Effect of an Approach to Partial Tears Rehabilitation of the Posterior Biceps Femoris Muscle in Advanced Soccer Player

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Abstract

Injuries of all kinds frighten football players and other sports players as they prevent them from participating in competitions and thus achieving victory and winning titles.

The research aims to prepare a rehabilitation approach using exercises with rubber bands for the biceps muscle injury, which is within the group of posterior muscles of the thigh, to rehabilitate it scientifically based on its mechanics and motor characteristics to ensure that the injury is rehabilitated as quickly as possible to return to competition and to reduce the possibility of its reoccurrence in the future for advanced football players.

The researcher employed the experimental method to suit the nature of the research. The research sample was purposefully selected from football players representing clubs, Al Etisalat, Amanat Baghdad, and the Electrical Industries Club in Baghdad who had been exposed to first-degree partial tears of the biceps muscles.

The researcher has conducted measurements of pre- and post-measurements on (6) regular players in the rehabilitation program's implementation. The researcher has conducted an exploratory experiment on (2) football players from outside the research sample to detect all the obstacles that the researcher may face while doing the work of his main experiment.

The main experiment was carried out on 20.10.2022 up to 20.11.2022 with three qualifying sessions per week for four weeks, for a total of (12) sessions, with (40-50) minutes for each session, after which post-tests were conducted on 21.11.2022. The results were taken, the data was processed statistically, and presented and discussed scientifically.

The results showed that the prepared rehabilitative approach positively impacted rehabilitating and returning injured players with first-degree partial tears of the biceps muscles to playing because it contributed to returning the injured muscles closer to their normal state. The program showed its effectiveness in improving muscle strength and lengthening the biceps femoris and other muscles working on the posterior and anterior thigh. It also reduced the severity of pain. The researcher recommended the use of this rehabilitation approach to rehabilitate injuries of partial rupture of the biceps muscle.

Keywords: rehabilitation approach, partial tear, biceps muscle.

Introduction:

Sports injuries occur more in the muscular system than in the rest of the body's systems, (Al-Sulaiman, M: 2019, p.190) stated that it constitutes about (35) % of all injuries in football, and some studies conducted by the European Union indicated that football team that has (25) players are expected to cause (7) injuries to the posterior thigh muscles, including the biceps muscle, during one season. The injury may also occur repeatedly in a percentage of (40%) of the total number of players who were exposed to a partial tear of the biceps muscle, in addition to (Of the 55% of musculoskeletal injuries to the thigh, 37% of them affect the posterior thigh muscles.

Soccer is a physically demanding sport that requires players to perform various high-intensity activities such as sprinting, jumping, sudden changes in direction, and explosive movements. These activities significantly strain the hamstring muscles, often leading to partial tears that can prohibit players from playing for long periods. The lion's share of these injuries to the posterior thigh muscle is the biceps muscle, constituting (86%) (Opar, D., et al: 2015: p. 857-865). Some studies have reported that high intensity of performance is the main cause of biceps muscle injury, as well as neuromuscular fatigue, weak eccentric muscle strength, the advanced age of the athlete, and lack of flexibility of the muscle, in addition to the presence of a previous injury, the mass of the muscle tear that occurred, and the shortening of the muscle bundles of the biceps muscle (Nosaka, K., et al: 2011, p. 2427-2437), (Chen, TC., et al: 2007, p. 992-999). The long biceps femoris muscle is one of the causes of the recurrence of injury to the muscle. Here it is necessary to point out the nature of the biceps muscle, as described by (El-Din, TH: 2014, P. 185) which is one of the posterior thigh muscle groups and is in the posterior lateral section of the thigh as well as on the lateral side about the muscles of the posterior thigh muscle group. The posterior thigh muscles consist of three muscles: the biceps, the semimembranosus, and the semitendinosus, as shown in Figure (1).

