



The Effect of a Rehabilitative Treatment Program on The Efficiency of The Knee Joint After Reconstructing the Cartilaginous Ligament by Prolotherapy

Dr. Hossam Ahmed Darwish Al-Sayed¹

¹ Brigadier General, Egyptian Armed Forces

ABSTRACT:

The present research goals are to design a regenerative, motor, and rehabilitative treatment program to identify its effect on the injury of the anterior cartilage cut after regenerative treatment (prolotherapy) by studying the following objectives:

Reducing pain, improving the muscle strength of the Agonists' muscles, and improving the range of motion of the knee joint after regenerative therapy.

The author used an experimental procedure of one single group strategy with pre-and post-treatment evaluation. Participants (n= 8) have been recruited individuals who suffered from a cut in the medial anterior cartilage and were injected with prolotherapy with ages between 50-70 years.

They were all diagnosed with anterior cartilage cuts after regenerative in the knee according to a medical examination. Results specified that: commended rehabilitation exercises program exhibits an encouraging impact on the working muscles and functional effectiveness of the injured knee joint during post-medical treatments. The pre-and post-treatment revealed statistically significant differences. post-treatment measurements revealed clear improvement in the thigh circumferences, muscle strength, pain degree, and range of motion effusion for the injured knee joint.

Keywords: Prolotherapy - Meniscotomectomy - Regenerative therapy - Effusion - Rehabilitation

Introduction:

Meniscus injuries, which are among the main causes of knee pain, constitute up to 16% of knee surgeries. It is also the most prevalent injury due to its poor ability to heal, as its direct blood supply is reduced by 25%. It was found that articular cartilage surgeries have a significant rate of failure over the long term, resulting in the return of symptoms like instability, pain, and decreased range of motion). (21)



Ahmad Abd al-Hadi (2018) sees that the hip joint is one of the most vulnerable areas of the body to injury and the subsequent destruction of the ability to move and maintain balance as a result of rupture or cutting off one of the ligaments or cartilage, which requires the need to take care of the joint and study the best methods and means for rehabilitation after injury (2)(61:10)

David et, (2004) indicated that knee injuries are a common source of stress and lead to more than 1 million knee surgeries performed annually in the United States, as reported by the National Athletic Trainers Association. knee injuries make up 10 to 19 percent of injuries in secondary school sports and 60.3 percent of all related surgeries. The incidence of knee injuries in team sports ranges from 7 to 54 percent, depending on the nature of the sport. (15)(27)

This necessitated the intervention of scientists to use new advanced methods that work to speed up the recovery of the injured, in addition to reducing the period of their absence from work, which causes a great loss, especially if he is one of the sports champions, which circumstances may require traveling abroad for treatment.

Nyland Et All (2001) assert that the meniscus is a pair of fibrous cartilage structures with a C-shaped curvature located between the femur and tibia in each knee, and extends circumferentially along the knee lateral and medial sides, with the medial meniscus being more circular compared to its lateral counterpart hemispherical. The underside of each meniscus is flat to align with the smooth upper surface of the tibia, while its concave shape helps in congruence with the convex femoral condyle. (20)

Esmaili Jah (2016) The meniscus posterior and anterior horns are attached to the tibia to anchor them in position. Articular cartilage comprises about 30% organic matter and 70% water. The organic component of the meniscus is a fibrillar collagen matrix that comprises type I collagen, proteoglycans, fibroblasts, and a minor proportion of non-collagenous dry substance. (10)(15)

S- Hankemeier et al. (2009) The meniscus helps maintain knee joint stability by controlling movement and offering a circumferential tracking surface for the tibialis femur. The stabilizing function is shared with multiple ligaments that collaborate to avoid excessive stretching during movements. The transverse ligament acts to connect the meniscuses at the front knees and plays crucial in preventing them from pushing the joint plays a crucial role in preventing them extruding out of the joint during any movement. It serves to avoid excessive motion by connecting the medial collateral ligament (MCL) to



the medial meniscus, femoral condyle, and medial tibial condyle, and connecting the lateral collateral ligament (LCL) to the femur lateral epicondyle and the fibula head. Such ligaments serve to apply tension and restrict motion during full flexion and extension, respectively.(5)(22)

