Original Article

Effective Of Continuous Therapeutic Ultrasound Combined With Exercises For Rotator Cuff Diseases

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Abstract

Objective: Evaluate an effective of continuous therapeutic ultrasound for Rotator Cuff diseases.

Study Design: It is a case control study design was conducted.

The setting and time of the study: This study was carried out among patients in Erbil city/ Kurdistan Region/ Iraq, in Rezgary Hospital and clinical center of Physiotherapy. During six months from February 2022 to Julay2022.

Participants: thesis is an observational study in 90 people between the ages of 18 and 50 years.

Interventions & Main Outcome Measures: The participants are divided into two groups: 45 patients who underwent ultrasound and exercises, 45 patients who underwent exercises without ultrasound, while experimental research and ultrasound therapy are applied at Rizgari Teaching Hospital and Sardam privet Hospital.

Result: The clinical effect of the ultrasound therapy with exercises was applied between-group differences at each time intervention separately, and no statistically significant differences were highlighted between group A and B at before providing therapies. Similarly, both groups showed identical effect after first follow-up and hence resulted to non-statistically significant difference, turning to after the second follow-up, there was highly significant difference which led us to report that group A and B had different impact in reducing the pain and we can point out that A had better performance in reducing the pain.

Conclusion: Rehabilitation exercises may reduce disability rates by improving muscle strength increase blood flow increases modality of muscle and function while reduce the pain of patients with rotator cuff disease.

Keywords: rotator cuff disease, therapeutic ultrasound, shoulder rehabilitation

Introduction:

The most frequent cause of shoulder pain, particularly in middle-aged and older people, is rotator cuff disease. In 74 percent of cases of shoulder pain, it is the underlying reason, making it the most frequently diagnosed cause of shoulder dysfunction. The tendons that make up the rotator cuff get weaker with aging. cuff experience ongoing degenerative

changes that can cause the tendons to partially or completely rupture, causing the rotator cuff to become painful, weak, and dysfunctional. stiffness in the scapular muscles, the soft tissues, and postural abnormalities(Haahr, Østergaard et al. 2005, Krischak, Gebhard et al. 2013, Kim, Kang et al. 2015)

Conservative therapy may be effective in treating rotator cuff disease, although this depends on the patient's gender, the amount of the tear, and the severity of the condition Atrophy. The goals of conservative care include pain reduction, increased range of motion (ROM), and improved scapulothoracic rhythm and function. Along with functional rehabilitation, manual therapy, and physiotherapy modalities like therapeutic ultrasound (US), which is used to promote healing and regeneration in inflamed tissue, lessen pain and muscle spasms, and improve ROM1\ conservative management also includes patient education. NSAIDs, analgesics, and injections are also used. The use of US, however, does not considerably help shoulder issues, according to certain studies(Gursel, Ulus et al. 2004, Celik, ATALAR et al. 2009, Calis, Berberoglu et al. 2011).

Materials and methods:

