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High intensity laser therapy versus radial shock wave therapy in treatment of shoulder impingement syndrome

Terapia laserowa o wysokiej intensywności w porównaniu z terapią falą uderzeniową w leczeniu zespołu ciasnoty podbarkowej

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Abstract

Background. Shoulder pain is very common problem in medical practice, ranked third after lower back and neck issues. Shoulder impingement syndrome is thought to be the most common reason for shoulder pain. It accounts for around 44% to 65% of all shoulder problems. Purpose. to compare between the effects of High Intensity Laser Therapy versus Radial Shock Wave Therapy in treatment of shoulder impingement syndrome. Methods. 45 patients were randomly enrolled into three equal groups. Group A (n = 15) received HILT plus conventional physical therapy program, Group B (n = 15) received RSWT plus the same conventional physical therapy program, and Group C (n = 15) received a conventional physical therapy program. The assessment were conducted pre and post treatment using the Visual Analogue Scale, Shoulder pain and disability index and electro goniometer to active shoulder flexion and abduction range of motion. Results. MANOVA test demonstrated a significant ($P < 0.05$) decrease in VAS and SPADI and a significant ($P < 0.05$) increase in shoulder flexion and abduction ROM in the three groups. VAS, SPADI, shoulder flexion, abduction ROM revealed that there was more improvement in-group A ($P < 0.05$). Conclusion: HILT showed a superior effect compared with RSWT on pain, function and shoulder flexion and abduction ROM in treatment of SIS.

Keywords

high-intensity laser therapy, radial shockwave therapy, shoulder impingement syndrome

Streszczenie

Tło. Ból ramienia jest bardzo powszechnym problemem w praktyce medycznej, zajmując trzecie miejsce po problemach z dolną częścią pleców i szyją. Uważa się, że zespół ciasnoty podbarkowej (SIS) jest najczęstszą przyczyną bólu ramienia, stanowiąc około 44% do 65% wszystkich problemów z tym obszarem. Cel. Porównanie efektów Terapii Laserowej o Wysokiej Intensywności (HILT) oraz Terapii Falą Uderzeniową (RSWT) w leczeniu zespołu ciasnoty podbarkowej (SIS). Metody. 45 pacjentów zostało losowo przydzielonych do trzech równych grup. Grupa A (n = 15) otrzymała HILT wraz z konwencjonalnym programem fizjoterapii, Grupa B (n = 15) otrzymała RSWT wraz z tym samym programem fizjoterapii, a Grupa C (n = 15) otrzymała tylko konwencjonalny program fizjoterapii. Oceny przeprowadzono przed i po leczeniu, używając Skali Wizualno-Analogowej (VAS), Indeksu Bólu i Niepełnosprawności Barku (SPADI) oraz elektrogoniometru do mierzenia zakresu ruchu zginania i odwodzenia ramienia. Wyniki. Test MANOVA wykazał istotne ($P < 0.05$) zmniejszenie VAS i SPADI oraz istotne ($P < 0.05$) zwiększenie zakresu ruchu zginania i odwodzenia ramienia we wszystkich trzech grupach. Porównania międzygrupowe wykazały, że grupa A osiągnęła znaczniejszą poprawę ($P < 0.05$). Wnioski: HILT wykazała wyższą skuteczność w porównaniu z RSWT pod względem redukcji bólu, poprawy funkcji oraz zwiększenia zakresu ruchu zginania i odwodzenia ramienia w leczeniu zespołu ciasnoty podbarkowej (SIS).

Słowa kluczowe

terapia laserowa o wysokiej intensywności, terapia falą uderzeniową, zespół ciasnoty podbarkowej (SIS)

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Introduction

Shoulder impingement syndrome (SIS) happens when there is decreased space between two bones (the acromion and the humeral head) in the shoulder complex [1]. As a result, some of the parts in this area get squeezed, which causes pain and makes it harder to move [2]. Squeezed structures in the shoulder might be the supraspinatus tendon, subacromial bursa, or bicipital tendon getting trapped when they move between different parts of the shoulder [3]. This happens when the shoulder is used too much when the arm is raised above the head and also when the muscles that keep the shoulder stable are not strong enough [4].

It has been reported that high intensity laser therapy (HILT) rapidly reduces pain and inflammation. Its pain resolution effect is provided by decreased pain stimuli and increased morphine-mimetic elements. Additionally, it has also been reported that HILT can induce photochemical and photothermal effects that increase blood flow, cell metabolism and vascular permeability. Furthermore, HILT is suggested to enhance mitochondrial oxidative reaction and increase production of adenosine triphosphate (photobiology effect) [5].

On the other hand, extracorporeal shockwave therapy (ESWT) is commonly used to treat problems with muscles and bones. Some examples include tennis elbow, foot pain, heel pain, and calcific rotator cuff tendinopathies [6]. ESWT has positive effects on the body by using mechanical stimulation, which helps increase the production of certain substances that promote growth, and also improves the flow of blood in a specific area [7, 8, 9]. Also ESWT reduces pain by stopping the activation of the serotonergic system and the nerves in the affected area [10].