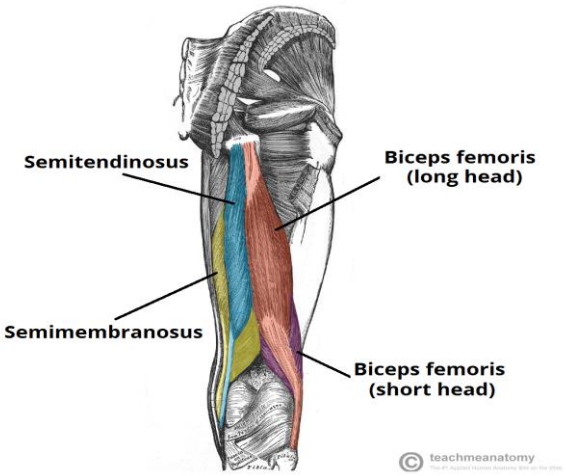

Figure No. (1) shows the muscles of the posterior thigh.

When a player is exposed to an injury (partial tear) in the posterior muscles of the thigh, several symptoms occur, according to (Abu al-Naja, I. J: 2018, p. 68) ;(Clanton, T. O., et al: 2012, p. 667-676). Among these symptoms is the presence of heaviness in the back part of the thigh, where there is sudden pain in the back area of the thigh, muscle

weakness, and limited range of motion. In addition to the presence of a tumor at the site of the injury, and finally, a gap appears inside the muscle in the same injured place. In some very serious injuries, we can hear a sound when the injury occurs.

Effective rehabilitation of these injuries is crucial for advanced soccer players to ensure a safe and quick return to play. The treatment and rehabilitation of sports injuries have become an existing science built on scientific foundations. This science has grown until it has a cognitive structure that justifies its emergence as an independent science under physical education and sports sciences. It did not stop at this point but rather went to analysis to diagnose the causes and reach optimal solutions.

(Lamb, D: 1984, p. 8) indicated that sports rehabilitation is a branch of sports medicine, as it relates to how to rehabilitate players to return them to competitions by employing rehabilitative exercises in addition to electrical stimulation, including strength, endurance, and stretching exercises. (Fandel, D: 1994, p. 4) added that experts in sports rehabilitation agreed with doctors specializing in sports injuries for the athlete's return to competition as quickly as possible. Points out (Al-Sulaiman, M: 2016, p. 25-30), the rehabilitation time varies depending on the type of injury and whether it occurred because of fast running, in which the rehabilitation time is shorter than the injury associated with hyperextension. Likewise, the duration of the return to competition can be predicted. If the difference is 30 degrees compared to the healthy limb, the return time will be more than a month. If the difference is 20 degrees compared to the healthy limb, this gives a good impression, and the recovery time because of the injury is about two weeks or a little more depending on the site of the injury.

The success of the rehabilitation process, as mentioned (Kamash, Y. L and Nimir, Y. L: 2018, p. 394), is linked to achieving the goals for which it was set, to ensure that the injured person fully recovers and returns to practicing sports normally. One of the most important goals of the rehabilitation process for sports injuries, such as partial tears of the posterior biceps femoris muscle is reducing pain and inflammation, restoring muscle strength and flexibility, and preventing re-injury, With the correction of any mechanical defect in movement, and the development of nerve and muscle coordination, Eliminating the period of passive rest, as rehabilitation programs begin as soon as possible with treatment (Hughes, J., et al: 2016, P. 1355-1362). Achieving these goals is essential for the long-term success and health of the players.

The rehabilitation of hamstring injuries, particularly partial tears of the posterior biceps femoris muscle, is a critical aspect of sports medicine. Traditional rehabilitation approaches often involve prolonged rest and passive recovery, which can lead to muscle atrophy and prolonged downtime. Recent advancements in rehabilitation techniques emphasize active recovery, incorporating resistance training to maintain and improve muscle strength and function during the healing process.

Exercises using rubber bands or resistance bands are among the important exercises in preparing sports rehabilitation and physical therapy curricula for injuries, due to their versatility, affordability, and effectiveness. They provide variable resistance, which increases with the degree of stretch, allowing for progressive loading that is crucial for muscle recovery. Research has demonstrated that resistance band exercises can effectively activate and strengthen muscles, enhance flexibility, and improve neuromuscular control (Dos Santos, R. A., et al: 2017, p. 533- 540), (Andersen, L. and Aagaard, P: 2010, p. 619- 629), (Chmielewski, T., et al: 2005, p. 371- 380).

