Case Report

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Physiotherapy Section

Effect of Class IV LASER Therapy as an Adjunct to Conventional Physical Therapy on Piriformis Syndrome: A Case Report

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ABSTRACT

Piriformis syndrome is a clinical condition characterised by the entrapment of sciatic nerve beneath the piriformis muscle, resulting in non discogenic sciatica. This syndrome is often neglected despite its capacity to induce considerable pain and functional impairments. Physical therapy plays a crucial role in the management of such conditions, providing customised interventions aimed at symptom alleviation and functional restoration. Class IV Light Amplification by Stimulated Emission of Radiation (LASER) therapy has surfaced as a promising therapeutic approach for a variety of musculoskeletal conditions. LASER therapy possesses the potential to effectively mitigate pain associated with piriformis syndrome while enhancing patient outcomes. Hereby, the authors present a case study involving a 27-year-old male patient who reported experiencing pain in the right hip region. He exhibited an antalgic gait and faced difficulties with daily activities due to the intensity of pain. The outcome measures comprised evaluations of hip Range of Motion (ROM), the Numeric Pain Rating Scale (NPRS) and the Oswestry Low Back Disability Questionnaire (ODI). Following two weeks of consistent physiotherapy interventions and one week of subsequent follow-up, the patient demonstrated a notable reduction in pain, allowing him to return to normal activities. The present findings substantiate the efficacy and safety of Class IV LASER therapy as a non invasive intervention for the treatment of patients with piriformis syndrome, with no adverse effects observed in both the short and long-term.

Keywords: Light amplification by stimulated emission of radiation, Musculoskeletal disorders, Numeric pain rating scale, Pain, Range of motion, Sciatic nerve

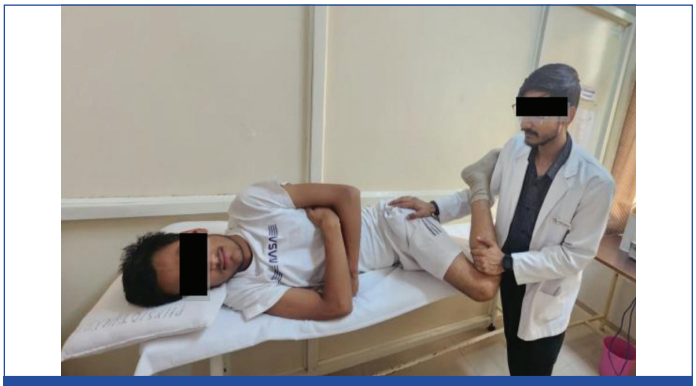
CASE REPORT

A 27-year-old male patient visited the Orthopaedic Department expressing complaints of pain in his right buttock. Due to the acute nature of his pain and notable tenderness in the superolateral quadrant of the right buttock, he was referred to the Department of Physiotherapy. Patient is a businessman and typically maintained a seated posture for 5-6 hours daily as part of his professional routine. He had no history of smoking or drinking, and no pertinent medical or family history was reported.

The onset of the pain occurred 3-4 months prior and has progressively exacerbated over preceding 3-4 days. The patient has resorted to self-medication with Non-steroidal Anti-inflammatory Drugs (NSAIDs) at intervals of 6-7 hours over the last three days to alleviate the discomfort, yet has not sought formal treatment. During the present visit, the pain was described as shooting in nature inspite of attempts to engage in prolonged periods of rest, activities such as sitting, climbing stairs, and walking for more than 5-6 minutes remain arduous, accompanied by a sensation of numbness extending into leg and foot.