Previous studies show that HILT improved pain, disability, and shoulder range of motion in patients with SIS at short term even post one treatment session (Chen et al., 2020) [11], compared to low level laser therapy (LLLT) (Roadman et al., 2023)[12], or compared to placebo control group (Yılmaz et al., 2022) [13]. Likewise, application of ESWT with conventional physical therapy in treating shoulder impingement has been reported to improve pain and disability better than conventional physical therapy alone or with corticosteroid injection (ElGendy et al., 2023) [14], Also in comparison with LLLT in terms of shoulder function and quality of sleeping (Badıl Güloğlu, 2021) [15]. However, it remains unclear which would be better in managing SIS, whether HILT or RSWT. Therefore, this study has been conducted to compare the effect of HILT versus RSWT on pain, function, and shoulder flexion, abduction ROM in patients with SIS.

Material and methods

This study was conducted in Faculty of Physical Therapy, Deraya University, Miniya, Egypt, from September 2022 to April 2023 to compare between the effects of HILT versus RSWT on pain, function, flexion and abduction ROM in treatment of SIS.

Design of the study

This study was a fair test where participants were randomly assigned to different groups in order to compare different treatments.Before starting the study; author's got permission from the Research Ethical Committee, Faculty of Physical Therapy, Cairo University, Egypt (P.T.REC/012/003470).

Sample size calculation

The sample size for this study was calculated using the G*power program 3.1.9 (G power program version 3.1, Heinrich-Heine-University, Düsseldorf, Germany) for one tailed test. Sample size calculation based on F tests (MANOVA: Special effects and interactions), $\alpha = 0.05$, power = 0.80, and effect size f2 (V) = 0.186 with three independent groups comparison for 4 major dependent variable outcomes. The study needed at least 45 patients (15 patients in each group) to get accurate results.

Randomization

Patients were divided into three different groups (A, B, and C) by randomly selecting from sealed envelopes with computer-generated index cards. This was done using the SPSS software. Every patient in the study signed a form saying they agreed to take part and could choose to leave at any time during the study.

Patients

Forty-five patients were chosen from faculty of Physical Therapy, Deraya University (Miniya, Egypt). Their ages were between 30 and 45 years old. Patients were diagnosed clinically and radiologically as stage 2 unilateral SIS at least for four weeks [16, 17]. Patients had positive clinical signs on at least 2 of the following tests: empty can test, Hawkins sign, and as Neer's sign [18]. Shoulder pain increased with overhead-throwing activity [19]. Patients had decrease with shoulder flexion and abduction ROM [20] and restriction of passive Rom of affected shoulder less than 30% compared with non-affected [10]. Four patients were not included from the study, as they did not meet the inclusive criteria.

Patients with certain medical conditions were not included in the study. These conditions include neck problems, rheumatic disorders, arthritis in the shoulder joint, calcium build-up, thyroid disease, heart problems and previous neurological disorders [17]. In addition, if the patients had done physical therapy, steroids injection within 6 months before the study, or had shoulder surgery [16, 17, 20], if they had significant muscle loss in their shoulder, or if they had been treated with platelet-rich plasma or stem cell injections in the affected shoulder within the last 3 months, or if they currently have cancer or had cancer in the past 5 years [20].

Interviewed patients were given a clear explanation of the study aims and procedures. They were requested to sign a consent form. One patient was excluded from this study because he refused to participate during the interview. Included patients were randomly assigned into three different groups. Group A: (n = 15) received HILT twice a week in addition to a conventional physical program. Group B: (n = 15) received RSWT one time per week plus the same conventional physical therapy program. Group C: (n = 15) received only conventional physical therapy program three times per week. All groups received conventional program 3 times per week. Treatment was done for six weeks (Fig.1).

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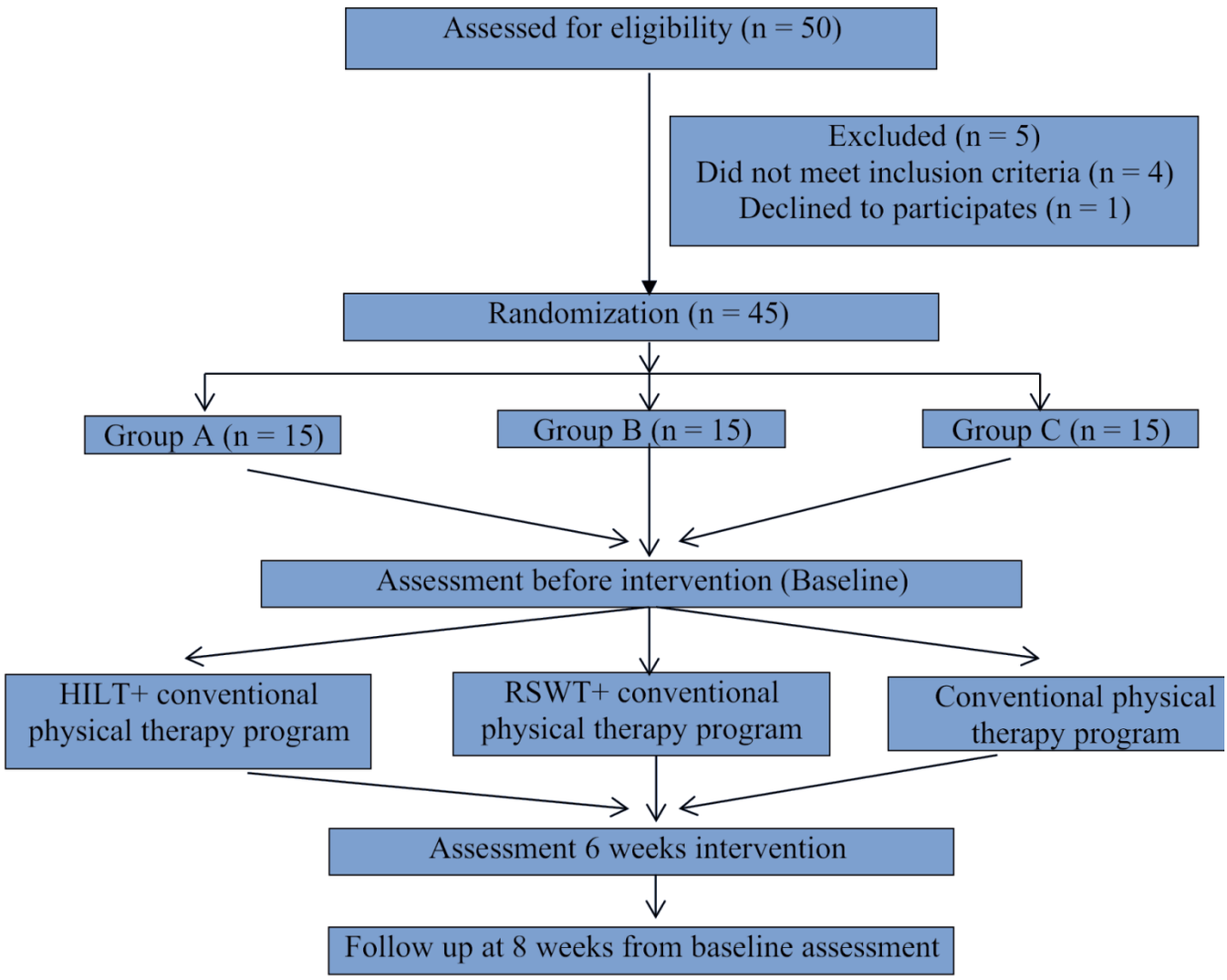

