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## The effect of exercises with shockwave therapy on rehabilitating shoulder muscle tears in discus throwers

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### Abstract

The aim of the study was to develop rehabilitative exercises accompanied by shockwave therapy for the study sample, and to determine the effect of using rehabilitative exercises with shockwave therapy on rehabilitating the study sample. The researcher adopted a single-group experimental method, and the research population was selected from frozen shoulder patients in various hospitals and centers in Baghdad, where the number of patients with this injury reached 53. The research sample consisted of 7 intentionally selected patients, representing a percentage of 13.20% of the original population. This sample was intentionally chosen due to its proximity to the researcher's location and rehabilitation center. Based on the research results, the researcher reached the following conclusions: there was an improvement in the condition of simple shoulder joint mobility among the research sample between pre-test and post-test in experimental groups. Shockwave therapy had a positive effect on improving range of motion in the experimental research sample. The exercises used also reduced pain levels among frozen shoulder patients. Based on these conclusions, the researcher recommends adopting shockwave therapy and its accompanying exercises to improve simple shoulder joint injuries due to their positive results in improving such injuries. Furthermore, emphasis should be placed on raising awareness about sports injuries among athletes and how to address them promptly to prevent further damage.

**Keywords:** shockwave therapy, rehabilitating shoulder, muscle tears

### Introduction

Injuries are one of the most important fields that researchers have been focusing on recently, due to their high occurrence rate and difficulty in dealing with them. Injury is a complete determinant of movement, and sports injuries and their treatment and rehabilitation methods are considered among the sciences related to sports that have received attention and research due to their importance in providing necessary information for prevention, treatment, rehabilitation of injuries, and helping injured individuals return to their daily activities. Sports rehabilitation represents the process of restoring the anatomical form and functional performance of the injured organ to its pre-injury state using various therapeutic means, whether they are motion-based or involve the use and utilization of devices and tools. The most appropriate method for restoring functional efficiency of this part is sports exercises or rehabilitation exercises (Hans, 1991, p.11) <sup>[1]</sup>. The purpose is to return the athlete to practicing their activity after an injury and protect the injured area from recurring injury. Therefore, rehabilitation is a means of treating various injuries as it helps increase the rate of healing for muscular tissues, ligaments, and bones. It also helps in speeding up the drainage of accumulations and blood clots. Additionally, it works on quickly restoring the functions of injured muscles and joints in the shortest possible time. It also works on restoring physical and functional efficiency to the injured part. It is important for the body to undergo tissue repair and regeneration in both bones and ligaments while reducing pain and improving movement. Shockwaves penetrate muscle layers deeply that cannot be reached through manual pressure or other devices such as ultrasound waves whose results do not appear except in mild cases (David F.G., 2013, page 149) <sup>[3]</sup>.

The shoulder joint is exposed to injury because it is an essential and important limb in the

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human body and the most necessary movements depend on it. Studies have proven the importance of using exercises that accompany the devices because of their significant role in creating the appropriate environment for treatment without resorting to surgical intervention and returning the injured person to his normal position in the shortest possible period using the latest technology devices. The process of rehabilitation using devices accelerates the recovery process for the injured person and improves the functional level of the affected part because the device works according to certain degrees and perspective, and this contributes to the functional improvement of the injured part (Muhammad, 1984, p. 34) [7], which relies on shock wave technology, which has proven its efficiency in treating cases of complex injuries such as frozen shoulder injury.

The shoulder joint is one of the joints most prone to injury due to its many uses and the movements that cause it. Frozen shoulder joint injury occurs as a result of multiple conditions such as joint inflammation of the ligaments and tendons surrounding the joint or as a result of improper or excessive use, as the joint is characterized by freezing as a result of the injury, which leads to the feeling of pain and is limited by movement and because of the lack of treatment of this injury accurately and using traditional methods that do not depend on modernity and advanced technology. It has been scientifically proven that the use of advanced devices helps in shortening the time and costs of treatment and accelerating the recovery period. Shock wave treatment has positive effects on recovery and a faster return to daily activities and by working with special exercises in a scientific way and thus improving functional efficiency.