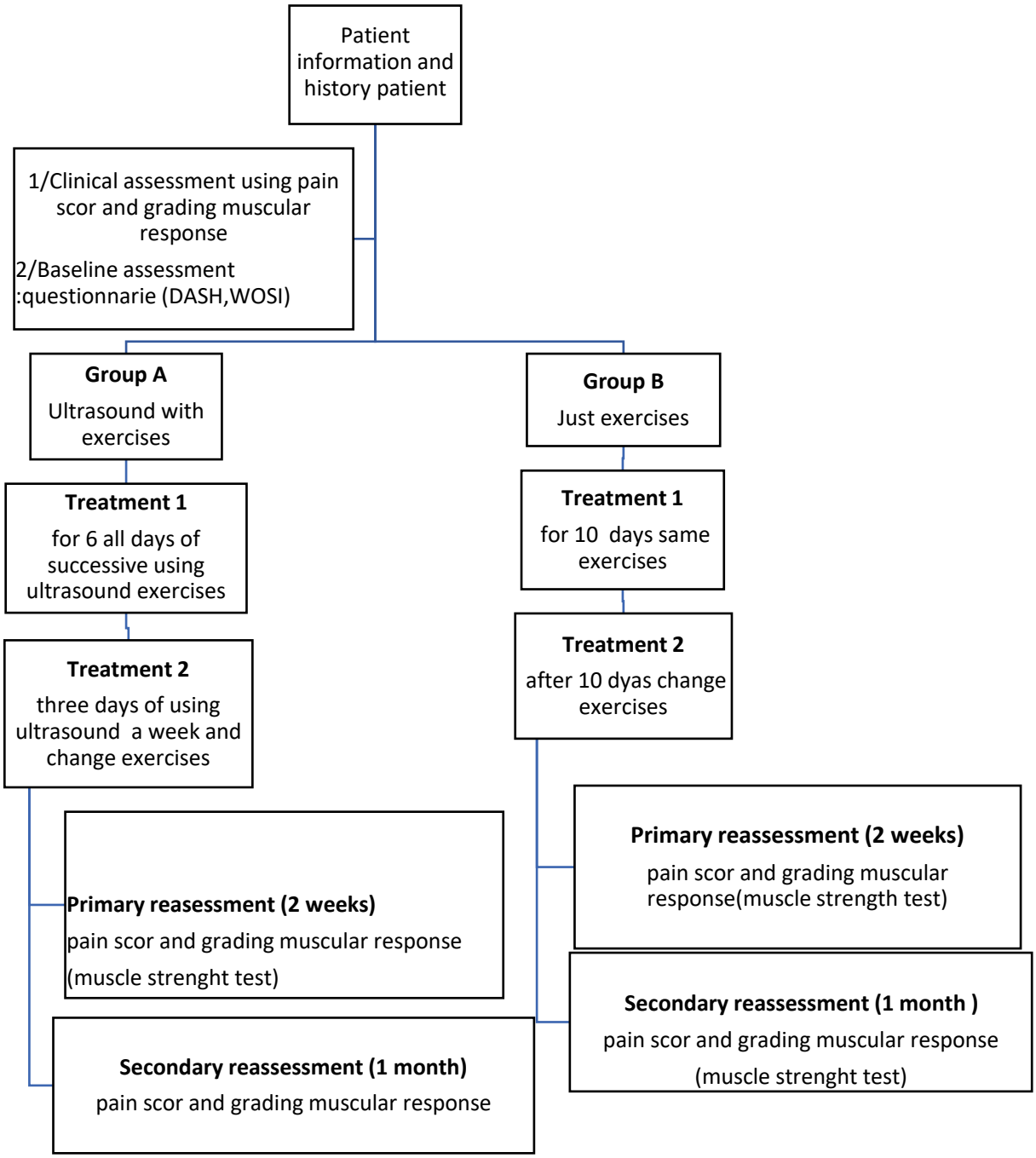
thesis is an observational study in 90 people between the ages of 18 and 50 years.The participants are divided into two groups: group A 45 patients who underwent ultrasound and exercises, group B 45 patients who underwent exercises without ultrasound, while experimental research and ultrasound therapy are applied at Rizgari Teaching Hospital and Sardam.privet Hospital, Among patients with shoulder pain who visited the outpatient clinic of (in a hospital or private center) on February 2022 those who met the following criteria ,were include in this study firstly ,I record the history of the patient ,secondary ,I asked the patient pain score on the visual analog scale (1 to 10). finally, a performed the muscle strength test or grading muscular response for the patient show (figure 1).finally their wounds and ulcers were examined. In case of any discrepancies, the patient was asked about her pregnancy and the pacemaker .... instructing her on the purpose of the ultrasound and the process that will be used. I made sure he understood that he should feel a slight sensation of warmth, but without stinging or burning. She examined the shoulder for any signs of trauma or acute inflammation, as well as any lotions or ointments that might have been used. It applies a small amount of tightness to the areas where it was applied. I placed a little stretch over the deltoid muscle, followed by a slight painless lateral bend to the left. Then I put the gel on the hairy head. As the treatment progressed, In our research set the device on a single actuator (two to four times in an ERA), asked them for continuous feedback from the patient, and applied some additional stretching. I then repeated the 8-min treatment at the next trigger point and trigger point, using 1 MHz continuous US at 1 to 1.5 W/cm2 above the trigger point.

