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The Effect of Rehabilitation Exercises for a Meniscus Tear (Before Surgery Intervention) to Improve the Range of Motion and Muscle Strength of Soccer Players

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Abstract: The effect of rehabilitation exercises for a torn meniscus (before surgical intervention) on the range of motion and muscle strength of soccer players. The importance of the research lies in studying the meniscus tear injury by preparing rehabilitative exercises applied before the surgical intervention in order to improve the range of motion (extension, flexion) and the muscle strength of the muscles working on the knee joint (front, back) for football players aged (20-28 years). The objectives of the research include: knowing the rehabilitation exercises for a torn meniscus (before surgical intervention) and their effect on the range of motion and muscle strength of football players. Areas of research include the human field: a sample of football players in Dhi Qar Governorate who will undergo surgical intervention after applying rehabilitation exercises. Their number is (2) and their ages range from 20 to 28 years. Temporal scope: for the period from 2/2/2021 until 3/20/2021 Spatial scope: The South Center for Physiotherapy and Rehabilitation of Sports Injuries. The most important conclusions include: The results of the pre- and post-test of the experimental research sample showed a clear improvement in the research variables (range of motor). , muscular strength) and in favor of the post-test.

Keywords: rehabilitation exercises, meniscus tear, variable range of motion and muscle strength, football players.

Chapter One:

1-1 Introduction and importance of research

The injury rate in football is increasing due to the nature of the game and its characteristics and that it differs from other games during training and competition, including meniscus tears, which work to distribute the body weight as well as reduce shocks to the knee joint. The injury often occurs when the leg bends inward or outward, causing a twist in the knee. The severity and type of injury determines the appropriate treatment for the injured person. Treatment may be through rest, ice, immobilization, elevation and chemical medication, then the injured person gradually returns to his functional and daily activity. This may apply to ordinary people who do not practice sports, but some injured athletes want to return to the fields in the shortest time, especially high-level football players. Surgical intervention is the appropriate treatment. Rehabilitation exercises before surgical intervention, or what is called pre-rehabilitation, prepare the injured person for the surgical operation, in addition to improving the range of motion and muscle strength. Pre-rehabilitation is a treatment for some of the consequences of the injury, including reducing pain, inflammation and joint roughness, as well as improving the delivery of oxygen to the injured area and others, in addition to strengthening the muscles working on the joint due to weakness after the injury. This makes the injured person able to bear the effort after the surgical intervention, as well as the player's gradual and faster return to the football fields. In other words, the more the functions impaired by the injury improve, the faster the recovery will be after the surgical intervention. The importance of the research lies in preparing rehabilitation exercises for the player injured with a torn meniscus, and the time to apply these exercises should be before the surgical intervention to improve the range of motion and muscle strength of football players.

The researcher believes that the aim of studying some variables related to pre-rehabilitation is to create an ideal environment that is conducive to surgical intervention and post-surgical rehabilitation.

1-2 Research Problem

Due to the large number of sports injuries in football, many scientific attempts have emerged to study as many injuries as possible, as the injury is an obstacle to reaching an advanced sports level, in addition to the physical exhaustion of the injury in addition to the psychological state that the injured person lives in throughout the period of injury. The researcher, being a specialist in the rehabilitation of sports injuries and a football player, noted that there is often neglect in rehabilitation before surgical intervention and what is called pre-rehabilitation, meaning the injured person is left until the date of surgery is reached. This wrong idea causes many problems, including relapses and complications, in addition to the limitation of movement and weakness of the muscles working on the joint caused by a meniscus tear injury. Hence, the researcher decided to study the idea of preparing rehabilitation exercises for meniscus injuries before surgical intervention to prepare the injured person for surgery and speed up his return to the field again after post-surgical rehabilitation.

1-3 Research objectives

To know the effect of rehabilitation exercises for meniscus tear injury (before surgical intervention) on the range of motion (extension, flexion) of football players.

To know the effect of rehabilitation exercises for meniscus tear injury (before surgical intervention) on muscle strength (anterior, posterior) of football players**.**

1-4 Research hypotheses

There are statistically significant differences between the pre- and post-tests in the motor range, in favor of the post-test.

There are statistically significant differences between the pre- and post-tests in muscle strength, in favor of the post-test.

1-5 Research Areas

1-5-1 Human DomainA sample of football players in Dhi Qar Governorate who will undergo surgical intervention after applying rehabilitation exercises, their number is (4) and their ages range from 20 to 28 years.

1-5-2 Time domain:For the period from 02/01/2022 to 03/20/2022

1-5-3 Spatial Domain:Southern Center for Physical Therapy and Rehabilitation of Sports Injuries.