(Hughes P: 2000, p. 95) mentioned them, as being bands made of rubber, and their elongation depends on the nature of the movement and provides a type of resistance aimed at developing the muscles and rehabilitating the injury. In the year (1978) It enabled researchers in the field of injuries were able to form the initial idea for rehabilitating various sports injuries using a foldable elastic band and they called it (Thera-band). This is in addition to using it in the field of training, which was developed to become one of the most used tools today in sports rehabilitation, training, and fitness. And health. It is recommended to use rubber bands because they are low in cost, easy to use, easy to carry anywhere, easy to store, and diverse in the exercises that are performed, in addition to providing a variety of resistance with the speed of movement by resisting force torque compared to other methods of strength development and rehabilitation, and the mechanism of using rubber bands The injured must place the tape every time in the same affected place. If the rubber band is placed closer than before, the resistance increases. If the tape is placed in a longer place than the first time, the resistance will be easier, and accurate performance of the exercise should occur there. Marin, it is necessary also to maintain the original fixed tape in its shape as a straight line with the motor axis to ensure that the angle of the force is at the beginning and end of the motor, and from here came:

The importance of the research

The importance of this research lies in the rehabilitation process for partial tears of the posterior biceps femoris muscle in advanced soccer players using rubber bands. This study can contribute to progressive resistance training with rubber bands to enhance muscle healing and reduce the overall recovery time, maintaining and improving muscle strength and flexibility during rehabilitation can lead to better performance outcomes and reduce the possibility of its reoccurrence in the future for club football players. Rubber bands are portable and affordable, making them accessible for players to use both in clinical settings and at home, ensuring consistent adherence to rehabilitation protocols.

Research problem

Partial tears of the posterior biceps femoris muscle pose a significant challenge for advanced soccer players, as they require a delicate balance between allowing adequate healing time and maintaining muscle strength and flexibility. Traditional rehabilitation methods often fall short in addressing these needs, leading to extended recovery periods and a high risk of re-injury.

This is the researcher's observation when follow-up of players in Iraqi clubs, he noticed they are frequently exposed to injuries to the posterior biceps femoris muscle. In addition to its occurrence more than once for players who had previously been injured during the same season after undergoing traditional rehabilitation approaches, The researcher decided to study the problem and find appropriate solutions for it by preparing the rehabilitation approach for the torn muscle and returning the injured athlete to competition quickly and in a short time.

The research objectives

-Identify the effect of a rehabilitation program by using exercises with rubber bands on improving the strength of the biceps muscle with a partial tear and other muscles working on the thigh for football players during the 2022–2023 season

-Identify the rehabilitation program's effect by using exercises with rubber bands to improve the lengthening of the biceps femoris with a partial tear and other muscles working on the thigh for football players during the 2022–2023 season.

-Identify the effect of the rehabilitation program by using exercises with rubber bands on reducing the degree of pain in the affected biceps femoris muscle with a partial tear for football players during the 2022–2023 season.

Research hypothesis: There are statistically significant differences between the pre-tests and the post-tests on the research sample:

There are statistically significant differences between the pre-and post-tests in the variable of the maximum strength of the posterior thigh muscles, in favor of the post-test.

There are statistically significant differences between the pre-test and post-test in the degree of feeling the pain intensity in favor of the post-test among members of the research sample.

There are statistically significant differences between the pre-and post-tests in the lengthening of the posterior thigh muscles, in favor of the post-test.

Research areas

Human fields: Al-Etisalat Club, Amanat Baghdad Club, Electrical Industries Club, and Al-Masafi Club in Baghdad Governorate

Time field: from 20-10-2022 to 20-11-2022

Spatial field: Captain Raad Salman Center for Rehabilitation of Sports Injuries - Amanat Baghdad Club Stadium and College of Physical Education and Sports Sciences

Research Methodology

The researcher used the experimental method of one group system to suit the nature of the research.

