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Effect of Exercises with the Elasticity of Resistant Means in Various Degrees in Rehabilitating Grade II Tear of the Adductor Femoral Muscle for Men

Hind Ali Thabit[1]

(PhD), Instructor, Al-Faraheedi University,

Abstract

This study aims to prepare exercises with elasticity of resistors in various degrees and identifying their effect in rehabilitating the grade II tear for the adductor femoral muscle in men. An experimental, two-groups (experimental and control) design was used to guide this study. The study included a sample of 20 males age 30-45-years who experience grade II tear of the adductor femoral muscle who visit the physiotherapy unit in Al-Karkh General Hospital in Baghdad City for the period from October 4th, 2020 to January 10th, 2021. The experimentation was initiated by employing the augmentation in the elasticity of the resistors represented by the ropes and bands according to the physiology of the articular kinesiology of the thigh, especially the movements of abduction and adduction to it. Also, the adopting the foundations of rehabilitation in that the degree of pain (visual analogue scale [VAS]) determinant of the difficulty of exercise or the cessation of application, which ranged between (50-80%) of the muscle strength facing the specified degree of elasticity. Likewise, the committing to determine the intensity or difficulty of each exercise in terms of the range of motion that the angle of the thigh extension reaches from the main axis of the body, in a time for each exercise ranging from (5-10) seconds, with repetitions of (5-15) times, and in sessions of (2-4) for each exercise, a complete rest between one exercise and another, and at a rate of three rehabilitative sessions per week for a period of time (12) consecutive weeks.

After completing the experiment, the researchers verified the results using the statistical package for social science (SPSS) version 26. The study results revealed that the application of exercises with elasticity of the means of resistors in various degrees helps in restoring the approximation strength, restoring the range motion of abduction and minimizing the severity of pain of the adductor femoral muscle in men with of grade II tear. It is necessary to pay attention to the motor factor that provides the resistor approves in rehabilitation by choosing the elasticity of the means of the resistors of different degrees taking into account the possibility of returning symmetry of muscle tissue to healing when used. It is imperative to increase the duration of rehabilitation programs required for a full recovery.

Background

Rehabilitation exercises have been defined as a means to activate the locomotor system of the injured person, reduce the incidence of exacerbations, as well as advance his functional efficiency. These exercises aim to accelerate the recovery of the injured person to his physical and physiological capabilities considering the psychological factor of the injured after the injury (Thamer, 2010). These exercises also aim to restore the injured person as close as possible to the normal state. The process of restoring general fitness, ability to perform and skill before the injury is the most difficult process. That is, the most methods that secure the achievement of this goal are the synergy of both fields of sports medicine, physical education and sport science in setting up rehabilitation programs for the injured person and his safe return to society (Jalaluddin, 2009).

Delving into the novelty of rehabilitative exercises and what the means provide requires caveats

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regarding the need for specialist doctors to supervise the experiment with new or good use of known ones and to codify it in a scientific manner free from speculation or imposing personal experience since that matter does not accept risking the injured person's condition. Thus, it is necessary for facing the specified resistance to coincide with the contraction movement of the muscle itself, which imposes a precise knowledge of the functioning of the muscles and the muscles that support them or prove their contraction and what is opposite to it in this contractile action. Furthermore, moving the joint freely with its normal range of motion, the ligaments, muscles, and tendons influence the stability of the joint by the cohesion of the end of the articular bones with each other, so strong ligaments and muscles increase the stability and strength of the joint (Susan). Moreover, the adductor muscles of the femoral joint are one of the basic groups working on this joint, which are used according to their anatomical structure and the nature of their work in performing and implementing many basic skills in various sports due to the strong and continuous groundings during training and matches. The tear injury of the adductor muscles occurs in the muscle components, whether in its sheath or in the muscular fibers. The tear of the adductor muscle often occurs in its tendons, especially in the tendons of origin.

It is known that the blood supply to tendons is less than in muscle stomachs, as well as many other reasons that make its treatment last for a long time (Eid, 2006). The short adductor muscle, the long adductor muscle, and the large adductor muscle that is inserted into the femoral bone combine to form the adductor muscle. This anatomical location of the adductor muscle makes it susceptible to tears, especially for football players. It works as a single work, not as individuals, as shown in Figure (1) (Smart, 2017).

