Effect of Range Of Motion with Active Cryotherapy Modification on Pain Intensity in Postoperative Fracture Patients in SMC Hospital Telogorejo

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ABSTRAK

Fraktur atau sering dikenal dengan patah tulang adalah hilangnya kontinuitas tulang, retak atau patahnya tulang yang semulanya utuh, baik bersifat lokal maupun sebagian tulang yang biasanya disebabkan oleh trauma/rudapaksa atau tenaga fisik, kecelakaan, baik itu kecelakaan kerja, kecelakaan lalu lintas dan sebagainya yang ditentukan jenis dan luasnya fraktur. Permasalahan yang muncul setelah dilakukannya prosedur operasi adalah terjadinya nyeri dan penurunan kekuatan otot. Terdapat berbagai jenis terapi latihan gerak sesuai kebutuhan, yaitu latihan penguatan otot (strengthening), ketahanan (endurance), peregangan (stretching) dan lingkup gerak sendi ROM (Range Of Mottion). Selain ROM, terapi dingin (cold teraphy) juga merupakan terapi modalitas yang dapat menyerap suhu jaringan sehingga terjadi penurunan suhu jaringan melewati mekanisme konduksi. Tujuan penelitian ini adalah Untuk menganalisi pengaruh range of motion dan cryotherapy untuk mengurangi nyeri pada pasien fraktur post operasi. Desain penelitian yang digunakan adalah deskriptif. Jumlah sampel pada penilitian ini sebanyak 38 responden dengan teknik pengambilan sampel menggunakan teknik non probability sampling (sampel tidak acak) dengan metode accidental sampling. Hasil penelitian menunjukan bahwa adanya pengaruh yang signifikan antara Range of motion dan Modifikasi Cryotherapy Aktif terhadap Nyeri pada pasien fraktur post operasi di SMC RS Telogorejo (p value = 0,000). Oleh karena itu disarankan bagi petugas kesehatan untuk memberikan terapi secara berkala kepada penderita pasien fraktur post operasi melalui aktivitas fisik yang sesuai dalam upaya meningkatkan kemampuan merawat kesehatannya dengan baik.

Kata Kunci : Fraktur, Range of motion, Cryotherapy aktif, Nyeri

ABSTRACT

A fracture, commonly referred to as a broken bone, involves the loss of bone continuity due to cracking or breaking, typically caused by trauma, physical exertion, accidents such as work-related or traffic incidents. Post-surgical complications often include pain and reduced muscle strength. Various types of movement training therapies are employed based on specific needs, including muscle strengthening, endurance, stretching, and Range of motion (ROM) exercises for joint mobility. In addition to ROM exercises, cold therapy, known as cryotherapy, is used to lower tissue temperature through conduction. This study aimed to assess the impact of Range of motion exercises and Modified Active Cryotherapy on pain reduction in post-operative fracture patients. The study utilized a descriptive design with 38 respondents sampled via non-probability (non-random) accidental sampling. The findings revealed a significant correlation between Range of motion exercises and Modified Active Cryotherapy in reducing pain among post-operative fracture patients at SMC Telogorejo Hospital (p-value = 0.000). In conclusion, it is recommended that healthcare professionals regularly administer appropriate physical therapies to post-operative fracture patients to enhance their health management capabilities. Future study could explore combining Range of motion exercises and active cryotherapy with other variables to optimize pain management for these patients.

Keywords : *Active cryotherapy, Fracture, Pain, Range of motion*

INTRODUCTION

Fracture or often also called fracture is the disruption of bone integrity due to cracking or breaking of bones that were not previously broken, either partially or completely. This condition is usually caused by physical trauma, coercion, or exertion, such as workplace accidents, traffic accidents, and so on which the type and extent of the fracture are determined. (Muttaqin, 2008; Lukman & Ningsih, 2013; Ministry of Health of the Republic of Indonesia in Noorisa, Apriliwati, Aziz, & Bayusentono, 2017).

In 2018, the World Health Organization (WHO) recorded a total of more than 5.6 million deaths due to traffic accidents, as well as 1.3 million people with broken bones. One common type of injury is lower extremity fractures, which occur in 40% of all accident incidents (WHO, 2018). Based on the findings of Basic Health Research conducted by the Health Research and Development Agency in 2018, the prevalence of fractures in the province of Central Java, Indonesia, was recorded at 64.5%. Based on a preliminary search conducted on November 18, 2023, researchers found that the total number of fracture patients at SMC Telogorejo Hospital in 2022 amounted to 267 patients. From January to October 2023, the total number of fracture patients admitted to the hospital was 255 people, with an average of 43 patients per month.