Figure 1. Flow chart of study participants

Procedures

Assessment procedure

During initial interview, demographic data were recorded and baseline assessment was conducted to assess pain intensity using Visual analogue scale (VAS) and to evaluate shoulder pain and disability using shoulder pain and disability index (SPADI) [21]. Then active shoulder flexion and abduction ROM was measured using electro goniometer in a supine position.The electro goniometer was centered at the acromion for abduction and greater tuberosity for flexion [15].

Post treatment assessment after 6 weeks: same procedure.

Follow up assessment after 8 weeks: same procedure.

Treatment procedure

High Intensity Laser Therapy (HILT)

The HILT had three parts during each session. In the beginning, a quick scan of anterior and posterior joint line of the shoulder with one shot of 850 mj at frequency of 30 Hz. The scanning was performed parallel to the joint line. The patient's arm was turned inward for the posterior scan and outward for the anterior scan. In this phase, a total of 4000 J of energy was given.

The next part was a fixed scan phase, with one -shot emission of 350 mj at a frequency of 20-25 Hz. The amount of energy that was given was 4000 J. In this phase, the hand tool was put perpendicular to the shoulder joint for 5 sec.

In last part, there was a quick manual check of same spots treated in the initial phase and the deltoid area until reach a total energy dose of 2000 J.

Using all three stages of HILT takes about 15 minutes. Regular tool with a fixed spacer was used to make sure it stayed the same distance away from the skin. During the procedure, both the patient and the operator wear special goggles to protect their eyes from the laser [17].

Radial Shock Wave Therapy (RSWT)

Patient returned his hand behind his back to expose the supraspinatus tendon. Alternatively, the hand was placed in front, and the arm was turned outwards to show the subscapularis tendon. The arm was also turned inwards to reveal the infraspinatus tendon and teres minor tendon.

Each patient got (RSWT) once every week for a total of 6 sessions [22, 23]. In each session, they took 3000 shots. It began

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at 1. 0 bar in the first 200 shots. After every 200 shots, the energy level was increased until it reached a maximum level of 5. The average pressure was 4.0 bar, and the frequency was 3.2Hz. Coupling gel was used to reduce amount of shockwave energy lost between applicator head and the skin [20].

Conventional physical therapy

First, warm pack was used on the upper trapezius muscle for 15 minutes to help lessen muscle spasms. After warmed up and relaxed, a standardized exercise program was applied. The exercise program involved wand exercises (10 repetitions/ 3 times), Codman (10 repetitions/ 3times) and strengthening exercises included isometric and resistive exercises of the shoulder girdle for abduction, flexion, hyperextension and internal and external rotation. The exercises were changed based on what the patient could handle. During the period of pain, patient did isometric exercises. After the pain started to go away, the resisted exercises were added. In addition to the routine hot pack and exercise program, transcutaneous electrical nerve stimulation (TENS) in conventional mode for 20 minute was applied [16] 3 times a week for 6 weeks [24].

Statistical analysis

The statistical analysis was conducted by using statistical SPSS Package program version 25 for Windows (SPSS, Inc., Chicago, IL). Data are expressed as mean and standard deviation for patient general characteristics (age, weight, height, and BMI) and main outcome variables (VAS, SPADI, flexion, and abduction). One-way analysis of variance (ANOVA) was used to compare between 3groups for general characteristics variables. Mixed design MANOVA was used, the first independent variable (between subject factors) was the tested groups with 3 levels (A, B, and C). The second independent variable (within subject factor) was measuring periods with 3 levels (baseline, after 6-weeks, and after 8-weeks). P-value was a significant at ($P < 0.05$).