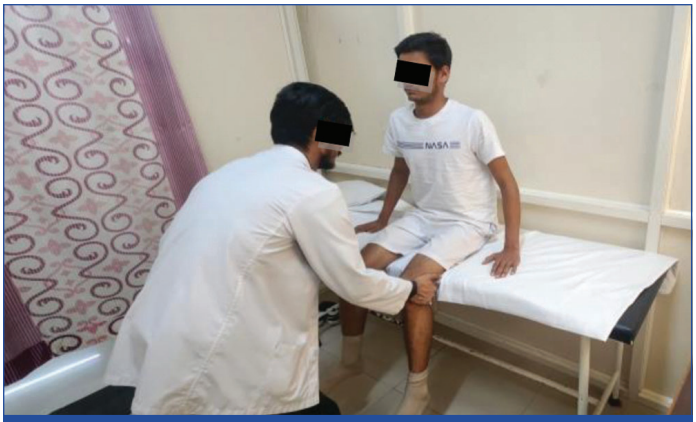
The patient presented with an antalgic gait, along with Hand on Hip Sign (HHS), and was instructed to minimise clothing for further evaluation in a cabin to maintain the privacy. The patient's physique was ectomorphic, with a postural assessment conducted in standing position revealing no deformities, misalignments, or muscular imbalances when assessed in anterior, posterior, and lateral views. In prone position, the patient exhibited a poor general condition, with muscular atrophy and mild swelling at the site of pain (right buttock). Palpation revealed grade-3 tenderness [1], with no significant temperature difference compared to the unaffected side. Direct palpation over the right sciatic notch precisely reproduced the patient's pain, which intensified with palpation over the supero-lateral quadrant of the right buttock. Limb length measurement was done using measuring tape, and it shows right limb was 1.2 cm shorter then left one.

Specific diagnostic tests, such as Freiberg test [2,3], Flexion Adduction Internal Rotation Test (FAIR) [4], Beatty test [5], and Pace sign [6], shown in [Table/Fig-1-3], were employed in physiotherapy for provisional and differential diagnosis. Straight Leg Raise Test (SLRT) [7] on the right leg elicited increased buttock pain at 50°, while the slump test yielded positive for right-side. Based on the patient signs and symptoms, some above mentioned special tests were conducted to make a diagnosis. Beatty sign was negative, while other tests were found positive [Table/Fig-4].



[Table/Fig-1]: FAIR test performed on the patient [4].

On the basis of these findings and HHS, the patient was diagnosed with piriformis syndrome. Because of this syndrome, symptoms of Prolapsed Intervertebral Disc (PIVD) and radiculopathy may persist in patient. A lumbar spine X-ray, in anteroposterior and lateral views, was advised to rule out other possible causes of pain. The



[Table/Fig-2]: PACE sign performed on the patient [6].

[Table/Fig-3]: Beatty test performed by the patient [5].

imaging results displayed a normal lordotic curvature of lumbar spine, characterised by 28° lumbo-sacral angle, and without any degenerative changes were observed.

Physiotherapy Intervention

A two-week regimen of physical therapy, along with one week of a home exercise protocol, was devised to alleviate pain. Cryotherapy [8], Transcutaneous Electrical Nerve Stimulation (TENS) [9], and Class IV LASER therapy were employed during the first week, after which, commencing on the second week, onwards Positional Release Technique (PRT) was added alongside the ongoing treatment, and is shown in [Table/Fig-5]. Before treatment, all the procedures were explained to patient, and a written informed consent was taken.

Treatment started with 10 minutes of cryotherapy over the affected area, followed by 10 minutes of rest to minimise its effect. After that, 2-pole TENS was used in continuous mode for 25 minutes. Class IV LASER therapy was used at last over the taut and painful area using non contact and continuous grid scanning mode for five minutes. This treatment was repeated daily. Detailed description is shown in [Table/Fig-6].

From 2nd week, the PRT was integrated into the treatment along with ongoing therapy, which included five repetitions per session with three sets, each lasting 90 seconds [10]. Following each repetition, an active rest of one minute was given, with two minutes of active rest provided after each set.