The research community and its sample

Method and tools:

The researcher selected the research sample intentionally, namely first-class football players from Baghdad province, who suffered from a first-degree partial tear in the biceps femoris muscle within the clubs participating in the Iraqi First Class League and registered in the lists of the Iraqi Football Association, numbering (6). All the players were chosen as experimental research samples. The researcher conducted the exploratory experiment on (2) football players from outside the research sample**.**

The following tools were used:

- A device (Goniometer) to measure the range of movement, one number.
- A Goniometer, a modified device for measuring the degree of pain, is one number.
- Dynamometer, one device for measuring force.
- One digital electronic stopwatch.
- Thera Band (Chinese made), twelve.
- Measuring tape.
- Knee Brace, number four.
- A terrace of various heights.
- Supports.

Exploratory experience

The researcher conducted the exploratory experiment to uncover all the obstacles that the researcher might encounter while carrying out a work whose main aspect was tested and the priority of preparation for the requirements of that experiment before time. The

cost, the auxiliary staff, the live equipment, and tools, etc., on Tuesday, dated (18/10/2022).

The qualifying curriculum, i.e., the main experiment, was applied to the experimental sample starting on Thursday, 20/10/2022, in the following manner:

- The treatment method used (rehabilitation exercises).
- Duration of the curriculum (4 weeks).
- The number of rehabilitation units is three units per week.
- Stretching exercises are started until the goals of the first stage are completed in the first week while getting used to strength exercises using low-intensity rubber bands.
- At the beginning of the second and third week, there will be a session for stretching exercises, another for strength, and a third for combined strength and stretching.
- At the beginning of the fourth week, there will be a session for strength and stretching together, then return-to-field exercises with or without the ball in the rest of the sessions.
- The time for one rehabilitation unit is (40-50) minutes depending on each stage.
-The exercises were performed in the main section of the training unit, with a time ranging from (25-35) minutes and immediately after the warm-up.
- Number of qualifying exercises (15 exercises).

The details of the qualification curriculum were as follows:

General warm-up: (walking, jogging, stretching exercises for the muscles in the upper limb, exercises to rotate the torso, and exercises to stretch the muscles in the lower limb). In a time (ten minutes).

Special warm-up: (Perform stretching of all parts of the injured person's body, focusing on the core muscle, which is the two-headed muscle). In a time (five minutes).

The main section: This section included performing rehabilitation exercises to rehabilitate the posterior thigh muscles, and it took (25-35) minutes depending on each stage. During the rehabilitation process, the researcher focused on using stretching exercises, making sure that they were in the form of repeated contraction while lengthening the muscles. It is the most appropriate solution for the muscle to be able to work during lengthening, as well as strengthening exercises using rubber bands of varying intensity and color, which should strengthen the biceps muscle than strength exercises characterized by speed and explosiveness, forward and backward running exercises, as well as running and jumping with or without a ball. The researcher considered, when using the rehabilitation exercises, the progression from easy to difficult, the emphasis on correctly performing the exercises, and continuous emphasis. If the sample feels pain, they must immediately stop performing and change the exercise or modify it to prevent the appearance of pain.

Pre-tests:

The researcher conducted pre-tests on all members of the two experimental samples on 10/19/2022 at five o'clock in the afternoon, Baghdad time. The tests included a test to measure the maximum strength of the thigh muscles, a lengthening test, and a test to measure the degree of pain.

The researcher sought the help of private sources, experts, and specialists in injuries, physiology, and football, see Appendix (4). He also processed the results of the pre-tests of the experimental group with appropriate statistical methods, to avoid influences that could affect the results of the research, and they were treated using statistical methods (arithmetic mean, standard deviation, and tabular T value).

The first test: measures the muscular strength of the lower limbs (Allawi, M and Naser al-Din R: 1982, p. 29).

The purpose of the measurement is to measure the maximum strength of the thigh muscles.

Measurement procedures: The measurement is carried out using an electronic scale to measure muscle strength. The measurement is done from the injured person's sitting position on a chair, with the device fixed under the injured person. One end of the device is fixed behind the chair and the other end is fixed on the injured person's leg, and the injured person pushes the leg forward.

Recording: The injured player records the amount of force in kilograms.

The second test: is a test to measure the degree of pain in the posterior thigh muscles (Al-Sulaiman, M: 2016, p. 264)

Test objective: To measure the degree of pain in the posterior thigh muscle.