Results

Forty-Five patients with SIS were enrolled in this study. They met the inclusion and exclusion criteria. They completed baseline, post treatment and follow –up evaluation.Each group contained 15 patients.

Demographic data – there were no significant differences among 3 groups regarding on general characteristics: age, weight, height, and BMI (Table 1).

Table 1. Patient general characteristics

Variable	Group A (n = 15)	Group B (n = 15)	Group C (n = 15)	p-value
Age [year]	40.27 ± 3.65	41.60 ± 3.64	40.13 ± 4.58	0.542
Weight [kg]	75.50 ± 16.67	76.37 ± 10.06	72.43 ± 10.46	0.459
Height [cm]	162.13 ± 9.98	163.20 ± 10.19	158.90 ± 6.08	0.400
BMI [kg/cm^2]	28.72 ± 5.53	28.77 ± 3.76	28.67 ± 4.28	0.392

$P < 0.05$

Within group comparison revealed that there were significant improvement in VAS, SPADI, shoulder flexion, and abduction ROM among a baseline, after 6-weeks, and after 8-weeks follow up.

Between groups comparison showed that there was no significant difference in baseline evaluation among 3 groups. After 6-weeks and after 8 weeks, there were significant differences among groups for all outcomes (Table 2).

Statistical multiple pairwise comparison tests (before-treatment vs. after 6-weeks), and (before-treatment vs. after 8-weeks) for outcome variables VAS, SPADI, shoulder flexion, and shoulder abduction within each group showed that there were a significant decrease in VAS and SPADI after 6-weeks and 8-weeks compared to before-treatment within groups A, B, and C. The flexion and abduction ROM significantly ($P < 0.05$) increased after 6-weeks and 8- weeks compared to before-treatment within groups A, B, and C. These significant differences of VAS, SPADI, flexion, abduction ROM after 6-weeks and 8-weeks were in favor of group A over groups B and C. Likewise, group B were significantly better than group C in all outcome parameters (Table 3).

Table 2. Within and between groups comparisons for outcome variables

Variable	Item	Groups (Mean ± SD) Group A (n = 15)	Group B (n = 15)	Group C (n = 15)	p-value[2]
VAS	Before-treatment	7.80 ± 1.37	7.73 ± 1.35	7.00 ± 1.64	0.081
	After 6-weeks	2.00 ± 0.63	3.51 ± 1.37	4.67 ± 1.95	0.0001*
	After 8-weeks	1.50 ± 0.94	2.80 ± 1.01	4.40 ± 2.16	0.0001*
	P-value[1]	0.0001*	0.0001*	0.0001*	

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Variable	Item	Groups (Mean ± SD) Group A (n = 15)	Group B (n = 15)	Group C (n = 15)	p-value[2]
SPADI	Before-treatment	61.11 ± 9.08	55.10 ± 11.86	50.56 ± 15.27	0.128
	After 6-weeks	16.77 ± 8.02	15.59 ± 8.99	36.13 ± 22.07	0.001*
	After 8-weeks	14.95 ± 9.49	14.79 ± 8.83	33.78 ± 23.54	0.0001*
	P-value[1]	0.0001*	0.0001*	0.003*	
Shoulder flexion	Before-treatment	109.00 ± 21.31	115.67 ± 15.22	110.00 ± 16.03	0.608
	After 6-weeks	168.00 ± 12.07	159.67 ± 8.95	140.00 ± 32.95	0.001*
	After 8-weeks	176.00 ± 5.07	166.00 ± 10.55	142.67 ± 33.26	0.0001*
	P-value[1]	0.0001*	0.0001*	0.0001*	
Shoulder abduction	Before-treatment	98.00 ± 20.33	111.33 ± 14.07	110.67 ± 18.31	1.000
	After 6-weeks	164.67 ± 22.63	162.33 ± 14.86	130.67 ± 28.33	0.0001*
	After 8-weeks	176.00 ± 5.07	170.00 ± 6.54	140.00 ± 34.84	0.0001*
	P-value[1]	0.0001*	0.0001*	0.001*	

P < 0.05; P-value[1]: Probability value within each group; P-value[2]: probability value among groups