Inclusion criteria

The following were the inclusion criteria for the study: the presence of unilateral shoulder pain and limited range of motion for the acute stage prior to the study, normal passive shoulder movement, a diagnosis of rotator cuff disease by magnetic resonance imaging (MRI), and the absence of any physiotherapy for the shoulder during the acute stage prior to the study. In addition, people who were interested in participating in the study needed to have at least two of the following positive impingement signs: positive results in the Speed, Neer, or Hawkins tests or the drop arm, lift-off, or supraspinatus isolation tests; a shoulder that was resistant and painful during internal and external rotation (IR and ER); or pain during the abduction of the shoulder with a painful arch. Patients who were continually referred to the study and who satisfied these criteria were given information regarding the specifics of the investigation.

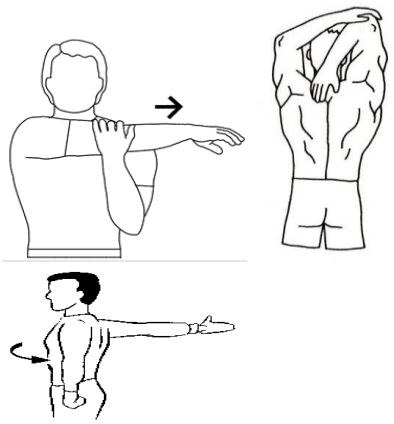
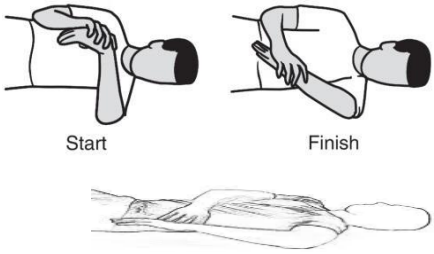
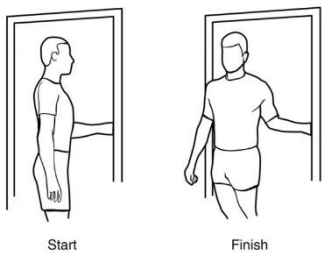
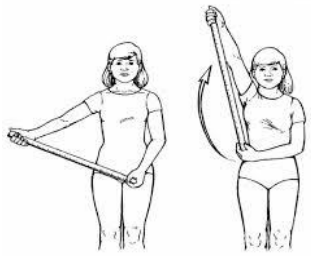
Exclusion criteria

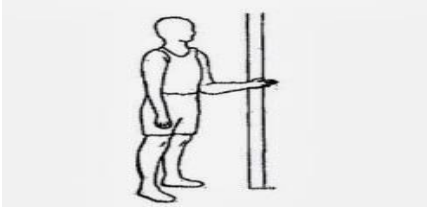
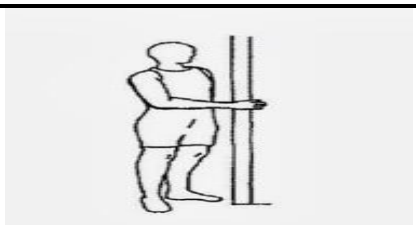
Patients were not allowed to participate in the study if they exhibited any of the following characteristics: a history of acute trauma, surgery, or a fracture to or in the vicinity of the shoulders; a limitation of range of motion (ROM) in the upper extremities; a neurological deficit in the upper extremities; an underlying inflammatory rheumatic disease; or signs of cervical pathologies that might be associated with shoulder pain.



