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-Sayed

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INTRODUCTION:

Meniscus injuries are among the common causes of knee pain, as they account for one-sixth of knee surgeries. It is also the most common injury due to its poor ability to heal, as its direct blood supply is reduced by 25%. It was found out that articular cartilage surgeries have a long-term failure rate with recurrence of symptoms (pain, instability, 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 of 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, All (2004) indicated that knee injuries are a common source of stress and lead to more than 1 million knee surgeries performed in the United States each year (according to the National Athletic Trainers Association), knee injuries (10% to 19%) of injuries secondary school sports and (60.3%) of all secondary school sports-related surgeries. And it constitutes from team sports (7% to 54%) of sports injuries, varies according to the nature of the sport.(15)(27)

This necessitated the intervention of scientists to use new advanced methods that work out 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 C-shaped pair of fibrous cartilage that lies between the femur and tibia in each knee, and extends circumferentially along each medial and lateral side of the knee, noting that the medial meniscus is slightly more circular than its lateral counterpart hemispherical; Each meniscus has a flat underside to match the smooth upper surface of the tibia, and a concave shape to provide congruence with the convex femoral condyle. (20)

Esmaili Jah (2016) The anterior and posterior horns of each meniscus are attached to the tibia to hold them in place. Articular cartilage is composed of about (70% water and 30%) organic matter. This organic matter is a fibrillar collagen matrix consisting of type I collagen, fibroblasts, proteoglycans, and a small amount of non-collagenous dry matter. (10)(15)

S-Hankemeier et,all(2009) The meniscus provides stability to the knee joint by restricting movement and providing a circumferential tracking surface for the tibialis femur. The stabilizing function is shared with multiple ligaments that work together to prevent excessive stretching of any movement. The transverse ligament connects the meniscuses at the front of each knee and prevents them from pushing out of the joint at any point. It serves to avoid excessive motion by connecting the medial collateral ligament (MCL) to the medial tibial condyle, femoral condyle, and medial meniscus, and connecting the lateral collateral ligament (LCL) to the lateral epicondyle of the femur and the head of the fibula; These ligaments provide tension and limit motion during full flexion and extension, respectively.(5)(22)

Mohamed Fathy Hendy (1991) The meniscus also provides shock absorption and stability by distributing weight evenly across the joint. Proper weight transfer in the knee reduces stress on any other joints in the body. Provides lubrication to the knee by spreading synovial fluid across the joint and acts as a protective measure. for the articular cartilage of the knee. This cartilage is susceptible to injury because it is not close to the blood supply and has a high level of
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pressure on it due to excessive movement. the femoral and tibial articular cartilages by diffusing fluids into that avascular area.(15)(22)

Stanitski CL, et all(1988). ALL considers that direct blood supply to the articular cartilage is minimal (10% to 25% peripherally) preventing articular cartilage preservation. This area is often referred to as the red area, and the inner part of the meniscus that does not receive a blood supply is referred to as the white area. While the red area has a moderate chance of healing from an injury, the white area is almost completely unable to heal itself in the event of an injury. (19)(23)

Hoser C.et ALL(2001) A tear is the most common form of meniscus injury and is generally classified according to appearance into four categories: longitudinal tears, radial tears, horizontal tears, and oblique tears. It is indicated that radial or horizontal tears are more likely to occur in the elderly while younger patients have a higher incidence of longitudinal tears. These can each be described as partial thickness tears or full thickness tears, depending on the cephalic depth of the disease. (11)

International Journal of Prolotherapy Medical Sector (2011) Articular cartilage damage can occur either through trauma or progressive degeneration. Traumatic injuries are often the result of 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 the older patients are less able to heal due to the lack of synovial fluid in addition to the lack of movement. (25)

An injectable-based supplement that has shown promising results in a treatment called prolotherapy Various musculoskeletal disorders. The aims were to determine the therapeutic efficacy of dextrose therapy on pain, range of motion, and function in patients with knee osteoarthritis (23).
There Bahman (2015) confirms that there are few ways to treat arthritis, most of them focus on relieve symptoms, but do little to change the biochemical environment of the joint. Current treatments include simple analgesics, anti-inflammatory medications, muscle-strengthening exercises, physiotherapy, intra-articular injections of cartilage supplements such as hyaluronic acid, arthroscopic surgery, and arthroplasty Michael et al(2010)( Toopchizadeh et al.( 2012); Barron and Rubin, (2007), however no nonsurgical treatment exists. Uniformly effective for the treatment of meniscus, even seemed proliferative therapy or regenerative injection therapy, is a complementary treatment Injection for musculoskeletal pain. Dextrose is the most common 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. It is likely that 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) After prolotherapy treatment only (25.9%) of the patients had normal movement, but after prolotherapy this percentage increased to 75%. Before injection therapy, only four patients had normal walking ability, which increased to 20% after prolotherapy. With regard to the ability to exercise before prolotherapy treatment, (14.2%) of the patients could exercise for more than 60 minutes, but after prolotherapy this percentage increased to (85.7%). (32)

