THE EFFECT OF INFRARED AND MUSCLE ENERGY TECHNIQUE ON INCREASING JOINT RANGE OF MOTION IN PATIENT WITH POST OPEN REDUCTION INTERNAL FIXATION 1/3 DISTAL HUMERUS PATIENTS : A RESEARCH ARTIKEL

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ABSTRACT

Introduction: Fractures occur in individuals of all ages. However, the type and location of the body varies greatly depending on different factors, mainly related to the quality of the individual bone and the nature of the trauma. The population over 50 years of age in Sweden is expected to increase by 18% between 2010 and 2025, and it is estimated that the number of faults will increase by 26% during this time. The highest incidence of fractures recorded in the data are fractures of the clavicle, tibia, and fractures of the humerus.

Case presentation: Immobilization after a fracture of the distal humerus will cause limited mobility of the elbow joint due to stiffness. A 10-year-old boy named An.AN was diagnosed with joint stiffness and postoperative pain .

Implementation and results: The provision of infrared and muscle energy techniques in the case of joint stiffness of the distal 1/3 of the distal humerus is very necessary to reduce pain both at rest, motion, and pressure as well as to increase the range of motion of the joint and improve the limited functional ability of the elbow.

Discussion: This study was conducted for 4 weeks and was carried out 2 times a week to receive infrared intervention and muscle energy technique. Infrared is given for 15 minutes in the elbow area and muscle energy technique with post isometric relaxation to reduce pain and increase the range of motion of the elbow joint. This study is expected to provide many advantages for this case.

Conclusion: the provision of infrared and muscle energy techniques that are carried out twice a week for 4 weeks can be given to patients with postoperative joint stiffness to increase joint range of motion and improve function.

Keywords: pain, joint stiffness, post orif 1/3 distal humerus, infrared, muscle energy technique.

Introduction

The elbow joint is a complex structure that provides important mechanical functions of the upper extremity between the hand, wrist and shoulder. The function of the elbow joint is useful for smooth movement, a strong grip, and serves as a support for the forearm. Loss of elbow function can greatly affect activities of daily living such as those caused by fractures and cause joint limitations. It is

important to recognize the unique anatomy of the elbow, including bone geometry, articulation, and soft tissue structure (Fornalski et al, 2003).

Stiffness of the elbow joint after surgery, is often a symptom that often occurs due to limited range of motion. Stiffness of the elbow joint will cause limited joint range of motion where the normal value is up to 130 ° to be free to carry out most activities of daily life. Some patients complain of functional weakness and ask for help if they cannot bend their elbow maximally (Shende et al, 2021).

Elbow stiffness is a common problem seen in postoperative patients with traumatic and non-traumatic elbow injuries. Pain, limitation of joint range of motion and functional decline can affect performance decline and automatically interfere with daily activities. So, physiotherapeutic intervention is needed to reduce pain and improve elbow function (Shende et al, 2021).

The muscle energy technique (post isometric relaxation) is the result of a reduction in muscle tone in one or a group of muscles after a short duration of submaximal contraction of the same muscle. This technique is based on the principle of autogenic inhibition. Static stretching has the following objectives, namely increasing muscle strength, improving musculoskeletal function and minimizing the risk of injury. The muscle energy technique (post-isometric relaxation) aims to help lengthen muscles through their contraction and relaxation methods and affect the reduction of tone in muscles or muscle groups (Shende et al, 2021).

Physiotherapy is useful for reducing pain and increasing joint range of motion and increasing muscle strength with infrared physiotherapy modalities and muscle energy techniques. This muscle energy technique is given to increase the range of motion of the joint as well as a form of education so that it can be done at home so that the recovery of the limited range of motion of the elbow joint and pain is reduced.

Case presentation :

Subjective examination

The patient fell off the bicycle in mid-March, when the right arm fell to tread and the patient felt instability in his right arm. Then the patient was brought to the emergency department of PKU MUHAMMADIYAH JATINOM Hospital and an X-ray was performed with the results of a complete overlap fracture of the distal 1/3 distal humerus dextra. The patient was immediately hospitalized and scheduled for surgery. At this time, the patient sometimes still feels pain in the elbow, slightly swollen elbow, pain when bending the elbow and limited elbow joint motion. Currently, the patient is still in control and doing physiotherapy twice a week in the hospital.

The goals to be achieved are to reduce the pain felt by the patient, increase the limited range of motion of the joints, and increase daily functional activities in daily activities.

Physical examination

The physical examination study includes aspects of vital signs, inspection, palpation. On examination, vital signs included blood pressure, pulse, respiration, temperature, height and weight, all of which were good. And the next examination is inspection, palpation, percussion and auscultation. Inspection was carried out statically and dynamically, static inspection was found to be slightly swollen and slightly dark in color on the right elbow and visible dorsal incision marks on the right elbow. Dynamic inspection found p asien looked in pain when bending the elbow, the patient is able to bend the elbow, although not optimal, the patient is able to move the shoulder, wrist and fingers normally . On palpation, there was spasm of the right biceps and brachioradialis muscles, tenderness, stillness and movement in the right elbow. Auscultation and percussion were not performed.