Testing tools: knee support, straps for stabilization, bed, pain scale.

Starting position: The athlete is examined from the position of lying on his back, with the other leg and torso secured with a belt, and the examiner lifts the injured leg while it is secured, slowly and towards the top of the flexion of the hip joint, in case it is not If the affected person's eye is in pain during the first test, the examining person asks The injured player raises his leg in a straight position three lifts in a row, as quickly as possible, to the top.

Scoring method: Recording the score from zero to ten points.

The third test: is the stretching test for the posterior thigh muscles (Muhammed, A. R: 2010, p. 65)

Objective of the test: to measure the length of the posterior thigh muscles.

Tools used: Goniometer, one device, two assistants.

Performance method: From a lying position on the back, the laboratory raises the healthy leg towards his chest with the leg fully extended, then raises the injured leg in the same manner as the previous performance.

Recording method: Three attempts are given; the best attempt is recorded by calculating the angle of raising the hip joint towards the chest using a range of motion measuring device.

Unit of measurement used: degree.

Post-tests:

The post-tests were conducted on 11/21/2022, and the researcher processed the results between the pre-and post-tests with appropriate statistical means, to know the significance of the differences or not in the tests in question, and they were processed using the statistical package (SPSSver.12) and the program (EXCEL) to extract (Arithmetic mean and deviation Standard and tabular (T) value.

Presentation and discussion of results

The researcher conducted pre- and post-measurements and tests for the research variables to rehabilitate the posterior biceps femoris muscle that had been partially torn among members of the research sample, and the data was dealt with statistically for verification. One of the research hypotheses, and the results of the tables are presented, and the researcher discusses them scientifically. He also supported it with reliable sources.

1- Arithmetic means and the difference of the arithmetic means between the results of the pre-and post-test to test the degree of pain.

Table (1) shows the difference between the arithmetic mean, the standard deviation, and the calculated (t) value, as well as the significance of the difference to test the extent of the degree of pain.

Variables	Measure unit	Pre-test		Post-test		F	F P	T value	Sig	Indication
		Mean	Std. Deviation	Mean	Std. Deviation					
Degree of pain	Degree	6,447	1,746	0,00	0,00	6,447	1.747	8.205	0.000	Morale
* Tabular t value at degree of freedom = (4 - 1) = 3 and at a significance level of 0.05										

2 - Arithmetic means and the difference of the arithmetic means between the results of the pre-test and the post-test in the strength test of the posterior thigh muscle.

Table (2) shows the difference of the arithmetic means, its standard deviation, the calculated (t) value, and the significance of the differences in the muscular strength test for the posterior thigh muscles.

Variables	Measure unit	Pre-test		Post-test		F	F P	T value	Sig	Indication
		Mean	Std. Deviation	Mean	Std. Deviation					
Muscular strength	Kg	6,699	3,041	37,809	5,518	31,189	6,081	10,139	0.000	Morale
* Tabular t value at degree of freedom = (4 - 1) = 3 and at a significance level of 0.05										

3 - The arithmetic means and its differences between the results in the pre-test and the post-test of the muscle lengthening test.

Table (3) shows the difference of the arithmetic means, its standard deviation, the calculated (t) value, and the significance of the differences in the muscle lengthening test.

Variables	Measure unit	Pre-test		Post-test		F	F P	T value	Sig	Indication
		Mean	Std. Deviation	Mean	Std. Deviation					
Muscle stretching	Degree	134,00	13,170	79,000	7,509	54,000	13,099	8,555	0.000	Morale
* Tabular t value at degree of freedom = (4 - 1) = 3 and at a significance level of 0.05										