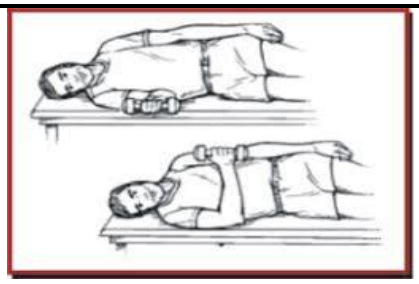
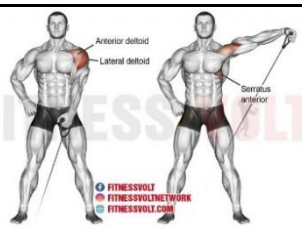
Figures 1/ show patient assessment

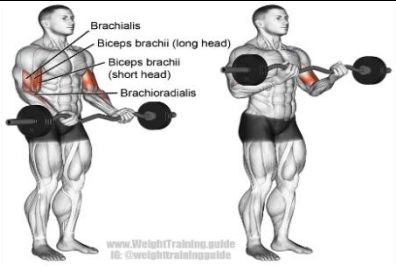
Session first

Aim exercises	Photo	Dose
Benefit of the pendulum exercise is that it is passive. This means that there is very little contraction of the muscles surrounding the shoulder.		1 set for 3 minutes continuous
Bicep stretches These stretches can increase flexibility and range of motion, allowing you to move deeper and further with greater ease. Plus, they help to relieve muscle tightness and tension, which is beneficial in preventing injury and improving performance.		2 set repetitions with 30 second hold and 5 second rest
Increases range of motion		4 set repetitions with 30 second hold and 5 second rest
These stretches can increase flexibility and range of motion, allowing you to move deeper and further with greater ease. Plus, they help to relieve muscle tightness and tension, which is beneficial in preventing injury and improving performance		2 set repetitions with 30 second hold and 5 second rest
Strength exercises for strength abduction and flextion muscle of shoulder		4 set of 12 repetition with 5-10 second rest in between sets

Rotator cuff strengthening improve strength of shoulder muscle (rotator cuff) External rotation contractions with optimal scapular posture		4 set repetitions with 10 second isometric hold and 5 second rest
		4 set repetitions with 10 second isometric hold and 5 second rest

Session second

Aim exercises	Photo	Dose
Rotator cuff strengthening improve strength of shoulder muscle (rotator cuff) External rotation contractions with optimal scapular posture		4 set of 12 repetition with 5-10 second rest in between sets
Rotator cuff strengthening improve strength of shoulder muscle (rotator cuff) Internal rotation contractions with optimal scapular posture		4 set of 12 repetition with 5-10 second rest in between sets
Increases flextion muscle of shoulder		4 set of 12 repetition with 5-10 second rest in between sets
Increases abduction muscle of shoulder		4 set of 12 repetition with 5-10 second rest in between sets

Biceps muscle strengthening		4 set of 12 repetition with 5-10 second rest in between sets

Result:

To begin with, an extensive set of descriptive statistics is used to help us understand the patterns, significant differences, and nature of the dataset. Descriptive statistics are an important stage in any study that begins with interpreting the nature of the data. However, not all aspects of the data are accessible.

To identify factors associated with should pain, it was necessary to find out the participants occupations and almost half of them (48%) were housewife. The second highest percentage was for workers with 24%, followed by 19% whose occupations was employee. In addition, a few volunteers in the present study were still students with 7% and only 2% was retired.

Since the participant of this study were all somewhat suffering from shoulder pain at certain level, and based on the below Table, age was found to be quite effective and elderly people seemed to face difficulties with moving their shoulders. Thus, the outcome shows that 62.2% of the patient registered with pain in their shoulders were in age greater than 41 years old. 23.3% of patients were aged from 31 to 40 years old. Only 2.2% of them were below 20 years old. This can be highlighted that elderly people are more likely to suffer from pain shoulder. Left or right site was also indicated to identify which site of the should is more likely to be impairment or get pain table 1.

Table 1: Age group frequency demonstration

Class	Frequency	Percent
<= 20.00	2	2.2%
21.00 - 30.00	11	12.2%
31.00 - 40.00	21	23.3%
41.00 - 50.00	54	60.0%
51.00+	2	2.2%
Total	90	100.0%

According to the study's objectives, it was important to highlight the patient's sides in order to find any potential patterns, 56% were from right side whereas 44% were from left side.

Level of severity was also point of concern and as demonstrated in (Figure 1), it can be noticed that sever pain was reported the highest percentage by 61% of the patients, then people with moderate pain level pointed by 23%. Only 12%, however, said that they had pain.