The management of fracture handling has become something very complex. The success of fracture treatment depends on various aspects, such as the extent of the fracture, the severity of the soft tissue damage, the delay in receiving treatment, the duration of the surgical procedure, the patient's overall health condition, and other aspects. injuries, surgical approaches used, and post-operative care provided. Therefore, the two main options for treating fractures are Open Reduction Internal Fixation (ORIF) and Open Reduction External Fixation (OREF). This method is designed to secure bone fragments in place and prevent any movement (Younis, Aldahamsheh, Talib, & Ibrahim, 2018).

Postoperative complications include discomfort and reduced muscle strength. Patients may feel a decrease in the range of motion of the joint due to pain when moving, which may limit their ability to move the joint. Morphological problems in the muscles can lead to reduced muscle strength around the joints that undergo ORIF (Nazarina, 2022). Postoperative patients often experience pain after fracture surgery, which can hinder daily activities and interfere with the rehabilitation process. Decreased muscle tone and strength can be caused by the length of the recovery process. Nurses and families have a responsibility to maintain and repair the patient's body in order to improve the recovery process and allow the body to fight disease effectively (Klafke, Homberg, Glassen, & Mahler, 2016).

Pain is an unpleasant sensory and emotional sensation that arises as a result of damage to body tissues, either real or potential, or defined in the term danger. Pain is a complex sensory experience that involves many dimensions. This phenomenon shows variation in severity (mild, moderate, severe), quality (blunt, burned, sharp), duration (temporary, intermittent, persistent), and spread (shallow or deep, localized or spread). Pain, although it is a feeling, includes

cognitive and emotional elements that manifest as suffering. Pain is also related to avoidance reflexes and changes in autonomic output (Mochamad Bahrudin, 2017).

After the surgical procedure of fracture of one of the patient's limbs, currently the patient is not able to move optimally. There are limitations in mobility and muscle conditions that can be maintained by regularly training muscles, one of which is by doing exercises that encourage joint movement and increase the range of motion (Astanti, 2017). There are various forms of movement training therapy as needed, namely muscle strengthening exercises (strengthening), endurance (endurance), stretching (stretching) and the range of motion of the ROM (Range Of Mottion) joint (Sjmsuhidayat & Jong, 2013). In addition to ROM, cold treatment is another therapeutic technique that can lower tissue temperature by absorbing heat through conduction. The physiological effects of cold therapy are the result of a decrease in tissue temperature, which leads to local and systemic hemodynamic changes, as well as responses to the neuromuscular system. Cryotherapy is the use of cold therapy. Cryotherapy refers to the use of ice (cold packs), in the form of cold compresses, for the purpose of treating injuries. This is a treatment method that is routinely used in injury management (Bleakley, 2017).

Based on the findings of the research conducted (Pranowo, 2021), cold compress therapy has proven to be effective for patients who have undergone laparotomy surgery. Cryotherapy, in particular the application of cold compresses, has a positive impact on postoperative pain management in fracture patients. Cryotherapy can effectively reduce edema, reduce discomfort, inhibit muscle contraction, and minimize the possibility of cell or tissue necrosis. Cryotherapy is used to extract heat through conduction or an intermediate mechanism, which leads to a decrease in local tissue damage by gradually lowering the temperature over a period of time.

Postoperative fracture patients often experience a variety of problems, including discomfort after ORIF surgery due to the invasive nature of the surgical techniques performed. Although bone fragments have been reduced, the act of inserting screws and plates into the bone during manipulation will cause tremendous discomfort. The pain was intense and persistent, lasting hours to days. This problem arises due to the advancement of the inflammatory phase accompanied by tissue swelling. Non-pharmacological treatment in patients with postoperative fractures that can be done is to perform a range of motion (ROM) and provide active cryotherapy to make the patient feel comfortable. So the researcher is interested in conducting a study on "The Effect of Range of Motion with Active Cryotherapy Modification on Pain Intensity in Postoperative Fracture Paien in Telogorejo Hospital"

METHOD

The type of research used in this study is quasy experimental design using one group pre-test post test design, which is measured before the intervention is given and measured again after the intervention is given where the results are compared between before and after the intervention is given (Swajarna, 2015).

