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Case Study Report: Nursing Intervention for Postoperative Tibial Fracture Mobility Improvement

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ABSTRACT

Surgery is an invasive medical procedure performed to restore the anatomy and physiology of impaired body organs. One type of surgery is fracture surgery, which aims to restore the anatomy and physiology of bones that are broken for various reasons. The purpose of this study was to provide nursing care to a post-operative tibial fracture patient with a physical mobility disorder in the Flamboyan Room of Dr Harjono Ponorogo Hospital. This study used a descriptive design with a case study approach involving a participant who met the criteria. Data collection techniques included interviews and observation of muscle strength and range of motion (ROM) values. The results of the assessment found that the patient had grade 2 muscle strength in the left extremity, and the ROM value was reduced. The nursing diagnosis was Physical Mobility Disorder. Nursing interventions according to SIKI included early mobilisation and early ambulation for seven days. The evaluation results showed that muscle strength increased from grade 2 to grade 5 by the sixth day, and the ROM value improved to reach the average normal limit by the sixth day. ROM exercises and the use of crutches were effective in improving physical mobility. ROM exercises are effective for improving physical mobility because they can reduce pain levels, thus decreasing concerns related to mobility.

Keywords: Mobility; Fracture; Mobilisation

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INTRODUCTION

Fractures or broken bones are one of the causes of mortality in Indonesia, where bone injury occurs due to trauma, physical activity, force, bone condition, and the structure of the surrounding tissues, which determine whether the fracture is classified as an open or closed fracture (1). The World Health Organization (WHO) in 2019 reported that the incidence of fractures is increasing, with approximately 15 million cases recorded, corresponding to a prevalence rate of 3.2%. In 2017, there were approximately 20 million fracture cases with a prevalence rate of 4.2%, and in 2018, this increased to 21 million cases with a prevalence rate of 3.8% (2). The 2018 Basic Health Research (Riskesdas) reported that 38,863 people suffered fractures of the lower extremities, with 3,775 cases involving tibial

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fractures. In East Java, the number of fracture cases recorded from January to October 2016 was 1,422 cases (3). During 2017–2018, there were 756 fracture cases recorded at Dr Harjono Regional Hospital, Ponorogo (Medical Records of Dr Harjono Regional Hospital, Ponorogo, 2018)

Fractures are caused by trauma or physical force, including workplace accidents and traffic accidents. A fracture occurs when a bone is subjected to greater pressure than it can withstand. When a bone experiences excessive pressure, it is unable to bear the load, leading to cracks or eventual breakage. Patients with fractures typically complain of symptoms such as swelling or oedema, severe pain around the fracture site, and muscle weakness in the affected limb. Due to the pain, patients naturally tend to avoid movement as a protective mechanism, leading to immobilisation or impaired physical mobility. One of the treatment approaches for fractures is surgery. Following surgery, post-operative fracture patients often experience discomfort and pain, manifesting as swelling or oedema, numbness, joint stiffness, pain, and pallor in the affected limbs, which subsequently leads to immobilisation and impaired physical mobility (4).

Efforts to address impaired physical mobility in post-operative tibial fracture patients, according to the Nursing Intervention Standards (Standar Intervensi Keperawatan – SIKI), include mobility support (I.05173), which refers to interventions carried out by nurses to facilitate patients in enhancing physical movement activities (5). Early mobilisation is a nursing action aimed at improving physical mobility, beginning with light exercises in bed, such as breathing exercises, effective coughing exercises, and range of motion (ROM) exercises, progressing to patients being able to get out of bed and walk, with or without assistive devices.

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METHODS

This study was conducted at Dr. Harjono Regional Hospital, Ponorogo, from January to May 2024, utilizing a case study design with a nursing process approach. The subject of the case study was one adult patient suffering from impaired physical mobility. The selection of the case subject was based on an adult patient with impaired physical mobility who agreed to participate as a case study subject, following their informed consent. Prior to data collection, the researcher explained the purpose of the study to the patient. If the patient agreed to participate, they were asked to sign an informed consent form. Data were collected from various sources, including interviews, observation, and assessment. The assessment data included general information, medical history, past medical history, present illness, physical assessment using the Head-to-Toe approach, and the 13 domains of NANDA. Based on the above theory, the author conducted an assessment of Ms V using a medical-surgical assessment format, along with interview, observation, and physical examination methods to obtain the necessary data. The focus of this study was the application of Range of Motion (ROM) techniques and the use of crutches for Ms V, which proved effective in improving muscle strength and ROM values.