Mohamed Fathy Hendy (1991) In addition to its stabilizing function, the meniscus also plays a crucial role in shock absorption by even distribution of weight across the joint. Right weight transfer within the knee can help to reduce stress on the other joints within the body. Provides lubrication to the knee by spreading synovial fluid across the joint and serves to protect the knee's articular cartilage (protective measure). This cartilage is susceptible to injury because of its avascular nature and increased levels of stress caused by excessive movement. the tibial and femoral articular cartilages by diffusing fluids into that avascular area. (15)(22)

Stanitski CL, et al. (1988), ALL consider that direct blood supply to the articular cartilage is minimal (10% to 25% peripherally) preventing articular cartilage preservation. This region is commonly known as the red area, while the inner part of the meniscus that lacks a direct blood supply is known as the white area. The red area is relatively more responsive to treatment compared to the white area, which is unable to heal itself from an injury. (19)(23)

Hoser C.et al. (2001) A tear is the most frequent meniscus injury type and they are typically categorized according to their visual characteristics into 4 groups: longitudinal tears, radial tears, horizontal tears, and oblique tears. It is indicated that horizontal or radial tears are more prevalent in older patients, whereas younger individuals exhibit a greater likelihood of experiencing longitudinal tears. These could be classified as either partial or full-thickness tears, based on the disease's cephalic depth. (11)

International Journal of Prolotherapy Medical Sector (2011) Articular cartilage damage can occur either through trauma or progressive degeneration. Traumatic injuries are often caused by a twisting motion of the knee or a fall from a height into a squatting position, both of which place stress on the meniscus. Most often, the injury occurs during exercise. It is expected that during the mechanical stress of the long years of life, erosion of the joints will occur, in contrast to the younger and active ones. The fibers in older patients are less able to heal due to the lack of synovial fluid in addition to the lack of movement. (25)

Prolotherapy is an injectable-based supplement that exhibits promising outcomes for treating various musculoskeletal conditions. The purpose was to



assess the efficiency of dextrose therapy on range of motion, pain, and function in knee osteoarthritis individuals (23).

Bahman (2015) confirms that there are few ways to treat arthritis, most of them focus on relieving symptoms rather than altering the joint biochemical environment. Current treatments comprise anti-inflammatory medications, simple analgesics, physiotherapy, muscle-strengthening training, intra-articular injections of cartilage supplements like arthroscopic surgery, hyaluronic acid, and arthroplasty **Michael et al(2010)**(**Toopchizadeh et al.(2012)**; **Barron and Rubin, (2007)**, however, no non-surgical cure exists. While no single treatment is consistently effective for meniscus injuries, some complementary therapies like regenerative injection therapy have shown promise for treating musculoskeletal pain. Dextrose accounts for the frequently used solution for injection. (10)(17)

Prolotherapy is to develop a solution to pain and dysfunction of the joint and improve health to restore the ability to perform the requirements of daily life. Likely, the individual will not need medical care for the pain and disability, prolotherapy aims to improve an individual's life by reducing pain, improving range of motion, and exercising.

When using a measure of the motor range of the injured from (0-10), a significant improvement was found from 1.1 to 4.1. Before prolotherapy treatment, only 25.9% of the cases exhibited normal movement, but this percentage reached 75% after prolotherapy. Before injection therapy, only 4 cases exhibited normal walking ability, which increased to 20% after Prolotherapy. Regarding the ability to exercise before prolotherapy treatment, 14.2% of the cases were able to exercise for more than 60 minutes. However, this percentage significantly raised to 85.7% after receiving prolotherapy. (32)

