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A Case Study on the Effectiveness of Therapeutic Exercises in the Rehabilitation of Medial Meniscal Injury

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Abstract: ***Background: Meniscal injuries, common in athletes and older adults, occur when the knee twists under external force. Menisci are fibrocartilaginous structures vital for weight distribution, joint stabilization, and proprioception. Method: This case study focused on a 37-year-old male injured during football, using the WOMET Scale, Numerical Rating Scale, and Goniometer to assess outcomes. Results and Discussions: Post-test results showed improved knee flexion (120°), extension (130°), hip flexion (105°), reduced pain and a WOMET score increase from 33.9% to 77.9%. Conclusion: Therapeutic exercises significantly improved flexibility, muscle strength, and joint function, aiding recovery and enhancing quality of life.***

Keywords: Meniscal Injury, Numerical Rating Scale, Goniometer, WOMET Scale, ROM

1. Introduction

Meniscal injury is one of most common knee soft tissue injuries, commonly affecting young athletes and an older, degenerative population[1].The menisci are fibrocartilaginous structures that contribute to static weight bearing, distributing compressive forces during joint movement, joint lubrication, joint stabilization and proprioception[1].The knee menisci are crescent shaped wedges of fibrocartilage situated between the femoral condyles and tibial plateaus[2]. The outer edges of the menisci are convex with attachments to the joint capsule and the inner edges taper to a concave free edges[3].

The menisci are important in many aspects of knee function, including load sharing, shock absorption, reduction in joint contact stresses, passive stabilization, increasing congruity and contact area, limitation of extremes of flexion and extension, and proprioception. Many of these functions are achieved through the ability of the menisci to transmit and distribute load over the tibial plateau. The findings of joint space narrowing, osteophyte formation, and led to investigations of role of meniscus in joint function[4].

The prevalence of meniscal tear is approximately 12% to 14% with approximate incidence of 61 cases in every 100000 people. Meniscal tear is more common in males, the male female ratio ranges from 2.5:1 to 4:1[4].

Several factors are risk factors for meniscal tears, increasing the likelihood of developing meniscal tears. The non-modifiable risk factors for meniscal tears include sex, where the incidence in men is 2.5 times more than in women. Meniscal tears are more in individuals with a biconcave tibial plateau, a discoid meniscus, those with lower extremity alignment, and those with ligamentous laxity. The modifiable risk factors that increase the risks of developing meniscal tears are a high body mass index, certain occupations, such as squatting, lifting and carrying weights, stairs climbing, and athletes, and those engaging in sports-related activities, including footballers, and those playing rugby. The injury is sustained when a person, standing on a semi- flexed knee, twists his body to one side. The twisting movement, an important component of mechanism of injury is only possible with a flexed knee. During this movement the meniscus is sucked in and nipped as rotation occurs between the condyles of femur and tibia. This results in a longitudinal tear of the meniscus. The meniscus may be torn with a minor twisting may occur while walking on uneven surface. A degenerated meniscus in the elderly may get torn by minimal or no injury. The medial meniscus gets torn more often because it less mobile[5].

Joint range of motion is the most common outcome used to evaluate the effect of treatment for musculoskeletal disease. It is a reliable and valid measurement tool to objectively measure disease improvement or progression, outcomes, and mobility impairment is of importance[6].

The Western Ontario Meniscal Evaluation Tool (WOMET) is a questionnaire designed to evaluate health-related quality of life (HRQOL) of patients with meniscal pathology[7].

Non-operative management is useful for the initial treatment for acute knee trauma and as a first - line treatment method in degenerative meniscal tears. In the former situation, the 'PRICE' (protection, rest, ice, compression, elevation) protocol is applied.

In the latter non-operative management (anti-inflammatory and analgesic medications, quadriceps strengthening, activity modification, unloader bracing and intra-articular

injections, etc.) rather than surgical methods should be tried for at least three to six months.

This is a case of a 37-year-old male with complaints of pain and swelling at the knee joint and diagnosed with medial meniscal radial tear, so the aim of this study is to find out the effectiveness of therapeutic exercises in the rehabilitation of medial meniscal injury.

2. Aims and Objectives

Aim of the study

To improve range of motion, strength of muscle around knee joint and also to decrease knee swelling.

Objective of the study

To determine the effectiveness of therapeutic exercise in the rehabilitation of meniscal injury.