Table 1. Examination of vital signs

Indicator	Mark	Information
Blood pressure	100/80 mmHg	Normal
Pulse	87 x/minute	Normal
Breathing	21 x/minute	Normal
Body temperature	36.5 ^{0} C	Normal
Height	148 cm	Normal
Weight	40kg	Normal

Furthermore, the physiotherapist did an examination of joint motion on active motion , with no complaints, the patient was able to move the shoulder in any direction without complaint, moved the elbow to flexion without full ROM, pain and limitation of motion occurred, full ROM extension and wrist had no complaints. Passive motion can be done without complaint shoulder movement , elbow flexion is limited due to pain and limitations, wrist without complaint. Isometric movement against resistance on elbow movement the patient feels pain.

Table 2. Examination of passive motion joint movements

Elbow movement	Painful	ROM	Endfeel
Flexion	+	Limited	Firm
Extension	+	Unlimited	Hard

Table 3. Examination of active motion joint movements

Elbow movement	Painful	ROM
Flexion	+	Limited
Extension	+	Unlimited

Table 4. Examination of joint movement isometric motion against resistance

Elbow movement	Painful	Contraction
Flexion	+	Not optimal
Extension	+	Not optimal

Furthermore, the physiotherapist performs a specific examination, namely an examination of the range of motion of the joint with a goniometer to determine how wide the elbow joint is. Active extension flexion S: 0 – 0 – 75, passive extension flexion S: 0 – 0 – 80 , active elbow rotation R: 80 – 0 -90 and passive rotation R: 80 – 0 -90.

Table 5. Examination of LGS with a goniometer

Movement	Active	Passive
Flexion - extension	S : 0 – 0 - 75	S : 0 – 0 - 80
Rotation	R : 80 – 0 -90	R : 80 – 0 -90

Pain assessment using Visual Analog Scale (VAS) both silent pain, motion and pressure and measurement of muscle strength with Manual Muscle Test (MMT)
Pain measurement was performed using the Visual Analog Scale (VAS). This instrument provides an opportunity for patients to express pain and complaints they experience and provides a description of the classification of pain which consists of a value of 0 = no pain, a value of 1-3 : mild pain, a value of 4-6 = moderate pain , a value of 7-10 = severe pain. On examination of pain there is silent pain: 2.2. , motion pain : 8.3 ., tenderness : 3.7 .

Table 6. Pain assessment with VAS

Inspection	Mark	Information
Silent pain	2.2	Mild pain
Motion pain	8.3	Severe pain
Tenderness	3.7	Moderate pain

Functional Activity Examination using elbow functional assessment tool. This is done by asking and answering the patient for pain and limitations during activities. Type of pain scale at rest, movement, directing spoon to mouth, directing glass to mouth, moving container, difficulty using knife/pencil, difficulty drawing objects.

Table 7. Examination of functional activities with elbow functional assessment

a. Pain	Score	
Pain level at rest 1-10	2	
Pain level when moving 1-10	8	
b. Function	Score	Information
1. Difficulty directing the glass to the mouth	4	1= easy to do 2= mild difficulty 3= moderate difficulty 4= severe difficulty 5=cannot be done
2. Difficulty pointing spoon to mouth	4	
3. Difficulty pouring water into a glass	4	
4. Difficulty moving the water container	3	
5. Difficulty using a knife	3	
6. Difficulty pulling objects	3	

Management and ourcome

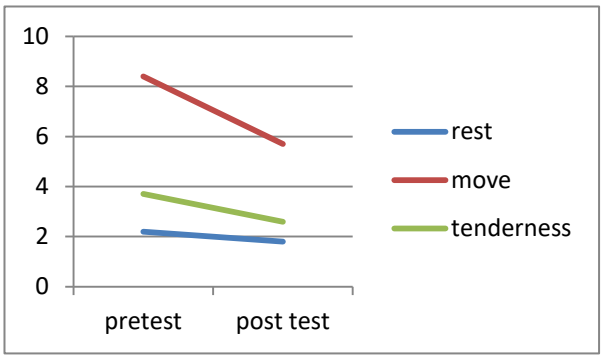
The physiotherapy process is carried out to the patient as long as the patient follows all treatment sessions at the hospital. And the patient comes to the physiotherapy poly, the purpose of the intervention is to reduce pain and increase the range of motion of the joints and improve the functional ability of daily activities.
The table below describes the interventions carried out:

Table 8. Physiotherapy program

Intervention	Dose	Information	Aim
infrared	F: 2 times a week Q : 15 minutes Distance : 30 cm	The therapy area is freed from the cloth, the light on the elbow area	For muscle relaxation, blood circulation
Muscle energy technique	F: 2 times a week with post isometric relaxation method with autogenic inhibition after stretch facilitation. This technique is given to the	Education	To relieve pain, reduce muscle tone, stretch tense muscles, strengthen weak muscles, increase local circulation and mobilize constricted joints.

	biceps, brachioradialis, and brachilais muscles contracted as long as the maximum degree of pain is held for 5-7 seconds after which rest. After resting, stretch 10 seconds for 8-10 repetitions followed by gentle passive stretching.		