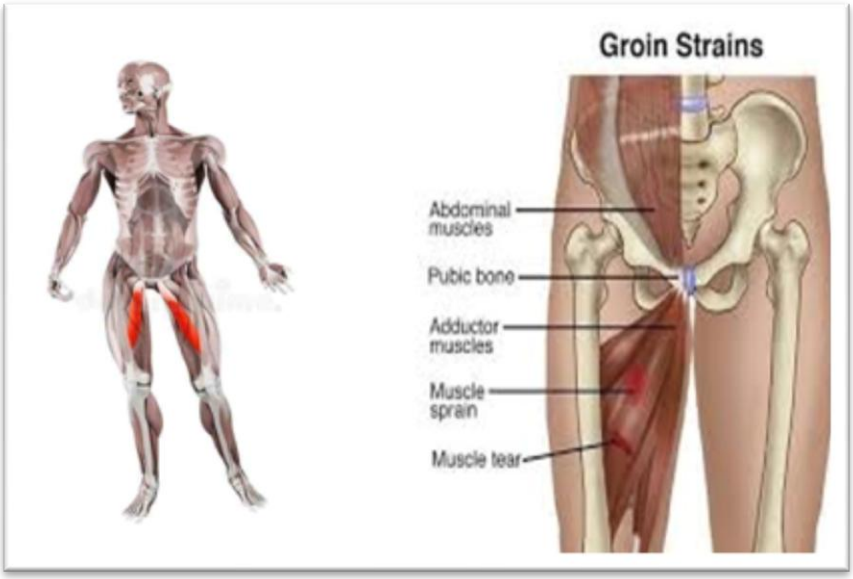

Figure 1. The anatomical location of the adductor muscle

As for the ligament in anatomy, it is a vital structure composed of dense, arranged connective tissues which like the tendon in terms of structure. The ligament is basically composed of collagen fibers and other fibers which are flexible and arranged in parallel, to make the tissue have a high capacity to afford the intensity of the axes, and ligaments are rich in nerves (Nerves) and poor in blood vessels.

Each ligament has a special anatomical shape for the fibers and has a certain extent of flexibility,

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and a point of contact with the skeleton to perform its functions, as it connects and stabilizes the bones together to allow movement in certain directions to move the joint. Any defect in these properties results in a defect in the movement of the joint (Abdul-Atheem, 2004). In the case of grade II tear of adductor muscle, a tumor appears in the femoral muscles and the skin color changes over the area of the injury as well as the feeling of pain. These factors determine the degree, type, and severity of the injury.

The recommendations of studies relevant to rehabilitate this type of injury confirm that the injured person cannot be exposed to exertion immediately after the injury. They recommend complete rest to remodel molecules cell protein or to heal tendon wounds attached to bone. Thus, this is considered as a determinant for the therapist to deal with the injury (Wikstrom & Tillman, 2007).

Since the programs and exercises of physical therapy are applied according to the caveats of not exacerbating the injury, thus, kinetic therapy is considered the basis of physical therapy that derives its effect from the scientific uses of various natural elements to treat injuries and manifestations of fatigue and exhaustion in many cases.

Without these natural means having adverse effects, as is the case with many unnatural chemical and radiological methods (Mohammed, 2002). One of the things that sports rehabilitation is most concerned with is restoring muscle strength and flexibility so that the individual, after recovery, can practice his normal life without feeling pain when restoring his normal movement. Flexibility is generally defined as the range of motion around a joint or a group of joints, or as the broadest range that we can reach in terms of bending or rotating. While, it is defined as the absolute range of motion for a specific joint or group of joints that can be achieved with a rapid effort with the help of a colleague or the use of auxiliaries. The physical fitness of the individual depends on a number of elements, where flexibility is considered as one of these elements, which is one of the important and vital factors affecting physical fitness, it takes a place in the ranking of the elements of physical fitness as well as the rest of the elements such as strength, ability, speed, stamina, balance, and agility, on the basis of which rehabilitation programs and exercises can be formed (Brad Walker, 2007).