3. Methodology

Study Design: Case Study Method
Study Settings: Refly Physiotherapy Centre, Kannur
SAMPLE SIZE :1 Patient
Study Duration: 3-4 Weeks
Materials Used: Assessment chart, Pen, pencil, Book, Pillow, Towel, Couch, Goniometer

Criteria

Inclusion Criteria:
- Male with age between 35 and 60
- Patient who are able and willing to participate in rehabilitation program
- Patient who have desire to return to their previous level of physical activity or sports participation • Grade 3 meniscal tear

Exclusion Criteria:
- Previous surgery on affected side
- Recent fracture or dislocation of the affected knee
- Severe pain that limits the participation in rehabilitation exercise
- Uncooperative patient

Procedure

Treatment Techniques

1. Rice

RICE stands for Rest, Ice, Compression, and Elevation. Rest: Take a break from the activity that caused the injury. Ice: Use cold packs for 20 minutes at a time, several times a day. Do not apply ice directly to the skin. Compression: To prevent additional swelling and blood loss, patient is advised to wear an elastic compression bandage. Elevation: To reduce swelling, recline when the patient rests, and put their leg up higher than his heart.

2. Standing Calf Stretch

Patient is instructed to face the wall and put his hands against the wall at about eye level. Keeping the injured leg back, the uninjured leg forward, and the heel of his injured leg on the floor. Turn the injured foots lightly in ward (as if it was pigeon-toed) until he feels a stretch in the back of the patient's calf. Hold for 15 to 30 seconds. Repeat 3 times.

3. Straight Leg Raise

The patient is instructed to lie on his back with his legs straight out in front. Tighten up the top of thigh muscle on the injured leg and lift that leg about 8 inches off the floor, keeping the thigh muscle tight throughout. Slowly lower the leg back down to the floor (3 sets of 10 repetition).

4. Heel Slide

The patient is instructed to sit on a firm surface with his legs straight in front. Slowly slide the heel of the injured leg towards the body by pulling his knee to chest as he slides. Return to the starting position (3 sets of 10).

5. Hamstring Stretch on Wall

The patient is instructed to lie on back with his buttocks close to a doorway, and extend the legs straight out in front along the floor. Raise the injured leg and rest it against the wall next to the door frame. The other leg should extend through the doorway. He should feel a stretch in the back of your thigh. Hold this position for 15 to 30 seconds (3 repetition).

6. Passive Knee Extension

The patient is instructed to lie on his back, and a rolled-up towel is placed underneath the heel of injured leg so it is about 6 inches off the ground. Relax the leg muscles and let gravity slowly straighten your knee. Hold this position for 2 minutes (3 repetition).

7. Wall Slide

The patient is instructed to stand with his back, shoulders, and head against a wall and then look straight ahead. Keeping the shoulders relaxed and feet 1 foot away from the wall and a shoulder's width apart. Keeping head against the wall, slide down the wall, lowering the buttocks toward the floor until the thighs are almost parallel to the floor. Hold this position for 10 seconds. Make sure to tighten the thigh muscles as he slowly slides back up to the starting position (3sets of 10 repetition).

8. Step Up

The patient is instructed to stand with the foot of the injured leg on a support (like a block of wood) 3 to 5 inches high. Keeping the other foot flat on the floor. Shift the weight onto the injured leg and straighten the knee as the uninjured leg comes off the floor. Lower the uninjured leg to the floor slowly (3 sets of 10 repetition).

9. Resisted Knee Extension

Making a loop from a piece of elastic tubing by tying it around the leg of a table or other fixed object. The patient is instructed to step into the loop so the tubing is around the back of the injured leg. Lift the uninjured foot off the ground. Hold onto a chair for balance, if needed. 1. Bend the knee about 45 degrees. 2. Slowly straighten the leg, keeping the thigh muscle tight. (3 sets of 10 repetition)

Outcome Measures: Goniometer, WOMET (Western Ontario Meniscal Evaluation Tool), Numerical Rating Scale

4. Results

Table 3.1: Numerical pain rating scale

Sl. No	Pre test	Post test
1	10	2

Table 3.2: Goniometric evaluation

	Pre test	Post test
Knee joint		
Flexion	90°	120°
Extension	110°	130°
Hip joint		
Flexion	80°	105°
Extension	30°	30°
Abduction	30°	30°
Adduction	30°	30°
External rotation	25°	35°
Internal rotation	30°	40°
Ankle joint		
Dorsiflexion	20°	20°
Plantar flexion	20°	30°

Table 3.3: WOMAT

Sl. No	Pre test	Post test
1	33.9%	77.9%

While comparing pre-test and Post-test values, Post-test value is 2 which is better than pre-test value 10. Hence it confirms that there is significant difference in pre-test and post-values. While comparing pre-test and Post-test values, Post-test value is 2 which is better than pre-test value 10. Hence it confirms that there is significant difference in pre-test and post-values. While comparing pre-test and Post-test values, the Post-test values of WOMET Scale is 77.9% which is greater than pre-test value 33.9%. Hence it confirms that there is significant difference in pre-test and post-test values of WOMET Scale.

