Low Level LASER Therapy Versus Shock Wave Therapy in Shoulder Impingement Syndrome

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Abstract

The Purpose: Of this study was to investigate the effects of Low Level LASER Therapy (LLLT) versus Shock Wave in treatment of shoulder impingement syndrome.

Subjects: Forty patients of both gender (21 females and 19 males) diagnosed as shoulder impingement syndrome with mean age (41.35 ± 3.25) years represented the sample of the study. They were recruited from the Hospital of Misr University for Science and Technology.

Design: Forty patients were evaluated pretreatment and post treatment for shoulder pain severity, shoulder functional disability, shoulder flexion, abduction and internal rotation motions.

Material: Radial Extracorporeal shockwave device and Gallium arsenide low level LASER therapy apparatus were used for treatment. Guymon Goniometer, visual analogue scale (VAS) and quick disability questionnaire were used for evaluation.

Methods: Forty patients were randomly distributed into two equal groups; each group consisted of 20 patients. Group I with a mean age of (49.39 ± 3.91) years received 12 sessions of LASER therapy (total dose of 14.4 J/session, 3 sessions per week) and therapeutic exercises (strengthening exercises, and stretching exercises for shoulder joint) 3 times per week, for 4 consecutive weeks. Group II with a mean age of (50.33 ± 3.22) years received 12 sessions of shock wave (6000 shock, 2000 shocks per session, 3 sessions, 1 weeks a part, 0.22mJ/mm²) and the same therapeutic exercises as group I (3 times per week, every other day, for 4 consecutive weeks).

Results: The results revealed significant difference in all measured variables regarding group I and II when comparing pre and post treatment mean values ($p < 0.0001$). Significant improvement was observed in favor of group I in all measured variables (pain severity, shoulder disability index and range of motion).

Conclusion: Both LLLT and the shock wave therapy had a significant effect on decreasing shoulder pain severity, shoulder functional disability, increasing in shoulder flexion, abduction and internal rotation motions. However, LLLT was more effective in treatment of patients with shoulder impingement syndrome.

Key Words: Shoulder – Impingement syndrome – Shockwave – LASER – Low level LASER.

Introduction

IMPINGEMENT syndrome refers to a pathologic condition in which there is irritation of the supraspinatus tendon secondary to abrasion against the under surface of the anterior one third of the acromion. Subacromial impingement syndrome (SIS) encompasses a spectrum of subacromial space pathologies including partial thickness rotator cuff tears, rotator cuff tendinosis, and subacromial bursitis [1]. Shoulder Impingement syndrome (SIS) is a phenomena of mechanical compression of the rotator cuff against the anterior under surface of the acromion and coracoacromial ligament particularly during arm elevation. It has been described as a group of symptoms rather than a specific diagnosis. It is the most common cause of shoulder pain [2].

Impingement syndrome is a common diagnosis seen by orthopedic surgeons and primary care physicians. Clinically, patients with impingement syndrome report pain located in the region of their shoulder and lateral aspect of their upper arm. Although this shoulder pain may occur at rest, it is typically exacerbated with elevation of the arm overhead. Physical examination classically demonstrates reproduction of patients’ shoulder pain by raising their arm into the impingement arc (70° to 120° arm elevation) [8]. Physical therapy modalities and exercises can be listed as the most common treatment for shoulder pain [4].

Chang, et al. [8] mentioned that laser have played an important role in contemporary medicine,
Low level laser therapy (LLLT) has been used to speed wound healing after surgery, for pain relief, and for biological stimulation. Therefore, this study explored the use of LLLT as a treatment to reduce CTS-induced pain and unnecessary costs. LASER is a widespread but controversial treatment based on the belief that LASER radiation at intensities too low to produce significant heating, produces clinically meaningful improvement in a variety of soft tissue conditions such as soft tissue injuries, wounds and neuropathies [6].

Shock waves are sound waves generated by a source that creates vibration which are then transported through tissue via fluid and solid particles interaction [7]. Shock waves have been used for the treatment of numerous musculoskeletal disorders, including calcified tendonitis of shoulder, lateral epicondylitis, achilles and patellar tendinopathies, chronic planter fasciitis, osteonecrosis of the femoral head, delayed union and non union of fractures [8].

In the last ten years, shock wave therapy has been successfully employed as an anti-inflammatory therapy in a number of orthopedic diseases such as pseudoarthrosis, tendinitis calcarea of the shoulder epicondylitis, plantar fasciitis, and several inflammatory tendon diseases [9].