(Ross A. Hauser2016) Prolotherapy has been used to treat various diseases of the muscular system, chronic, which is a practical and effective therapeutic strategy for the treatment of ligament laxity and associated musculoskeletal diseases and arthritis, interest in parenteral therapy has increased over the past two decades among both clinicians
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and patients, accompanied by an increasing number of published treatment outcome studies that confirm anecdotal findings that the treatment progressive Effective in treating many conditions. (21)(33) (37)

Prolotherapy is a non-surgical, regenerative injection technique that delivers small amounts An irritant solution to the insertion site of painful and degenerated tendons, joints, ligaments and into adjacent joint spaces during several treatment sessions to promote the growth of normal cells and tissues. Irritant solutions often contain dextrose (d-glucose), a naturally occurring form of glucose normally found in the body. The main goal of parenteral therapy for chronic musculoskeletal conditions is to stimulate regenerative processes in the joint. that would facilitate the restoration of joint stability by increasing the tensile strength of joint stabilizing structures, such as ligaments, tendons, joint capsules, and cartilage hinge. (32)(36)

Prolotherapy works through three phases of healing and regeneration inflammation, proliferation, and tissue remodeling. Reprinted from Steilen D, Hauser R, Woldin B, Sawyer S. Open Journal of Orthopedics, under the terms of the CC-BY 2.5 license. In vitro studies on human fibroblasts and exposure of chondrocytes to extracellular dextrose concentrations of only 0.5% resulted in proliferation and production of a number of growth factors, many of which are essential for joint contents repair, structural and functional integrity. (21)

Muhammad Qadri Bakri (2000) confirms that treatment with purposeful measured movement (sports therapy) is one of the basic natural means in the field of integrated treatment of sports injuries from diseases, and that sports therapy represents a 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 for the purpose of completing 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 usually lasts at least 3 months. However, some patients with a partial ACL tear may still experience symptoms of instability.

When applying prolotherapy treatment, most patients began to feel a real improvement after (3-4 injections). The type of the treatment and the duration between them is determined by the rate of progress 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 review of literature including researcher’s readings, reference survey of previous studies and his experience gained from working in the field of sports injuries and physical rehabilitation, it is clear that this study of meniscal cartilage injuries did not find enough study 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 with the aim of returning injured athletes to the normal state before the injury occurred. muscles working on it.

SUMMARY:
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The present research target is to design a regenerative, motor and rehabilitative treatment programme in order 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, 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 injected with prolotherapy with ages between 50-70 years.

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

Key Words: Prolotherapy - Meniscofemoral ligament - Regenerative therapy - Effusion - Rehabilitation

RESEARCH IMPORTANCE

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

1- Getting rid of pain and effusion inside the knee joint
2- An increase in the level of muscle strength
3- Identifying the impact of regenerative therapy in the treatment of the knee joint
Objectives
The current research aims to identify the effect of the proposed rehabilitation program for the knee joint after 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
Statistic there are significant hypotheses between the pre-measurement and the post-measurement in the treatment of the injured knee joint in favor of the post measurements.
1- Statistic there are 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
2- There are statistically significant differences between the mean of the pre-measurement and the mean of the post-measurement in the motor range, pain intensity, and the degree of infiltration in favor of the post-measurement

RESEARCH IDIOMS:
Rehabilitation:
It is to restore or maintain the working function of the injured part of the body, so that it can carry out the necessary functions and burdens and its daily needs. (5-35)
Physical Motor Therapy:
One of the basic natural means in the field of integrated treatment in sports injuries, and some diseases by employing the purposeful, measured movement to restore the injured person to his basic functions and also the injured member (4)
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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 undesirable feeling or emotional experience with different types 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 ligment of the anterior horn of the medial meniscus
The anterior cartilaginous ligament of the anterior horn of the medial meniscus

phmm abbreviation
posterior medial meniscofemoral ligament of the anterior horn of the medial meniscus
The cartilaginous-femoral ligament posterior to the anterior horn of the medial meniscus

The meniscus is a C-shaped pair of fibrous cartilage that lies between the femur and tibia in each knee, and runs circumferentially along each medial and lateral side of the knee, noting that the medial meniscus is slightly more circular than its lateral, hemispherical counterpart. Each crescent has a flat underside to match the smooth upper surface of the tibia, and a concave shape to provide congruence with the convex femoral condyle. (20)

Methods
Approach
The researcher used the experimental approach(one group design ) With pre- and post -measurement .