RESULT

Assessment

The assessment of Ms V was conducted using a medical-surgical assessment format, through interview, observation, and physical examination methods to obtain the necessary data. The assessment revealed that Ms V had undergone surgery two days prior. Her main complaint was impaired physical mobility in the left leg, accompanied by pain. On examination of the lower extremities, a postoperative wound from a tibial fracture was found, covered with an elastic bandage. When touched, the participant grimaced in pain, with a Wong-Baker pain score of 4. The muscle strength was recorded as 5 in the right upper extremity, 5 in the left upper extremity, 5 in the right lower extremity, and 2 in the left lower extremity.

The assessment of the participant's left leg revealed the following range of motion (ROM) values: At the hip joint, flexion and extension were both recorded at 60 degrees, while abduction and adduction were each measured at 10 degrees. External and internal rotations were both measured at 40 degrees. At the knee, flexion and extension were each measured at 45 degrees. In the ankle joint, dorsiflexion was recorded at 15 degrees, plantarflexion at 10 degrees, inversion at 2 degrees, and eversion at 2 degrees.

The participant indicated the onset of pain following the surgical procedure. The pain was elicited by movement of the left leg and was characterised as stabbing and throbbing in nature. It was localised to the anterior aspect of the left calf, specifically over the tibia. On the pain scale, the participant rated the severity as 6 out of 10. The pain was described as intermittent, with episodes subsiding during rest and re-emerging upon movement of the left leg.

Nursing Diagnoses

1. **Impaired Physical Mobility (D.0054)** related to impaired bone structure integrity, as evidenced by difficulty moving the extremity, pain during movement, reluctance to move, oedema in the lower left leg, decreased muscle strength with a score of 2 (normal 5), reduced ROM of the left leg with mean values at the hip 38%, knee 35%, ankle 31%, and limited movement.
2. **Acute Pain (D.0077)** related to physical injury agent.
3. **Risk of Infection (D.0140)** related to invasive procedures.

Nursing Interventions

Based on the diagnosis of impaired physical mobility, interventions were carried out over 7×24 hours using the *Indonesian Nursing Outcomes Standards* (SLKI), aiming to improve muscle strength, ROM values, and physical mobility, from complete bed rest to the ability to use crutches, including stair navigation, and to reduce pain. The care plan was based on the *Indonesian Nursing Intervention Standards* (SIKI), focusing on mobility support and ambulation support. Specific interventions included the application of range of motion (ROM) exercises and the use of crutches.

Implementation

Nursing actions included performing ROM exercises, a seven-stage crutch training programme, and

deep breathing relaxation techniques. Mobility support was provided by monitoring the patient's vital signs, assessing movement tolerance, identifying muscle strength and ROM values, teaching early bed mobility exercises, and performing ROM exercises to enhance muscle strength and ROM, as well as initiating early ambulation using crutches. Exercises were carried out for seven days, twice daily (once guided and once independently), with each ROM exercise session lasting 20 minutes and crutch training lasting 10 minutes during guided sessions.

