

(RESEARCH ARTICLE)



Effectiveness of range of motion therapy to improve muscle strength in postoperative limb fracture patients

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Abstract

Introduction: A fracture or fracture is a separation or tear in bone continuity caused by trauma. Fracture fixation surgery is one of the procedures in handling fractures. However, there are still many short-term and long-term complications that can be experienced by patients, one of which is a decrease in range of motion which results in a decrease in muscle strength. Range Of Motion (ROM) is one of the therapies that can be done to improve and maintain the perfection of the ability to move joints completely and to increase muscle time and tone.

Objective: To increase muscle strength in postoperative limb fracture patients can apply Range of Motion therapy.

Methods: The method used in this study uses case studies with pre and post intervention. Range of Motion therapy is carried out 2 times a day in 3 consecutive days starting from the second day postoperatively. The patient was given ROM therapy on the second day postoperatively passively. On the third and fourth postoperative days, patients are asked to do ROM actively as taught on the first day.

Results: Results showed that there was an increase in muscle strength in patients postoperative limb fractures after Range of Motion therapy.

Conclusion: Range of motion therapy with appropriate procedures and performed routinely can improve muscle strength and daily activities in patients with postoperative limb fractures.

Keywords: Fracture; Muscle strength; Postoperative; Range of motion

1. Introduction

The human body consists of many types of bones. Fractures or fractures are mostly caused by accidents or severe falls. The risk of fractures is high in elderly people due to weaker bones [1]. Fractures are a worldwide public health problem and pose a serious economic burden, especially in people with osteoporosis. Fractures can lead to workplace absenteeism, decreased productivity, disability, impaired quality of life, loss of health, and high health care costs and are a major burden to individuals, families, communities, and health care systems [2].

The latest analysis of 2019 Global Burden of Disease (GBD) data shows that approximately 1.71 billion people worldwide live with musculoskeletal conditions, including low back pain, neck pain, fractures, other injuries, osteoarthritis, amputations, and rheumatoid arthritis [3]. Based on the results of research by the Health Research and Development Agency shows that fractures (fractures) as the fourth most common cause of injury in Indonesia, recorded

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a fracture incidence rate of 5.5%. Meanwhile, for the prevalence of injuries by body part, injuries to the lower extremities have the highest prevalence of 67.9%. Many factors affect the incidence of fractures, one of which is age. The total incidence of fractures in children under 17 years (11.4%) is highest when compared to other age groups. In addition to age, the data also showed that sex and place of incidence had an association with the incidence of bone fractures, in men (6.6%) more susceptible to bone fractures than women (4.6%) [4].

A fracture is a separation or tear in bone continuity that occurs due to excessive pressure on the bone and the bone is unable to hold it [5]. A fracture is a disconnection or crack of tissue caused by trauma determined by the extent and type of trauma. Thus experiencing a decrease in physical function which is one of the potential threats to integrity [6]. Fractures are divided into open fractures (open/compound fracture), which is if the fracture penetrates the skin so that it is in contact with outside air, and a closed fracture (simple fracture) [7]. There are 2 classifications of fractures, namely open fractures are fractures in which the skin of the visible extremity has been penetrated and closed fractures are said to be closed if there is no contact between the bone fragments and the external environment, considered hygienic fractures (because the skin is intact) without complications [8].

A fracture is a break in bone continuity caused by direct or indirect trauma. When the bone is fractured, the surrounding structure will be disrupted [9]. The causes of fractures in general can be caused by extrinsic causes including direct trauma, indirect trauma, bending, torsional, and compression. While intrinsic causes include muscle contractions and pathological conditions [10]. Fracture is one of the causes of disability, one of which is due to trauma due to an accident. Fractures can cause damage to bone fragments, and affect the function of the musculoskeletal system which affects activity tolerance so that it can affect the quality of life of patients [11].

Fracture management is based on the principles of reduction, immobilization, and rehabilitation [12]. Fracture fixation surgery is one of the most commonly performed surgical procedures in the field of orthopedics. Surgical treatment of fractures aims to restore the original anatomy of the bone to restore lost motor function [13]. Surgical treatment or surgery is the most common method of treating fractures. With the continued development of surgical techniques and internal fixation materials, more and more studies are reporting good results after surgical treatment of fractures. However, there are still postoperative complications that affect the short-term or long-term or long-term prognosis of the fractured patient. Among these complications, decreased range of motion (ROM) of the joints is one of the important factors affecting function after surgery. The lack of ROM from the joints will affect joint and muscle function, which will have important impacts on the patient's work and life after surgery, such as reduced physical flexibility and reduced motor function [14].