Physical therapy modalities are often the first line of management for shoulder pain [10]. Conservative treatment of patients with impingement symptoms commonly includes therapeutic exercise programs intend to restore normal kinematics and muscular control of scapula [11].

It seems reasonable to use treatment modalities aimed at rapid recovery rate with a minimum number of sessions, this would minimize the negative effects of a Hospital-based rehabilitation procedure on patient’s daily life and their subsequent compliance [12]. A faster program with fewer treatment sessions not only enables the patients to proceed with most of their daily activities but also decrease the cost of treatment, this would reflect an additional health care advantage for the treatment of impingement syndrome.

Material and Methods

Forty patients (21 females and 19 males) referred from orthopedic department at hospital of Misr University for Science and Technology (MUST) diagnosed as shoulder impingement syndrome represented the sample of the study. Their age ranged between 30-50 years mean age (41.35±3.25) years old. All participants received a comprehensive explanation about the purpose of the study, its benefits, inherent risks, and expected commitments with regard to time. Study was conducted in physical therapy department of MUST hospital and a private clinic in the period from March 2011 to May 2012.

Inclusion criteria:
- Shoulder impingement syndrome.
- Age 30-50 years.
- Positive Neer sign.
- Positive Hawkins sign.
- The patient reported pain with active shoulder elevation in the scapular plane.
- The patient reported tenderness with palpation of the rotator cuff tendons.
- The patient reported pain with resisted isometric abduction.

Exclusion criteria:
- Rotator cuff tears.
- Frozen shoulder.
- Glenohumeral or acromioclavicular arthritis.
- Any previous shoulder surgeries.
- Malignancy.
- Blood coagulation disorders or patients on anti-coagulant drugs.
- Shoulder subluxation or dislocation.

Group assignment:

The subjects were randomly assigned into two groups of equal numbers each containing twenty patients, group I (GI) (N=20) received LASER therapy in addition to a program of exercise therapy and group II (GII) (N=20) received Shock wave therapy in addition to the same program of exercise given to GI.

A- Instrumentations for evaluation:

Evaluation was conducted for each patient of the two groups before and after treatment. The assessment procedure included the following:

- Pain assessment:

Pain was assessed by using visual analogue scale (VAS). This scale allows continuous data analysis and uses a 10cm long scale with 0 (no pain) and 10 (killing pain). Patients place a mark along the line to denote their level of pain [13].

- Pain and functional disability:

Disability has been assessed by using the quick disability of the arm, hand, and shoulder (DASH)
questionnaire. This questionnaire asks about symptoms and abilities to perform certain activities in the past week by circling the appropriate number. This questionnaire is valid as a measure of the disability in patients with disorders of upper limbs [14]. It is a general upper limb evaluation questionnaire [15]. DASH has three dimensions: Physical function, pain and social function. It is expressed as a percentage where 0 represents no disability and 100% represents a lot of disability. It has test-retest reliability and criterion validity, and has been shown to be sensitive to change [16].

- **Range of motion (ROM) assessment:**

  An electrogoniometer (Model 01129 Guymon Goniometry) was used to determine the (ROM) of the shoulder joint. It is a tool used to eliminate the need to manually score each measurement by storing the information internally. It has a range of 0° to 360° and is accurate to (+/- 1). It stores up to 80 data points or 80 subject/joint number. The validity and reliability of electrogoniometer for measurement of shoulder joint movement was tested and well documented [17].

  The device was calibrated before treatment at 0 point and shoulder movements were measured.

  Shoulder movements including; flexion, abduction and internal rotation were determined for each patient from supine lying position.

  All measurements were done for three consecutive times and the mean was calculated and used for the purpose of data analysis.

**B- Instrumentation used for treatments:**

- **Radial Extracorporeal shockwave device:**

  It is a device that provide shock wave its model is radial spec and serial number is (1107394) medispec. It is connected to electrical main supply 115/220VAC at frequency 50/60 HZ and 5 A.

- **LASER therapy device:**

  Phyaction (796), Gallium arsenide (Ga-As), laser device, with a 15-W probe was used to deliver low level LASER therapy. Maximum power 16 W at frequency 50 HZ, with wave length of 904nm, pulse duration of 200 nsec, and a beam diameter of 4.0mm.

**Treatment procedures:**

- **G (I)-LASER group:**

  Subjects representing the sample of this study received.