The importance of the research lies in preparing rehabilitation exercises accompanied by the shockwave device in treating and rehabilitating the frozen shoulder joint at the ages of 45-55. These exercises will be prepared after conducting pre-tests to determine the range of motion on the research sample that was chosen intentionally and they are from the category of men and their number is (7) injured from Visitors to physical therapy centers and these tests are a test to measure the range of motion of the shoulder joint, which includes movements (flexion of the shoulder - extension of the shoulder - abduction of the shoulder - horizontal abduction of the shoulder - horizontal adduction of the shoulder - internal rotation of the shoulder - external rotation of the shoulder). Then, exercises are developed and used during the rehabilitation units in the main experiment, and after completing the units, post-tests are performed to determine the extent of the effect of using the exercises and the shock wave device in rehabilitating frozen shoulder injury. This experiment is under the supervision of the researcher, the assistant team, and the rehabilitation staff represented by therapists working in rehabilitation centers.

### Research Problem

As the researcher is also a worker in rehabilitation centers and is also an athlete, she noticed the presence of this injury as an obstacle that limits and reduces the exercise of the ability to move, so she decided to study this injury as an attempt to contribute to finding modern methods that facilitate the process of rehabilitating the frozen shoulder in the quickest time and with the best results, and to enrich the therapists with modern and advanced methods of treatment.

From the above, the researcher discovered that most rehabilitation centers lack the use of a shock wave device, and the therapists' lack of use of it and exercises based on the idea

of accelerating the healing process. The researcher decided to study this injury and try to treat and rehabilitate it using modern techniques represented by shock waves based on modern devices. And advanced and innovative, in addition to the development of means and tools to help in treating injuries in general, as rehabilitation at this time relied on the use of the best devices and tools to help in rehabilitation as a result of the development taking place in science and technology and the use of robots and advanced devices that have not yet taken their place in treating and rehabilitating injuries, and this condition needs To focus.

### Research objectives

- Preparing qualifying exercises accompanied by the shock wave device for the research sample under study.
- Knowing the effect of using rehabilitation exercises with the ultrasound device to qualify the research sample under study.

### Research hypothesis

There are no statistically significant differences between (pre-test and post-test) for the range of motion using the shock wave device for the shoulder joint.

### Research areas

- **The human field:** The human field included a sample of men with frozen shoulder joints aged (45-55) years, who numbered (7) sufferers.
- **Spatial area:** Al-Husseini Physical Therapy Center located in the Baladiyat area in Baghdad
- **Time frame:** From (1/1/2023) until (//2023).

### Research methodology

#### Research Methodology

There are many methods that are used in scientific research, and the choice of method depends on the nature of the study, "and because phenomena can be studied through a scientific method that is appropriate to the nature of the problem to be researched" (Al-Kazemi, 2012, p. 84) [14], the researcher used the experimental method that he knew (Rateb (1999) [6] as the approach that is based on experiment and laboratory testing, guided by a method of using modern scientific tools, devices, and equipment with the aim of discovering any causal relationship between one or more variables within a tightly controlled and organized framework. It also allows knowing the value of the effect of the independent variable on the dependent variable and is characterized by the ability to adjust and control external variables. Increased control means more confidence in the results reached by the researcher (Rateb, 1999, p. 205) [6]. The researcher used the experimental design for one group with the test (pre- and post-test).

### The research community and its sample

The research population was selected from people with frozen shoulder in Baghdad from various hospitals and centers, where the number of people with this injury reached 53 patients. The research sample, which numbered (7) patients, was chosen intentionally, representing a percentage of (13.20%) from the community of origin. This sample was chosen intentionally due to the proximity of the sample location and the rehabilitation center for the researcher.

