



**THE EFFECT OF ISOMETRIC ON PAIN, MUSCLE STRENGTH
AND INFECTION RISK POST-ORIF**

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ABSTRACT

Femoral shaft fracture is a serious injury commonly caused by high-energy trauma and often requires Open Reduction Internal Fixation (ORIF). Patients following ORIF are at risk of acute pain, impaired physical mobility, and infection due to surgical wounds and implant placement. Femoral shaft fracture is a serious injury commonly caused by high-energy trauma and often requires Open Reduction Internal Fixation (ORIF). Patients following ORIF are at risk of acute pain, impaired physical mobility, and infection due to surgical wounds and implant placement. This study employed a single-case design with a nursing care approach. The subject was a 24-year-old male patient who sustained a closed left femoral shaft fracture due to a traffic accident and underwent ORIF. Nursing interventions included isometric exercises based on the protocol developed by Khosrojerdi et al., performed four times daily for five consecutive days. Pain intensity, muscle strength, and signs of infection were evaluated throughout the intervention period. The evaluation showed a reduction in pain intensity from a Numerical Pain Rating Scale (NPRS) score of 7 to 3. Lower extremity muscle strength improved to grade 4/5 on the Manual Muscle Testing (MMT) scale. No signs of infection were observed during the intervention period. Isometric exercise was effective in reducing pain and improving muscle strength and mobility in a patient with a femoral shaft fracture following ORIF, supporting its use as a nursing intervention in postoperative orthopaedic care.

Keywords: femoral fracture; isometric exercise; mobility; ORIF; pain

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INTRODUCTION

Femur fractures are one of the most common types of long bone fractures and are generally caused by high-energy trauma such as traffic accidents, falls from heights, and sports injuries. Globally, the incidence of femur fractures continues to increase every year and is one of the main contributors to disability in both the productive and elderly age groups (Fu et al., 2025). The high incidence rate shows that femur fractures are still a significant health problem in various countries, including developing countries.

A femur shaft fracture is a serious condition because it risks causing massive bleeding, hypovolemic shock, and damage to the surrounding soft tissues. This fracture also has the potential to cause long-term complications if not treated appropriately, such as malunion, nonunion, and impaired limb function (Afsari, 2023; Garla, 2023). Management of a femur fracture requires a comprehensive and continuous medical and nursing approach. Open Reduction Internal Fixation (ORIF) is the main therapy for femur shaft fractures with the aim of restoring the anatomical position of the bone and accelerating the healing process. Although ORIF provides good bone stability, postoperative patients often experience various nursing problems, such as acute pain, impaired physical mobility, and the risk of infection due to surgical wounds and internal implant placement (Afsari, 2023; Garla, 2023).

Post-ORIF pain is a physiological response due to tissue damage, inflammation, and tissue manipulation during surgery. Pain that is not handled properly can hinder the early mobilization process, increase the length of hospitalization, and reduce the patient's quality of life. In addition, prolonged immobilization can also lead to muscle atrophy, deep vein thrombosis, and peripheral circulation disorders (Garla, 2023; Anshari, 2022). Early mobilization is one of the important components in the rehabilitation program for postoperative femur fracture patients. Mobilization that is carried out gradually can improve blood circulation, prevent complications due to lying down, and accelerate the recovery of limb function. Research by Puspitasari et al., (2025) shows that early ambulation in postoperative patients with lower extremity fractures has a significant effect on increased independence and reduced risk of complications.

Isometric exercises are a form of static muscle training that can be done from the initial postoperative phase because it does not cause excessive joint movement. This exercise is effective in increasing muscle strength, maintaining muscle mass, and helping to reduce pain. Research by Khosrojerdi et al., (2018) shows that isometric exercises in patients with lower extremity fractures are able to reduce pain intensity and significantly increase muscle strength compared to conventional treatments. This case report aims to describe the application of EBN-based isometric exercises in nursing care in patients after ORIF closed fracture shaft femur sinistra.

METHOD

The collected data were analysed using a descriptive approach appropriate for a single-case study design. Pain intensity measured by the Numeric Pain Rating Scale (NPRS) and muscle strenght assessed using Manual Muscle Testing (MMT) were recorded daily and compared before and after the intervention to evaluate changes. Data related to infection risk were analysed descriptively through daily observation of clinical signs, including wound condition and body temperature. The effectiveness of nursing care was determined by comparing patient outcomes with the expected outcomes based on the Indonesian Nursing Outcomes Standards (PPNI, 2019).

RESULT

The patient Mr. M, a 24-year-old male, was treated with a medical diagnosis after ORIF closed fracture shaft femur sinistra due to a traffic accident. At the initial assessment, the patient complained of severe pain in the surgical area with a pain scale of 7, accompanied by limited movement of the lower left extremity. Muscle strength examination showed a value of 3/5. The surgical wound was covered with a bandage, appeared to be mild edema, and no signs of infection were found. Based on the results of the assessment, three main nursing diagnoses were upheld, namely acute pain, physical mobility disorders, and the risk of infection according to (SDKI PPNI, 2017). Pharmacological therapy: Aqua Pro Injection 25 mL, Bisakodil 10 mg - STOLAX soup, Ecosol Nacl Lar.Inf 0.9% btl 500ml), Ketorolac trometamol injection 30 mg/mL, Ranitidine injection 25 mg/mL, Ringer Lactate lar. infusion, btl 500 ml, and Seftriaxone serb. Inj. 1000 mg/vial.