1-6 Definition of Terms

Rehabilitation exercises: These exercises are performed during the pre-rehabilitation phase, i.e. before surgical intervention, with the aim of improving the general fitness of the injured person’s body, as well as improving the range of motion and muscle strength of the muscles working on the knee joint, in addition to the effect of these exercises in the two phases of the operation and rehabilitation after the operation.

Chapter Two:

Research methodology and field procedures

2-1 Research Methodology:

The researcher used the experimental method with pre-test and post-test to suit the problem to be solved.

2-2 Research community and sample:

The researcher conducted a field survey of some joint specialists' clinics, in addition to following up on some hospitals in Dhi Qar Governorate to follow up on players with meniscus tears and their

arthroscopic surgeries. The researcher obtained (8) injured players as a research community, and the researcher chose the research sample from (4) injured players intentionally who met the conditions set by the researcher, i.e. players with meniscus tears, and who had arthroscopic surgeries for periods appropriate to the time period for prior rehabilitation set by the researcher. The researcher worked with the injured for different periods, since the dates were different, as he worked individually with the injured.

2-2-1 Homogeneity of the research sample

The researcher made homogeneity for the sample members in the variables that have an impact on the experimental variable. Table (1) Homogeneity of the research sample

Table (1) Shows the values of the arithmetic means, standard deviations and the value of the coefficient of skewness.

Measurements	The middle Arithmetic	Deviation Standard	Error Standard	Factor twist	Significance
Mass (kg)	75,72	05.3	0.752	1.273	homogeneous
Training age (month)	84.00	3.81	0.752	0.247	homogeneous
Total length (cm)	00,180	61.2	0.752	0.955	homogeneous
Chronological age (month)	291.00	32.54	0.752	2.244	homogeneous

2-3 Methods, tools and devices used in the research

2 3-1 Means of collecting parameters

- Note
- Personal interviews
- Tests
- Arabic and foreign sources and references
- International Information Network (Internet)

2-3-2 Tools and devices used in the research

- Medical bed for measuring range of motion
- Small and large rubber bands
- Rubber band of different resistances
- Half Balance Balls
- Iron weights
- Ice packs after rehabilitation exercises
- Genometroid
- Dynamometer
- Restameter
- Stopwatch
- moving bike
- Treadmill
- Leg curling device
- Push up and seated machine

- Standing golf equipment
- Hack Pack Device
- Smith device

2-4 Tests used in the research

2-4-1 Measuring the range of motion in the case of extension: (Bashar, Hassan Binwan, 2018)

Purpose of measurement :Measurement of the range of motion of the knee joint in extension.

Tools used :Genometer, couch.

Measurement method: The person measuring stands next to the patient while he is lying on the couch. The gynometer is placed on the sides of the affected knee joint. The patient is then asked to extend the affected leg forward. The movable arms of the device move along the axial line median of the affected leg, and the latter remains fixed in its original position. The angle between the arms of the gynometer is read, which represents the angle of extension of the knee joint.

2-4-2 Measuring the range of motion in flexion (Bashar, Hassan Binwan, 2018)

Purpose of measurement: Measurement of the range of motion of the knee joint in flexion.

Tools used :Genometer, couch.

Measurement method: The person measuring stands next to the patient while he is lying on the couch, and the gynometer is placed. Then the patient is asked to bend the affected leg inward. The movable arms of the device move with the movement of the joint inward in a manner parallel to the longitudinal median line of the affected leg. The angle between the arms of the gynometer is read, which represents the angle of flexion of the knee joint.

Measurement of the state of extension and flexion

2-4-3 Measurement of anterior muscle strength(Laila Sayed Arafat, 2012)

The purpose of measurement: Measurement of the anterior muscle force acting on the knee joint.

Devices used: Dynamo meter.

Measurement procedures: The player lies on the ground in a comfortable position, attaches the dynamometer to the player's leg, and pulls the device with maximum force.

Registration: The force is measured in kg.

2-4-4 Measurement of posterior muscle strength(Laila Sayed Arafat, 2012)

The purpose of measurement: Measurement of the strength of the posterior muscles acting on the knee joint.

Devices used: Dynamo meter.

Measurement procedures: The player lies on the ground in a comfortable position, attaches the dynamometer to the player's leg, and pulls the device with maximum force.

Registration: The force is measured in kg.

Measurement of the strength of the anterior and posterior muscles acting on the knee joint

2-5 Main experiment

2-5-1 Pre-tests

Pre-tests were applied to injured players on different dates. The first injured player was on 2/2/2021 and the last injured player was on 16/2/2021. Measurements were taken at a sports injuries and physiotherapy center.