Results of pain measurement with VAS



Picture 1. VAS pretest-postest

Examination of pain with VAS obtained the following results:
Figure 1 . The results of the VAS measurement from the start of therapy to one to the end
The graph above shows a decrease in motion pain and tenderness from pretest-postest . Application modalities infrared and muscle energy technique can decrease frequency of pain in painful silence: 2.2 , painful motion: 8 , 4, tenderness: 3.7 to T end silent pain: 1.8, painful motion: 5.7 , tenderness: 2,4. Examination was carried out at the beginning and end of therapy only.

Joint of Motion Measurement Results
The measurement of the range of motion of the joint is carried out using a goniometer on passive and active motion of the elbow joint as follows:

Table 9 . Measurement of the range of motion of the joints from therapy to one to the end

Region	Pretest Active	Postest active	Pretest passive	Postest passive
Elbow	S : 0 – 0 - 75	S : 0 – 0 - 90	S : 0 – 0 - 80	S : 0 – 0 - 95
	R : 80 – 0 -90	R : 80 – 0 -90	R : 80 – 0 -90	R : 80 – 0 -90

Based on the table above, it was found that there was an increase in the range of motion of the joints that had been treated with therapy.

Functional Activity Measurement Results

Functional activity measurement is done by elbow functional assessment

Table 10 . Measurement of functional activity from after the first therapy to the end of therapy

a. Pain	Pretest	Postest	
Pain level at rest 1-10	2	2	
Pain level when moving 1-10	8	6	
b. Function	Score	score	Information
1.Difficulty in directing the glass to the mouth	4	4	1= easy to do 2= mild difficulty 3= moderate difficulty 4= severe difficulty 5=cannot be done
2.Difficulty pointing spoon to mouth	4	4	
3.Difficulty pouring water into the glass	4	3	
4.Difficulty moving the water container	3	2	
5.Difficulty using a knife	3	2	
6.Difficulty pulling objects	3	3	
Amount	21	18	

Discussion

1. Infra- red (IR)

   Infrared is a type of electromagnetic radiation, its wavelength is between 780 nm and 1000 m. IR is divided into several bands: Near Infrared (NIR, 0.78–3.0 m), Medium Infrared (MIR, 3.0–50.0 m) and Far Infrared (FIR, 50.0–1000.0 m) (Lin, 2013). The warm feeling will stimulate the release of histamine which causes vasodilation of blood vessels, the occurrence of vasodilation of blood vessels will increase circulation so that irritating substances (factor P) will be carried away from the tissue and pain will be reduced (Gale, 2006) .

   Several studies have reported that IR can heal wound healing, photoprevention, relieve pain, aches and pains, arthritic rheumatic wounds, ankylosing spondylitis, photodynamic therapeutic potential, ophthalmic, neurological, and psychiatric disorders, and stimulate the proliferation of mesenchymal and cardiac stem cells. Heat and radiation emitted from infrared materials can improve blood circulation, facilitate cell growth and tissue regeneration (Lin, 2013).

   The infrared ray is placed at 60 cm from the patient's skin for 15 minutes with the patient ina relaxed position and the therapeutic area free from cloth . Itmust always be ensured that the patient feels warm and comfortable (Usman et al, 2019).

2. Muscle energy technique

The effectiveness of administering muscle energy technique (MET) interventions is growing this year. The therapeutic effect of this intervention can be used in various musculoskeletal conditions. MET uses stimulation of soft tissue or joints used in the treatment of musculoskeletal dysfunction. Postoperative pain is one of the factors causing patients to not move their joints and muscles optimally. MET is a relatively pain-free mobilization technique used to regain mobility, reduce tissue edema, reduce muscle spasm, stretch fibrous tissue and retrain joint function (Faqih et al, 2019).

According to Sherington's law of reciprocity of inhibition, a hypertonic antagonist can reflexively inhibit the agonist's muscle. Therefore, in the presence of a shortened antagonist muscle, restoring normal muscle tone and/or length should be treated first. MET has the effect of reducing pain, reducing muscle tone, stretching tense muscles, strengthening weak muscles, increasing local circulation and mobilizing restricted joints. Antagonist muscle relaxation occurs because the agonist muscle is actively contracting. It facilitates mobility at the joint due to the mutual inhibition relationship (Faqih et al, 2019).

METs with post isometric relaxation method with autogenic inhibition after stretch facilitation. This technique is given to the biceps, brachioradialis, and brachilais muscles where they are contracted to the maximum degree the pain is held for 5-7 seconds after which it rests. After resting, a 10 second stretch is performed for 8-10 repetitions followed by gentle passive stretching (Shende et al, 2021).

Conclusion

Physiotherapy program for 1 month with infrared and muscle energy technique that can improve body function profile and functional ability (activity and participation).

acknowledge

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