Table (1) shows that there are significant and statistically significant differences between the pre-and post-tests of the sample and in favor of the post-test to test the degree of pain. The researcher attributes the reason for this to the nature of the rehabilitation curriculum prepared by the researcher, which contained strength and stretching exercises, and exercises using rubber bands. The effective effect in relieving and eliminating pain during rehabilitation through rebuilding the sarcomere units of the biceps muscle, as improving blood circulation within the muscle and increasing the activity of enzymes, which helped the injured to achieve those moral differences, as well as the good application of the method with the direct supervision of the researcher who presented these results, and this was confirmed by (Al-Sharida Fadel; 1990, p. 164) by saying that the muscles that are exercised under the supervision of a specialist develop more than others. The researcher discovered the importance of strength and stretching exercises and exercises using rubber bands and jogging exercises in his approach to reducing and eliminating pain, and both were approved. From (Fox, B., et al: 1997, p. 125), (Zaki, M: 2004, p. 142), (Page, P: 2012, p. 109-119), where confirmed that flexibility exercises complement rehabilitation programs, improve muscle elasticity, enhance joint range of motion, reduce pain, and promote better circulation, all of which contribute to a faster and more comfortable recovery process. Incorporating these exercises into a comprehensive rehabilitation program can lead to more effective and efficient healing, allowing the injured person to return to their activities with reduced risk of re-injury.

Table (2) indicates that there is a significant and statistically significant difference between the pre-and post-test in the muscle strength test and favor of the post-test. The researcher attributed the reason for this to the approach that was used Its preparation, which included strength exercises, stretching, and exercises using rubber bands, and these exercises contributed to Developing muscular strength during the rehabilitation process, and the researcher indicated that strength exercises have a method of implementation that has an effective effect in healing and rehabilitating the injury to the biceps muscle, as (Abu Al-Naja, I. J: 2018, p. 282) confirms However, any rehabilitation program must include exercises Strengthening: These exercises seek to increase strength as well as the ability to endure performance, as (Al-Hazzaa, H. M: 2010, p. 95-98) confirmed that the basis for developing muscular strength is through two rules, which are the gradual load and its increase, where the function of any type of resistor to achieve This solution, in the form of free weights, a weight training device, rubber ropes, or exercises using body weight, is what the researcher confirmed by employing rubber bands to develop muscle strength based on the rules of grading the load and increasing Eh. The researcher confirms that the process of development in strength occurred as a result of adaptation in the muscular system and regulation of nerve impulses, more than the level of strength resulting from muscle hypertrophy, and this was induced due to a period of The rehabilitation process did not exceed (4) weeks only, which is in line with (Abdel Zaher, M. M: 2014, P. 285) who stated that muscular development of strength when starting a training program results from nervous and muscular adaptation and that muscular hypertrophy requires a period from eight weeks to seven months.

Table (3) indicates a significant and statistically significant difference between the pre-test and the post-test in muscle stretching and for the benefit of the post-test. Here the researcher attributes the reason to the influence and importance of the approach The

rehabilitation used included exercises (strength and stretching) and exercises using rubber bands.

(Dos Santos, R. A., et al: 2017, p. 533 540) confirms that muscle stretching exercises using rubber bands are highly effective in accelerating the recovery process for injuries such as partial tears of the posterior biceps femoris muscle. These exercises provide progressive resistance, enhance flexibility, improve neuromuscular control, and are convenient for consistent use. When integrated into a comprehensive rehabilitation program by a treating physician, they significantly contribute to the desired rehabilitation outcomes, and this is also confirmed by (Al-Sulaiman, M. S: (2016), p. 29-30) Stretching exercises help restore the organization of scarred fibers that formed as a result of the injury, and that this scarring hurts the muscles, making them slow in the speed of recovery and making them Relatively weak in terms of strength and length, if its formation continues inside the muscle The injury is damaged, and therefore the use of muscle stretching exercises is considered important during the injury rehabilitation phase.

Conclusions: Through the research results, the researcher reached the following conclusions:

1. The rehabilitative approach that was prepared had a positive impact on rehabilitating and returning injured players to playing because it contributed to returning the injured muscles closer to their normal state.
2. The rehabilitation approach helped reduce the degree of pain and develop the strength and muscle-lengthening components of the biceps muscle.

Recommendations

1- Benefiting from the rehabilitative approach developed by the researcher to rehabilitate injuries of a partial tear of the biceps muscle.
2- To rely on a careful medical examination when identifying the injured hand.
3- The importance of inferring the process of knowing the degree of pain to rehabilitate the injured player.

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