



Peripheral nerve block (Tetra block) - an effective alternative anesthesia for patients undergoing fractured femur neck surgery with recent myocardial infarction and low ejection fraction: a case report

Authors

Dr Anu Ambooken¹, Dr Chinchu Rose Steby², Dr Jinny John³

¹MBBS, MD Anaesthesiology, FICM, Senior Consultant Anaesthesiologist, Department of Anaesthesiology, St.Thomas Hospital Chethipuzha, Changanassery, Kerala-686104.

²MBBS, MD Anaesthesiology, DNB, MNAMS, Consultant Anaesthesiologist, Department of Anaesthesiology, St.Thomas Hospital Chethipuzha, Changanassery, Kerala-686104.

³MBBS, MS Orthopaedics, Consultant Orthopaedic Surgeon, Department of Orthopaedics, St.Thomas Hospital Chethipuzha, Changanassery, Kerala-686104.

Corresponding Author

Dr. Chinchu Rose Steby MBBS, MD, DNB, MNAMS

Consultant Anaesthesiologist, Department of Anaesthesiology, St.Thomas Hospital Chethipuzha, Changanassery, Kerala-686104

Abstract

The fractured neck of the femur (NOF) is a common injury among the elderly population¹. Ischemic heart disease (IHD) is a common comorbid condition in these patients, and recent myocardial infarction (MI) adds a unique challenge for the anesthesiologist¹. The best timing for the surgery is known to be the day of admission or the day after admission. However, this poses a challenge due to patients possibly being on antiplatelet or anticoagulant therapy, which means central neuraxial blockade is not an option¹. General anesthesia (GA) for these patients can lead to cardiovascular and respiratory instability due to associated low ejection fraction (EF)². Hemodynamic fluctuations related to anesthesia can be harmful. In this case study, a patient with a NOF fracture and a recent MI with a low EF underwent hemiarthroplasty. The procedure used a peripheral nerve block (PNB) alongside sedation as the sole anesthetic technique. The patient remained stable throughout the surgery and in the postoperative period.

Keywords: Neck of femur fracture, Myocardial Infarction, Peripheral Nerve Block, Tetra block, Loco-regional, Ejection Fraction.

Introduction

NOF fracture is one of the most common injuries requiring surgical treatment¹. Among patients with hip fractures, in-patient hospital mortality varies

from 1.6% to 9.7%, 30-day mortality varies from 6.6% to 10.9%, and 1-year mortality is reported to range from 26% to 30%¹.

The best timing for the surgery is the day of admission or the day after admission¹. Shortening the time from admission to surgery decreases the rate of complications and mortality¹. However, surgery may be delayed mostly due to major health problems associated with the elderly, leading to poor outcomes for the patient¹.

IHD is a leading cause of morbidity and mortality. Administering the type of anesthesia and maintaining hemodynamics is a unique challenge to the anesthesiologist in these patients. Both central neuraxial blockade (CNB) and GA pose challenges in these patients for multiple reasons.

Considering the timing of surgery and the patient's comorbidities, the question arises whether other anesthesia techniques are helpful for NOF fractures. We proceeded with a PNB technique and sedation, as it minimally affects the circulatory and respiratory systems. We utilized a Tetra Block technique, combining Femoral Block, Lateral Femoral Cutaneous Nerve (LFCN) block, Obturator Nerve Block, and Parasacral Sciatic Nerve Block, along with sedation for a patient who recently experienced a MI

Case Report

We have a case of a 72-year-old woman who came to the Orthopaedic Casualty department after experiencing a fall 2 days ago. She complained of pain in her right hip and was unable to stand upright due to the pain. This patient has a history of Type 2 Diabetes Mellitus, Hypertension, and Coronary Artery Disease(CAD). Additionally, she had undergone Percutaneous Transluminal Coronary angiography (PTCA) 8 years ago.

Her ECG showed significant ST-depression in the leads II,III,aVF,V5, and V6 with poor R wave progression and LBBB. Based on her medical history and ECG changes, the cardiologist recommended a Troponin I test. As her serial Troponin-I tests were increasing in nature she was diagnosed with Non-ST-segment elevation myocardial infarction (NSTEMI) due to Acute

Coronary Syndrome (ACS). Her echocardiography revealed an EF of 30% with severe left ventricular systolic dysfunction. She was admitted to the cardiac care unit (CCU) and started on dual antiplatelet therapy and anticoagulants. Three days later, her condition improved, and she was scheduled for an Uncemented Hemiarthroplasty on her right leg after discussions with the orthopedic surgeon, cardiologist, and ICU specialist. After obtaining high-risk consent, the patient was taken to the operating room. Venous access was established, and antibiotic prophylaxis was given. The patient also received 40 mg of intravenous pantoprazole. Pulse oximetry, ECG, and continuous invasive arterial blood pressure were monitored. Preload was achieved with 300 ml of crystalloid and premedication with IV Ondansetron 8 mg, and IV Midazolam 0.5mg. The patient was sedated with Dexmedetomidine IV infusion at a rate of 0.7 mcg/kg/hr and received Oxygen Therapy through a nasal cannula set at a flow rate of 2L/min. The patient was positioned in a supine position with the legs slightly abducted. The inguinal and thigh region were disinfected, and sterile towels were placed. Using an ultrasound transducer, we identified the Femoral Nerve and injected an anesthetic solution consisting of 5 ml of 0.5% Ropivacaine and 12 ml of 2% Lignocaine with Adrenaline. After the Femoral Nerve Block, we performed a lateral probe scrolling to identify the LFCN, located in a triangle created by the Fascia Lata, the Tensor Muscle of the Fascia Lata, and the Sartorius muscle. We injected 3 ml of 0.5% Ropivacaine, and 2 ml of 2% Lignocaine with Adrenaline.

