

# Rehabilitation program and its effect on the efficiency of the knee joint after cross-linked ligament surgery

<sup>1</sup>Dr. Fatemah Assad Khuraibet

**Abstract---** *The rapid progress in training and its methods is one of the factors that contributed to the high rates of sports injury and its complications, especially injuries of the muscular and nervous system, due to the use of high intensity and for long periods with the absence of the correct codification of pregnancy in a manner consistent with the functional condition of the player. The injuries of the articular system are of concern to athletes, as the human movement in general and the sports movement in particular depends on the basic movements performed by the joints, so any injury in these joints hinders the athlete from successfully completing his motor tasks.*

*Objectives: The current research aims to design a rehabilitation program (kinetic - aqueous) and study its effect on the functional efficiency of the muscles working on the knee joint after the partial surgical repair of the anterior cruciate ligament and its effect on:*

- 1. Reducing pain severity.*
- 2. Improving muscular strength for the group of the flexor and extensor muscles of the affected knee joint.*
- 3. Improving the affected knee joint motor range.*

*Hypotheses:*

- 1. There are statistically significant differences between the mean pre-measurement and the average post-measurement in reducing pain in the affected knee joint in favor of post-measurement.*
- 2. There are statistically significant differences between the mean pre-measurement and the average post-measurement in the muscle strength of the holding muscle group and the extensor of the affected knee joint in favor of post-measurement.*
- 3. There are statistically significant differences between the mean pre-measurement and the mean after measurement in the kinetic range of the affected knee joint in favor of the post-measurement.*

*Conclusions:*

- 1. The rehabilitation program (kinetic - aqueous) has a positive effect on the functional efficiency of the muscles working on the knee joint after the partial surgical repair of the anterior cruciate ligament.*
- 2. There are statistically significant differences between the tribal and the dimensional measurements in favor of the dimensional measurements in all the variables (circumference of the thigh, muscle strength, pain intensity, and kinetic range) of the affected knee.*

<sup>1</sup>Assistant Professor, Department of Physical Education and Sport, College of Basic Education, Kuwait

3. *Increasing the improvement in the percentages of the rates of changing the dimensional measurements from the tribal measurements in the research variables.*

**Keywords---** *Rehabilitation, Therapeutic rehabilitation exercises, Range of motion, Physical therapeutic motion,*

## I. INTRODUCTION

The rapid progress in training and its methods is one of the factors that contributed to the high rates of sports injury and its complications, especially injuries of the muscular and nervous system, due to the use of high intensity and for long periods with the absence of the correct codification of pregnancy in a manner consistent with the functional condition of the player.

The injuries of the articular system are of concern to athletes, as the human movement in general and the sports movement in particular depends on the basic movements performed by the joints, so any injury in these joints hinders the athlete from successfully completing his motor tasks.

Abd al-Basit Seddik (2013) explains that rupture of the anterior cross-linked ligament is affected by the pregnancy rate, age, and kinetic range of the knee joint. Anterior cruciate ligament injuries are one of the most dangerous knee injuries during training and competition, and it is often that late anterior cruciate ligament injuries are discovered because they may disappear for a while as a result of misdiagnosis, but with repeated exposure to neglect the injury clearly shows.

Mattacola et.al (2002) indicates that most athletes with anterior cross-linked ligament find it difficult to return to training and competition after injury because of a mechanical and functional instability of the knee joint.

In a study by Nordenfal at All (2009) on Swedish society, it was found that women from 11-20 years old had a ruptured anterior cruciate ligament equivalent to 144 cases of rupture for every 100,000 women, compared to 225 cases of rupture for every 100,000 men between the ages of 21- 30 years. Therefore, sports rehabilitation is one of the most important successful methods in treating various injuries, as it works to speed the drainage of blood clusters, and also works to quickly restore the affected muscles and joints to their functions in the least possible time as possible.

Through the multiplicity of methods of physical therapy and rehabilitation, the importance of the aqueous medium has begun to appear, as it works as a preventive medicine and physical therapy in the face of many cases of injury treatment and rehabilitation after injury or surgery. Water is an excellent medium for rehabilitation and treatment because it is pain during movement. And Nemat Ahmed Abdel Rahman states (2000) that one of the main reasons that contribute to benefiting from water exercises is to reduce the strain of joints, bones and muscles as a result of the property of floating the body in the water, because the perceived weight of the body is 90% less than the actual weight of the body on the ground, The ratio varies depending on the depth of the water, and exercise in the water reduces muscle pain that occurs when the training program intensifies on the

ground. As a result of the ability of the water to float the bodies, the pressure is removed from the joint membrane and raises the ability of movement with more flexibility and flexibility.