Participants:
Participants (n=8) Purposefully recruited. They were between (50-70)years and who had partial resection of the meniscus after
injections of regenerative therapy. doctor's approved 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 in the knee joint.
4-They should not have undergone any previous surgery in the knee joint.
5-Approximate physical characteristics of individuals (height, weight, age).

Table (1) Means, Standard Deviation and Squewness of Participants on Age, Weight and Height N=8

<table>
<thead>
<tr>
<th>Variables</th>
<th>Unit</th>
<th>Mean</th>
<th>SD</th>
<th>Median</th>
<th>coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>month</td>
<td>56.125</td>
<td>3.758</td>
<td>55.500</td>
<td>0.00</td>
</tr>
<tr>
<td>Length</td>
<td>Length</td>
<td>176.250</td>
<td>11.234</td>
<td>182.00</td>
<td>-0.796</td>
</tr>
<tr>
<td>Weight</td>
<td>Weight</td>
<td>99.475</td>
<td>10.128</td>
<td>101.650</td>
<td>-0.357</td>
</tr>
</tbody>
</table>

Table (1) indicated that the coefficients of skewness of the research community in the variables under study were limited to (±3), which indicates the moderation of the data in the anthropometric measures (age - height - weight), "under study."
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Table (2) Statistical description of the research sample and the sample's moderation in the variables under study n=8

<table>
<thead>
<tr>
<th>Variables</th>
<th>Mean</th>
<th>SD</th>
<th>Median</th>
<th>Coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMI</td>
<td>32,137</td>
<td>3,544</td>
<td>32,050</td>
<td>1.015</td>
</tr>
<tr>
<td>Circumference</td>
<td>63.750</td>
<td>2.712</td>
<td>63.500</td>
<td>-0.222</td>
</tr>
<tr>
<td>Flexibility</td>
<td>71.387</td>
<td>3.569</td>
<td>71.300</td>
<td>0.274</td>
</tr>
<tr>
<td>Power</td>
<td>59.375</td>
<td>3.737</td>
<td>58.150</td>
<td>0.479</td>
</tr>
<tr>
<td>Effusion</td>
<td>1.625</td>
<td>0.517</td>
<td>2.00</td>
<td>-0.644</td>
</tr>
</tbody>
</table>

It is clear from Table (2) that the coefficients of skewness of the research community in the variables under study were limited to (±3), which indicates 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

<table>
<thead>
<tr>
<th>Variables</th>
<th>Mean</th>
<th>SD</th>
<th>Median</th>
<th>Coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pain</td>
<td>7.500</td>
<td>0.755</td>
<td>8.000</td>
<td>-1.323</td>
</tr>
</tbody>
</table>

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-
- Songraphy for each case.
- Nutrition clinic for interviews.
- Multiple weights device, rectameter device for measuring height, medical scale
- A goniometer to measure the range of motion for joint flexibility, an optical analog scale to measure 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 experience gained from working in the field of sports injuries and physical rehabilitation, supervising the implementation of the medical aspect, and identifying program components that are appropriate to the nature of the dental stage of the sample.

**Suggested program content**

In order to develop the proposed programme the physician attendance was necessary 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-Blood analysis should be done for each one separately.

3-It continues for (6) weeks every week (prolotherapy injections) (no anti-inflammatory drugs or analgesics are taken).
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 designed based on the analysis of some references and scientific studies, and by reviewing the previous rehabilitation programs, and accordingly, the proposed program was developed for a period of (4) weeks for those with partial resection of the meniscus after regeneration treatment, with 2 weekly sessions, the time of the session ranges between (30 to 45)
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Each session included the following
warm up-
And its duration is from (5 to 10) M, in order 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 included a set of relaxation exercises to return 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 programme in terms of pre-measurements and the implementation of post-measurements is from one individual to another. Therefore, the proposed programme was applied 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
In order to achieve the set targets and after applying the proposed programme and conducting the required measurements and statistical treatments for the research variables, we present the results as follows:
table (4) Significance of differences between pre and post measurements in the variables N(8)

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

It is clear from Table (4) that:
There are statistic significant differences between the pre and post measurements in all the variables under study and in the direction of the post measurement, as all values of the possible error are smaller than the significance level of 0.05.