Force is defined as the ability to overcome or counteract an external resistance, and it is defined as the maximum force a muscle can perform in one maximum contraction (Ahmed, 2019). Muscle strength physically requires a muscle stretch before contraction, and it is necessary to re-improve the flexibility to provide a range of muscular stretch necessary for contraction. One of the most important functions of the short adductor muscle, the long adductor muscle, and the large adductor muscle is contraction to adduct the thigh to the medial side of the body. So, it would be an attempt to try out the exercises of resistors elasticity that target the flexibility and muscular strength of these muscles to control the degrees of compliance of the elasticity of the power kit, the rubber cords, and the various air balls, through which the rehabilitation requires moving muscle contractions in proportion to the degree of resistance of elasticity of each of them as shown in the appendix (1).

The study problem lies in the necessity to provide support and assistance to the workers in the physiotherapy centers, most of which deal with fixed and movable iron resistors such as weights added to the injured limbs to get out of the restrictions by simple or easy rehabilitation methods that are handled and used and their gradations take into account the degree of injury in the adductor muscle.

They can be provided outside these centers if used properly for this purpose under the supervision

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of therapists specializing in sports rehabilitation. This study aims to prepare exercises with elasticity of resistors of various degrees and identifying their effect on rehabilitating a grade II tear of the adductor muscle for men. The researchers hypothesize that (12) there are statistically significant differences in the strength and elasticity of the adductor muscles of the experimental and control groups between the mean of the results of the pre and posttests at a significance level (0.05), (2) there are statistically significant differences in the strength and elasticity of the adductor muscle for the study and control groups in the posttest at a significance level of 0.05.

Methods

An experimental design with study and control groups, pre-posttest was used to guide this study.

Sample and sampling

The phenomenon undermines the problem of the current study imposed the limits of this community who are (20) males who age 30-45-years, who experience a grade II tear of the adductor femoral muscle, do not have severe complications, and attend the physiotherapy department in Al-Karkh General Hospital in Baghdad City for the period from April10th, 2020 to October 1st, 2021. They were diagnosed as having grade II tear of the adductor femoral muscle based on the Magnetic Resonance Imaging (MRI). A written consent was obtained from the study subjects. They were equally allocated into the study and control groups.

Measurement and procedure

To verify the effectiveness of the positive effect of rehabilitative exercises, measurements were adopted by tests of the Dynamometer device to measure the internal adduction of the adductor femoral muscle after isolating the auxiliary muscle groups with a unit of measurement of kilogram (Wikstrom, 2007), the angle-out angle goniometer with an angle degree unit (Williams, 2007) and a VAS pain measure form ranges between (0-10) degrees when testing the dimensions outside (Wikstrom, 2007). These four measures express recovering from the injury. After reviewing the disease record for the duration of this injury, it was found that the patients were distributed between (12-14) days. The experimentation began when the researchers employed augmentation in the elasticity of the resistors; represented by ropes and bands, according to the physiology of the articular movement of the thigh, especially the abduction and adduction.

By using the fundamentals of rehabilitation in that the pain extent be a determinant for the difficulty of the exercises or stopping their application which ranged from 50-80% of the muscular strength that counters the degree of the determined elasticity. Also, the adherence to determination of the severity or difficulty of each exercise of the range of motion that the angle of the thigh's divergence from the body main axis, at a time of each exercise ranging from (5-10) seconds, with repetitions of (5-15) times, with 2-4 sessions for each exercise, a complete rest between one exercise and another, at a rate of (3) rehabilitative sessions per week, for 12 consecutive weeks.

After accomplishing the experimentation, data were analyzed using the statistical package for social sciences (SPSS) for windows, version (26). The statistical measures of percentage, arithmetic mean, standard deviation (Std. Dev.), paired-sample t-test, and independent-sample t-test were used.

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Results

Table 1. *Results of pretest for the study groups*

Test	Experimental Group			Control Group			Leven	Sig.	*t*	Sig.	Ass.
	N	Mean	SD	N	Mean	SD					
Inward adduction strength	10	6.5	2.014	10	5.9	1.524	1.31	0.267	0.751	0.462	NS
Outward abduction angle	10	15.6	1.647	10	16	1.944	0.459	0.507	0.497	0.626	NS
VAS	10	7.5	0.527	10	7.6	0.516	0.375	0.548	0.429	0.673	NS

Significance level = 0.05; t-test value is significant at p-value ≤ 0.05; df = (N-2) = 18