Rushing to push the player to competition or training without completing the rehabilitation and treatment period, may result in a movement shortage and a feeling of organic pain accompanied by psychological pain, and this affects the functional efficiency of the affected knee joint, which may lead to the return of the injury again and in the same The joint.

Through the researcher's readings and the reference survey of previous studies such as the study of Moataz Billah Hassanein (1992), Amr Omar Salem (2001), Wael Kamal Hamid (2005), Mohamed Abdel Aziz (2002), Mustafa Ibrahim (2004), Ahmed Abdel Salam (2006) Ali Jalal Al-Din (2007), Amr Masoud (2009), Stocker at All (1997), Prentice (2000) Seven at all (2003), as well as her experience gained from working in the field of sports injuries and physical rehabilitation, it becomes clear that the problem of rehabilitation of the ligament Anterior cross after surgical repair in the same joint, did not receive sufficient study and with no clear or conclusive results in its qualification and return to competition clearly, which He was the main driver for this study.

## **II. Paper objectives:**

The current research aims to design a rehabilitation program (kinetic - aqueous) and study its effect on the functional efficiency of the muscles working on the knee joint after the partial surgical repair of the anterior cruciate ligament and its effect on:

4. Reducing pain severity.
5. Improving muscular strength for the group of the flexor and extensor muscles of the affected knee joint.
6. Improving the affected knee joint motor range.

## **III. Paper hypotheses:**

4. There are statistically significant differences between the mean pre-measurement and the average post-measurement in reducing pain in the affected knee joint in favor of post-measurement.

5. There are statistically significant differences between the mean pre-measurement and the average post-measurement in the muscle strength of the holding muscle group and the extensor of the affected knee joint in favor of post-measurement.

6. There are statistically significant differences between the mean pre-measurement and the mean after measurement in the kinetic range of the affected knee joint in favor of the post-measurement.

## **IV. paper idioms:**

- Rehabilitation: It is to restore or maintain the full function of the affected part of the body, so that it can perform the necessary functions, burdens, and daily needs.

- Therapeutic rehabilitation exercises: "One of the means of physical and motor physical therapy for the purpose of employing the targeted movement, whether in the form of exercises or physical and functional or skillful work, in order to work to restore the basic functions of the injured member and physically rehabilitate him to return efficiently to exercise sports or daily activity."
- Physical therapeutic motion: "One of the basic natural means in the field of integrated treatment of sports injuries, and some diseases by employing the codified movement aimed at restoring the injured person to his basic functions, as well as the affected organ."
- Range of motion: "It is the breadth of bone and joint movement, as working muscles allow."
- Pain: It is defined as "an unwanted feeling or emotional experience with different types of potential tissue injuries".

## **V. Anterior cruciate ligament (ACL):**

The anterior cruciate ligament is located in the middle of the knee, and it is similar to the rope, where the upper limb holds the thigh bone and the lower end is the tibia bone, and the function of this ligament is to prevent the tibia from moving forward in relation to the thigh bone.

- Hydrotherapy:

It means the use of all water methods for therapeutic purposes and the main function of water here is to pump heat and cold for these water uses as this happens mechanical and chemical alert has a tangible therapeutic effect.

## **VI. Paper curriculum and procedures:**

### **Research approaches and curriculum:**

The researcher used the experimental method for its suitability to the nature of the research, using the experimental design of one group using pre and post measurement.

### **Research samples:**

The research sample was chosen intentionally, consisting of (5) players and their ages ranged between (20: 25) years and those with anterior cruciate ligament injury after a partial surgical repair and after the doctor approved the start of the physical rehabilitation process.

### **Conditions to choose the sample:**

1. They must have anterior cruciate ligament after partial surgical repair.
2. All members of the sample agree to participate in the program.
3. The convergence of environmental conditions between individuals.

