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The Pericapsular Nerve Group (PENG) Block on Total Hip Replacement Operation

Doddy Timboel Soedarso¹, Simson S. Soerodjotanojo², Erica G. M. Simanjuntak¹

¹Department of Anesthesiology and Intensive Therapy, Faculty of Medicine, Universitas Kristen Indonesia, Jakarta, Indonesia

²Department of Anesthesiology and Intensive Therapy, Faculty of Medicine, Universitas Udayana, Denpasar, Indonesia

Corresponding Author: Doddy Timboel Soedarso

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ABSTRACT

Background: In Total Hip Replacement (THR) surgery, the term PENG block refers to the use of regional anesthesia or block anesthetic which aims to reduce pain during and after surgery. "Peng block" is an abbreviation for "Peripheral Nerve Block", which is an anesthetic procedure carried out by injecting a local anesthetic around certain nerves to numb certain areas of the body, in this case, around the hips and thighs.

Case Report: A 53-year-old female patient, ASA III, was planned for left Total Hip Replacement (THR) surgery. The patient had an initial complaint of pain in the right hip since approximately 5 months ago. Patients with cardiovascular comorbidities have frequent PVCs, patients with respiratory emphysematous lung and bilateral pleural effusion, and patients also suffer from osteoarthritis. From the patient's EKG, Frequent PVC results were found and Echocardiography results showed normal heart chamber dimensions, Mild Aorta Regurgitation, Mild Tricuspid regurgitation with low probability of Pulmonary Hypertension, Normal Left Ventricle (LV) and Right Ventricle (RV) function, Normal LV diastolic Function, Ejection Fraction BP 50.5%, TAPSE 21 mm, eRAP 8 mmHg.

Conclusion: Pericapsular Nerve Group (PENG) block can be an option in THR surgery, where it is expected to contribute to

FN, ON, and AON anesthesia, and therefore, can provide analgesic coverage for pelvic surgery while also reducing the opioid requirements of patients with THR surgery thereby reducing the side effects of Opioids that can occur can also provide comfort to patients when starting physiotherapy

Keywords: total hip replacement, peng block, anesthetic, hip

INTRODUCTION

Pathology of the hip is one of the most common pathologies resulting in surgery in both young and old populations. Due to fractures, trauma, tumor surgery, joint pathology, or other reasons, operations on the hip joint are frequently performed, and patients suffer from severe pain.¹ In 2018, Giron-Arango et al. described a new regional technique for pelvic analgesia; Pericapsular Nerve Group (PENG) block. PENG block is a type of plane block that is placed under ultrasound guidance at the level of the anterior inferior iliac spine, targeting the articular branches of the femoral nerve, obturator nerve, and accessory obturator nerve.² PENG blocks have been shown to significantly reduce hip fracture pain provide effective postoperative analgesia for Total Hip Arthroplasty and maintain quadriceps strength.³ In hip joint replacement surgery, the anesthetic blocks that are often used are: 1) Femoral Nerve Block (Targets the femoral

nerve which innervates the front of the thigh and pelvis.

Effective for reducing postoperative pain); 2) Sciatic Nerve Block (targets the sciatic nerve to block pain in the back of the thigh and part of the leg); 3) Lumbar Plexus Block (targets the entire lumbar plexus including the femoral, obturator, and lateral cutaneous nerves of the thigh. Suitable for general post-operative pain in THR); 4) Epidural or Spinal Block (Sometimes used together or as an alternative to providing more extensive anesthesia in the lower body). Benefits of Using Peng Block: 1) Effective Pain Control: Patients feel less pain after surgery, 2) Reducing Opioid Use: Helps reduce dependence on pain medications such as morphine or similar, 3) Faster Recovery: Because pain is under control, it is easier for patients to begin post-operative physical rehabilitation, 4) Minimal Side Effects: Compared to general anesthesia, the risk of complications such as nausea, vomiting or respiratory problems is lower.