(**Ross A. Hauser2016**) Prolotherapy has been used to treat various diseases of the muscular system, chronic, which is a practical and effective healing approach for the treatment of ligament laxity and associated musculoskeletal diseases and arthritis. interest in parenteral therapy has increased among both patients and clinicians over the past two decades. This has been supported by a growing body of research that validates the anecdotal evidence suggesting the treatment's efficacy in managing various conditions. (21)(33) (37)

Prolotherapy accounts for a non-surgical, regenerative injection procedure that delivers small quantities of an irritant solution into the insertion site of painful and degenerated tendons, joints, and ligaments as well as into neighboring joint spaces over numerous treatment sessions to stimulate the growth of normal cells and tissues. Irritant solutions commonly comprise



dextrose (d-glucose), a naturally occurring form of glucose usually existing inside the body. The main objective of parenteral therapy for chronic musculoskeletal conditions is to stimulate regenerative procedures in the affected joint that would enable joint stability restoration by increasing the tensile strength of joint stabilizing structures, including joint capsules, tendons, ligaments, and cartilage hinge. (32)(36)

Prolotherapy works through three healing and regeneration phases inflammation, proliferation, and tissue remodeling. In vitro, investigations conducted on human fibroblasts and chondrocytes exposure to extracellular dextrose levels of only 0.5% led to the proliferation and production of various growth factors, many of which play a crucial role in repairing the contents of the joint, improving its functional and structural integrity. (21)(

Muhammad Qadri Bakri (2000) confirms that treatment with purposeful measured movement (sports therapy) is among the fundamental natural approach in the integrated treatment of sports injuries from diseases and that sports therapy represents special importance in the field of rehabilitation, especially in its final stages when implementing work therapy in preparation for the return of the injured person To practice specialized activities and his return to functional performance after restoring the basic functions of the body of the injured person by using physical exercises of all kinds to complete the treatment and rehabilitation processes. (5)

From the above, we find it difficult for the injured person to return to performance again, and the injury is often accompanied by swelling and inflammation as a result of the unbalanced load on the cartilage in the knee joint, as 80% of cases can be treated with regenerative therapy accompanied by rehabilitative physical-kinetic therapy and 20% with surgical treatment (32)

Anterior cruciate ligament rupture. It can happen to athletes and those who work in physical jobs. There are methods of treatment without surgery. Most people recover from an ACL tear within six to nine months. The recovery and rehabilitation period typically lasts for 3 months at a minimum. Nevertheless, Symptoms of instability may persist even after a patient with a partial tear of the ACL has undergone recovery and rehabilitation.

When applying prolotherapy treatment, most patients began to feel a real improvement after (3-4 injections). The type of treatment and the duration between them is typically based on the progress rate achieved by the patient with a decrease in pain, infiltration, and healing of injuries. Studies confirmed the speed of recovery by 50% and an improvement in the level of pain from 80-90% for all patients. (14)(36)



According to a review of the literature including previous studies and the researcher's experience working in the field of physical rehabilitation and sports injuries, it is apparent that this study of meniscal cartilage injuries did not find enough studies and with the lack of clear and decisive results in treating cartilage and rehabilitating it to return to competition clearly In the least time, which was a major motive for conducting this study, and accordingly, the researcher designed a proposed rehabilitative treatment program to return injured athletes to the normal state before the injury occurred. muscles working on it.

Research Importance

This study is the first of its kind according to what the researcher reached through applying for a rehabilitative program after regenerative treatment for a meniscus injury, and the researcher designed a program that might lead to

- 1- Getting rid of pain and effusion inside the knee joint
- 2- increase the muscle strength level
- 3- Identifying the impact of regenerative therapy in the treatment of the knee joint

Objectives

The present research is dedicated to identifying the consequence of the proposed rehabilitation program for the knee joint following regenerative therapy through

- 1- Reducing pain.
- 2- Improve the muscle strength of the muscles working on the knee
- 3- The range of motion of the knee joint improved after regenerative therapy.

Hypotheses

The pre-and post-measurement in the treatment of the injured knee joint revealed statistically significant hypotheses, with the post-measurements showing greater improvement.