1. Means, tools and devices used
2. Means of collecting information
3. Arab and foreign sources.
4. Information network (Internet)

5. Personal interviews with experts and specialists in all fields of research
6. Tools used
7. Rehabilitation center
8. A special chair for sitting
9. Equipment used
10. Goniometer to measure range of motion
11. A scale for measuring weight
12. medical bed (stamen)
13. A laptop computer
14. Digital video and photographic camera
15. Search steps
16. Measurements used in the research
17. Anthropometric measurements

### Weighting

Body weight is measured to the nearest 100 grams (0.1 kg) using a calibrated scale. The measurement process is carried out without shoes and with the least possible clothing on the subject's body. It is necessary to take care not to place the scale on a soft floor (such as a carpet or a foam mattress) when performing the measurement process. (Al-Hazzaa, 2009, p. 201) <sup>[9]</sup>.

### Measure the height

The total length of the body is measured to the nearest centimeter using a stadiometer. The process of measuring height must be carried out without shoes and with the examinee standing erect. It should be taken into account that pressure is placed on the subject's head with the measuring pad, especially when the hair on the head is thick. (Al-Hazzaa, 2009, p. 201) <sup>[9]</sup>.

- Test to measure the degree of pain (Al-Najjar, 1996, 46) <sup>[1]</sup>.
- Purpose of the test:
- Determine the degree of pain
- Performance description

From the position of lying on the back of the injured person on the medical bed and raising the legs to the top in it, the patient is asked about the degree of pain from (10 degrees as a maximum) and the degree of (zero as a minimum). The degree of pain is determined after completing the doctor's examination of the injured person and asking him questions to answer them. Prepared for this purpose.

1. Measurements of motor range: (Buckup, 2004) <sup>[15]</sup>.
2. Measurements of range of motion of the shoulder joint

The shoulder joint range of motion was measured in (7) different movements:

- Shoulder flexion movement
- Shoulder extension movement
- Shoulder abduction movement
- Horizontal shoulder abduction movement
- Horizontal adduction movement of the shoulder
- Internal rotation movement of the shoulder
- External rotation movement of the shoulder

### Exploratory experience

The researcher conducted the exploratory experiment on (4) patients with frozen shoulder, on Sunday 15/1/2023, at exactly (4) pm, at the Al-Rafidain College Center for Physiotherapy, Rehabilitation and Sports Medicine, with the help of the assistant work team (appendix). To prepare the research requirements of tools and devices, and for the

purpose of identifying the correct and optimal way to implement the measurements in question, as well as defining the assistant work team about the measurements, the extent to which the research sample accepts the measurements, the time taken to perform them, and the difficulties that the assistant work team may face.

The researcher concluded the following from the exploratory experiment:

- Aligning the time allocated for performing measurements.
- The work team's ability and understanding to perform measurements well
- Suitable measurements for the research sample in particular.

### Pretests

The assistant work team, under the supervision of the researcher and the supervisor, conducted pre-tests for the sample members, which numbered (7) injured, at Al-Rafidain College Center for Physiotherapy, for 3 days for each group, one day (Tuesday - Wednesday - Thursday) (17-18-19/1/2023). At four in the evening, the assistant work team and the physical therapists tried to stabilize the conditions related to the tests in terms of time, place, and tools used in order to work as much as possible to make the conditions similar when conducting the post-tests.

### Main experience

The researcher prepared the treatment program and then supervised the assistant work team during the treatment sessions:

- The curriculum for the treatment of frozen shoulder injury began on Sunday 1/22/2023.
- The assistant team, supervised by the researcher, applied the treatment program to the research sample for a period of (6) weeks.
- The number of therapeutic sessions was (18), at a rate of (3) units per week, and the time and number of the sessions were as follows:
- Sessions in which rehabilitative exercises are used, 15-20 minutes. (18) Sessions.
- The sessions in which the shock wave device was used, 2-5 minutes. (6) Sessions.