2-5-2 Rehabilitation exercises

The researcher prepared rehabilitation exercises to rehabilitate the knee joint after a meniscus tear for football players, relying on sources, references, and personal interviews, in addition to Arab and foreign studies. After that, the rehabilitation exercises were applied to the research sample one month before the operation date, one after the other, as the date of the operations varied from one injured person to another. The period took (4 weeks) for each injured person, with (3 rehabilitation units per week), i.e. (12 rehabilitation units), and the time of each rehabilitation unit was (30/45 minutes). The researcher used prolongation in the rehabilitation exercises for two periods before the rehabilitation unit in order to prepare the muscles to apply the rehabilitation exercises, and at the end of the rehabilitation unit to improve the general fitness of the body. The researcher used weight exercises with light weights as well as free exercises. These exercises aim to improve the muscle strength of the muscles working on the knee joint, including the anterior and posterior muscles. The exercises used by the researcher focused on improving the range of motion on the posterior part through extension and flexion exercises and some joint flexibility exercises, in addition to free exercises and balance exercises. The researcher used many methods, including large and small elastic. The researcher took into account the following when applying the rehabilitation exercises: continuing with static contraction exercises on rest days, applying ice three times a day for (20 minutes), as well as using a knee support, in addition to using some medical drugs in case of severe pain.

2-5-3 Post-tests

The researcher conducted the post-tests under the same conditions as the pre-tests for a period from 3/4/2021 to 3/18/2021.

2-6 Statistical processing

The researcher used the program (spss) .

3-7 Presentation, analysis and discussion of the results of the research variables (range of motion, muscle strength)

3-7-1 Presentation and discussion of the results of the pre- and post-tests for the variables (motor range).

T	Tests	Unit of measure	Pre-test		Post-test		value (T) calculated	Significance level	Type of indication
			(-s)	(±A)	(-s)	(±A)			
1	The tide	degree	750,165	240.3	125,178	090.3	867.6	0,000	moral
2	Bend	degree	750.30	375.2	000.21	603.1	21,848	0,000	moral

The table shows the results of the pre- and post-tests for the variables (motor range).

3-2 Discussion of the results of the pre- and post-test of the range of motion (extension, flexion) for the research sample

The table shows that there are significant statistical differences between the pre- and post-tests in the range of motion variable in favor of the post-test. The researcher attributes the emergence of these results to the rehabilitation exercises, including muscle stretching and flexibility exercises at the beginning and end of the rehabilitation unit, as they led to an improvement in the range of motion of the knee joint. This is confirmed by (Talha Hussam Al-Din, 1997): “The warm-up at the beginning of the unit aims to raise the temperature of the muscles that resist the viscosity that prevents the fluids from being pushed, i.e. the more the fluid moves, the less its viscosity, and thus the movement of the muscles will be facilitated, which leads to increased flexibility.” Most rehabilitation exercises require a full range of motion to be performed, and the effect of these exercises was reflected in the development of the flexibility characteristic, which was confirmed by (Al-Fadhli, 2004): “The body’s tissues in general have a unique ability to expand and contract, and thus they are affected by rehabilitation cases if the injured person is exposed to a gradual increase in physical loads.” Developing muscle strength through rehabilitation exercises had a positive effect in increasing the range of motion. Joint range of motion: “Increasing the range of motion means improving the elasticity of the muscles and ligaments surrounding the joint, in addition to improving the neuromuscular function of the sensors responsible for providing sensory information to the brain about this range.” The researcher believes that the correct technique during the performance of rehabilitation exercises, which require extending and flexing the legs, contributed to developing the joint’s range of motion.

3-3 Presentation and discussion of the results of the pre- and post-tests for the variables (muscle strength of the anterior and posterior muscles)..

T	Tests	Unit of measure	Pre-test		Post-test		value (T) calculated	Significance level	Type of indication
			(-s)	(±A)	(-s)	(±A)			
1	Front	kg	375,18	060,1	750.22	462.0	418,10	0,000	moral
2	Background	kg	375,16	597.1	000,19	069,1	594.3	0.009	moral

The table shows the results of the pre- and post-tests for the variables (anterior and posterior muscle strength).