- 1-The pre- and post-measurements of the strength of the muscles working on the knee joint exhibit statistically significant differences between their mean values, with the post-treatment measurement demonstrating greater improvement.
- 2- The pre- and post-measurements in the motor range, pain intensity, and the degree of infiltration exhibit statistically significant differences between



their mean values, with the post-treatment measurement demonstrating greater improvement.

Research Idioms:

Rehabilitation:

It is to retain or restore the working function of the body's injured part, enabling it can carry out the required tasks, bear loads, and meet the demands of daily activities. (5-35)

Physical Motor Therapy:

It is among the fundamental natural approaches in the integrated handling of sports injuries and certain diseases. This approach employs purposeful, measured movement to restore the injured persons to their baseline functions and also the injured member (4)

Range of Motion:

It is the widening of the movement of bones and joints as permitted by the working muscles. (33) (6)(

pain:

It is an unpleasant physical sensation or emotional experience that can result from various kinds of possible tissue injuries. (9:24) (34)

Effusion:

Excess fluid around the joint tissues. It makes the joint appear larger and more swollen compared to other joints. (34)

Abbreviation: ahmm

Anteromedial meniscofemoral ligament of the medial meniscus's anterior horn.

- The anterior cartilaginous ligament of the medial meniscus's anterior horn.

phmm abbreviation

posterior medial meniscofemoral ligament of the medial meniscus's anterior horn.

- The cartilaginous-femoral ligament is posterior to the medial meniscus's anterior horn.
- The meniscus is a C-shaped pair of fibrous cartilage that lies between the femur and tibia in each knee and runs circumferentially along the knee's

medial and lateral sides, noting that the medial meniscus has a somewhat more circular shape compared to its lateral, hemispherical counterpart. Each crescent has a concave shape to allow congruence with the convex femoral condyle and a flat underside that conforms to the smooth upper surface of the tibia. (20)

Methods

: Approach

In this study, the researcher employed a pre- and post-measurement experimental approach of single group design.

Participants:

Participants (n=8) were recruited purposefully. They were between 50-70 years and had a partial resection of the meniscus after injections of regenerative therapy. doctor's approval to start the physical rehabilitation program.

Participants were recruited according to the following criteria:

- 1-Men in the age group (50-70) years.
- 2-They must have had a partial tear of the meniscus in the knee
- 3-They should not have undergone any previous rehabilitation programs for the knee joint.
- 4-They should not have undergone any previous surgery on the knee joint
- 5-Approximate physical characteristics of individuals (weight, height, age).

Table (1): Means, Standard Deviation, and Skewness of Participants on Age, Weight, and Height.

n=8

Variables	Unit	Mean	SD	Median	coefficient
Age	month	56.125	a 3.758	55.500	0.00
Length	Length	176.250	11.234	182.00	-0.796
Weight	Weight	99.475	10.128	101.650	-0.357

Table (1) indicated that the skewness coefficients for the studied population in the variables under study were restricted to (± 3), indicating the moderation of the data in the anthropometric measures (weight - height - age), "under study."

Table (2): Statistical description of the research sample and the sample's moderation in the variables under study

n=8

Variables	Mean	SD	Median	coefficient
BMI	32,137	3,544	32,050	1,015
Circumference	63.750	2.712	63.500	-0.222
Flexibility	71.387	3.569	71.300	0.274
Power	59.375	3.737	58.150	0.479
Effusion	1.625	0.517	2.00	-0.644

It is clear from Table (2) that the skewness coefficients for the studied population in the variables under study were restricted to (± 3), indicating the moderation of the data in the variables "under study "

Table (3) Statistical description of the research sample and the moderation of the sample in the pain degree test N=8

Variables	Mean	SD	Median	coefficient
Pain	7.500	0.755	8.000	-1.323

It is clear from Table (3) that the torsion coefficients of the research community in the pain degree test under study were limited to (± 3), which indicates the moderation of the data in the pain degree test "under study."