4. The affinity of the physical characteristics of individuals (height, weight, age).

Table (1)

Arithmetic mean, standard deviation, and torsion coefficient of the sample

In age, weight and height variables

<b>Torsion coefficient</b>	<b>Standard deviation</b>	<b>SMA</b>	<b>Measurement unit</b>	<b>Variables</b>
<b>0.168</b>	<b>3.67</b>	<b>253.25</b>	<b>month</b>	<b>age</b>
<b>0.331-</b>	<b>4.15</b>	<b>78.34</b>	<b>Kg</b>	<b>weight</b>
<b>1.323</b>	<b>2.26</b>	<b>177.04</b>	<b>cm</b>	<b>length</b>

It is clear from Table (1) that the coefficients of torsion in the variables under the table of the research sample as a whole ranged between -0.331 and 1.323, meaning that they were confined between +3, -3, which indicates the homogeneity of the sample as a whole in these variables.

1. Used tools and devices:
2. A form for collecting data on each person affected.
3. Dynamometer to measure standard maximum power.
4. Rest meter to measure length.
5. Medical scale to measure weight.
6. Goniometer to measure motor range for the joint flexibility by degree.
7. VAS to measure pain severity by degree.
8. A tape measure to measure the circumference of the thigh (in centimeters).

#### **Suggested rehabilitation exercises program:**

The proposed rehabilitation program was designed based on the analysis of some references and scientific studies, and through a review of the previous qualification programs to learn the differences and shortcomings when designing them, and accordingly the proposed program was developed for a period of (20) weeks for those with anterior cross-ligament connection after a partial surgical repair, at (3) Sessions per week, and then the number of sessions reached (60) sessions, and the session time ranged between (35: 60) minutes.

**Each session included the following: -**

- Warming up: (5-10 minutes) In order to create muscles, through therapeutic massages and a set of flexibility and stretching exercises, within the limits of pain.
- Basic exercises: (20-40 minutes) it included specific exercises at each stage of the proposed program.
- Calming down: (5-10 minutes) it included a set of relaxation exercises to return the body to normal.

**Statistical treatment:**

- SMA.
- Standard deviation.
- Change range percentage %.
- (T) Test.
- Torsion coefficient.

**VII. Results presentation and discussion**

To achieve the research objectives, and after applying the proposed program, and making the required measurements and statistical treatments for the research variables, we display the results as follows:

Table (2)

Significance of the differences between the averages of the pre and post measurements in the parameters of the thigh circumference, Muscle strength, pain intensity and articular motility of the affected knee

**N = 5**

Significance level	Estimate (T) value	Differences between measurements	Post measurement		Premeasurement		Measurement unit	variables
			+H	S	+H	S		
significant	4.31	11.21	7.47	74.33	6.74	63.12	cm	Thigh circumference
significant	10.15	43.75	10.02	103.17	5.22	59.42	kg	Muscular strength
significant	13.58	7.04	0.6	1.58	1.53	8.62°	degree	Pain severity

significan nt	10.16	27.15	5.06	45.03	7.20	72.45 <sup>o</sup>	degree	<b>Motor range</b>
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T value in the table (2.23) = 0.05

From Table (2) it is clear that there are statistically significant differences between the pre and post measurements in the parameters of the thigh circumference, muscle strength, pain intensity and motor efficiency of the affected knee joint.

Table (3)

The percentage of improvement for the affected knee in the variables under consideration between pre and post measurements

<b>Improvement percentage %</b>	<b>Differences between measurements</b>	<b>Post measurement average</b>	<b>Premeasurements average</b>	<b>variables</b>
<b>17.76%</b>	<b>11.21</b>	<b>74.33</b>	<b>63.12</b>	<b>Thigh circumference</b>
<b>73.63%</b>	<b>43.75</b>	<b>103.17</b>	<b>59.42</b>	<b>Muscular strength</b>
<b>81.76%</b>	<b>7.04</b>	<b>1.58</b>	<b>8.62</b>	<b>Pain severity</b>
<b>40.61%</b>	<b>29.42</b>	<b>43.03</b>	<b>72.45</b>	<b>Motor range</b>

From Table (3), it is clear that the improvement in the dimensional measurement from the tribal measurement in the parameters of the thigh circumference, the muscle strength, the pain intensity and the motor efficiency of the affected knee joint.

#### **Results discussion:**

It is clear from Table (2) that there are statistically significant differences between the arithmetic averages and the standard deviations between the pre and post measurement in the research variables that included the circumference of the thigh, muscle strength, pain intensity and kinetic range of the knee joint with anterior cruciate ligament, where these differences indicate the extent of regularity and continuity of the sample. In the application of the program, and that the water exercises (inside the pool) increased their motivation to continue.