  **a- LASER treatment for 12 sessions, 3 sessions per week as follows:**

  From sitting position with the affected shoulder exposed and at side. The LASER was applied to the most painful eight points around the capsule and joint line of shoulder joint. Each point received a dose of 1.8 Joules (J) with a total dose of 14.4 J/session [17], the total energy density was 4.5 J/cm. Total session time was 16 minutes. Pulse frequency was 5000 HZ with 5cm depth of penetration and the irradiation area 3.2cm.

  **b- The exercise program was applied as follows:**

  - Passive stretching exercise for the posterior shoulder capsule and surrounding musculature was done for only 3 times with a holding time 30 seconds and 30 seconds rest period between repetitions [11].

  - Strengthening exercises for shoulder flexion, rowing, and horizontal extension. For each of the exercises, a 10-repetition maximum was determined. This determination was based on the examiner’s observation of movement quality and the subject’s responses with regard to fatigue and pain. Deterioration in movement quality or pain exceeding a mild discomfort was avoided during all strengthening exercises by either reducing the level of resistance or modifying the ROM until the subject was able to progress. Each exercise was performed as 3 sets of 10 repetitions with a 60-seconds rest period between, each set.

  A seated press-up and the elbow pushup exercises were also included. Both were performed to fatigue or for a maximum of 25 repetitions. The quality of all repetitions of each exercise was continuously monitored by the investigator of the study. This standardized program was based on work of, Bang and Deyle [11].

**G (II)-Shock wave therapy:**

In addition to the exercise program given to G1, subjects of this group received shock wave therapy as follows. From sitting with shoulder abducted at 45° and elbow flexed and the forearm rested on flat surface, the shock waves was applied on most tender point near the insertion of rotator cuff at greater tuberosity under the acromion [19].

The shock wave therapy was administrated using 15mm head applicator. Each patient in the experimental group received 3 sessions one session per week for three consecutive weeks with 6000 impulses, an energy flex density of 0.22mJ/mm², pulse rate 10/sec and frequency 1-15 Hz. The
Low Level LASER Therapy Versus Shock Wave Therapy

The treatment area was prepared with a coupling gel to minimize the loss of shock wave energy at the interface between applicator tip and skin [19].

Results

The purpose of this study was to compare the effects of shock wave versus LASER therapy on pain, functional disabilities, and shoulder range of motion in patients with shoulder impingement syndrome.

The results of the study after the suggested period of treatment revealed significant improvement in the measured variables including pain, function, and range of motion of the shoulder in GI and GII when comparing the pre and post treatment mean values. Significant differences were observed in favor of GI regarding pain severity; joint function and shoulder range of motion, when comparing the post treatment mean values of the two groups. However no significant differences were observed when comparing the pretreatment mean values of the two groups (GI and GII).

Data obtained from both groups pre and four weeks post treatment program regarding, Visual Analogue Scale (VAS), disability of the arm, hand, and shoulder (DASH) questionnaire, and shoulder flexion, abduction and internal rotation range of motion, were statistically analyzed and compared.

GI twenty patients (twelve females and eight males) with shoulder impingement syndrome were included in this group that received LASER therapy and exercises. The mean (± SD) of age (49.39±3.91) years.

GII twenty patients (nine females and eleven males) with shoulder impingement syndrome were included in this group that received shock wave therapy and exercises. The mean (± SD) of age (50.33±3.22) years.

Comparing the general characteristics of the subjects of both groups revealed that there was no significance difference between both groups in the mean age (p>0.05).

VAS between subjects of GI:

The mean values ± SD of VAS before application of LASER was (6.98±1.5), while after application of LASER was (1.41±1.08). The mean difference was 5.56 and the percent of improvement was 79.65%. There was a significant reduction of pain between pre and post treatment in VAS (p<0.0001) (Table 1, Fig. 1).

Table (1): Pre and post treatment mean values of VAS for GI.

<table>
<thead>
<tr>
<th></th>
<th>VAS X ± SD</th>
<th>MD</th>
<th>% of improvement</th>
<th>t-value</th>
<th>p-value</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre</td>
<td>6.98±1.5</td>
<td>5.56</td>
<td>79.65</td>
<td>12.06</td>
<td>0.0001</td>
<td>H.S</td>
</tr>
<tr>
<td>Post</td>
<td>1.41±1.08</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

VAS = Visual Analogue Scale. MD = Mean difference. p-value = Probability value. Sig. = Significance.

Fig. (1): Pre and post treatment mean values of VAS for GI.