Evaluation

Based on the evaluation results of participant Nn.V, who underwent surgery for an open tibial fracture and experienced physical mobility impairment, the issue was fully resolved. The following are the indicators observed during the 7-day care period for the participant with mobility issues:

1. **Muscle Strength**

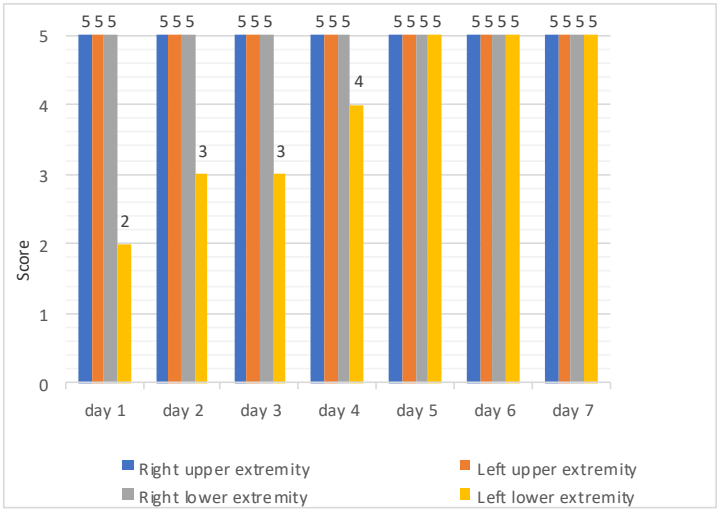

Figure 1: Graph of depicting the progression of muscle strength scores by MMT

Source: Data derived from the observation of improvements in physical mobility

Figure 1 illustrates that the therapy administered was effective in enhancing muscle strength, as evidenced by the progressive improvement in the strength of the participant's left leg. The increase in left leg muscle strength was observed on the second day, rising from grade 2 to grade 3, on the fourth day from grade 3 to grade 4, and reaching the normal value on the fifth day, progressing from grade 4 to grade 5.

2. **Range Of Motion Score**

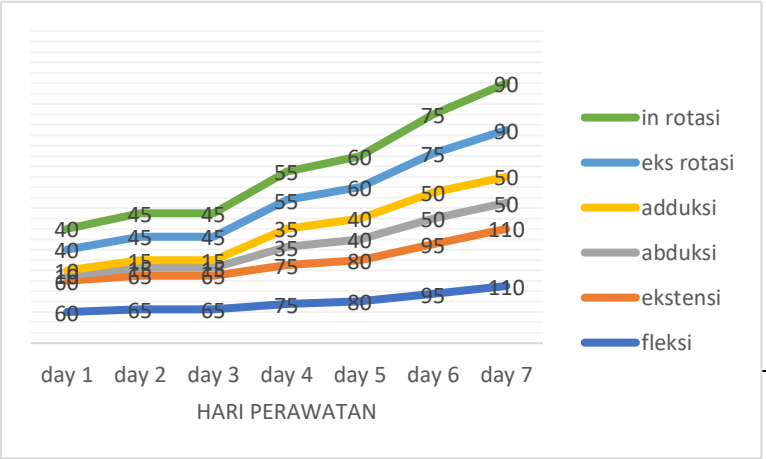

Figure 2: Progression of the Left hip Range of Motion (ROM) Score

Figure 2 demonstrates the progression of the participant's left hip ROM scores. The data indicate a consistent improvement in physical mobility over the course of the observation period. This increase in ROM score reflects the effectiveness of the interventions provided in enhancing the participant's joint flexibility and functional movement.

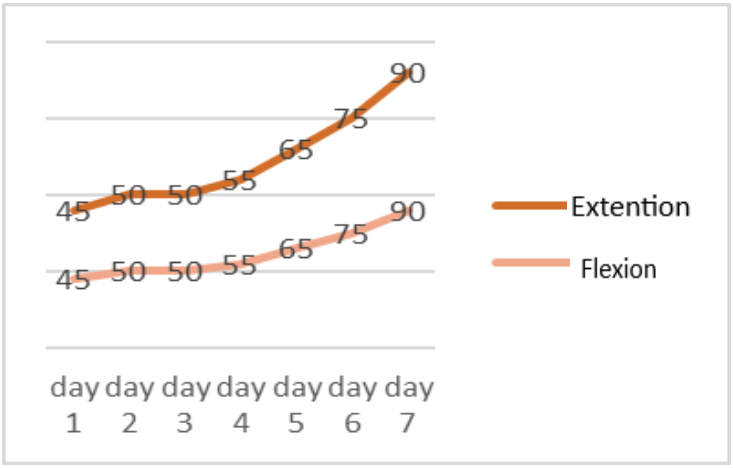

Figure 3: Progression of The Left Knee Range of Motion (ROM) Score

Figure 3 demonstrate a consistent improvement in the participant's knee mobility, reflecting the effectiveness of the implemented rehabilitation strategies in enhancing joint flexibility and functional movement.