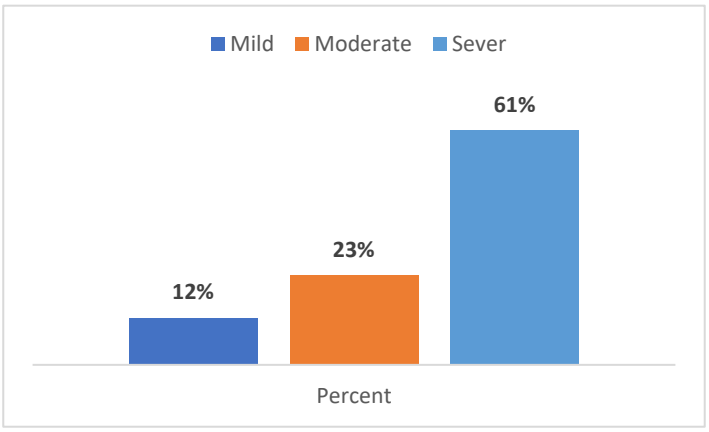


Figure 1: Measure of severity of pain exploration of patients

1. Pain Score

Table 2 shows pain scores in three different timelines (before, first follow-up and second follow-up) for both methods of reducing the pain. Before was considered as baseline where the curing methods was not processed, and the pain after putting through exercise (A) and using device (B) were measured twice to see if there is any improvement in reducing the pains on their shoulders. Once can notice that mean values for both groups before processing any cures were considerably high as for group A it was 9.159, then decreased greatly to 5.477 after the first check-up and then even dropped more to 1.818 and the standard deviation was also declined to 0.620.

Similarly, the same argument can apply to group B and their pains seemed to be reduced reasonably after the treatment based on the below findings. It was high just like patients from group A before healing process with mean value 8.761 units, followed by 6.087 and then fell to 3.043 with great standard deviation cutting down as well.

It was worth looking at their differences to see if the cure was effective and since the same individuals were measured three times and data type was ordinal level 1 - 10, and violated normality test based on Table 5. We, therefore, used non-parametric repeated measured test Friedman to determine whether there were statistically significant differences in shoulder pain over the course of three-time interventions for each group, and Wilcoxon Signed Ranks Test for multiple comparison.

Table 2: Normality and non-parametric repeated measurement test

Groups		Pain Score Variable	Shapiro-Wilk		Friedman Test
	Mean± SD		Statistic	Sig.	Chi-square (P-value)
A	9.159 ±1.397	Before	0.669	0.000	88.000 (0.000)
	5.477±1.422	First Follow-up	0.937	0.019	
	1.818±0.620	Second Follow-up	0.771	0.000	
B	8.761±1.433	Before	0.724	0.000	92.000 (0.000)
	6.087±1.262	First Follow-up	0.894	0.001	
	3.043±1.192	Second Follow-up	0.895	0.001	

The exercise intervention elicited statistically significant changes in pain score concentration over time, $p < .001$. Post-hoc analysis with revealed that shoulder pain concentration was statistically significantly decreased from pre-

intervention to first follow-up months, p-value < .001, and from pre-intervention to the second follow-up, p-value < .001 and also from first to the second follow-up intervention, p-value < .001.

P-value = 0.000, found that the device usage intervention resulted in statistically significant changes in pain score concentration over time. Pairwise comparison analysis between the time revealed that shoulder pain concentration decreased statistically significantly from pre-intervention to first follow-up months (Mean rank difference = -6.050 units, p-value < 0.001), as well as from pre-intervention to second follow-up (Mean rank difference = -5.972 units, p-value < 0.001) and from first to second follow-up intervention (Mean rank difference = -6.065 units, p-value < 0.001).