Table 1.

Evaluation of Nursing Outcomes of Patients After ORIF Femur Shaft Fracture Sinistra			
External Indicators	Before Intervention	After Intervention (5th day)	Results
Pain intensity (NPRS)	7	3	Downward
Muscle strength (MMT)	3/5	4/5	Increase
Mobilization ability	Limited	Increase	Improve
Signs of infection	None	None	None
Injury status	Mild edema	Dry sores	Visible 50% granulated tissue, no signs of infection

DISCUSSION

The application of nursing interventions in the form of pain management, mobilization support, infection prevention, and isometric exercises for five days resulted in significant changes in the patient's condition. The intensity of the pain gradually decreased from a scale of 7 on the first day to a scale of 3 on the fifth day of treatment. This reduction in pain suggests that isometric exercises combined with standard nursing interventions are capable of providing optimal therapeutic effects. Physiologically, static muscle contractions

in isometric exercises can increase local blood flow, reduce muscle spasms, as well as stimulate the release of endorphins that play a role in lowering pain perception. These findings are in line with the research of Khosrojerdi et al., (2018) who reported that isometric exercises significantly decreased pain intensity in patients with postoperative lower extremity fractures. The results of this study are also supported by the study of Febryandy et al., (2025) which shows that early mobilization with isometric exercise intervention in post-ORIF patients is able to significantly reduce pain and increase muscle strength. Research by Lee et al., (2023) shows that isometric exercises performed in a structured and monitored manner are able to reduce pain and significantly increase muscle strength.

The increase in muscle strength was also evident during the treatment period. The MMT value of the lower left extremity increased from 3/5 at the initial assessment to 4/5 after five days of treatment. This increase in muscle strength suggests that isometric exercises are effective in maintaining muscle mass and function even though the patient is still in the early postoperative phase. These results are supported by the research of Khosrojerdi et al. (2018) which showed a significant increase in muscle strength in the intervention group. Isometric exercises are safe to give to post-ORIF patients because they do not cause joint movements that can interfere with the stability of bone fixation.

Postoperative pain and the risk of other complications such as prolonged immobilization are frequent problems in femur fracture patients. Garla (2023) explains that immobilization that is not adequately treated can lead to various complications such as muscle atrophy, deep vein thrombosis, and peripheral circulation disorders. In this case, the application of isometric exercises from the initial postoperative phase is able to prevent the decline in heavier muscle function and support the patient's rehabilitation process optimally.

Improvement in pain and muscle strength has a positive impact on the patient's ability to mobilize. After five days of intervention, the patient was able to change position in bed and sit at the edge of the bed independently. Early mobilization plays an important role in improving blood circulation, preventing complications due to bedlessness, and accelerating the recovery of limb function. These results are in line with the opinion of Puspitasari et al., (2025) who stated that early mobilization and ambulation in postoperative patients with lower extremity fractures can improve patients' functional abilities and independence.

Isometric exercises can reduce pain through the mechanism of muscle contraction that is static, contractions without joint movement or changes in articulation angles. Muscle contractions that are carried out constantly are able to cause an analgesic effect through the central response of the nervous system. Muscle contractions on one side of the body can trigger analgesic mechanisms that contribute to a decrease in pain perception. Isometric exercises are considered effective in reducing postoperative fracture pain, especially because they can be done without causing additional mechanical stress to the fracture area that is still in the healing process (Khosrojerdi et al., 2018).

Isometric exercises can also increase muscle strength in the extremities that have been fractured, the condition of immobilization after a fracture can cause muscle weakness and atrophy if no rehabilitative intervention is carried out. Isometric exercises allow muscles to continue to contract without moving the joints, so that the muscles remain activated even if the extremities cannot be actively moved. Repeated muscle activation through isometric exercises helps prevent atrophy, maintain muscle mass, and gradually increase muscle strength during the postoperative recovery process of fractures (Khosrojerdi et al., 2018).

During the treatment period, patients are also closely monitored for the risk of infection. Infection prevention interventions include aseptic wound care, body temperature monitoring, observation of signs of local and systemic infection, personal hygiene education, and collaboration in administering antibiotics. In these cases, no signs of infection were found such as fever, redness, increased pressure pain, or purulent discharge from the surgical wound. This shows that the infection prevention efforts provided have been effective (PPNI, 2017; PPNI, 2018; PPNI, 2019). This finding is in accordance with the opinion of Afsari (2023) and Anshari (2022) who stated that proper wound care and strict postoperative monitoring are the main keys in preventing infection in post-ORIF patients. The application of isometric exercises in post-ORIF closed fracture shaft femur sinistra patients in this case report is consistent with the findings of previous studies and strengthens the evidence that isometric exercises are an effective, safe, and easily applicable nursing intervention in patients with lower extremity fractures.

CONCLUSION

The application of EBN-based nursing care combined with EBN-based isometric exercises in post-ORIF closed fracture shaft femur patients has been proven to be effective in reducing pain intensity, increasing muscle strength, improving the ability to mobilize gradually, and preventing infection complications during the treatment period. Isometric exercises can be a safe, easy-to-perform, and effective nonpharmacological intervention to support the early rehabilitation of patients with postoperative lower extremity fractures.

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