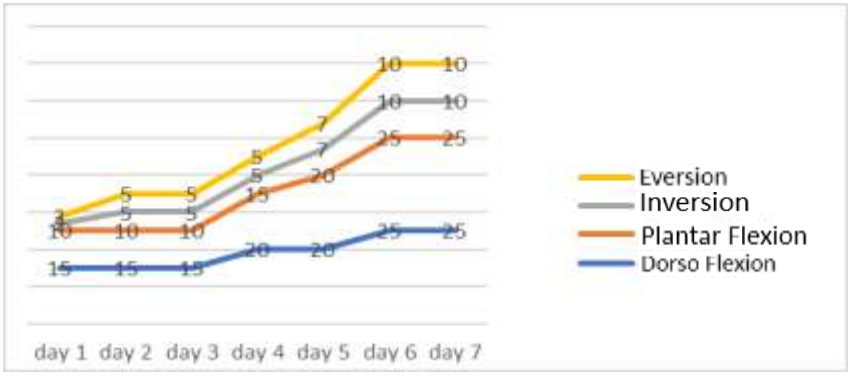

Figure 4: The Progression of The Left Ankle Range of Motion (ROM) Scores

The graph illustrating the progression of the left ankle range of motion (ROM) scores demonstrates a consistent improvement throughout the intervention period. This improvement indicates that the therapeutic interventions implemented were effective in enhancing joint mobility. The participant exhibited gradual increases in dorsiflexion, plantarflexion, inversion, and eversion angles, reflecting a restoration of functional movement in the affected ankle. These findings support the success of the applied nursing interventions in improving the physical mobility of the participant following tibial fracture surgery.

3. Pain Level

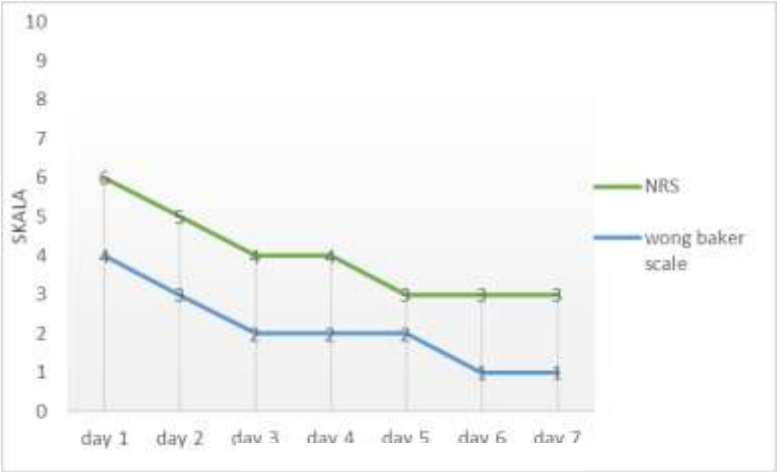

Figure 5: The Progression of Pain Level

Figure 5 demonstrates that the implemented therapy was effective in reducing the level of pain, as evidenced by a progressive decrease in the pain scale from a moderate level to a mild level. This consistent decline in pain intensity indicates that the interventions provided had a positive impact on the participant's comfort and pain management throughout the course of care

DISCUSSION

Improvement of Physical Mobility Following Post-Operative Intervention in a Tibial Fracture Patient

The enhancement of muscle strength in the participant was observed from the second day of intervention, progressing from grade 2 to grade 3. On the fourth day, an increase from grade 3 to grade 4 was noted, and by the fifth day, the participant achieved normal muscle strength (grade 5). Improvements in range of motion (ROM) were also recorded progressively, with the hip joint reaching normal ROM values by the fourth day, the knee joint by the sixth day, and the ankle joint by the seventh day. A progressive reduction in the pain level was observed, with pain intensity decreasing from moderate to mild by the third day.