Tools and Equipment

Data collection form for each patient-

-Sonography for each case

-Multiple weights device, octameter device for measuring height, medical scale

-A goniometer to estimate the range of motion for joint flexibility, an optical analog scale to estimate the degree of pain-

- dynamometer for measuring force, tape measure for thigh circumference-

The Recommended Rehabilitation Exercises Program

The researcher reviewed and referenced the previous studies that were available to him, in addition to his gained experience from working in physical



rehabilitation and sports injuries, supervising the implementation of the medical aspect, and identifying program components that are suitable to the nature of the sample dental stage.

Suggested program content

To develop the proposed program, the attending physician was used to evaluate each case individually to determine the appropriate physical load.

The program consists of (10) weeks divided as follows

(6) the week of the medical program, (1) a week of rest, and (4) the week of the rehabilitation program.

First, the medical program

- 1-Ultrasound examination for each individual separately.
- 2-It continues for (6) weeks every week (prolotherapy injections) (no anti-inflammatory drugs or analgesics are taken.)
- 3-Applying a laser session before the injection.
- 4-At the end of the sixth week (sonar) for evaluation.

The seventh week (rest)

Secondly, the proposed rehabilitation program.

For a period of (4) weeks, twice a week, starting from (30)m. to (45)m

The program was developed relying upon analyzing relevant literature, including scientific studies and references, and by reviewing the previous rehabilitation programs, hence, the developed program was designed to be implemented over 4 weeks for individuals who have undergone partial resection of the meniscus after regeneration treatment, with 2 weekly sessions, the time of the session ranges between (30 to 45)

Each session included the following

warm up-

And its duration is from (5 to 10) M, to prepare the muscles through a group of flexibility and stretching exercises until Pain limits

Main training period:-

Its duration is from (20 to 40) minutes and it includes specific exercises for each stage separately.

-calm down

Its duration ranged from (5 to 10) M, and it comprises a series of relaxation exercises to restore the body to its state.

natural

Implementation of the proposed program:

Due to the difference in the timing of injury from one individual to another, the timing of the program in terms of pre-measurements and the implementation of post-measurements is from one individual to another. Therefore, the proposed program was implemented in the period from (mid-January 2023 to April 2023) taking into account the standardization of measurement conditions and the same tools and in the same order for all members of the sample

Statistical treatment

- Mean
- Standard deviation
- Percentage% rates of change
- T-test
- Torsion coefficient

Discussion

To attain the set goals and after implementing the intended program and conducting the desired measurements and statistical analyses for the research variables, we present the findings as follows:

Table (4): **Significant differences between pre and post-measurements in the variables.N(8)**

Variables	pre		post		Sum of ranks	Average of ranks	Sign direction	Z value	ERROR
	MEAN	SD	MEAN	SD					
weight	99.475	10.128	91.712	7.576	36.00 0.00	4.50 0.00	8.0- 0.00+ 0.0=	2.521	0.012
BMI	32.137	.544	29.612	2.898	36.00 0.00	4.50 0.00	8.0- 0.00+ 0.00=	2.524	0.012
Circumference	63.750	2.712	74.000	1.690	0.00 36.00	0.00 4.50	0.00- 8.0+ 000+	2.555	0.011
Flexibility	71.387	3.569	43.937	3.212	36.00 0.00	4.50 0.00	8.0- 0.00+ 0.00=	2.521	0.012
Power	59.375	3.737	102.862	6.077	0.00 36.00	0.00 4.50	0.00- 8.0+ 000+	2.521	0.012
Effusion	1.625	0.517	0.00	0.00	36.00 0.00	8.00 0.00	8.0- 0.00+ 0.00=	2.598	0.009

Table (4) demonstrates significant statistical variances among the pre and post-measurements in all studied variables in the direction of the post-measurement, as all probability of error values are smaller than the significance level of 0.05.