VAS between subjects of GII:

The mean values ± SD of VAS before application of shock wave was (6.41±1.24), while after application of shock wave was (2.58±0.88). The mean difference was 3.83 and the percent of improvement was 59.75%. There was a significant difference between pre and post treatment in VAS (p<0.0001) (Table 2, Fig. 2).

Table (2): Pre and post treatment mean values of VAS for GII.

<table>
<thead>
<tr>
<th></th>
<th>VAS X ± SD</th>
<th>MD</th>
<th>% of improvement</th>
<th>t-value</th>
<th>p-value</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre</td>
<td>6.41±1.24</td>
<td>3.83</td>
<td>59.75</td>
<td>10.31</td>
<td>0.0001</td>
<td>H.S</td>
</tr>
<tr>
<td>Post</td>
<td>2.58±0.88</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

VAS = Visual Analogue Scale. MD = Mean difference. p-value = Probability value. Sig. = Significance.

Fig. (2): Pre and post treatment mean values of VAS for GII.
VAS between subjects of GI and GII:
The mean value \( \pm SD \) of VAS after treatment for G I was \((1.41 \pm 1.08)\) and that for G II was \((2.58 \pm 0.88)\). The mean difference between both groups was \((1.16)\). There was a significant reduction of pain regarding G I in VAS post treatment \((p<0.05)\) (Table 3, Fig. 3).

<table>
<thead>
<tr>
<th>( \bar{X} \pm SD )</th>
<th>MD</th>
<th>t-value</th>
<th>( p )-value</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>GI ( 1.41 \pm 1.08 )</td>
<td>1.16</td>
<td>3.22</td>
<td>0.003</td>
<td>S</td>
</tr>
<tr>
<td>GII ( 2.58 \pm 0.88 )</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

VAS = Visual Analogue Scale.
MD = Mean difference.
\( p \)-value = Probability value ............................
Sig. = Significance.

DASH between subjects of GI:
The mean values \( \pm SD \) of DASH before application of LASER was \((67.2 \pm 13.62)\), while after application was \((33.53 \pm 6.17)\). The mean difference was \((30.8)\) and the percent of improvement was \((47.87\%)\). There was a significant difference between pre and post treatment in DASH \((p=0.0001)\) (Table 4, Fig. 4).

Table (4): Pre and post treatment mean values of DASH for GI.

<table>
<thead>
<tr>
<th>( \bar{X} \pm SD )</th>
<th>MD</th>
<th>% of improvement</th>
<th>t-value</th>
<th>( p )-value</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre ( 67.2 \pm 13.62 )</td>
<td>49.4</td>
<td>73.51</td>
<td>10.36</td>
<td>0.0001</td>
<td>S</td>
</tr>
<tr>
<td>Post ( 33.53 \pm 6.17 )</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

DASH = Disability of the arm, hand, and shoulder.
MD = Mean difference.
\( p \)-value = Probability ............................
Sig. = Significance.

DASH between subjects of GII:
The mean values \( \pm SD \) of DASH before application of shock wave was \((64.33 \pm 9.32)\), while after application was \((33.53 \pm 6.17)\). The mean difference was \((30.8)\) and the percent of improvement was \((47.87\%)\). There was a significant difference between pre and post treatment in DASH \((p=0.0001)\) (Table 5, Fig. 5).

Table (5): Pre and post treatment mean values of DASH for GII.

<table>
<thead>
<tr>
<th>( \bar{X} \pm SD )</th>
<th>MD</th>
<th>% of improvement</th>
<th>t-value</th>
<th>( p )-value</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre ( 64.33 \pm 9.32 )</td>
<td>30.8</td>
<td>47.87</td>
<td>13.21</td>
<td>0.0001</td>
<td>H.S</td>
</tr>
<tr>
<td>Post ( 33.53 \pm 6.17 )</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

DASH between subjects for GI and GII:
The mean value \( \pm SD \) of DASH after treatment for group I was \((17.8 \pm 13.7)\) and that for group II was \((33.53 \pm 6.17)\). The mean difference between both groups was \(-15.73\). There was a significant difference between group I and group II in DASH post treatment \((p<0.0001)\) (Table 6, Fig. 6).
Table (6): Post treatment mean values of DASH of GI and GII.