### Posttests

The assistant work team, under the supervision of the researcher and the supervisor, conducted the post-tests on Tuesday, Wednesday, and Thursday (7-8-9/3/2023) after completing the application of the (6) week treatment program, to determine the extent of development occurring among the (7) infected patients. At Al-Rafidain College of Physiotherapy Center for (3) days), the team tried as much as possible to stabilize the conditions related to the tests in terms of time, place, and tools used in order to work as much as possible to create conditions similar to the pre-tests.

### Statistical methods

To process the results, the researcher used the statistical portfolio system (SPSS):

1. Percentage.
2. Arithmetic mean.
3. Standard deviation.
4. Correlation coefficient (Pearson).
5. T-Test.
6. 3- Presentation, analysis and discussion of the research

results

## 7. Presenting and analyzing the results of the research tests

for the (shock waves) group between the pre- and post-tests:

**Table 1:** Arithmetic means, standard deviation values, and calculated T value for the investigated tests of the (shockwaves) group.

No.	Tests	Measuring Unit	SMA	Standard Deviation	S F	A H	Calculated No. value	SIG	Meaning of differences	
1.	Flexion	Pre	Degree	117.50	8.864	31.250	8.345	10.591	0.000	Significant
		Post	Degree	148.75	3.536					
2.	Extension	Pre	Degree	26.25	7.440	17.500	4.629	10.693	0.000	Significant
		Post	Degree	43.75	5.175					
3.	Distancing	Pre	Degree	116.25	7.440	23.750	5.175	12.979	0.000	Significant
		Post	Degree	140.00	5.345					
4.	Horizontal distancing	Pre	Degree	36.25	7.440	21.250	3.536	17.000	0.000	Significant
		Post	Degree	57.50	7.071					
5.	Horizontal rounding	Pre	Degree	25.00	5.345	12.500	4.629	7.638	0.000	Significant
		Post	Degree	37.50	4.629					
6.	Rotate inward	Pre	Degree	33.75	9.161	16.250	7.440	6.177	0.000	Significant
		Post	Degree	50.00	5.345					
7.	Rotate outward	Pre	Degree	43.75	10.607	21.250	6.944	8.656	0.000	Significant
		Post	Degree	65.00	8.864					
8.	Degree of pain	Pre	Degree	8.67	0.816	5.000	0.894	13.693	0.000	Significant
		Post	Degree	3.67	0.516					

Significant at the level of significance  $< (0,05)$  at the degree of freedom  $(n-1) = 7$ 

By reviewing the results of tables (1), we notice the significance of the differences between the pre- and post-tests of the research group for the variables of range of motion and the degree of pain for the shock wave results. We see that the proportions of the arithmetic mean levels were significant compared to the pre-arithmetic mean. We also notice that the group's arithmetic mean is higher than all the arithmetic means, and is attributed The researcher concluded that the use of shock waves has a high and beneficial effect, as these waves work to produce air vibrations at the speed of sound. These vibrations work to activate cells, dissolve and break down calcified tissues as a result of injury to the shoulder, and work to promote the production of collagen, the basic protein, which is the most important element in building connective tissues, as mentioned: (Texas, 2022) <sup>[12]</sup>. It is consistent with the recommendations of the medical committee of the hospitals from which the injured and the reviewers were transferred to the medical center. The researcher was concerned with determining the appropriate time, which ranged between (2-5 d), which is the appropriate period for the severity of the researched injury, and worked to ensure how much the shockwave nozzle was directed at an appropriate distance And in the right direction to the affected tissue. This is according to the medical reports and the X-rays attached to them, because these waves have a specific range and fixed direction" (Khalil, 2004, p. 202) <sup>[16]</sup> "Increasing the range of motion means an improvement in the elasticity of the muscles and ligaments surrounding the joint, as well as an improvement in the neuromuscular work in controlling the work of the responsible sensors." About providing sensory information to the brain to this extent" (Ill, 2009, p. 185) <sup>[10]</sup>, and here we note that the exercises suggested by the researcher helped to rehabilitate the injury to a greater extent than the other groups, as we mentioned, because they had a direct focus on the work of the shoulder joint and its basic movements. These suggested exercises complement the device's work. And this was confirmed by (Abbas Hussein) "The performance of rehabilitative exercises improves blood circulation, which increases the blood that reaches the organs and the locomotor system on a regular basis, and this helps to increase the food that reaches them to compensate for the deficiency caused by the injury, and this in turn will compensate for what was damaged from the injured tissue." "