Table 3. Post-hoc test within group comparisons for outcome variables

Variable	Item	Before-treatment vs. After 6-weeks Group A (n = 15)	Group B (n = 15)	Group C (n = 15)	Before-treatment vs. After 8-weeks Group A (n = 15)	Group B (n = 15)	Group C (n = 15)	After 6-weeks vs. After 8-weeks Group A (n = 15)	Group B (n = 15)	Group C (n = 15)
VAS	Before treatment	7.80 ± 1.37	7.73 ± 1.35	7.00 ± 1.64	7.80 ± 1.37	7.73 ± 1.35	7.00 ± 1.64	2.00 ± 0.63	3.51 ± 1.37	4.67 ± 1.95
	After treatment	2.00 ± 0.63	3.51 ± 1.37	4.67 ± 1.95	1.50 ± 0.94	2.80 ± 1.01	4.40 ± 2.16	1.50 ± 0.94	2.80 ± 1.01	4.40 ± 2.16
	P-value[1]	0.0001*	0.0001*	0.0001*	0.0001*	0.0001*	0.0001*	0.386	0.130	1.000
SPADI	Before treatment	61.11 ± 9.08	55.10 ± 11.86	50.56 ± 15.27	61.11 ± 9.08	55.10 ± 11.86	50.56 ± 15.27	16.77 ± 8.02	15.59 ± 8.99	36.13 ± 22.07
	After treatment	16.77 ± 8.02	15.59 ± 8.99	36.13 ± 22.07	14.95 ± 9.49	14.79 ± 8.83	33.78 ± 23.54	14.95 ± 9.49	14.79 ± 8.83	33.78 ± 23.54
	P-value[1]	0.0001*	0.0001*	0.019*	0.0001*	0.0001*	0.005*	1.000	1.000	1.000
Shoulder flexion	Before treatment	109.00 ± 21.31	115.67 ± 15.22	110.00 ± 16.03	109.00 ± 21.31	115.67 ± 15.22	110.00 ± 16.03	168.00 ± 12.07	159.67 ± 8.95	140.00 ± 32.95
	After treatment	168.00 ± 12.07	159.67 ± 8.95	140.00 ± 32.95	176.00 ± 5.07	166.00 ± 10.55	142.67 ± 33.26	176.00 ± 5.07	166.00 ± 10.55	142.67 ± 33.26
	P-value[1]	0.0001*	0.0001*	0.0001*	0.0001*	0.0001*	0.0001*	0.806	1.000	1.000
Shoulder abduction	Before treatment	98.00 ± 20.33	111.33 ± 14.07	110.67 ± 18.31	98.00 ± 20.33	111.33 ± 14.07	110.67 ± 18.31	164.67 ± 22.63	162.33 ± 14.86	130.67 ± 28.33
	After treatment	164.67 ± 22.63	162.33 ± 14.86	130.67 ± 28.33	176.00 ± 5.07	170.00 ± 6.54	140.00 ± 34.84	176.00 ± 5.07	170.00 ± 6.54	140.00 ± 34.84
	P-value[1]	0.0001*	0.0001*	0.025*	0.0001*	0.0001*	0.0001*	0.395	0.920	0.641

P < 0.05

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Statistical multiple pairwise comparison (post-hoc test) for outcome variables between groups A, B, and C (Table 4) showed that there was a significant difference in VAS after 6-weeks and 8-weeks between pairwise of group A versus group B in favor of group A, group A versus group C, and group B versus group C respectively.

Post-hoc test for SPADI showed that there was a significant difference in SPADI after 6-weeks and 8-weeks between pairwise group A versus group C, and group B versus group C. In the contrary, no significant differences were found between pairwise of group A versus group B.

Post-hoc test for flexion ROM showed that there was a significant difference in flexion after 6-weeks and 8-weeks between pairwise group A versus group C, and group B versus group C. However, no significant differences between pairwise of group A versus group B.

Post-hoc test for abduction ROM showed that there was significant difference in abduction after 6-weeks and 8-weeks between pairwise group A versus group C and group B versus group C. On the other hand, no significant differences were detected between pairwise of group A versus group B.

Table 4. Post-hoc test between group comparisons for outcome variables

Variable	Items	Groups (Mean ± SD)			Pairwise P-values		
		Group A (n = 15)	Group B (n = 15)	Group C (n = 15)	Group A (n = 15)	Group B (n = 15)	Group C (n = 15)
VAS	After 6-weeks	2.00 ± 0.63	3.51 ± 1.37	4.67 ± 1.95	0.0001*	0.0001*	0.036*
	After 8-weeks	1.50 ± 0.94	2.80 ± 1.01	4.40 ± 2.16	0.005*	0.0001*	0.003*
SPADI	After 6-weeks	16.77 ± 8.02	15.59 ± 8.99	36.13 ± 22.07	1.000	0.001*	0.0001*
	After 8-weeks	14.95 ± 9.49	14.79 ± 8.83	33.78 ± 23.54	1.000	0.001*	0.001*
Shoulder flexion	After 6-weeks	168.00 ± 12.07	159.67 ± 8.95	140.00 ± 32.95	0.748	0.0001*	0.022*
	After 8-weeks	176.00 ± 5.07	166.00 ± 10.55	142.67 ± 33.26	0.502*	0.0001*	0.005*
Shoulder abduction	After 6-weeks	164.67 ± 22.63	162.33 ± 14.86	130.67 ± 28.33	1.000	0.0001*	0.0001*
	After 8-weeks	176.00 ± 5.07	170.00 ± 6.54	140.00 ± 34.84	1.000	0.0001*	0.0001*

$P < 0.05$

Discussion

This study was designed to compare the efficacy of HILT versus RSWT in treatment of SIS.VAS, SPADI and shoulder flexion and abduction ROM were evaluated at baseline, after 6 weeks and after 8 weeks follow up. It has been hypothesized that both HILT and RSWT would show similar effects on pain, function and shoulder flexion and abduction ROM in SIS. However, null hypotheses were rejected as the current study demonstrated that HILT showed superior effect compared with RSWT on pain, function and shoulder flexion and abduction ROM in SIS ($P < 0.05$).

Unfortunately, only one previous study compared the effects of HILT versus RSWT in cases of knee osteoarthritis. However, despite the difference in diagnosis, their results were in line with the outcomes of this study. As they reported significant improvement in HILT compared to RSWT group in knee pain and function. Albeit, they had not proposed an explanation of this difference in effects [Mostafa et al., 25]. However, it is likely that the better outcomes in HILT group might have been due to greater depth of penetration of HILT than RSWT. The depth of HILT penetration was reported to be up to10 cm [Nazari et al., 26] in comparison to 3 cm for RSWT [Gonkova et al., 27]. The deeper penetration of HILT might have provided more improvement of deeper involved tissues of the shoulder, thus resulting in the better outcomes seen in HILT group.

