456, respiratory rate 18times/min, SpO_2 100% with nasal cannula 2 lpm, blood pressure 106/80mmhg, pulse 90x/min, temperature 36.5 C, VAS stationary 0, VAS bed rest 0-1, and VAS motion pain 1-2 (Figure 3), urine production 0.7 cm^3/kg weight. Patients get ketorolac injection therapy 3x30 mg, and kalnex 3x500 mg. Ranitidine 2x50

mg, Ondansentron 3x4 mg, and Lactolosa Shirp 3x1Cth. From the cardiology department obtained injection in Lovenox 1x0.4 cm^3 SC, ramipril 5mg 0-1-0, and Spironolactone 25mg 1-0-0.

Figure 3. The patient showed VAS pain with a Visual analog score of 0 and VAS pain in motion at numbers 1-2

Figure 4. Above: Patient knee condition in VAS 0-1. Below: When the patient's foot is raised; the VAS score was 0-1.

DISCUSSION

A hip fracture is a fracture that occurs between the edge of the femoral head and 5 centimeters below the minor trochanter. Based on their relationship to the joint capsule of the hip, fractures are generally divided into two main types. The first fracture is a fracture above the capsule insertion, called an intracapsular, subcapsular, or femoral neck fracture. The second fracture is an extracapsular fracture. Extracapsular fractures are further divided into trochanteric (intertrochanter and reverse oblique) and subtrochanteric fractures. Fractures are divided into intracapsular and extracapsular based on their relationship to the vasculature of the femoral cap and the complexity of the underlying mechanism. [4]

Between 70,000 and 75,000 hip fractures, mostly of the proximal femur, occur each year in the UK, with a total cost of around £ 2 billion in treatment, including medical and social care. This is mainly due to the aging of the population which has made hip fractures a major health problem. These costs are mainly attributable to hospitalization costs and other expenses are attributable to health and social protection costs. Currently, approximately 25% of hip fracture patients are admitted to medical care centers, and up to 10-20% who are treated at home end up being transferred to institutional care. [4.5]

Osteoporosis and osteopenia are the most common causes of hip fractures, requiring patients to be rushed to treatment centers and receive trauma orthopedic treatment. The UK National Hip Fracture Database reports that the average age of someone with a hip fracture is 84 for men and 83 for women, with a proportion of 76 % of hip fracture patients who are female. Further, around 30% patients with this fracture die within 12 months and about 10% within one month. Therefore, hip fracture can be classified as the problem with a high mortality rate. [6] The mortality rate caused by fractures does not only come from the fracture itself but also comes from related diseases. Therefore, hip fracture is not a specific surgical problem at all. Effective and safe treatment of hip fractures requires the coordination of various medical sectors, including the skills of anesthesiologists, surgeons, and rehabilitation, which includes a holistic approach to patient mobilization and follow-up from hospital care to the community. [4]

The mortality rate of hip fractures among the elderly range from 14% to 36% with a temporary and sometimes permanent decrease in independence and quality of life. Current guidelines suggest that surgery for a hip fracture should be accomplished within 24 hours of damage, as previous surgeries have been linked to better functional outcomes, shorter hospital stays, shorter pain durations and non-union rates, postoperative complications, and lower mortality. [7]

Those who support for early management opined that this approach reduces the length of stay in bed for patients, thus decreasing the risk of related complications, namely pressure sores, deep vein thrombosis, and urinary tract infections. Oppositely, those who support the postponement of surgery believe in providing an opportunity to optimize the patient's medical status, thereby reducing the risk of perioperative complications.[7] The argumentation for supporting early management or not is related to the accepted definition of initial surgical management. It is unclear whether periods of 24, 48, or 72 hours or more are considered unacceptable delays in hip fracture surgery. [8]

Hip fractures is divided into two types. The first one is femoral neck fractures. The second category is intertrochanteric fractures. If the fracture happened in femoral neck, it threatens the blood source to the proximal bone fragments. This fracture is traditionally managed with reduction and internal fixation. The fixation is carried out with several screws or pins (for example, Knowles) or assemblies of compression screw side plates (for example, Richards, Zimmer). The most common further complications are nonunion and avascular necrosis of the femoral head. Medullary prostheses for the replacement of the femur head and neck are chosen as an alternative treatment to avoid the second surgical procedure required by this final complication. Even though the hemiarthroplasty procedure allows for faster postoperative mobilization, the time of surgery and blood loss are greater compared to the internal fixation procedure. Additionally, the mortality of postoperative procedure may be slightly raised in treated patients using hemiarthroplasty than in patients undertaking internal fixation. [9]