Table 2. *Results of the study groups in the pretest and posttest*

Test	Group	Pretest		Posttest		Mean Difference	Std. Error	*t*	Sig.	Ass.
		Mean	SD	Mean	SD					
Inward adduction strength	Ex	6.5	2.014	31.6	1.265	25.1	2.283	34.77	0.000	S
	Co	5.9	1.524	23.7	2.584	17.8	2.616	21.515	0.000	S
Outward abduction angle	Ex	15.6	1.647	36.1	1.197	20.5	2.068	31.343	0.000	S
	Co	16	1.944	31	2.404	15	3.3	14.375	0.000	S
VAS	Ex	7.5	0.527	1.3	0.483	6.2	0.632	31	0.000	S
	Co	7.6	0.516	3	0.667	4.6	0.843	17.25	0.000	S

Significance level = 0.05; t-test value is significant at p-value ≤ 0.05; df = (N-1)

Table 3. *Results of posttest for the study groups*

Test	Study Group			Control Group			*t*	Sig.	Ass.
	N	Mean	SD	N	Mean	SD			
Inward adduction strength	10	31.6	1.265	10	23.7	2.584	8.683	0.000	S
Outward abduction angle	10	36.1	1.197	10	31	2.404	6.006	0.000	S
VAS	10	1.3	0.483	10	3	0.667	6.53	0.000	S

Significance level = 0.05; t-test value is significant at p-value ≤ 0.05; df = (N-2) = 18

The results in table (2) reveal that there is a marked improvement in the posttest measurements of the dependent variables compared to the pretest. The results of table (3) display the superiority of the injured persons in the experimental group over those in the control group in this recovery reflected by the improvement in the level of adduction strength, the range of motion the abduction, and the degree of local pain of the adductor muscle. The researchers attribute these results to biological responses in the physical and biochemical direction of muscular tissue to the gradual encountering the degree of elasticity of each type of resistance and that the application was based on non-discretionary determinants from the researchers, by considering the pauses that are warned by the injured person's feeling of pain during contractions necessary to face each specific degree of stretching of these treatment methods which characterized by their allowing for movable contraction to achieve two purposes at the same time, which are increasing the level of muscular strength and increasing the level of muscular flexibility through repeated movement. The effectiveness of these methods had a clear logical effect if the determinants of sports rehabilitation were adhered to, as muscular stretching exercises are the movements that depend on the organized, coordinated work between the nervous and muscular systems. If the coordination between the work of the nervous and muscular systems was good, the movement becomes harmonious and this is what is expressed by (neuromuscular compatibility). Meanwhile, the

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individual feels the ability to perform well. Using harmonic exercises requires tools or without tools. The main purpose of these exercises is the correct and balanced physical development, and every part of the body has special exercises to avoid sudden sports injuries (Kochanwicz & Boraczynski, 2009). Stretching and flexibility are also of the most effective methods for developing and increasing the effectiveness of muscles and tendons due to many factors that would be influential and contribute to reducing the level of flexibility. Also, flexibility or range of motion can be determined or affected by external and internal factors. The internal ones include the bones, ligaments, the muscle body, the length of the muscle, tendons and skin. Also, these factors would limit the range of motion of any joint.

As for the external factors, they include age, gender, temperature, and restricting or limited in movement clothing. It is confirmed that injuries or immobility influence the amount of flexibility (Muhammad Reda, 2008). This goes in line with the known scientific fact that resistance exercises are used to develop muscular strength and increase the size of skeletal muscles (Jamal, 2012). Physical therapy is a treatment that people with different injuries undergo, which includes the use of many different methods such as traction, pulling, natural pain-reducing treatments such as cold, heat, electrical and stimulation, and effective natural treatments such as endurance training for local muscle strength (Black & stevens, 2009).

Conclusions and Implications

1. Application of exercises with the elasticity of resistor means in various degrees help in restoring the adductive strength of the femoral adductive muscle for men with grade II tear.
2. Application of exercises with the elasticity of resistor means in various degrees help in restoring the range of motion and minimizing the pain intensity for the femoral adductive muscle for men with grade II tear.
3. It is necessary to pay attention for the kinetic factor that the resistor adopted in rehabilitation provides by choosing the elasticity of the resistors means of different degrees, considering the possibility of recovery of muscular tissue when using them, the time period for the rehabilitation programs necessary for the symmetry of complete recovery must be increased.

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Appendix 1. Treatment methods with gradient slasticity

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