2. Muscle Strengthen

Muscle strengthen was another side of consideration and Table 3 shows the descriptive statistics of all measurement relevant to the side of this study. As seen below, the mean values of ABDU and ADD measurements were considerably affected with treating them by A treatment with (3.114 and 3.523) at before getting benefit from the cure and then became (4.136 and 4.409) after the first follow up, they even added up to ceiling of our limit with exactly 5 in the second time of scoring ABDU and ADD scales. This means that all participant provided with 5 after the second follow up. These figures, however, changed slightly in group B from (2.783 and 3.609) to (3.609 and 4.239) in the first follow up, and then reached up to (4.457 and 4.739) in the second follow-up. Additionally, it is worth mentioning that the mean values of each of the variable FLEX, EXTE, MEDAIL and LATRAL has changed effectively over time upon receiving A treatment, where before starting the procedure, their mean values were (3.455, 3.386, 3.159 and 3.477) and then altered to 4.977 all at once after checking up the patients in the second follow-up. The mean values were also changed for patients who went through B treatment but with fewer noticed changes.

Table 3: Mean and standard deviation of muscle scores over time for each group

Measurements	Groups	Before		First Follow-up		Second Follow-up		Friedman Test
		Mean	SD	Mean	SD	Mean	SD	Chi-square (P-value)
ADBU	A	3.114	0.722	4.136	0.632	5.000	0.000	79.274 (0.000)
	B	2.783	0.758	3.609	0.829	4.457	0.657	81.000 (0.000)
ADD	A	3.523	0.664	4.409	0.497	5.000	0.000	73.500 (0.000)
	B	3.609	0.745	4.239	0.705	4.739	0.444	52.667 (0.000)
FLEX	A	3.455	0.627	4.364	0.487	4.977	0.151	75.459 (0.000)
	B	3.478	0.505	4.239	0.673	4.739	0.444	75.459 (0.000)
EXTE	A	3.386	0.813	4.318	0.561	4.977	0.151	72.769 (0.000)
	B	2.913	0.755	3.804	0.749	4.522	0.658	78.739 (0.000)
MEDAIL	A	3.159	0.776	4.205	0.553	4.977	0.151	77.294 (0.000)
	B	2.804	0.778	3.783	0.814	4.478	0.658	80.938 (0.000)
LATRAL	A	3.477	0.762	4.386	0.538	4.977	0.151	70.806 (0.000)
	B	3.478	0.505	4.152	0.729	4.674	0.519	71.676 (0.000)

Like pain investigation, for muscle strengthen comparison test was applied and again non-parametric test was used. As displayed from Table 4, all of measurements related to muscle strengthen side were found to be statistically significant for both curing methods A and B due to producing small p-value with 0.000 < 0.05 for all. This can be reported that the treatments had indeed impact on increasing the strengthen of the patients who participated in this study. However, yet not known where exactly the significant difference and for this pairwise test was put in place as per Table 9 below. It can be concluded high significant mean differences were identified among the stages, which means that the strength of their muscles was improved after processing the patients under treatment A and B. This argument was true for all measurements considered for muscle strengthen.

Table 4: Pairwise comparison test result for time intervention in each group separately

Measurements	Group	Test	Before - After 1st Follow-up	Before - After 2nd Follow-up	After 1st Follow-up - After 2nd Follow-up
Abdu	A	Wilcoxon Test	-6.150	-5.844	-5.291
		P-Value	0.000	0.000	0.000
	B	Wilcoxon Test	-5.708	-6.050	-5.652
		P-Value	0.000	0.000	0.000
Add	A	Wilcoxon Test	-6.091	-5.719	-5.099
		P-Value	0.000	0.000	0.000
	B	Wilcoxon Test	-5.209	-5.579	-4.796
		P-Value	0.000	0.000	0.000
Flex	A	Wilcoxon Test	-6.172	-5.795	-5.196
		P-Value	0.000	0.000	0.000
	B	Wilcoxon Test	-5.916	-6.132	-4.796
		P-Value	0.000	0.000	0.000
Exte	A	Wilcoxon Test	-5.962	-5.603	-5.038
		P-Value	0.000	0.000	0.000
	B	Wilcoxon Test	-5.687	-5.971	-5.416
		P-Value	0.000	0.000	0.000
Medail	A	Wilcoxon Test	-5.973	-5.749	-5.353
		P-Value	0.000	0.000	0.000
	B	Wilcoxon Test	-5.891	-6.037	-5.166
		P-Value	0.000	0.000	0.000
Latral	A	Wilcoxon Test	-5.738	-5.615	-4.914
		P-Value	0.000	0.000	0.000
	B	Wilcoxon Test	-5.568	-6.108	-4.707
		P-Value	0.000	0.000	0.000

Likewise, in order to find patterns between the two considered approaches at each stage, Table 5 describes the differences and as per the results, no statistically significant differences were appeared among the two proposed methods to increase the strength of muscles. Therefore, both methods had similar effect on increasing the muscle strengthen.