Better knowledge of regional anatomy and surgical techniques is critical to delivering nerve block anesthesia effectively when lateral hip approaches are used, and the skin and fascia (iliotibial tract) are incised on the lateral aspects of the

thigh, proximal and distal major trochanters. The next step is to split the gluteus muscle medius and minimus to open the incised hip capsule. This can open the hip joint. Need to mention that incomplete anesthesia of the joints, muscles, or skin can create a painful surgery. [1]

The process of preparing anesthetic techniques before surgery should accommodate the requirements of the surgery, patient comfort, and the ability of the anesthesiologist. General anesthesia (GA) has been preferred in the surgical management of trauma over the past decades, however, this technique may disrupt compensatory sympathoadrenal reflexes and physiological balance in trauma patients. Additionally, GA in patients undergoing emergency surgery does not yet have a clear fasting status. Therefore, the safe and easy implementation of GA cannot be guaranteed. Several factors such as the simplicity, safety and effectiveness of regional anesthesia along with the stability of cardiovascular function and better early postoperative rehabilitation in regional anesthesia are the reasons why this anesthetic technique is used more as a safe procedure for this type of patient. From various regional anesthesia techniques, postoperative analgesia and better hemodynamic stability can be achieved using continuous spinal anesthesia and epidural compared to single-use spinal anesthesia. However, it should be noted that continued use of spinal and epidural needles with catheters can cause various side effects such as bradycardia, hypotension, post-dural puncture headache, spinal hematoma, and even meningitis. In comparison, lower extremity peripheral nerve block has minimal hemodynamic effect and does not result in reduced regional blood flow to the lower extremities. In the past, peripheral nerve blocks were rarely selected as an anesthetic procedure in patients undergoing lower extremity surgery due to the inexperience of anesthesiologists in performing this procedure. Various studies are underway to assess the safety of combined femoral and sciatic blocks versus general and central neuraxial blocks for lower extremity surgery. [2]

In Guideline Procedure Specific postoperative pain management (PROSPECT) regional anesthesia in hemiarthroplasty surgery is highly recommended (Grade A). And the administration of Paracetamol as a premedication and Non-Steroid anti-inflammatory (NSAID) is recommended (Grade A) as a multimodal anti-pain in hemiarthroplasty procedures. [16] Multimodal analgesia become one of the most preferable modality in knee surgery.[17]

The hip joint receive vascularization from the sacral plexus (via its articular nerve branches to the quadratus femoris, the superior gluteal and sciatic nerves), the obturator nerve (from hip branches), and the femoral nerve (via its branches towards the rectus femoris). Moreover, all of these nerves can be occluded in the inguinal and parasacral regions. [10] The entire sacral plexus can be blocked by parasacral sciatic nerve block. Obstruction of the proximal obturator nerve can block its coxal branch. A femoral nerve block can block its branches to the rectus femoris. The above nerve block succeeded in anesthetizing the entire lower limb (including all hip muscles) except for certain areas of the skin and the iliopsoas muscle (innervated in the abdomen). [11] The LFC (lateral femoral cutaneous) nerve supplies an area of skin distal to the incision that can easily be blocked with ultrasound. However, the psoas compartment block and calcaneofibular ligament (CFL) block cannot anesthetize the proximal skin area supplied by the subcostal and iliohypogastric nerves. This can be corrected by subcutaneous infiltration of local anesthesia. During surgery, the operator avoid dissecting the iliopsoas muscle; however, they are stretched during distal traction on the femur to anchor the head of the prosthetic femur in the hip socket. This procedure causes discomfort to the patient. However, this maneuver can be managed under light sedation and only takes a few seconds. [1]

Adequate anesthesia for hip surgery can be achieved with a combination of PSOAS compartment block with sciatic nerve block and skin infiltration.[12] PSOAS compartment block carries a more serious risk than femoral nerve block. The most common complication of PSOAS compartment block is dominated by epidural spread (around 40%). These complications can lead to significant hemodynamic instability in susceptible patients. In addition, the occurrence of a lumbar hematoma can be a serious complication, especially if the patient operated on the hip receives perioperative anticoagulant treatment. A case report of a patient undergoing hemiarthroplasty of the hip revealed that it was performed under anterior plexus block (3 in 1) with IV ketamine as adjuvant. In high-risk patients, hemiarthroplasty of the hip is performed using only LA infiltration for tissue dissection.[2]