In this study, a sampling technique was used, namely non-probability sampling

(non-random samples) with the accidental sampling method. This method uses a random sampling methodology, that is, every patient encountered by the researcher by chance can be selected as a sample, as long as the researcher considers the individuals he meets as a viable source of data (Riyanto, 2018). The independent variables in this study are Range of motion (ROM) and Active Cryotherapy Modification. The dependent variable in this study is pain in postoperative fracture patients. The population in this study is fracture patients in the SMC Telogorejo Hospital inpatient unit in January – October 2023 which totals 433 patients, with an average of 43 patients per month. The inclusion criteria in this study are Patients with upper or lower extremity fractures who underwent surgery who received analgetic therapy. Exclusion criteria The exclusion criteria in this study are Patients with multiple fractures. The number of respondents in this study was 38 respondents.

In this research, the researcher used 2 types of data, namely Primary Data, in this study, the primary data obtained is the characteristics of the respondents. Secondary data in this study is medical record records to obtain information related to the identity of postoperative fracture patients related to names, addresses and telephone numbers.

RESULT

Respondent Characteristics

Table 1
Respondent Characteristics
(n = 38)

Chaeracteristics	n	%
Age		
1. 17-25 y.o	2	5,3
2. 26 - 35 y.o	1	2,6
3. 36 - 45 y.o	6	15,8
4. 46 - 60 y.o	15	39,5
5. > 60 y.o	14	36,8
Gender		
1. Male	18	47,4
2. Female	20	52,6
Fracture location		
1. Upper extremities	12	31,6
2. Lower extremities	26	68,4
Total	38	100

Based on table 1, it shows that out of a total of 38 respondents of *postoperative fracture patients* at SMC Telogorejo Hospital, the majority of respondents are in the age range of 46 - 60 years, as many as 15 respondents (39.5%). Most of the respondents were female, as many as 20 respondents (57.9%). The majority of respondents worked as private employees, as many as 22 respondents (57.9%). In addition, the majority of respondents in this study experienced fractures in the lower extremities, as many as 26 respondents (68.4%).

Pain level in *postoperative* fracture patients before and after being given *range of motion* with active *cryotherapy* modification at SMC Telogorejo Hospital

Table 2
Pain level before being given *range of motion* with active cryotherapy modification

	N	Min	Max	Mean	SD
(*pre test*)	38	3	8	5.13	1.359
post test)	38	2	7	3.71	1.293

Table 2 above shows that the average pain scale in *postoperative* post-fracture patients before being given *a range of motion* with active *cryotherapy* modification is 5.13 with the lowest pain level on a scale of 3 and the highest on a scale of 8. Meanwhile, after being given *a range of motion* with active *cryotherapy modification* , the average pain

level of the respondents was 3.71 with the lowest pain level on a scale of 2 and the highest on a scale of 7. So that there was a decrease in pain after being given *a range of motion* with active *cryotherapy* modification , with an average score of 1.42.

Effect *of range of motion* with active *cryotherapy* modification on pain level in *postoperative* fracture patients at SMC Telogorejo Hospital

Table 3
Effect *of range of motion* with modification of *active cryotherapy* on pain level in patients with postoperative fractures

Variable		*p value*	*Mean Rank*
Range of motion with active *cryotherapy* modification on pain levels in *postoperative* fracture patients (*Post test – pre test*)	*Negative Ranks*	34[a]	17,50
	Positive Ranks	0[b]	0,00
	Ties	4[c]	
	N	38	
	Asymp. Sig. (2-tailed)	0,000	

The results of the Wilcoxon test in table 4.3 show that out of a total of 38 respondents in this study, as many as 34 respondents experienced a decrease in pain, the other 4 respondents did not experience a decrease in pain. The significance value was 0.000 (*p value* < 0.05). So that H_0 is rejected and Ha is accepted. which means that there is a significant influence between *Range of motion* and Active *Cryotherapy* Modification on Pain in *postoperative* fracture patients at SMC Telogorejo Hospital.