The successful improvement in physical mobility was attributed to the implementation of non-pharmacological therapies, including ROM exercises, crutch training, and deep breathing relaxation techniques. Environmental factors, such as the creation of a comfortable atmosphere, adherence to medication regimens, and appropriate wound care management, contributed significantly to reducing infection risk and promoting the acceleration of physical recovery.

Lubis et al. (2023) found that participants with a dependency scale of two demonstrated reduced muscle strength, diminished ROM, and difficulty in moving the lower extremities [(6)]. Following nursing interventions involving ROM exercises, improvements in physical mobility

were observed by the fourth day, marked by enhanced muscle strength, improved ROM, and reduced movement limitations. Similarly, a study by Ginting and Anggi (2023) supports these findings, indicating that the administration of ROM therapy twice daily for 15–20 minutes over a period of three days resulted in notable improvements in muscle strength and a decrease in joint stiffness among patients experiencing impaired physical mobility after open reduction and internal fixation (ORIF) surgery for tibial fractures [(7)].

In accordance with these findings, research conducted by Jamaludin (2022) demonstrated a gradual improvement in muscle tone among post-operative fracture patients, progressing from a score of 2 on the first day to 3 on the second day and 4 on the third day. Jamaludin (2022) also reported that muscle strength improvements were observed following ROM therapy, even among patients with additional mobility challenges such as obesity [(8)].

Early ambulation has also been shown to significantly enhance the fulfilment of activities of daily living (ADLs) and is strongly recommended as soon as the patient's clinical status allows [(9)]. ROM exercises have been evidenced to be effective in reducing pain intensity among post-operative lower extremity fracture patients, supporting the maintenance of muscle strength, enhancement of blood circulation, and preservation of joint mobility [(10)] [(11)].

Moreover, deep breathing relaxation techniques have been recognised as beneficial in decreasing pain intensity. A study by Puspitaningdyah, F., et.al (2021) indicated that the application of this technique reduced pain among fracture patients [(12)]. Nevertheless, the efficacy of the technique is influenced by the patient's level of concentration and environmental conditions [(13)].

Based on the theoretical framework and previous research findings, there were no discrepancies observed with the results obtained in this study. The combination of muscle strength and ROM assessments, ROM exercises, crutch training, and deep breathing relaxation techniques proved to be effective strategies for improving physical mobility in the participant.

The ROM exercise programme initiated on the first day contributed to an increase in muscle strength from grade 2 to 3, alongside an improvement in ROM by approximately 5 degrees. The introduction of crutch training from the third day further enhanced extremity mobility. Deep breathing relaxation techniques served as adjunctive interventions that supported pain management during both ROM exercises and crutch usage.

Through the consistent and systematic application of these interventions, the resolution of the nursing problem was achieved optimally, aligning with the expected outcomes.

CONCLUSION

This case study shows that systematic implementation of range of motion (ROM) exercises, crutch exercises, and deep breathing relaxation effectively improved physical mobility in postoperative tibia fracture patients. Within seven days, the patient showed significant improvement in muscle strength (from grade 2 to 5), ROM measurements, and decreased pain intensity (from moderate to mild). Nursing interventions based on the Indonesian Nursing Outcome Standards (SLKI) and Nursing Intervention Standards (SIKI) were effective in improving recovery, early ambulation, joint flexibility, and pain control, supported by environmental management, medication, and wound care. These findings are in line with previous studies highlighting the benefits of early mobilization, ROM, and relaxation in functional recovery after orthopedic surgery. Overall, this study underscores the importance of structured rehabilitation to restore physical mobility and improve quality of life in postoperative patients with mobility impairment. Nurses play a critical role in facilitating early mobilization, managing pain, and enhancing patient engagement through individualized care such as early mobilization: implement ROM and crutch training as early as possible to support faster recovery and pain management: Integrate deep breathing relaxation into the care plan to help manage postoperative pain and enhance comfort.

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