(Hussein, 2013, p. 250) <sup>[5]</sup>.

The greatest efficiency was for the shock waves used with exercises that focused on load and rest within the rehabilitation unit in which the correct method was followed through scientific foundations and modern sources of rehabilitation processes used in specialized rehabilitation centers. These exercises were applied with the proposed curriculum on the device and outside the device within a short period. Which falls under the definition, and here the focus of the researcher was through the work of the device and the working team helping to apply the exercises inside and outside the device with the smallest details so that there would not be any defect during the scheduled rehabilitation period. The focus was on two points: improving the range of motion of the shoulder joint, and this was confirmed by "the rehabilitation program has an effective and positive effect in increasing the muscle circumference of the affected limb, which means increasing the strength of the muscle groups that contribute to increasing the functional efficiency of the joint and returning it to its closest natural state." (Muhammad, 2000, p. 116) <sup>[17]</sup>. The researcher deliberately began the rehabilitation exercises shortly after they were allowed by the specialist doctor to perform rehabilitation on those injured by identifying the simple shoulder joint. The purpose of this is to recognize the injury so that it does not become more severe, meaning that as time passes, the injury becomes more severe than the one that follows it. That is, if it is simple, it becomes medium, as well as to the total determination of the joint. This in itself is a race against time to rehabilitate the injured person as quickly as possible so that the matter does not get worse over time, as working to move the joint and performing rehabilitation on it restores activity to the working muscles. Likewise, by movement, the calcifications that have appeared on the joint can be removed through the accumulation of fluids as a result of the injury inside. The joint and thus the work and movement of the joint are determined as a result. Working to move the joint works to break down these existing calcifications and break them down through metabolic processes and the elimination of waste in the body. This is what the researcher worked on through the basic movements of the joint that were applied to the device in different directions, and the purpose of them was to break up those calcifications and create a natural space, or the natural

distance, between the two bones of the joint and to strengthen the muscles working on it to support it and work to move it.

### Conclusions and recommendations

#### Conclusions

In light of the research results, the researcher reached the following conclusions:

1. An improvement in the condition of determining the simple shoulder joint in the research sample between the pre and posttest in the experimental groups.
2. The shockwaves had a positive impact on improving the range of motion of the experimental research sample. 3- The exercises used have reduced the level of pain in people with frozen shoulder. 4-2 Recommendations: In light of the conclusions reached, the researcher recommends the following recommendations: 1- Adopting the shock wave device and the exercises used with it to improve an injury affecting the simple shoulder joint due to the good results shown in improving the injury.
3. Emphasis on paying attention to the health awareness of injuries among athletes and how to remedy matters when an injury occurs so that the size of the collateral damage does not double.
4. Adding cultural brochures related to frozen shoulder injury and some common injuries among individuals in all colleges and state departments to spread health awareness.
5. Conducting studies on frozen shoulder injuries and shockwaves.

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#### Annex 1

Exercises	Exercise time	Repetitions	Rest between repetitions	Totals	Rest between groups	Remarks
Exercise (1)	30 seconds	4 repetitions	30 seconds	2	1 minute	The feeling of pain is moderate
Exercise (2)	30 seconds	4 repetitions	30 seconds	2	1 minute	The feeling of pain is moderate
Exercise (3)	30 seconds	4 repetitions	30 seconds	2	1 minute	The feeling of pain is moderate