Table (5) Percentages of change between the means of pre and post measurements in the variables under study (n=8)

<table>
<thead>
<tr>
<th>Variables</th>
<th>MEAN (pre)</th>
<th>MEAN (post)</th>
<th>Ratio percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>weight</td>
<td>99.475</td>
<td>91.712</td>
<td>8.5</td>
</tr>
<tr>
<td>BMI</td>
<td>32.137</td>
<td>29.612</td>
<td>8.5</td>
</tr>
<tr>
<td>Circumference</td>
<td>63.750</td>
<td>74.000</td>
<td>13.8</td>
</tr>
<tr>
<td>Flexibility</td>
<td>71.387</td>
<td>43.937</td>
<td>62.5</td>
</tr>
<tr>
<td>Power</td>
<td>59.375</td>
<td>102.862</td>
<td>42.3</td>
</tr>
<tr>
<td>Effusion</td>
<td>1.625</td>
<td>0.00</td>
<td>1625</td>
</tr>
</tbody>
</table>
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It is clear from Table (5) 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: Significance of differences and percentages of change between pre and post measurements in the pain degree test n=8

<table>
<thead>
<tr>
<th>Variables</th>
<th>pre</th>
<th>post</th>
<th>Sum of ranks</th>
<th>Average of ranks</th>
<th>Sign direction</th>
<th>Z value</th>
<th>ERRO</th>
</tr>
</thead>
<tbody>
<tr>
<td>weight</td>
<td>7.500</td>
<td>1.875</td>
<td>36.00</td>
<td>4.50</td>
<td>8.0-0.00+0.0=</td>
<td>2.539</td>
<td>0.011</td>
</tr>
</tbody>
</table>

It is clear from Table (6) that there are statistic significant differences between the pre and post measurements, the degree of pain test under study, and in the direction of the post measurement, as all values of the possible of error are smaller than the level of significance 0.05

Table 7: Percentages of change between the means of pre and post measurements in the pain score test under study n=8

<table>
<thead>
<tr>
<th>Variables</th>
<th>MEAN (pre)</th>
<th>MEAN (post)</th>
<th>Ratio percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>PAIN</td>
<td>7.500</td>
<td>1.875</td>
<td>300</td>
</tr>
</tbody>
</table>

It is clear from Table (7) that: The percentage change between the means of the pre and post measurements in the pain degree test under study has reached (300).

Discussion:

It is clear from Table (4) that there are statistic significant differences between the pre and post measurements of the arithmetic means and standard deviations, which included the thigh suture, muscle strength, range of motion, pain intensity of the knee joint, and the degree of effusion of the knee affected by the anterior medial cartilage, as these differences indicate the extent of 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.

It is clear from Table (5) that: The ratio of change between the mean of pre and post measurements in the variables under study were limited between (8.5, 62.5).

There are statistic significant differences in the arithmetic averages between the pre and post measurements and in the research 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 bounded between (1625, 8.5)

It is clear from Table (6) the following: There are statistically significant differences between the pre and post measurements. The pain degree test under study is in the direction of the post measurement, as all values of the possible of error are smaller than the significance level of 0.05. Which explains the positive impact of applying the programme on the research 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. Hence this indicates that the treatment programme (medical and rehabilitation) has a positive effect on the improvement in the efficiency of the injured knee joint.

Discuss the results of the first hypothesis, which states

There are statistic 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 demonstrated 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
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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 to the regenerative medical treatment, in addition to the rehabilitation programme 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, which states: There are statistically significant differences between the mean of the pre-measurement and the mean of the post-measurement in the motor range, pain intensity, and the degree of infiltration in favor of the post-measurement

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

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 was vanished in the post-test
The researcher imputes 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 was predictable 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) Calvinland Ohio (2023) DALE Guyer (2022) Bahman (2015).

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

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, that; the elderly patients are 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.

It is clear from Table (5) 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
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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), while the percentage decreased in the post-measurement, 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, which 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 propotherapy led to a decrease in the rate of pain, which is consistent with Ross Hauser, MD (2020)

Conclusions:
1- The therapeutic programme (medical - rehabilitation) has a positive effect on the functional efficiency of the muscles working on the knee joint after applying the two sections of the programme (regenerative and rehabilitative therapy).
2-There are statistic significant differences between the pre and post measurements in favor of the post measurements in all studyies variables.
3-An increase in the improvement in the percentages of the rates of change of the post-measurements from the pre-measurements in the variables of the study

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-Pay attention to permanent awareness of weight reduction and designing movement programs to prevent and avoid knee injuries.

3-Conduct more research in the field of regenerative and rehabilitative therapy.

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