5. Discussion

The aim of the study was to find the "Effectiveness of therapeutic exercise in rehabilitation of meniscal injury. Meniscal injury is one of the most common knee soft tissue injuries, commonly affecting athletes and an older, degenerative population. The case study was conducted at Refly physiotherapy Centre, Kannur. With respect to both inclusion and Exclusion Criteria, a 37-year-old male patient was taken as the subject for the case study. The mechanism of injury was while playing football and as resultant twist.

WOMET Scale, Numerical rating scale and Goniometer were the outcome measures. The Western Ontario Meniscal Evaluation Tool (WOMET) is a questionnaire designed to evaluate quality of life related to the health (HRQOL) of patients with meniscus pathology. The WOMET is a disease specific tool designed to evaluate HRQOL in patients with meniscal pathology. The WOMET has 16 items representing three domains having nine items, the combined domain of sports, recreation, work and lifestyle has your items, and emotions domain has 3 items. The best or least symptomatic score 0 and the highest and most symptomatic score possible is 1600. The score may report as total overall score atonal score of each domain or as percentage of normal by subtracting total score from 1600 and multiplying by 100[7]. While comparing the values of WOMET Scale, post-test value is 77.9% which is greater than pre-test value 33.9%. Hence it confirms that there is significant difference in pre and post-test values of WOMET Scale.

Numerical Rating scale were used to assess the pain in patient with meniscal injury. Numerical rating scale are simplest and most commonly used scale. The Numerical scale is most commonly 0 to 10 with 0 being "no pain" and 10 being "the worst pain imaginable". The patient picks (verbal version) or draws a circle around (written version) the number that best describes pain dimension, usually intensity. The Post test values is which is better than pre-test value of 10 hence it confirms that three is significant difference in Post-test value and pre-test values.

The Post test value of knee flexion in goniometer is 120° which is greater than pre-test flexion value 90°and Post test values of hip flexion is 105° and pre-test value is 90°. Hence it confirms that there is significant difference in Post-test value and pre-test values.

The researchers, according to the correct scientific foundations and rules, which consists of qualifying exercises, and that these prepared exercises have a role in the improvement of the flexibility variable this is what was confirmed by this study. The gradual exercise and its diversity from simple to difficult and repetitions so that there is a dynamism of the muscles during the application of the rehabilitative approach, as the rehabilitative exercises helped to return the knee joint to the natural state or closer to natural this is what was confirmed. The flexibility exercises check the property of flexibility to lengthen the muscles and ligaments together and thus works to gain range of motion. And improving flexibility can improve movements, joints, muscles, ligaments and tendons, and this is confirmed by this. Flexibility plays an important role in determining the level of the patient on which most movements depend.

The researcher also believes that improving flexibility in the joints and gaining muscle length leads to the production of a source of muscle strength through flexibility, and this is confirmed by this. Whenever there is an improvement in flexibility, muscle elongation and greater length, the muscle strength becomes at a good level of force- gaining production and this is what a reminder that rehabilitative exercises improve and increase muscle tone and thus increase muscle strength for weak muscle[8].

Limitation of the Study

- The study was done on a small sample.
- The study was conducted over a short duration. Thus, the result only shows the short-term effects of the interventions.
- It is difficult to get isolated meniscal cases.
- There is always a combination of ligament with meniscal injury so hence there is a limitation in applying protocol in the treatment.
- All the measurements were taken manually and this may introduce human error which could affect the reliability of the study.

Further Recommendations

Long term follow up is needed to evaluate whether there occurs any sustained or after effect of treatment.

- For more reliability and validity, long term study must be carried out.
- To establish the efficacy of treatment a large sample
- Need to continue to perform kinematic exercises to prevent knee joint injuries
- Work on developing both the flexibility of the joints of lower extremity and the elasticity of the muscles such as the back and front thigh muscles of the leg, then the rest of the joints of the body, balance and compatibility so that these elements are major part of all

6. Conclusion

The findings of this project show the significant role that structured exercise program played in the rehabilitation of a patient with meniscal injury. The project concludes the following: Therapeutic exercises increased the flexibility of knee joint and strengthened the muscles surrounding it. The application of rehabilitative exercises had a positive effect in the early treatment of knee joint. There are significant differences between the pre-test and post-test values for the experimental samples in all tests in favor of post-test. In summary, the project highlights that exercise not only aids in the recovery process but also enhances overall joint function, reduces pain and improves overall quality of life for individuals suffering from meniscal injuries.

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