DISCUSSION

1. Respondent Characteristics

   The results of the research that have been carried out show that the distribution of respondents in this study based on the age of the majority is in the age range of 46 – 60 years with a total of 15 respondents (39.5%). In this age range, bone density decreases so that it has more potential to cause fractures (Sitanggang, 2021). > age 40 have a decreased physical capacity to adapt to surgery due to a decline in certain bodily functions, most of those over the age of 40 who undergo surgery are at risk during surgery (Perry & Potter, 2018). Usually, when humans reach the age of >40 years, they undergo physiological changes characterized by a decrease in the capacity of tissues to repair, replace, and maintain their normal structure and function (Denata, 2013).

   Slightly different from the results of Yudianto (2022) research, the most fractured respondents in the late adolescence category (17-25 years) were (66%), Duhita (2019) in the age range of 17-25 years had the highest distribution of respondents (42.1%), and Lahvanya (2018) respondents The most research was in the age group of 17-25 years (25.9%). This is because younger individuals typically engage in more physically demanding and risky activities compared to those over the age of 40. As they age, they tend to reduce their physical activity levels and engage in fewer risky behaviors, thus lowering their chances of developing fractures.

   The results of the study showed that the distribution of respondents in this study based on gender was 20 respondents with female gender (52.6%). Menopause is associated with changes in bone density in women. Estrogen levels experience a rapid decline starting at age 40, roughly 10-15 years before menopause (known as pre-menopause). This decrease in estrogen causes prolongation and irregularity of the monthly cycle until menopause occurs. Reduced estrogen levels inhibit the process

of bone development and accelerate bone reabsorption. Bone mass decline during pre- and early menopause is a gradual process, with a decrease in bone density by 2-3% per year, resulting in a weakening of bones known as osteopenia. When estrogen levels decrease, bone development (osteoblasts) is inhibited, and the two hormones involved in this process, vitamin D and PTH (parathyroid hormone), also decrease, resulting in decreased bone mineral levels. If this condition continues, it will lead to the development of osteoporosis, a condition characterized by significantly low bone mineral levels that increase susceptibility to fractures (Humaryannto, 2017).

These results are in line with research conducted (Nugraha, 2014) which shows that adult men have more muscle mass accumulation, this is influenced by high testosterone hormones, causing stronger muscles. In women, estrogen levels are high, thus inducing muscle lengthening and joint flexibility. In contrast to the research of Basuki, Sarosa & Maryana (2014) which stated that the gender who underwent surgery was 30 or (50%) males and 30 or (50%) females. The results of the research conducted by the researcher before and the research research showed a balanced data between the number of men and women who had fractures and had undergone surgery. This can be due to disease factors and the same body structure between men and women so that both have the potential to undergo surgery (Duhita, 2019).

The results of the study showed that the distribution of respondents in this study based on the location of the fracture experienced was 26 respondents with lower extremity fractures (68.4%). The results of the above study are supported by research conducted by Black et al (2019) from the overall incidence of fractures, around 2-5% experience upper extremity fractures of the clavicle in adulthood, this can be said that clavicle fractures are more often encountered. Upper left extremity fractures are more common (56%) The fracture location is most commonly found in the radius bone and humerus (76.6%) Most fractures occur in the upper left extremity because it is a protective support when about to suffer an injury such as when stumbling, the right upper limb will be used more actively while the left side is used as a protector so that it is more susceptible to trauma (Aygun, 2020). Non-dominant extremities are obtained as many as 1.8 times more frequent fractures than dominant extremities (Habiburrahman, Leonas and Marwoto, 2018).

In times of trauma, individuals often instinctively use their nondominant extremities as a support tool to protect themselves, while their dominant extremities are used to hold on to objects around them (Habiburrahman, Leonas, & Marwoto, 2018). Fractures that occur in the lower extremities have a greater impact on mobility. Physical mobility disorders, which are characterized by limited physical movement in one or more extremities, are a common problem in patients after lower extremity fracture surgery (Syokumawena, 2022).

2. Pain level in postoperative fracture patients before and after being given range of motion with active cryotherapy modification at SMC Telogorejo Hospital

The level of pain in *postoperative* fracture patients before and after being given *a range of motion* with active *cryotherapy* modification . The results showed that the average pain level in *postoperative* fracture patients given *a range of motion* with active *cryotherapy* modification was 5.13. Then after being given *a range of motion* with active *cryotherapy* modification , the average patient's pain level dropped to 3.71. The findings of the study suggest that pharmacological therapy, specifically Ketorolac injection every 8 hours, is the treatment of choice for fracture patients. This treatment was given to all 38 respondents (100.0%) because of the acute pain experienced by postoperative fracture patients. The decision to provide acute pain treatment is based on a systematic approach. WHO analgesic ladder 3-1. In addition, patients are given nonpharmacological therapy, specifically range of motion exercises combined with *modified active cryotherapy*, to reduce pain intensity. The level of pain, or pain intensity, refers to the severity of the pain a person is experiencing. Measuring pain intensity is very subjective and varies from person to person. It is important to note that two people may feel the same amount of pain in very different ways. The most objective method of evaluating pain is to assess the body's physiological response to pain. However, although this methodology is objective, it does not offer a conclusive understanding of pain itself (Tamsuri, 2017).