CASE REPORT

A 53-year-old female patient, ASA III, was planned for left Total Hip Replacement (THR) surgery. The patient had an initial complaint of pain in the right hip since approximately 5 months ago. Patients with cardiovascular comorbidities have frequent PVCs, patients with respiratory emphysematous lung and bilateral pleural effusion, and patients also suffer from osteoarthritis. From the patient's EKG, Frequent PVC results were found and Echocardiography results showed normal heart chamber dimensions, Mild Aorta Regurgitation, Mild Tricuspid regurgitation with low probability of Pulmonary Hypertension, Normal Left Ventricle (LV) and Right Ventricle (RV) function, Normal LV diastolic Function, Ejection Fraction BP 50.5%, TAPSE 21 mm, eRAP 8 mmHg. The patient was evaluated and planned for Regional Subarachnoid Block Anesthesia (RA-BSA) and PENG block. While in the operating room, the patient was given premedication with 1.5 mg midazolam, 10

mg ketamine, and 25 mcg fentanyl then positioned for a PENG block using a 100 mm Stimuplex needle with the help of ultrasound and given 20 ml volume of 0.5% plain bupivacaine. After that, the patient was positioned for RA-BSA, and with a 27 G spinocan needle, 10 mg of bupivacaine heavy 0.5% 10 mg was given. The operation lasted 2 hours 35 minutes with a total bleeding of 100 ml. A total of 400 ml of Ringer's lactate was given. During surgery, the patient's hemodynamics remained stable and the patient did not complain of pain. Post-operatively, patients are treated in the intermediate room for post-operative monitoring. The patient was given analgesic therapy Patient Controlled Analgesia (PCA) morphine demand only and paracetamol 500 mg every 6 hours PO. The patient's stationary and moving NRS score within 24 hours after surgery was 0/10. The patient's stationary NRS score in 48-72 hours was 1/10 and the moving NRS was 2/10. The total use of morphine during the 4 days of patient treatment was 4 mg.

DISCUSSION

PCA with the use of opioids is an effective method for controlling pain after THR surgery. This method is used mainly in elderly patients with heart and kidney problems.⁴ Pericapsular Nerve Group (PENG) block has recently been proposed as an innovative method for treating pain due to hip or pelvic fractures by targeting the final sensory nerve branches of the femoral nerve. (FN), obturator nerve (ON), and accessory obturator nerve (AON).⁵ PENG blocks were first described in the anesthetic literature by Giron et al. in 2018 for use in treating pre- and post-operative pain in patients with hip fractures. It has been found that this method has a significant effect in reducing pain with an average reduction of 7 points on a 1-10 pain scale, while maintaining motor function.⁶

Anatomical studies by Short et al. demonstrated that the high branches of the femoral and obturator nerves (and the accessory obturator nerve) innervate the

anterior pelvic capsule because the anterior pelvic capsule receives major sensory innervation, while the posterior and inferior capsules lack sensory fibers. The pelvic capsule is divided into two parts: anterior and posterior, with nociceptive fibers mostly found in the anterior part while the posterior part has mechanoreceptors.⁷

Their anatomical course through the fibers of the psoas major muscle and the connection of the joint branches of these three nerves with the inferomedial acetabulum and the space between the anterior inferior iliac spine and the iliopubic prominence may represent potential sites for regional analgesia.⁷

This implies that injection of a local anesthetic in the fascial space between the psoas muscle and the superior pubic branch will contribute to the anesthesia of these three nerves and, therefore, may provide analgesic coverage for pelvic surgery.⁷

In a study by Latjnhouwers et al, it was found that a large group of patients with total hip arthroplasty (THA) and total hip arthroplasty (TKA) reported moderate to severe acute postoperative pain.⁸ In these patients a PENG block was performed before surgery. After surgery, the patient was treated in the intermediate room and given analgesics via demand-only morphine PCA. On the first day of treatment, the patient was evaluated and there was no post-operative pain and this was supported by the evaluation that the PCA was not pressed by the patient and after 4 days of treatment the patient's opioid requirement was only 4 mg. This is in accordance with research conducted by Kukreja et al that in the group of patients who underwent Total Hip Arthroplasty, results were found to use post-surgical opioids.⁹



Figure 1. Anatomical structure for pericapsular nerve block (PENG) of the left hemipelvis and proximal femur

CONCLUSION

PENG block may be an option for THR surgery. PENG block is expected to contribute to FN, ON, AON anesthesia, and therefore, may provide analgesic coverage for hip surgery. PENG blocks also reduce the need for opioids in patients with THR surgery, thus reducing the side effects of opioids that can occur. Apart from that, it can also provide comfort to patients when starting physiotherapy.

Declaration by Authors

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