<table>
<thead>
<tr>
<th></th>
<th>MD</th>
<th>t-value</th>
<th>p-value</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>GI</td>
<td>15.73</td>
<td>4.03</td>
<td>0.0001</td>
<td>H.S</td>
</tr>
<tr>
<td>GII</td>
<td>33.53±6.17</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

DASH = Disability of the arm, hand, and shoulder.
MD = Mean difference.
p-value = Probability

Table (7): Pre and post treatment mean values of ROM for GI.

<table>
<thead>
<tr>
<th>ROM (degrees)</th>
<th>Pre X±SD</th>
<th>Post X±SD</th>
<th>MD</th>
<th>% of improvement</th>
<th>t-value</th>
<th>p-value</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flexion</td>
<td>113.06±11.94</td>
<td>156.26±14.1</td>
<td>43.2</td>
<td>38.2</td>
<td>11.09</td>
<td>0.0001</td>
<td>H.S</td>
</tr>
<tr>
<td>Abduction</td>
<td>96.0±15.0</td>
<td>146.93±13.43</td>
<td>50.93</td>
<td>53.05</td>
<td>16.41</td>
<td>0.0001</td>
<td>H.S</td>
</tr>
<tr>
<td>Internal rotation</td>
<td>20.4±8.63</td>
<td>38.53±8.21</td>
<td>18.13</td>
<td>88.87</td>
<td>8.11</td>
<td>0.0001</td>
<td>H.S</td>
</tr>
</tbody>
</table>

Table (8): Pre and post treatment mean values of ROM for GII.

<table>
<thead>
<tr>
<th>ROM (degrees)</th>
<th>Pre X±SD</th>
<th>Post X±SD</th>
<th>MD</th>
<th>% of improvement</th>
<th>t-value</th>
<th>p-value</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flexion</td>
<td>112.73±12.22</td>
<td>143.86±13.47</td>
<td>-31.13</td>
<td>27.61</td>
<td>9.11</td>
<td>0.0001</td>
<td>H.S</td>
</tr>
<tr>
<td>Abduction</td>
<td>94.86±16.37</td>
<td>134.66±13.43</td>
<td>-39.8</td>
<td>41.95</td>
<td>7.97</td>
<td>0.0001</td>
<td>H.S</td>
</tr>
<tr>
<td>Internal rotation</td>
<td>21.86±6.9</td>
<td>32.8±5.4</td>
<td>-10.94</td>
<td>50</td>
<td>9.84</td>
<td>0.0001</td>
<td>H.S</td>
</tr>
</tbody>
</table>

ROM before and after treatment for GI:

The mean value ± SD of shoulder flexion, abduction, and internal rotation before the application of LASER were (113.06±11.94), (96.0±15.0), and (20.4±8.63) degrees respectively, while after application of LASER were (156.26±14.1), (146.93±13.43), and (38.53±8.21) degrees respectively. The mean difference between pre and post treatment of shoulder flexion, abduction, and internal rotation were (43.2), (50.93), and (18.13) respectively. There was a significant difference between pre and post treatment mean values of shoulder ROM (p<0.0001) (Table 7, Fig. 7).

ROM before and after treatment for GII:

The mean value ± SD of shoulder flexion, abduction, and internal rotation before the application of shock wave were (112.73±12.22), (94.86±16.37), and (21.86±6.9) degrees respectively, while after application of shock wave were (143.86±13.47), (134.66±13.43), and (32.8±5.4) degrees respectively. The mean difference between pre and post treatment of shoulder flexion, abduction, and internal rotation were (31.13), (39.8), and (10.93) respectively. There was a significant difference between pre and post treatment mean values of shoulder ROM (p<0.0001) (Table 8, Fig. 8).
Post treatment mean values of ROM for G I and G II:

Table. (9): Post treatment mean values of shoulder ROM for G I and G II.

<table>
<thead>
<tr>
<th>ROM (degrees)</th>
<th>GI X ± SD</th>
<th>GII X ± SD</th>
<th>MD</th>
<th>t-value</th>
<th>p-value</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flexion</td>
<td>156.26±14.1</td>
<td>143.86±13.47</td>
<td>12.4</td>
<td>2.32</td>
<td>0.02</td>
<td>$ S $</td>
</tr>
<tr>
<td>Abduction</td>
<td>146.93±13.43</td>
<td>134.66±13.43</td>
<td>12.26</td>
<td>2.28</td>
<td>0.03</td>
<td>$ S $</td>
</tr>
<tr>
<td>Internal rotation</td>
<td>38.53±8.21</td>
<td>32.8±5.4</td>
<td>5.73</td>
<td>2.25</td>
<td>0.03</td>
<td>$ S $</td>
</tr>
</tbody>
</table>