The mechanism of injury becomes the predisposing and most important factor for injury. The kinetic force of the muscles, the position of the patient, and the precautions available affect the force transferred to a particular part of the body and the pattern of resulting injury [15]. Some of these treatments certainly have an impact, both short and long impacts on the affected area; One of them is loss of movement, pain, and muscle weakness. Thus, it is necessary to improve the ability of Daily Living Activity in patients, also increase the Range of Motion and improve the Quality of Life of these patients [16]. Nursing problems that can arise in fracture patients include impaired physical mobility in the form of a state when a person cannot physically move either one or more parts of his extremities independently [17]. Side effects of action after postoperative fracture can be prevented by physical exercise that can increase muscle strength and endurance. Muscle strength is the force released by a muscle or group of muscles to contract when holding maximum load [18].

A nursing action that can be done gradually after fracture surgery is Range Of Motion (ROM) which aims to reduce the risk of contractures. Range Of Motion (ROM) is one of the exercises that can be done to improve and maintain the perfection of the ability to move joints completely to increase muscle time and tone [19]. Routine ROM can maintain joint and connective tissue mobility, minimize the effects of contracture formation, maintain mechanical elasticity of muscles, help smooth circulation, increase synovial movement for cartilage nutrition and joint diffusion, reduce or prevent pain, help the healing process after injury and surgery and help maintain awareness of motion from patients. To get maximum results, ROM must be repeated about 8 times and done at least 2 times a day for at least 3 consecutive days and can be done day 2 after surgery [20].

According to research conducted by Oktavia et al., (2020) the Range of Motion intervention showed a decrease in impaired physical mobility as well as the patient's muscle strength increased from 3 to 5 [21]. Research conducted by Olech et al., (2021) showed the results that the longer the implementation of Range of Motion in fracture patients, the patient's muscle strength also increased [22]. This is also in line with the research of Djamaludin et al., (2022) the patient's muscle tone on the first day of the three patients with an average value of 2 was lower than on the third day with a muscle tone result of 4. This indicates that the patient is experiencing improvement [23].

According to observations in the Lotus room 2 of RSUD Karanganyar Regency on July 24 – August 6, 2023, there were 12 patients with medical diagnoses of fractures in the extremities. Management of limb fracture patients treated in the Lotus room 2 of RSUD Karanganyar Regency consists of pharmacological management by administering analgesic drugs, surgical treatment, and physiotherapy for the restoration of range of motion. The purpose of this Range of Motion intervention is to help increase muscle strength in patients with postoperative fractures of the extremities. Based on the above phenomenon, researchers are interested in implementing the results of research on the effectiveness of Range of Motion therapy to increase muscle strength in postoperative limb fracture patients in Lotus Room 2 of Karinyar District Hospital.

2. Material and method

This study used a research method with descriptive correlative which is pre and post experimental in patients. The patient is given a therapeutic intervention range of motion technique. In this study, researchers used Range of Motion therapy and to measure the patient's muscle strength using a Manual Muscle Training (MMT) instrument with a scale of 0-5. For scale 0 if there is no muscle movement, scale 1 if there is contraction on palpation but no visible movement, scale 2 if there is movement but cannot resist gravity, scale 3 if it can move against gravity, scale 4 if it can move against the examiner prisoner but is still weak, and scale 5 if it can move and fight the examiner prisoner with full strength. Range of Motion therapy is carried out for 15-25 minutes, this therapy is carried out 2 times a day in 3 consecutive days starting from the second day postoperatively. Researchers gave ROM therapy on the second day postoperatively passively. On the third and fourth days postoperatively, researchers asked patients to do ROM actively according to what researchers taught on the first day. Muscle strength measurements are performed before the procedure and after ROM therapy every day. This case study has been carried out on July 24 – August 6, 2023 in Lotus Room 2 of RSUD Karanganyar by taking 3 patients with postoperative limb fractures. The focus of this study was to improve muscle strength in postoperative limb fracture patients. The criteria for sample inclusion were patients with postoperative limb ORIF and patients with composmentis awareness. The exclusion criteria in this study were patients who refused to be sampled, were not patients with postoperative ORIF extremities, patients with GCS below 14.

3. Results and discussion

After reviewing and collecting data on patients in Lotus Room 2 of Karinyar District Hospital, 3 patients were obtained with research inclusion and exclusion criteria. Patients with postoperative limb fractures and composmentis consciousness. Patients are carried out Range of Motion therapy for 15-25 minutes, this therapy is carried out 2 times a day in 3 consecutive days starting from the second day postoperatively. Researchers gave ROM therapy on the second day postoperatively passively. On the third and fourth days postoperatively, researchers asked patients to do ROM actively according to what researchers taught on the first day.