Table (5): Percentages of change between the means of pre and post-measurements in the studied variables

(n=8)

Variables	MEAN (pre)	MEAN (post)	Ratio percentage
weight	99.475	91.712	8.5
BMI	32.137	29.612	8.5
Circumference	63.750	74.000	13.8
Flexibility	71.387	43.937	62.5
Power	59.375	102.862	42.3
Effusion	1.625	0.00	1625

Table (5) demonstrates that the rates of change between the mean of pre and post-measurements in the variables under study were limited between (8.5, 62.5

Table(6): Significant differences and percentages of change among pre and post-measurements in the pain degree test.

(n=8)

Variables	pre		post		Sum of ranks	Average of ranks	Sign direction	Z value	ERROR
	MEAN	SD	MEAN	SD					
weight	7.500	0.755	1.875	0.834	36.00 0.00	4.50 0.00	8.0- 0.00+ 0.0=	2.539	0.011

Table (6) demonstrates statistically significant differences between the pre-and post-measurements, and the degree of pain test under study, with post-measurement improvements, where all probability of error values is smaller than the significance level 0.05.

Table (7): Percentages of change between the means of pre and post-measurements in the pain score test under study

(n=8)

Variables	MEAN (pre)	MEAN (post)	Ratio percentage
PAIN	7.500	1.875	300

Table (7) demonstrates that the percentage change between the means of the pre and post-measurements in the pain degree test under study has reached (300).

Discussion:

Table (4) demonstrates statistically significant differences among the pre and post-measurements of the arithmetic mean and standard deviations, which included the thigh suture, muscle strength, pain intensity of the knee joint, range of motion, and the degree of effusion of the knee affected by the anterior medial cartilage, as such variances imply the extent of the regularity of the sample and their continued application of the program, in both its medical and rehabilitative parts. Also, the regenerative therapy and the decrease in the degree of pain had the effect of increasing the motivation towards continuing to perform.

Table (5) indicates that the ratio of change between the mean of pre and post-measurements in the variables under study was limited between (8.5, 62.5).

There are statistically significant differences in the arithmetic averages between the pre and post-measurements and in the study variables, which included weight, body mass index, thigh circumference, flexibility, strength, and the degree of effusion.) and the strength of the muscles of the legs (42.3) and the degree of effusion (1625), the percentage of change was confined between (1625, 8.5)

Table (6) reveals statistically significant differences between the pre and post-measurements. The pain degree test under study is in the direction of the post-measurement, as the probability of error values is smaller than the significance level of 0.05. Which explains the positive impact of applying the program on the study sample.

It is clear from Table (7) the following: The change percentages between the averages of the pre and post-measurements in the pain degree test under study amounted to (300), which explains the positivity of all research variables in favor of the post-measurement, indicating that the treatment program



(medical and rehabilitation) has positively promoted an improvement in the effectiveness of the injured knee joint.

Discuss the results of the first hypothesis, which states

There are statistically significant differences between the mean of the pre-measurement and the mean of the post-measurement in favor of the post-measurement of the strength of the muscles working on the knee joint, which is evident from Table No. (4) and is represented in the circumference of the thigh and the strength of the muscles of the two legs, where the average of the thigh circumference was (63,750) in the pre-measurement While there was an increase in the post-measurement amounted to (74), and the average strength of the legs was (59.375) in the pre-measurement, while it increased in the post-measurement (102.862). (42.3)

The standard deviation of the thigh circumference in the pre-measurement was (2.712), while the standard deviation in the post-measurement was (1.690)(

The researcher sees the difference in the strength of the legs and the circumference of the thigh between the pre and post-measurements of the regenerative medical treatment, in addition to the rehabilitation program used, which includes several various rehabilitation methods that led to an increase in the sample's ability to continue and the improvement of the two variables and their impact on movement (joint flexibility)

The second hypothesis, states: statistically significant differences were observed between the mean values of the pre-and post-measurement for the motor range, pain intensity, and the degree of infiltration, with the post-treatment measurements showing greater improvement in all three variables.

The average (flexibility) motor range in the pre-measurement was (71,387), while the percentage increased in the post-measurement to (43,937), and this is consistent with the International Journal of Prolotherapy (2011). The average degree of pain in the pre-measurement was (7,500), while the average value decreased. The arithmetic in the post-measurement reached (1.875), and the average degree of infiltration of the knee joint in the pre-measurement was (1.625), while the value ended in the post-measurement by examining the sonar rays on the injured joint.