3-4 Discussion of the results of the pre- and post-test of muscle strength (anterior, posterior) for the research sample

The table shows that there are significant statistical differences between the pre- and post-tests in the variable of muscle strength of the anterior and posterior muscles in favor of the post-test. The

researcher attributes the emergence of these results to the rehabilitation exercises that included a group of diverse and different strength and resistance exercises. The exercises were standardized according to scientific foundations in determining the appropriate loads for the importance of the pre-surgery rehabilitation stage. The effects of these rehabilitation exercises were reflected positively in muscle strength, starting with the fixed and moving exercises, which are a good indicator of muscle stimulation. This was confirmed by the researchers (Jeffrey and Falk, 1986) "The development of the muscle strength trait requires fixed and moving exercises during the rehabilitation program in order to reach better results for developing muscle strength." The development in the strength of the anterior and posterior muscles during the period of applying the rehabilitation exercises, which caused an increase in the activity of muscle contractions as a result of increasing resistance and continuous repetitions, and thus this increase will improve the effort expended during performance, due to the efficiency of the muscle strength of the muscles working on the knee joint. This is consistent with the words of (Hunter and Nous, (1985) "The more the number of weekly training sessions, the more resistance and repetitions, which increases the growth of muscle strength." The researcher believes that pre-surgical rehabilitation contributes effectively through two things: first, developing muscle strength due to the weakness caused by the injury, and second, developing muscle strength in the posterior muscles, which are rarely trained, in addition to the effective contribution after surgical intervention to maintaining the gains of pre-surgical rehabilitation.

4 - Conclusions and recommendations

4-1 Conclusions

- The results of the pre- and post-tests of the experimental research sample showed a clear improvement in the research variables (motor range, muscle strength) in favor of the post-tests.
- One of the causes of meniscus tears is the lack of muscle strength exercises in the preparation of training programs, which makes it easy for the injury to occur.
- The rehabilitation exercises prepared by the researcher qualify injured players for surgical intervention and contribute to preserving the gains they have gained from pre-surgical rehabilitation.

4-2 Recommendations

- The researcher emphasizes the use of rehabilitation exercises before surgical intervention due to the positive effect shown by the research sample in terms of development in the results.
- The researcher recommends not neglecting training the posterior muscles after injury because focusing on training the anterior muscles alone causes an imbalance in the muscles and thus the injury may recur again.
- The researcher recommends accelerating surgical intervention after injury because leaving the injured person without rehabilitation for a period of time causes many consequences, including weakness of the muscles working on the injured joint.

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Appendices

Appendix (1)

Shows rehabilitation exercises one month before surgery

First week			The second week		
1	stationary bike	3×30 seconds	1	stationary bike	3×40 seconds
2	Front leg curl	3×8Tha (weight 15 kg)	2	Front leg curl	4×8Tha (weight18kg)
3	Straight front quarter dubney	3×8(the weight15kg)	3	Straight front quarter dubney	4×8(the weight18kg)
4	The front quarter of my house is open	3×8(the weight10kg)	4	The front quarter of my house is open	4×8(the weight12kg)
5	Bing Press Release	3×8(the weight20kg)	5	Bing Press Release	4×8(the weight24kg)
6	Curl legs back	3×8(the weight10kg)	6	Curl legs back	4×8(the weight12kg)
7	Front leg curl	3×8Tha (weight 15 kg)	7	Front leg curl	4×8Tha (weight18kg)
8	Take me a quarter inside	3×8(the weight10kg)	8	Take me a quarter inside	4×8(the weight12kg)
9	Adduction and abduction of the thighs	3×8(the weight15kg)	9	Adduction and abduction of the thighs	4×8(the weight18kg)
10	Curl legs back	3×8 (weight 10kg)	10	Curl legs back	4×8 (weight 12kg)

The weekthe third			The weekfourth		
1	Stationary bike from standing	4×60 seconds	1	Stationary bike from standing	5 minutes
2	Front leg curl	4×8Tha (weight12kg)	2	Front leg curl	5×10Tha (weight15kg)
3	Straight front half turban	4×8(the weight12kg)	3	Straight front half turban	5×10(the weight15kg)
4	The front half of my skirt is open	4×8(the weight10kg)	4	Curl legs back	5×10(the weight12kg)
5	Bing Press Release	4×8(the weight15kg)	5	Push seated machine	5×10(the weight15kg)
6	Curl legs back	4×8(the weight10kg)	6	Bing Press Release	5×10(the weight20kg)
7	Front leg curl	4×8Tha (weight12kg)	7	Front leg curl	5×10Tha (weight15kg)
8	Half a bear inside	4×8(the weight10kg)	8	Curl legs back	5×10(the weight12kg)
9	Adduction and abduction of the thighs	4×8(the weight15kg)	9	Half a bear inside	5×10(the weight12kg)
10	Curl legs back	×8(the weight10kg)	10	standing golf push	3×10 (weight 15kg)