Table 5: Non-parametric paired test between both groups at each time intervention

Time	Test Statistics	ADBU	ADD	FLEX	EXTE	MEDAIL	LATRAL
Before	Mann-Whitney U	1000.000	903.500	893.500	790.500	925.000	878.500
	P-Value	0.916	0.325	0.271	0.054	0.449	0.225
After 1st Follow-up	Mann-Whitney U	951.000	901.000	977.500	876.500	970.500	892.000

	P-Value	0.595	0.314	0.751	0.228	0.711	0.282
After 2nd Follow-up	Mann-Whitney U	958.000	961.000	938.000	981.000	1001.000	986.000
	P-Value	0.554	0.484	0.327	0.725	0.904	0.745

Discussion

Our study was aimed to determine the effectiveness of two types of ultrasound therapy including continues combined with exercises for treatments of rotator cuff. Prevalence of RCTs have been found to increase in with age in previous published by (Nové-Josserand, Walch et al. 2005) According to Motta et al., (2014), 30% to 50% of the population over the age of 50 suffer from rotator cuff disease. In our study, the outcome shows that 62.2% of the patient registered with pain in their shoulders were in age greater than 41 years old. 23.3% of patients were aged from 31 to 40 years old. Only 2.2% of them were below 20 years old.

According to the study's objectives, it was important to highlight the patient's sides in order to find any potential patterns and as seen from Figure 2, 56% were from right side whereas 44% were from left side.

The findings of this current study are in keeping with other similar studies, research by (Eslamian, Shakouri et al. 2012)found that 50 patients with rotator cuff tendinitis participated in the study. There were 25 patients in the experimental group and 25 patients in the control group (nine males and 16 females). There were 50.1612.10 (25–68) in the experimental group and 50.211.72 (25–75) in the control group as the mean ages. They ranged in age from 50 to 60 years old, on average. According to Table 1 (p=0.093, p=0.83), there were no significant differences in gender or age between the 2 groups. Some 30 patients had right-side involvement, while 20 had left-side involvement, which was 60% of the total number of patients studied. Patients' preference for the right or left shoulder was not statistically significant (p=0.157).

The current study found that the device usage intervention resulted in statistically significant changes in pain score concentration over time. Pairwise comparison analysis between the time revealed that shoulder pain concentration decreased statistically significantly from pre-intervention to first follow-up months (Mean rank difference = -6.050 units, p-value < 0.001), as well as from pre-intervention to second follow-up (Mean rank difference = -5.972 units, p-value < 0.001) and from first to second follow-up intervention (Mean rank difference = -6.065 units, p-value < 0.001).

In their research, (Page, Green et al. 2016)ultrasound treatment reduced pain better than a placebo. At six weeks, the pain reduction score was 8.60 points higher (with a range of 3.72 to 13.48 points higher) (17 percent absolute improvement). People who received ultrasound reported a reduction in pain of 14.9 points, while those who received placebo reported a reduction of 6.3 points.

including those by(Abdulla, Southerst et al. 2015), suggest that exercise may be an effective treatment for patients with shoulder pain found that conclusive evidence regarding which specific types of exercise, including intensity, duration and frequency, is lacking. Even though concentric and eccentric loading programs have been widely compared, the results are still equivocal, as (Hanratty, McVeigh et al. 2012)pointed out in their respective studies(Rio, Kidgell et al. 2015). There is some evidence that lower limb tendinopathy is beneficial, as stated, but very little study has been done on rotator cuff tendinopathy.

Conclusion

According to the results of our research, physiotherapy modalities and exercises may reduce disability rates by improving muscle strength increase blood flow increases modality of muscle and function while reduce the pain of patients with rotator cuff disease.

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