The standard deviation of flexibility in the pre-measurement was (3.569), while it was in the post-measurement (3.212). The standard deviation of pain in the pre-measurement was (0.755), while it was in the post-measurement (0.834). The standard deviation of knee joint infiltration in the pre-measurement was (0.517).) while the percentage vanished in the post-test



The researcher attributes this significant difference to the regenerative treatment (prolotherapy) with 5% dextrose, in addition to the various exercises and rehabilitation methods that were applied by the sample and proved their effectiveness and impact on the development of muscle strength of the muscles surrounding the joint, increasing flexibility and increasing the circumference of the thigh, and this is consistent with what he said **Ross A. Hauser on the use of prolotherapy for the treatment of various diseases of the musculoskeletal system (2016) chronic diseases, the National Library of Medicine (2016) the Department of Family and Community Medicine (2016) Calvin and Ohio (2023) DALE Guyer (2022) Bahman (2015).**

And that motor physical therapy is one of the elements of sports rehabilitation and which is consistent with **Muhammad Qadri Bakri (2000), Haitham Muhammad Hassanein and others (2021), Ihab Muhammad Emad El-Din and others (2020) and Ahmed Abu Rehab (2020)**

The increase in the age stage of the patients is due to the International Journal of Prolotherapy Medical Sector (2011). Which stated that it is expected during the mechanical stress of the long years of life, erosion of the joints occurs, unlike the younger and more active, the fibers in the older patients are less able to heal due to the lack of synovial fluid in addition to the lack of movement.

Table (5) reveals that the arithmetic average of the pre-measurement of weight was (99.475), while the percentage decreased in the average of the post-measurement and was (91.712), while the average body mass index in the pre-measurement was (32.137), while the percentage decreased in the average of the post-measurement to (29.612).) and the rate of change in both was (8.5) **Muhammad Fathi Hindi (1991)** confirmed that the articular cartilage provides shock absorption and stability by distributing weight evenly across the joint, Transferring the appropriate weight in the knee reduces the pressure on any other joints in the body, and the researcher attributes this to medical supervision and directing the research sample to adjust the weight due to its negative impact on knee joint injury, as confirmed by **DeFrate, ScD et. all (2020) and W. Wirth (2020) and (2020) Munugoda.**

It is clear from Table No. (5) that the mean of the pre-measurement of the effusion was (10625), with a decreased post-measurement percentage, and this was indicated by the ultrasound on the knee, which is consistent with **Mohamed ElAttar (2020) D.M.I. SOLIMAN (2016)**

Using prolotherapy to treat various diseases of the muscular system, will agree with **Ross A. Hauser(2016), Ross A. Hauser (2016) National Library**



of Sports Medicine (2016) It also led to the elimination of infiltration in the knee joint, which was confirmed by x-rays **Jah AAE, et al . (2005) Liodakis (2009)** The use of prolotherapy led to a decrease in the rate of pain, which is consistent with **Ross Hauser, MD (2020)**

Conclusions:

- 1- The therapeutic program (medical-rehabilitation) was found to have a positive impact on the functional efficiency of the muscles involved in the knee joint after applying the two sections of the program (regenerative and rehabilitative therapy).
- 2-Statistically significant differences were observed between the pre and post-measurements for all study variables, with the post-treatment measurements showing greater improvement in all cases.
- 3- The study found a significant increase in the percentage of improvement, as measured by the rate of change between pre-treatment and post-treatment measurements, for all studied variables.

Recommendations:

- 1-Recommend the use of regenerative therapy (prolotherapy) in the sports field for reducing the risk ratio and the financial cost with the application of the rehabilitation program.
- 2-Paying attention to a permanent awareness of weight reduction and designing movement programs to prevent and avoid knee injuries.
- 3-Conducting more research in the field of regenerative and rehabilitative therapy.



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