The study from Akkaya et al. compared ultrasound-guided femoral and sciatic nerve blocks and spinal anesthesia for total knee arthroplasty and Mehrotra and Mehourotra with 3 in 1 compared continuous sciatic and femoral nerve blocks in hip replacement surgery. Both studies found a safe, simple and effective method of using peripheral nerve blocks.[11,13] Patients at high risk for spinal or epidural anesthesia due to cardiovascular instability and consumption of anticoagulant can safely undergo lower extremity surgery using combined femoral and sciatic anesthesia. Baddoo also concluded that peripheral nerve block was an effective anesthetic technique to provide adequate cardiovascular stability and postoperative analgesia for lower limb amputations in patients with diabetes. The same result was found by Vijayamohan et al. in a study of total knee arthroplasty performed under a combination of femoral and sciatic blocks. [14] Tantra et al. also conducted a study using a combined femoral and sciatic block in anticoagulated patients with severe valvular disease and found the procedure to be simple.[15]

PROSPECT recommends Fascia iliac block action (grade D), for Hermiarthoplasty action according to M sign, M khan and R Chandrasekar can be performed with Femoral and sciatic nerve blocks.[16] Compared to a central neuraxial block which provides an analgesia duration of approximately 4 to 5 hours, a combined femoral and sciatic block provides a longer postoperative analgesia duration of approximately 12 to 13 hours. This advantage has implications for the administration of fewer doses of nonsteroidal anti-inflammatory drugs and opioids, so that postoperative side effects such as nausea, vomiting, and sedation can be minimized and adequate control of pain can be performed so that patients can perform early mobilization. The posterior Labat approach to the sciatic nerve block has a better success rate than other approaches such as the anterior, posterior, and parasacral approaches. Tagariello also found similar results in a study of the sciatic nerve block approach which reported that the posterior approach showed an almost 99% success rate in over 15,000 patients.[2]

Regardless of the type of anesthesia received, preoperative assessment of patient comorbidities and optimization of assessment is important to do prior to surgery. In the study by Bansal et al., mean duration of sensory and motor block, mean time to onset of sensory and motor block, perioperative VAS score greater than 24 hours, postoperative analgesia, need for total dose of rescue analgesic, incidence of adverse events and complications had comparable values in the two treatment groups. Patients were asked to provide an

assessment on a visual analogue scale (VAS) to determine the level of analgesia in the postoperative period. The evaluation is done with a line from 0 to 10 cm with the number "0" meaning "no pain" and the number "10" meaning "severe pain".[2] Intraoperative pain was assessed using a visual analogue scale (VAS); 0 means no pain and 10 means severe pain. A VAS value of up to 3 is considered uncomfortable and a VAS value greater than 3 is considered painful. Patients who completed surgery without requiring opioid administration (VAS ≤ 3 during surgery) were considered to have adequate anesthesia. Conversely, patients who experience pain (VAS > 3) and who receive additional opioids or general anesthesia at any time during surgery are considered to be under anesthesia. [1] Bansal et al. found that VAS scores were worth 0 to 10 hours postoperatively, with a peak VAS score of 3 post-15 hours of surgery and decreased to a VAS score of 2 post-24 hours of surgery. [2]

In this case report, there is still a bias value for the evaluation of VAS pain in the first 24 hours, due to the effect of opioids (morphine) in intrathecal which can last 24 hours post-subarachnoid block. The combination of nerve blocks needs a large doses of local anesthesia, therefore it is important to consider the toxicity risk. If available, a reduced amount of toxic LA levorotatory enantiomer should be utilized. The current block still causes ipsilateral limb sympathectomy. Tight monitoring of hemodynamics and other perioperative risks (excessive bleeding, hemodynamic complications, deep vein thrombosis, or pulmonary embolism) is crucial. [8]

CONCLUSION

The combined femoral nerve block and sciatic nerve for multimodal pain are highly effective in postoperative hip hemiarthroplasty.

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CONFLICT OF INTEREST

The author declare there is no conflict of interest.

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