Flexion  Abduction  Internal rotation
Shoulder movements

The mean value ± SD of shoulder flexion, abduction, and internal rotation post treatment for G I were (156.26±14.1), (146.93±13.43), and (38.53±8.21) degrees respectively, and that for G II were (143.86±13.47), (134.66±13.43), and (32.8±5.4) degrees respectively. The mean difference between both groups of shoulder flexion, abduction, and internal rotation were (12.4), (12.26), and (5.73) respectively. There was a significant difference between G I and G II in shoulder ROM post treatment ($ p<0.05 $) (Table 9, Fig. 9).

Discussion

This study was conducted to investigate the effects of LASER therapy versus Shock Wave in treatment of shoulder impingement syndrome. The study was conducted on forty male and female patients with mean age (49.83±3.64) in improvement of pain, functional disability and range of motion in shoulder impingement syndrome patients.

There was a significant decrease in the mean values of shoulder pain at the end of treatment in the LASER group.

This come in agreement with Stergioulas [18], who investigated relation of LASER therapy to placebo LASER treatment group in patients with frozen shoulder. He revealed that, LASER group was more effective in reducing pain and disability scores than placebo at the end of the treatment period, as well as at follow-up Prentice et al. [20] reported that, when the superficial sites of the radial, median, and saphenous nerves as well as painful areas were exposed to LASER irradiation, there were significant decreases in pain and less reliance on medication for pain control. Green et al. [21] concluded that, LASER therapy was demonstrated to be effective than placebo in decreasing pain and the disability and increasing range of motion.

The results disagree with Yeldan et al. [22] who concluded that there is no significant difference between LASER and placebo LASER therapy on pain, functional disability, and muscle strength of shoulder for patients with shoulder impingement syndrome after a program of three weeks of LLLT and functional exercises. And with Bingol et al. [23] showed no significant improvement in pain, active range and sensitivity in LASER treatment group compared to the control group in the patients with shoulder pain when measured after a program of two weeks of low power LASER and shoulder exercises.

This can be related to the shorter period of the treatment program.

The results can be attributed to the anti-inflammatory action of LASER as it decreases prostaglandin E2 (PGE2) that is a proposed mechanism in which Laser therapy promotes the reduction of edema, as prostaglandins cause vasodilation, which contributes to the flow of plasma into the interstitial tissues so the driving force behind edema production is reduced. The relief of pain results from decreased nerve conduction velocity after LASER application, hastened healing, anti-inflammatory action, autonomic nerve influence, and neuro hormonal responses from descending tract inhibition.

To examine the effects of shock wave therapy, the results showed highly significant decrease in shoulder joint pain at the end of the treatment program. These results come in agreement with
HO and Hsu [24] who reported that, shock wave therapy (ESWT) showed pain relief for rotator cuff tendinitis of the shoulder.

Pan et al. [25] stated that VAS improved after ESWT to tendinitis of the shoulder. Cacchio et al. [19] showed significant reduction in shoulder pain after 4 weeks of treatment by RSWT. Also, Charrin and Noel. [26] mentioned that pain severity decreased after receiving SWT treatment of thirty two patients with rotator cuff tendinitis.

The analgesic effect of SWT could be attributed to that, Shock waves induced analgesic effect by over stimulating the axons (gate-control theory) thereby increasing a person pain threshold [27]. Another hypothesized mechanisms of action include 1 the physical alteration of axons, therapy inhibiting pain impulse conduction, and chemical alteration of pain receptors neurotransmitter, thereby preventing pain perception [28,2] following a certain number of shock waves, it is likely that endorphins are released locally causing decrease of pain [29].

ESWT cause reduction of substance P in the target tissue in conjunction with reduced synthesis of this molecule in dorsal root ganglia cells as well as by selective destruction of unmyelinated nerve fibers within the focal zone of ESW [30]. Shock waves can provoke a painful level stimulation that leads to pain relief [31] hyper stimulation of nociceptors and interruption the flow of nerve impulses could lead to pain alleviation [32].

Conclusion:
From the finding of the current study we can conclude that both LLLT and Shock wave therapy are effective in reducing pain and increasing ROM in cases of shoulder impingement syndrome. However, LLLT is more effective in treatment of patients with shoulder impingement syndrome.

Recommendations:
It is recommended to conduct further research on different orthopedic cases and using larger samples.

References
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