Further, extracorporeal shock wave therapy (ESWT) has been reported in use to deal with rotator cuff tendonitis with and without calcific deposits. It has been reported that ESWT was effective in managing calcific rotator cuff tendonitis, however, it was no more effective than placebo, or other treatments in cases with non-calcific rotator cuff tendonitis [Circi et al., 28, Huisstede et al., 29]. Likewise, Speed [30] reported in a systematic review that there is low level evidence of non- effectiveness of both low dose focal shock wave and radial shock wave therapy in managing non- calcific rotator tendonitis. Since the current study did not included calcific rotator cuff tendonitis, this might provide an alternative explanation of the better outcomes of HILT over RSWT.

On the other hand, secondary aims in this study were to check for the effect of HILT with conventional physical therapy, and RSWT with conventional physical therapy versus conventional physical therapy alone. It has been hypothesized that there would be no significant pairwise differences on pain, function and measured shoulder ROM in 3 cases. Albeit, these hypothesis were rejected as both HILT and RSWT combined with conventional physical therapy showed better outcomes compared to conventional physical therapy alone.

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These results agreed with the findings of Li et al. [31] study that examined how using ESWT help patients with chronic rotator cuff tendonitis (CRCT) compared with placebo. They discovered that ESWT can lessen severity of shoulder pain and enhance shoulder capability in patients with CRCT.
The results of current study agreed with a previous study conducted by Mashaly and El Shiwi, [32]. They compared the benefits of shock wave therapy (SWT) and therapeutic exercises versus Phonophoresis and therapeutic exercises for treating SIS. The outcome showed that doing exercises and using SWT together were better at reducing shoulder pain and improving shoulder flexion, abduction and internal rotation ROM in patients with SIS.
Another research used two different treatments with patients' rotator cuff tendinopathy, RSWT and ultrasound therapy, in addition to control group received conservative therapy. The effects of the treatment were measured before and after, and again 4 weeks later. The analysis of the data showed that RSWT worked better than ultrasound therapy after treatment and at the 4-week follow up [10].
Badıl Güloğlu, [15] compared the efficacy of ESWT and low level laser therapy (LLLT) for patients SIS. All patients were evaluated before, after, and 3 months following treatment, ESWT group showed more improvements of function, psychological status, and mental health at the end of treatment. The improvement in pain and function at the third month follow up was significantly more evident in the ESWT group.
In contrast to the current findings, Engebretsen et al. [22] compared the short term effect of RSWT and supervised exercises in patients with SIS. One group received RSWT one session weekly for four to six weeks and other group received supervised exercises two sessions weekly for up to 12 weeks. Outcome measure was SPADI. They concluded that supervised exercises were worked better than RSWT for short-term improvement in patients with SIS. This study used 2000 pulses RSWT per session while the current study used 3000 pulses RSWT per session.
Results of a previous study showed more improvement in VAS, SPADI, shoulder flexion and Abduction ROM with HILT ($p < 0.05$) than LLLT as they compared the efficacy of HILT versus LLLT [33]. Also work done by Kamal et al. [34] who examined the impact of HILT versus US phonophoresis in SIS. They discovered that HILT better than US phonophoresis in reducing pain and improving movement for patients with stage 1 and 2 SIS. The treatment involved using 12 laser sessions. These sessions happened twice a week for 6 weeks in total. This was same treatment plan used in the current study.
The current study findings agreed with study Kamal et al., 17 who evaluated the effect of HILT on shoulder mobility in SIS. The findings showed that there was a big decrease in the size of the supraspinatus muscle, VAS and addition to improved shoulder flexion and abduction ROM in the HILT group compared to the group that did therapeutic exercises.
The results of this study were partly supported by Okman et al. [5] study. They compared the efficacy of the HILT and US for reduce pain and improve daily activities for patients with long-term shoulder pain. Patients were split into two groups by chance. Group received US and other group received HILT. This study demonstrated that HILT works better than US therapy in reducing pain and improving function in the short term.
Karaca [3] studied the impact of nine sessions of HILT three times a week on different days for three weeks. This tested on patients who had stage 1 and 2 SIS. This research discovered that people experienced less pain, became more independent in daily tasks, and felt satisfied with their treatment.
The findings of current study come also in accordance with another study published by SaeHoon et al. [35] who compared HILT effectiveness versus placebo in 66 patients with frozen shoulder. The VAS scale was measured at the beginning, and after 3, 8, and 12 weeks. The HILT group had less pain scores for three weeks and eight weeks. The amount of pain didn't change at all for 12 weeks.
In addition, Chen et al. [11] study supported that HILT has powerful, excellent and immediate effect in SIS. This is study evaluated HILT effect immediate after one session on pain levels, shoulder movement and a pain and function assessment called the Constant-Murley Scale (CMS). They found that HILT can quickly lessen pain and help in improvement shoulder flexion ROM in patients with SIS.
Unlike the current finding, Javier et al. [36] study that compared effect 15 sessions (5 sessions per week) of HILT and sham laser on pain and functionality levels on patients with SIS. They examined the results post treatment, as well as one month and three months later. During each session, patients received HILT or sham-laser intervention in addition to the same exercise therapy protocol consisting of stretching and strengthening exercises. Outcome measurements were VAS, pressure pain threshold, SPADI, CMS and Quick DASH. They found that combining HILT with exercise does not have a stronger effect than exercise alone. The main problem with the study is that there were not enough patients. Another important problem that could limit this study is the use of consecutive alternate allocation, which is not a specific method of randomizing. The first group of participants was chosen randomly, but this might make the study results unfair.