Moving medially from the patient's groin, we visualized the femoral artery and vein and then scrolled the probe 2-4 cm caudally and medially until we visualized the triple layering of the Adductor Longus, Adductor Brevis, and Adductor Magnus muscles. We performed the Obturator Nerve block between the muscle layers (Adductor Brevis and Adductor Magnus) with 4 ml of 0.5%

Ropivacaine and 4 ml of 2% Lignocaine and Adrenaline. Lastly, we performed the Sciatic Nerve Block with a Parasacral approach. The patient was positioned in lateral decubitus, with the fractured limb positioned superiorly. The sacral area was disinfected, and sterile towels were placed. We used a curvilinear probe and identified the various structures along a line connecting the Greater Trochanter and the Posterosuperior Iliac Spine, including the Piriformis muscle and the Sciatic Nerve. We injected an anesthetic solution of 8 ml of 0.5% Ropivacaine and 6 ml of 2% Lignocaine and Adrenaline.

After assessing the sensory and motor loss, surgery was started. The procedure took 45 minutes with minimal blood loss. The patient remained hemodynamically stable throughout the procedure. The patient was transferred to a room from the intensive care unit after 24 hours of observation.

Discussion

Fractured NOF is a common cause of hospital admission in the elderly population². MI following a hip fracture, but before surgical repair, is associated with a 30-day mortality rate as high as 30%³. In an elective setting, it is best to avoid surgery for at least 6 months following a myocardial infarction. However, in the case of a femur neck fracture, delaying surgery could likely lead to significant complications due to prolonged immobilization. The 30-day mortality following a myocardial infarction is reported as 19-26% in individuals over 75 years of age⁴.

Patients with IHD undergoing noncardiac surgery are at a higher risk for perioperative cardiovascular events. Ensuring the proper functioning of the cardiovascular, renal, pulmonary, and central nervous systems in elderly patients is a crucial factor in determining the outcome of surgical procedures under general or regional anesthesia⁵. Using a subarachnoid block may lead to significant hemodynamic instability

because the block level cannot be easily controlled. General anesthesia can also cause issues such as hypotension from intravenous induction agents, as well as tachycardia and hypertension due to sympathetic stimulation from direct laryngoscopy and endotracheal intubation^{3,4,5}. These factors can worsen the cardiac condition of the patient^{4,5}.

Considering this, it is important to explore alternative modes of anesthesia for these patients. As a result, we have chosen to proceed with a PNB for the lower limb, as it has minimal impact on the circulatory and respiratory systems.

We utilized the Tetra Block technique, comprising the Femoral Nerve Block, LFCN Block, Obturator Nerve Block, and Sciatic Nerve Block, in conjunction with sedation as an effective method for surgical management of NOF fracture patients. Existing literature supports the potential for operative intervention using a loco-regional approach, and indicates that the outcomes for frail patients treated with PNB are superior to those subjected to GA in terms of mortality and hospitalization time¹. This approach may be particularly beneficial for patients in whom drug therapy cannot be optimized, such as those requiring antiplatelet and anticoagulant therapy. Our approach to ultrasound-guided peripheral nerve blocks, also known as the Tetra block, presents some critical issues. Multiple blocks are required to achieve an anesthetic plane for the procedure. The anesthesiologist must always keep in mind the possibility of Local Anesthetic Systemic Toxicity as it requires blocking multiple nerves. Like all ultrasound nerve blocks, it's important to remember that they require competence, ability, experience, and appropriateness. Lastly, the coordination of the surgical team, and even the positioning of the patient, can be challenging when the other hip is not anesthetized¹.

Conclusion

Peripheral nerve block, also known as Tetra block, can be used as an effective alternative anesthesia for patients with a fractured femur neck in urgent situations. This is especially helpful when drug therapy cannot be fully optimized, such as when a patient is on antiplatelet or anticoagulant therapy.

Acknowledgments

We place on record, our gratitude to Rev.Father James Kunnath, Director of the Institute for letting us publish our work.

References

1. Klimkiewicz, J.; Klimkiewicz, A.; Gutowski, M.; Rustecki, B.; Kochanowski, D.; Ryczek, R.; Lubas, A. Femoral and Lateral Femoral Cutaneous Nerve Block as Anesthesia for High-Risk Intertrochanteric Fracture Repair Patients. *J. Clin. Med.* 2022, 11, 3708. <https://doi.org/10.3390/jcm11133708>
2. Umesh B, Deshmukh R. Bipolar Hemiarthroplasty of Hip in an Unstable Angina Patient: A Case Report. *J Orthop Case Rep.* 2018 Nov-Dec;8(6):42-45. doi: 10.13107/jocr.2250-0685.1250. PMID: 30915292; PMCID: PMC6424317.
3. Rostagno C, Cammilli A, Di Cristo A, Polidori GL, Ranalli C, Cartei A, Buzzi R, Prisco D. Acute coronary syndromes with significant troponin increase in patients with hip fracture prior to surgical repair: differential diagnosis and clinical implications. *Intern Emerg Med.* 2016 Mar;11(2):219-24. doi: 10.1007/s11739-015-1348-8. Epub 2015 Nov 12. PMID: 26563767.
4. Komarasamy B, Forster MC, Esler CN, Harper WM, Hall AP. Mortality following hip fracture surgery in patients with recent myocardial infarction. *The Annals of The Royal College of Surgeons of England.* 2007 Jul;89(5):521-5.
5. Chandran P, Perween R, John B, Shajahan MS, Ramesh R. Graded Epidural Anaesthesia as the Sole Anaesthetic Technique for Bilateral Total Knee Replacement in a Patient with Low Ejection Fraction: A Case Report. *Archives of Anesthesiology and Critical Care.* 2022 Nov 7;8(Supplement):420-2.