This is in line with the statement quoted from Wardani's (2014) research that non-narcotic analgesic drugs can be given to relieve pain with mild to moderate intensity. Meanwhile, narcotic analgesic drugs are very effective in reducing very severe pain. Citing a study from the Literature (2018), it was found that cold *cryotherapy* therapy has a significant impact in reducing pain in patients with closed extremities. Le Mone (2016) defines pain as an unpleasant sensory and emotional encounter that is related to real or potential damage to tissues or describes a state of damage.

3. Effect of range of motion with active cryotherapy modification on pain level in postoperative fracture patients at SMC Telogorejo Hospital

   Effect *of range of motion* with active *cryotherapy* modification on pain level in *postoperative* fracture patients . The results showed that there was a significant effect between *Range of motion* and Active Cryotherapy Modification on Pain in *postoperative* fracture patients at SMC Telogorejo Hospital (*p value* = 0.000). In line with the Greek study (2018) which showed that there was a positive effect of *early ROM Exercise* on postoperative patients with lower extremity fractures (*femur* fractures and *cruris* fractures) on the length of treatment days, namely the length of treatment days was 2 days shorter than that of *postoperative* patients with lower extremity fractures (*femur* fractures and fractures *cruris*) which was not carried out *early ROM Exercise*.

   Eka Sari's (2022) research provides evidence that *cryotherapy* is effective in reducing pain levels, as evidenced by the results of their research. Patients who experience discomfort due to a closed fracture before receiving medical treatment should consider using *cryotherapy* to reduce the intensity of pain. Similarly, the findings of the Latipah (2023) study showed that there was a correlation

between *range of motion* (ROM) exercises and the level of discomfort experienced by patients after orif surgery.

Doing ROM exercises is a practice that can effectively reduce pain by maintaining muscle strength, improving blood circulation, and maintaining joint mobility. Doing ROM regularly from a young age can improve blood circulation, thereby increasing wound oxygenation and better absorption of nutrients and medications (Ingkang Wilujeng, 2023). Research conducted by Dhuhairi (2021) shows that *cryotherapy* has a significant impact on reducing pain in postoperative ACL patients at Al-Irsyad Hospital Surabaya. *Cryotherapy*, also known as cryo, is used to reduce pain, anti-inflammatory purposes, relaxation, and reduce edema or bleeding (Gymn, 2017). *Cryotherapy*, with temperatures ranging from 30-12 degrees Celsius, induces cold action that decreases the hemodynamic flow in the capillaries. This leads to relaxation of the body and hence reduces postoperative discomfort (Chris, 2015).

Cryotherapy has been suggested as an initial therapy for muscle tension for more than three decades, particularly in the early stages of inflammation after injury. Cryotherapy is believed to help reduce the formation of swelling by causing narrowing of blood vessels, and also reduce further damage due to lack of oxygen by slowing down the metabolic activity of injured tissues (Literature, 2018). The findings of the study supported by other previous studies showed that the Range of Motion and Modification of Active Cryotherapy had a significant impact on the pain experienced by postoperative fracture patients at SMC Telogorejo Hospital.

CONCLUSION

The pain level in postoperative fracture patients before being given a range of motion with an active cryotherapy modification averaged 5.13, and after being given a range of motion with an active cryotherapy modification on average 3.71. The results of the Wilcoxon test showed a significance value = 0.00 (p value < 0.05). So Ha is accepted. which means that there is a significant influence between Range of motion and Active Cryotherapy Modification on Pain in postoperative fracture patients at SMC Telogorejo Hospital. Further research is suggested to combine range of motion and active cryotherapy with other variables to be more optimal in providing pain management in postoperative fracture patients. In addition, it is hoped that other researchers will also pay more attention to the application, the range of motion according to the patient's ability.

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