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Case Report

Physiotherapy Section

Integrating High-Intensity Laser Therapy with Exercise Regimen for Impingement Syndrome: A Case Report

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ABSTRACT

"Subacromial Impingement Syndrome (SAIS)" refers to conditions disrupting the balance between structural rigidity and soft tissue inflammation, leading to irritation in the subacromial space, primarily affecting the rotator cuff and bursa. High-Intensity Laser Therapy (HILT) is a non-invasive, painless treatment that increases mobility and stimulates deeper tissues. It can be used with anti-inflammatory and analgesic effects. In the present case report, a 62-year-old woman reported with right shoulder pain and limited motion for four months. Clinical metrics included a Pain Disability Index (PDI) score of 36, a Shoulder Pain and Disability Index (SPADI) score of 69%, and a Shoulder Function Index (SFInX) of 40, suggesting impingement syndrome. A high-intensity laser was applied to the site. The exercise regimen included posture improvement, pectoral and trapezius stretching, shoulder Range of Motion (ROM) exercises, gentle stretches, and finger stair exercises over four weeks. At treatment's end, significant functional improvements were noted, including reduced pain, increased ROM, and enhanced muscle strength.

Keywords: : Class IV laser, Physiotherapy, Rehabilitation, Shoulder pain and disability index

CASE REPORT

A 62-year-old retired female writer reported to the outpatient physiotherapy department with complaints of constant pain in her right shoulder for four months. The pain, located at the front and middle of the right shoulder, radiates down her right arm and has persisted throughout this period. She noted that the pain worsened at night, particularly when lifting her arm or sleeping on her right side, significantly disrupting her sleep. These issues hindered her ability to perform daily tasks such as heavy lifting, removing food from the microwave, serving meals, and carrying laundry, which limited her overall function.

The patient was alert and oriented to person, place, and time. Her vital signs showed a blood pressure of 128/78 mmHg, a pulse rate of 68 bpm, and a respiratory rate of 16 breaths per minute. Upon examination, she displayed a forward head posture with rounded shoulders. Her shoulder blades were elevated and upwardly rotated, and her right shoulder appeared higher than her left. When asked to raise her right arm, she was unable to do so. During her first clinic visit, she rated her shoulder pain as four out of 10 at rest and eight out of 10 during activities, on the Visual Analogue Scale (VAS). Isometric strength and ROM were limited in the right hand, showing an empty end feel [Table/Fig-1,2].

Muscles	Right	Left
Shoulder		
Flexors	Weak and painful	Strong and painless
Extensors	Weak and painful	Strong and painless
Abductors	Weak and painful	Strong and painless
Adductors	Weak and painful	Strong and painless
Internal rotation	Weak and painful	Strong and painless
External rotation	Weak and painful	Strong and painless

[Table/Fig-1]: Isometric strength of right and left shoulder.

Joint	Rt Active	Rt Passive	Lt Active*	Lt Passive*	Limitation
Shoulder					
Flexion	0-900	0-1800	0-1800	0-1800	Unable to perform due to pain
Extension	0-300	0-1800	0-1800	0-1800	Unable to perform due to pain
Abduction	0-700	0-1800	0-1800	0-1800	Unable to perform due to pain
Adduction	40-00	0-1800	0-1800	0-1800	Unable to perform due to pain
Internal rotation	0-120	0-450	0-450	0-450	Unable to perform due to pain
External rotation	0-150	0-450	0-450	0-450	Unable to perform due to pain

[Table/Fig-2]: Range of Motion (ROM).

Both the Neer test and the Hawkins-Kennedy test were performed to assess shoulder impingement. The Neer test evaluates shoulder impingement by passively elevating the arm in internal rotation; pain during this test may indicate issues with the supraspinatus or subacromial bursa. Meanwhile, the Hawkins-Kennedy test checks for shoulder impingement through internal rotation of the arm while the shoulder and elbow are flexed at 90 degrees. Both tests yielded positive results [1]. During the examination, tenderness in the infraspinatus and supraspinatus muscles was noted, with a tenderness grading of 3 on a scale of 1 to 5 [2]. Manual muscle testing and isometric strength testing showed no sensory deficits or muscle weakness in the dermatomal and myotomal distributions. The PDI score was recorded at 43, the SPADI score was 69%, and the SFInX score was 40 [3-5]. The positive results from the Neer and Hawkins-Kennedy tests, alongside reduced active ROM without loss of passive ROM, tenderness in the supraspinatus and infraspinatus muscles, and elevated disability scores (PDI, SPADI, SFInX), suggested shoulder impingement syndrome.

For treatment, HILT was provided using Aspen Laser's high-intensity Class IV laser, specifically a neodymium-doped yttrium aluminum garnet laser, over a week. The laser application was conducted in two phases, I and II, utilising a continuous circular motion. In phase I, the first three sessions involved a 75-second treatment at 8 watts and 6 J/cm^2, resulting in a total of 150 J of energy. This phase aimed

to induce analgesic effects during an intermittent period. In phase II, the next six sessions involved a 30-second treatment at 6 watts and a range of 120-150 J/cm^2 to generate a sustained bio-stimulatory effect. A total of nine HILT therapy sessions were completed over three weeks.

An exercise programme was commenced after the first phase of laser therapy, structured into four phases, each lasting one week.