Conclusion

Based on what the current study looked at and what it found, it was concluded that HILT showed a superior effect compared with RSWT on pain, function and shoulder flexion and abduction ROM in treatment of SIS. Further, either HILT or RSWT along with conventional physical therapy is superior to conventional physical therapy alone in managing SIS.

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Piśmiennictwo/ References

1. McLaren C., Colman Z., Rix A. and Sullohern C. The effectiveness of scapular taping on pain and function in people with subacromial impingement syndrome: A systematic review. Int Musculoskelet Med.2016; 38(3-4): 81-89.
2. Savoie A., Mercier C., Desmeules F., Frémont P. and Roy J-S. Effects of a movement training oriented rehabilitation program on symptoms, functional limitations, and acromio humeral distance in individuals with subacromial pain syndrome. Man Ther.2015; 20(5): 703-708.
3. Karaca B. Effectiveness of high-intensity laser therapy in sub acromial impingement syndrome. Photo med laser Surge.2016;34(6):223-228.
4. Cools MA, Johansson FR, Borms D and Maenhout A. Prevention of shoulder injuries in overhead athletes: a science-based approach. Braz J Phys. Ther.2015;19(5): 331-339.
5. Okmen BM, Okmen K, Ozkuk K, Uysal B, Sezer R and Koyuncu E. Comparison of the efficacy of high intensity laser and ultrasound therapies in chronic shoulder pain; randomized controlled single blind study. J Phys Med Rehabil Sci.2017; 20(2):57–65.
6. Christoph Schmitz, N. B. M. Császár, S. Milz et al. Efficacy and safety of extracorporeal shock wave therapy for orthopedic conditions: a systematic review on studies listed in the Pedro database" British Medical Bulletin.2015; 116 (1): 115–138.
7. Kuo Y.-R., Wang C.-T., Wang F.-S., Chiang Y.-C. andWang C.-J. Extracorporeal shock-wave therapy enhanced wound healing via increasing topical blood perfusion and tissue regeneration in a rat model of STZ-induced diabetes.Wound Repair and Regeneration. 2009; 17(4):522–530.
8. Link K. A., Koenig J. B., Silveira A., Plattner B. L. and Lillie B. N. Effect of unfocused extracorporeal shock wave therapy on growth factor gene expression in wounds and intact skin of horses.American Journal of Veterinary Research.2013;74(2):324–332.
9. Rosso F., Bonasia D. E., Marmotti A., Cottino U. and Rossi R. Mechanical Stimulation (Pulsed Electromagnetic Fields “PEMF” and Extracorporeal Shock Wave Therapy “ESWT”) and Tendon Regeneration: A Possible Alternative. Frontiers in Aging Neuroscience.2015;7(211).
10. Dedes Vasileios, Tzirogiannis Konstantinos, Polikandrioti Maria, Dede Ariadni Maria, Nikolaidis Christos, Mitseas Athanasios and Panoutsopoulos Georgios I. Comparison of Radial Extracorporeal Shockwave Therapy versus Ultrasound Therapy in the Treatment of Rotator Cuff Tendinopathy. Folia Medica.2019; 61(4):612-6.
11. Chen, Y.W., Cheng, Y.Y., Lee, Y., & Chang, S.T. The immediate effect of high-intensity laser therapy on pain relief and shoulder function in patients with subacromial impingement syndrome.World Journal of Physical and Rehabilitation Medicine.2020;4(1): 1016.
12. Ordahan, B., Yigit, F. & Mulkoglu, C. Efficacy of Low-level Laser Versus High-intensity Laser Therapy in the Management of Adhesive Capsulitis: A Randomized Clinical Trial. Saudi Journal of Medicine & Medical Sciences.2023;11, 201.
13. Yılmaz, M., Eroglu, S., Dundar, U. & Toktas, H. The effectiveness of high-intensity laser therapy on pain, range of motion, functional capacity, quality of life, and muscle strength in subacromial impingement syndrome: a 3-monthfollow-up, double-blinded, randomized, placebo-controlled trial.Lasers in Medical Science.2022; 37, 241-250.
14. Elgendy, M. H., Mazen, M. M., Saied, A. M., Elmeligie, M. M. & Aneis, Y. Extracorporeal Shock Wave Therapy vs. Corticosteroid Local Injection in Shoulder Impingement Syndrome: A Three-Arm Randomized Controlled Tria. American Journal of Physical Medicine & rehabilitation.2023; 102, 533-540.
15. BADıL GÜLOĞLU, S. Comparison of low-level laser treatment and extracorporeal shock wave therapy in subacromial impingement syndrome: a randomized, prospective clinical study. Lasers Med Sci.2021;36, 773-781.
16. Gunay Ucurum S, Kaya DO, Kayali Y, Askin A and Tekindal MA. Comparison of different electrotherapy methods and exercise therapy in shoulder impingement syndrome: A prospective randomized controlled trial. Acta OrthopTraumatolTurc.2018; 52(4):249–255.
17. Kamal Walid ahmed , Saber Mahmood, Ayad K.E, Mostafa Mohamed Serag Eldein Mahgoub and Bahey El- Deen Heba A. Effect of High-Power Laser on Shoulder Mobility in Sub Acromial Impingement Syndrome: Randomized Controlled Trial. Journal of Environmental Treatment Techniques.2020; 8(3):1157-1162.