Table 1 Characteristics of Respondents

Characteristic	Patient I	Patient II	Patient III
Age	21 Years	47 Years	39 Years
Gender	Female	Male	Male
Occupation	Student	Wiraswasta	Wiraswasta
Education	Senior High School	Senior High School	Bachelor
Fracture Type	Humerus	Femur	Tibia
Operation Type	ORIF	ORIF	ORIF

After reviewing and collecting data on postoperative limb fracture patients in Lotus Room 2 of Karinyar District Hospital, 3 patients were obtained in accordance with the inclusion and exclusion criteria of the study, namely patients with postoperative ORIF on the extremities and patients in composmentis awareness. Patients are carried out Range of Motion therapy for 15-25 minutes, this therapy is carried out 2 times a day in 3 consecutive days starting from the second day postoperatively. Researchers gave ROM therapy on the second day postoperatively passively. On the third and fourth days postoperatively, researchers asked patients to do ROM actively according to what researchers taught on the first day.

Table 2 Muscle Strength Progress

Patient	Day To	Pre	Post
Patient I	1	2	3
	2	3	3
	3	3	4
Patient II	1	2	2
	2	2	3
	3	3	4
Patient III	1	2	2
	2	2	3
	3	3	4

The result of the implementation of Range of Motion therapy in patient I is on the first day of the patient's muscle strength before therapy 2 after the Range of Motion of the patient's muscle strength becomes 3. On the second day of Range of Motion therapy, the patient's muscle strength was originally 3 but after the patient's muscle strength therapy remained 3. On the third day of therapy, there was an increase in the progress of the patient's muscle strength which was originally 3 to 4.

The results of the application of Range of Motion therapy in patient II, the first day of the patient's muscle strength was previously 2 and after therapy remained 2. On the second day, there was progress in increasing the patient's muscle strength from 2 to 3. The third day of application of Range of Motion therapy in the previous patient muscle strength patient 3, after therapy the patient's muscle strength became 4.

In patient III, Range of Motion therapy on the first day of the previous day of muscle strength of patient 2 after therapy remained 2. Starting from the second day, there is progress in increasing the patient's muscle strength, namely before muscle strength therapy patient 2, after muscle strength therapy the patient becomes 3. In the application of Range of Motion therapy on the third day before, the patient's muscle strength 3 after therapy became 4.

Based on the table above, it can be concluded that after Range of Motion therapy, there is an increase in muscle strength of postoperative extremity patients from the first day to the third day. This is in line with the results of research conducted by Fitamania et al. (2022) there is a significant effect on increasing muscle strength in range of motion (ROM) exercises effectively performed to help physical mobility in patients postoperative lower extremity fractures [24]. According to Pratiwi et al. (2023) muscle strength can be increased through active motion therapy, because a body movement will be followed by muscle contraction. Muscle contraction is an activation of tension-producing sites in muscle fibers, muscle contraction depends on the number of motor units that are stimulated and with the amount of resistance, the more motor units are stimulated thereby increasing muscle strength and power [25].

Research conducted by I. W. S. Putri et al. (2023) also showed results that the development of muscle and joint strength before and after the active Range Of Motion for 3 consecutive days in patients who had poor muscle and joint strength became good muscle and joint strength [26]. In line with the results of research conducted by Rohmah & Rivani (2023), namely the implementation during Range of Motion exercises, there were changes in muscle tone scores in postoperative fracture patients. So it can be concluded that Range of Motion exercises affect muscle tone in patients with postoperative extremity fractures [28].

The results of a case study conducted in Lotus Room 2 of RSUD Karanganyar Regency found that after applying Range of Motion therapy to patients with postoperative limb fractures for 15-25 minutes, this therapy was carried out 2 times a day in 3 consecutive days starting from the second day postoperatively. Researchers gave ROM therapy on the second day postoperatively passively. On the third and fourth days postoperatively, researchers asked patients to do ROM actively according to what the researchers taught on the first day, the results were obtained that there was an increase in muscle strength in patients postoperative limb fractures.

4. Conclusion

Therapy with Range of Motion technique proved effective for increasing muscle strength in patients with postoperative extremities. This therapy is carried out 2 times a day in 3 consecutive days starting from the second day postoperatively. Researchers gave ROM therapy on the second day postoperatively passively. On the third and fourth days postoperatively, researchers asked patients to do ROM actively according to what the researchers taught on the first day, the results were obtained that there was an increase in muscle strength in patients postoperative limb fractures.

Compliance with ethical standards

Disclosure of conflict of interest

Researchers had no problems in this study

Statement of ethical approval

All respondents received an explanation of the purpose of this study, namely to determine the effectiveness of range of motion techniques in increasing muscle strength in postoperative extremity patients. Informed consent was obtained from each participant prior to the study. Respondents are allowed to withdraw from the study at any time.

Statement of informed consent

Visited prospective respondents and was given an explanation of the purpose of this study, which was to test the effectiveness of range of motion techniques in increasing muscle strength in postoperative extremity patients. Informed consent was obtained prior to the study and respondents were allowed to resign at any time.

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