Phase 1: This phase focussed on achieving a pain-free passive ROM. Passive ROM exercises and isometric shoulder exercises were performed 8 to 10 times daily. Glenohumeral ROM and postural exercises, such as chin tucks and scapular retractions, were conducted 15 to 20 times daily. Once a 50% increase in ROM was attained, active-assisted ROM exercises using a strap were introduced in all directions. Additionally, neck and cross-body stretches were performed four times daily, each lasting 10 seconds.

Phase 2: Active ROM exercises began after the patient completed both active and passive ROM exercises without discomfort. Shoulder abduction or scaption (scapular plane elevation) exercises involve raising the arm in the scapular plane to less than 60 degrees. Strength training for the external and internal rotator cuff muscles was performed with the arms at the sides of the body, conducted three times daily with ten repetitions for one week. Phase 2 also continued the stretching exercises from phase 1, now extended to 15-20 seconds each.

Phase 3: The goal of phase 3 was to enhance the development of the rotator cuff and scapular muscles. Scaption now involves raising the arm to an angle exceeding 60 degrees. Exercises targeting the rotator cuff muscles responsible for the humerus's external and internal rotation were conducted at a 90-degree angle to shoulder abduction. Movements such as reverse-fly, shoulder extension, and bent-over rows were incorporated using an elastic band or a weight of 1 to 1.5 kg, with each exercise consisting of three sets of 10 repetitions.

Phase 4: In this phase, scapular muscular development exercises incorporated a medicine ball. The regimen included strengthening exercises for the rotator cuff and biceps, performed in three sets of 15 repetitions, with a gradual increase in external resistance of 25% to 50% [6].

The patient showed significant improvements across all functional areas, evidenced by pain reduction, enhanced joint ROM, and increased muscle strength. The muscles on the right side were relaxed, with no pain or tenderness upon palpation, and her right scapula was level with the left side. Shoulder pain decreased from 7/10 to 1/10 during activity. Current scores are PDI at 4, SPADI at 2.3% and SFInX at 89 [Table/Fig-3].

Parameters	Pre-intervention	Post-intervention
Shoulder pain (activity)	7/10	1/10
PDI score	43	4
SPADI score	69%	2.3%
SFInX score	40	89

[Table/Fig-3]: Post-interventional outcomes.

DISCUSSION

The HILT has emerged as an advanced physical rehabilitation treatment [6]. Research findings comparing the immediate effects of HILT and ultrasound in the management of SAIS denote that individuals receiving short-term HILT, consisting of 10 treatment sessions, experienced significantly greater pain relief, improvements in joint motion functionality, and enhanced muscle strength in the affected shoulder relative to those undergoing ultrasound treatment over two weeks [7-9]. In individuals afflicted with SAIS, HILT effectively alleviates discomfort and functional impairments while improving shoulder ROM. The clinical applications of HILT facilitate immediate enhancements in pain reduction and shoulder functionality for SAIS patients [8]. Comparatively, past studies have indicated that HILT outperformed Low-Level Laser (LLL) therapy in reducing supraspinatus tendon thickness and improving tendon echogenicity [9-11]. Furthermore, it was found that the combination of HILT with Kinesiology Taping (KT) therapy yielded more substantial benefits for shoulder function than LLL combined with KT therapy. By mitigating inflammation or promoting tendon repair, the integration of LLL therapy into an exercise-based rehabilitation regimen expedites physical recovery, resulting in diminished discomfort and accelerated functional improvements. Thus, if the advantages of pain reduction are strategically utilised to enhance exercise settings, LLL may exert a more pronounced influence on shoulder functionality. In individuals suffering from SAIS, LLL combined with muscle-strengthening activities led to improvements in shoulder function and reduced medication reliance over a three-month course [7-10]. Regarding the treatment of patients with knee osteoarthritis, findings revealed that HILT, in conjunction with exercise, proved more effective than LLL when combined with exercise, with both treatment modalities surpassing the efficacy of exercise alone. These findings contribute substantively to our understanding of the decision-making processes in recommending rest or exercise interventions. Yılmaz M et al., noted that compared to the placebo group, the HILT group exhibited significant enhancements in pain reduction, ROM, shoulder function, quality of life, and muscle strength at the third and twelfth weeks [10]. Kaydok E et al., conducted a study on the efficacy and safety of both high-intensity and low-intensity laser therapy in the treatment of lateral epicondylitis, affirming their effectiveness for short-term management [11]. The current findings indicate that exercise treatment significantly aided SAIS patients in alleviating pain and enhancing their functional assessments, ROM, and muscle strength, corroborating existing literature. The results further indicated that the administration of HILT in conjunction with active exercise therapies was clinically significant in alleviating the symptoms associated with SAIS, with this positive impact persisting for three months, thereby offering valuable insights into treatment options and exercises.

CONCLUSION(S)

On the final day of rehabilitation, significant improvements were noted in the patient across all functional domains, indicated by reduced pain, increased joint ROM, and enhanced muscle strength. The muscles on the right side showed a state of relaxation, with no pain or tenderness upon palpation. Furthermore, the right scapula was aligned at a level consistent with the left side. The combination of HILT and the exercise regimen was effective in achieving the positive results in treating the impingement syndrome. Thereby, offering valuable insights into treatment options and exercises.

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