18. Struyf F., Nijs J., Mollekens S., Jeurissen I., Truijen S., Mottram S., et al. Scapular-focused treatment in patients with shoulder impingement syndrome: a randomized clinical trial. Clin Rheumatol.2013; 32(1): 73-85.
19. Ravichandran H., Janakiraman B., Gelaw A.Y., Fisseha B., Sundaram S. and Sharma H.R. Effect of scapular stabilization exercise program in patients with subacromial impingement syndrome: a systematic review. J Exerc Rehabil.2020; 16(3): 216-226.
20. Li Chengxin, Li Zhizhuo, Shi Lijun, Wang Peixu, Gao Fuqiang and Sun Wei. Effectiveness of Focused Shockwave Therapy versus Radial Shockwave Therapy for Noncalcific Rotator Cuff Tendinopathies: A Randomized Clinical Trial. Hindawi BioMed Research International.2021; 4: 9.
21. Martins J, Napoles BV, Hoffman CB and Oliveira AS.Versão brasileira do shoulder pain and disability index: tradução, adaptação cultural e confiabilidade. Rev Bras Fisioter.2010; 14(6):527-36.
22. Engebretsen K, Grotle M, Bautz-Holter E, Sandvik L, Juel NG, Ekeberg OM and Brox JI. Radial extracorporeal shockwave treatment compared with supervised exercises in patients with subacromial pain syndrome: single blind randomized study.BMJ.2009; 339.
23. Al-Abbad Hani, Allen Sophie, Morris Susan, Reznik Jackie, Biros Erik, Paulik Bruce and Wright Anthony. The effects of shockwave therapy on musculoskeletal conditions based on changes in imaging: a systematic review and meta-analysis with meta-regression. BMC Musculoskeletal Disorders.2020; 21(1)275.
24. Moezy A., Sepehrifar S. and Solaymani Dodaran M. The effects of scapular stabilization based exercise therapy on pain, posture, flexibility and shoulder mobility in patients with shoulder impingement syndrome: a controlled randomized clinical trial. Medical Journal of the Islamic Republic of Iran.2014; 28(87).
25. Mostafa M S, Hamada H A, Kadry A M, Zahran SS and Helmy NA. Effect of high –power Laser Therapy Versus Shock Wave Therapy on Pain and Function in Knee osteoarthritis Patients: A Randomized Controlled Trial. Photo bio modulation, photomedicine,and Laser Surgery.2022;40(3)198-204.
26. Nazari, A., Moezy, A., Nejati, P. & Mazaher Inezhad, A. Efficacy of high-intensity laser therapy in comparison with conventional physiotherapy and exercise therapy on pain and function of patients with knee osteoarthritis: a randomized controlled trial 26 with 12-week follow up. Lasers in medical science.2019; 34, 505-516.
27. Gonkova, M.I.; Ilieva, E.M.; Ferriero, G. and Chavdarov, I. Effect of radial shock wave therapy on muscle spasticity in children with cerebral palsy. Int. J. Rehabil. Res.2013; 36, 284–290.
28. Circi E, Okur SC, Aksu O, Mumcuoglu E, Tuzuner T and Caglar N. The effectiveness of extracorporeal shockwave treatment in shoulder impingement syndromeand its relation with acromion morphology. Acta Orthop Traumatol Turc.2018;52(1):17-21.
29. Huisstede BM, Gebremariam L, van der Sande R, Hay EM and Koes BW. Evidence for effectiveness of Extracorporal Shock-Wave Therapy (ESWT) to treat calcific and non-calcific rotator cuff tendinosis--a systematic review. Man Ther.2011; 16:419-33.
30. Speed C. A systematic review of shockwave therapies in soft tissue conditions: focusing on the evidence.Br J Sports Med.2014;48(21):1538–42.
31. Li W, Zhang S-X, Yang Q, et al. Effect of extracorporeal shock-wave therapy for treating patients with chronic rotator cuff tendonitis. Medicine.2017; 96 (35):7940.31
32. Mashaly MM and El Shiwi AMF.Combined effect of therapeutic exercises and shock wave versus therapeutic exercises and phonophersis in treatment of shoulder impingement syndrome. Egyptian Journal of Occupational Medicine.2014;38 (1): 63-78.32
33. Zati, A., &Valente, A. Laser terrapin inmedicine, terraria elision remove endodermic in medicine riabiltaintre. EdizioniMinervamesica.2006; 162-185.
34. Kamal Walid Ahmed, Saber Mahmood, Ayad K.E, Mostafa M S , Younan Wagdy William and Zahran Samah Saad. High-Power Laser Versus Phonophoresis in Subacromial Impingement Syndrome: Randomized Controlled Trial. Annals of R.S.C.B.2021; 25 (3): 342 – 354.
35. Sae, H.K., Yeon, H.K., Hwa, R.L., &Young, E.C. Short-term effects of high-intensity laser therapy on frozen shoulder: A prospective randomized control study. Manual therapy.2015; 20 (6): 751-757.
36. Javier Aceituno-go`mez, Juan Avenda`no-Coy and Julio Go`mez-Soriano. Efficacy of high-intensity laser therapy in subacromial impingement syndrome: a three-month follow-up controlled clinical trial.Clinical Rehabilitation.2019; 33(5):894-903.

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