Table (3) shows that there are statistically significant differences between the average pre-measurement and the average post-measurement in the percentage of improvement for the thigh circumference, muscle strength, pain intensity and kinetic efficiency of the knee joint with anterior cruciate ligament. The improvement of the thigh circumference has reached 17.76%, while the muscle strength has reached the improvement was 73.63%, the pain intensity was 81.67%, and the motor range of the knee joint was 40.61%.

This indicates that the proposed rehabilitation program had a positive impact on improving the performance of the affected knee joint, by increasing the motor range for it, as the implementation of the program for 20 weeks contributed positively to this improvement, and this is consistent with what was indicated by "Muhammad Qadri Bakri "(2000), that integrated physical rehabilitation therapy has a positive effect on strengthening muscles, relaxing tense muscles, stimulating blood circulation, improving muscle tone, relieving pain and improving the psychological state.

The researcher believes that the diversification within the content of the exercises used in terms of intensity and size in addition to the use of the aqueous medium had an effective effect in the development of muscle strength, according to the opinion of "Abo Alala Abdel-Fattah" and Ahmed Nasr El-Din (2003) in that the various training doses in size and intensity It helps to gain more strength, and the gradual increase in resistance helps to gain muscle strength and growth.

Osama Reyad and Nahed Abdel Rahim (2001) also see that applying fixed and progressive exercises to using assistive exercises then free exercises and then exercises against resistance are of great importance in improving and developing muscular work, and raising this resistance gradually to reach the best possible level without Any complications occur.

Abdel-Basit Seddik (2013) believes that the first goal of the rehabilitation program is to reduce pain and swelling, although this is considered a treatment category, but the persistence of pain and swelling may continue during the rehabilitation stages. Talib Jasim (2011) states that rehabilitative exercises have a major role in increasing the kinetic range of joints which is reflected positively in reduce pain intensity. Ahmed Abdel-Salam (2006) indicates that rehabilitative exercises increase the elasticity of the joint and thus increase the motor range for it, as these exercises increase the elasticity of the muscles working on the joint. Mohamed El Sayed El Morsy (2009) asserts that hydrotherapy in the rehabilitation process has an effective effect on the functional efficiency of the affected joints.

Both Khairia AL Sokary and Mohamed Bereka (1999) explain the benefits of water exercises as an appropriate and excellent medium for treating minor and major injuries, as well as leading to a speedy recovery after performing surgeries and achieving preventive fitness and water works to reduce the stresses on the body, and that Water exercises address many of the problems of textures and injuries resulting from the overgrowth of the muscle groups that are used frequently.

Khairia AL Sokary and Muhammad Bareeqa (2000) , Nemat Abdul Rahman (2000), and Osama Reyad (2000), Bankley et.al (2006) agreed with Hesham Dereni (2010) who emphasized the importance and benefits of physical exercises inside the water, as they unanimously agreed that it is an important means to raise the level of public and private physical capabilities and the rehabilitation and preparation of athletes, in addition to physical therapy and preventive medicine against sports injuries in addition to the ease of motor and skill performance.

From the above, it is clear that the rehabilitative training program has a positive effect on increasing muscle strength, motor range and pain intensity for the muscles working on the affected knee joint.



## **VIII. Conclusions:**

4. The rehabilitation program (kinetic - aqueous) has a positive effect on the functional efficiency of the muscles working on the knee joint after the partial surgical repair of the anterior cruciate ligament.

5. There are statistically significant differences between the tribal and the dimensional measurements in favor of the dimensional measurements in all the variables (circumference of the thigh, muscle strength, pain intensity, and kinetic range) of the affected knee.

6. Increasing the improvement in the percentages of the rates of changing the dimensional measurements from the tribal measurements in the research variables.

## **IX. Recommendations:**

7. Guidance on the rehabilitation program (kinetic - aqueous) when rehabilitating the affected knee after the surgical repair of the anterior cruciate ligament, either for the first time or.

8. Attention to designing preventive motility programs to avoid the occurrence of anterior cross-ligament injury of the knee joint in particular, and the rest of the injuries in general.

9. Conducting more research in the field of physical rehabilitation, as well as designing rehabilitation training programs for non-athletes.

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