Home exercises were recommended to the patient for the following week, and he was instructed to perform them daily, twice per day, along with ergonomic advice (to avoid prolonged sitting and maintain good posture). One week after completion of therapy, the

Tests	Patient position	Description	Result
Freiberg test [2,3]	Supine	Therapist passively performed internal rotation at hip. Movement caused pain at the buttock indicated positive result.	Positive
FAIR test [4]	Side lying	Patient lied on the left-side with right leg on top. Therapist stabilised the hip with one hand and brought knee towards chest while internally rotating the leg. Increase in discomfort over buttock area, indicated positive result.	Positive
Pace sign [6]	Sitting	Patient was asked to abduct and externally rotate the hip, while the therapist applied resistance over the thigh. Increase in pain resulted in positive outcome.	Positive
Beatty test [5]	Side lying	Patient lied on left-side with right leg on top and performed abduction. Patient complaint no pain, hence test was negative.	Negative

[Table/Fig-4]: Diagnostic tests for piriformis syndrome.
FAIR: Flexion adduction internal rotation

AROM	Right			Left		
	After 1 week of initiating therapy	After 2 weeks of initiating therapy	1 week after completion of therapy	After 1 week of initiating therapy	After 2 weeks of initiating therapy	1 week after completion of therapy
Flexion	0°-95°	0°-100°	0°-105°	0°-110°	0°-110°	0°-110°
Extension	0°-15°	0°-20°	0°-30°	0°-25°	0°-25°	0°-25°
Internal rotation	0°-20°	0°-30°	0°-30°	0°-40°	0°-40°	0°-40°
External rotation	0°-25°	0°-40°	0°-45°	0°-45°	0°-45°	0°-45°
Abduction	0°-40°	0°-45°	0°-45°	0°-45°	0°-45°	0°-45°
Adduction	0°-25°	0°-30°	0°-30°	0°-35°	0°-35°	0°-35°

[Table/Fig-5]: Hip Range of Motion (ROM).
AROM: Active range of motion

Intervention	Patient position	Description
1st and 2nd week		
Cryotherapy [10]	Prone lying	A cold pack was placed over right gluteal and mid-thigh region for 10 minutes.
2-Pole Transcutaneous Electrical Nerve Stimulation (TENS) [11]	Prone lying	Electrodes were placed over right gluteal region (ischial tuberosity and medial to sacrum), continuous mode for 25 minutes with frequency of 80 Hz were used.
Class IV LASER therapy	Prone lying	Head of LASER was placed over taut muscle fibre in right gluteal region. Parameters used were continuous scanning mode with non-contact application and wavelength 810-910 nm, energy density 216 J/cm^2 with peak power 12.0 W for 5-minute treatment.
2nd week onwards		
Positional Release Technique (PRT) [12]	Prone lying	Patient was asked to bend right knee (90°) and palpate muscle to identify taut band. Muscle was shortened in position (passive hip extension) and adequate pressure was applied over trigger point for 90 seconds then back to starting position. He was advised to perform no active movement during the procedure. Five repetitions, three sets with two minutes rest given in-between.

Home exercise program		
Piriformis muscle stretching [12]	Supine lying	Patient was asked to cross his right leg over left leg. Then, pull the left knee towards right shoulder until stretch is felt. 3 repetitions with 30-seconds hold, 2 sets and 1 minute rest in-between.
Hip extension	Standing	Patient was asked to stand near wall and bend right knee (90°). Then, perform hip extension and return to starting position. 5 repetitions with 5-seconds hold, 2 sets and 1 minute rest in-between.

[Table/Fig-6]: Description of treatment program.

patient's gait was observed to be normal, with no HHS, indicating substantial recovery across all dimensions. No adverse effects, harms, or allergic reaction over the skin were reported at the end of two-weeks of physical therapy.

Outcome measures, such as NPRS and ODI, were used to asses, pain intensity and lower back disability [8,9]. NPRS is a subjective pain assessment tool in which patient is asked to score their intensity of pain on a scale of 0 to 10 [8]. ODI, which offers a subjective percentage score of disability in activities of daily life, is the gold standard tool for low back pain. Each of the ten sections of this questionnaire has six questions, with a score ranging from 0 to 5. The percentage of disability is determined by taking the total score, dividing it by the total possible score, and then multiplying the result by 100. The interpretation of ODI is as follows: 0%-20%: minimal disability, 21-40%: moderate disability, 41-60%: severe disability, 61-80%: crippled, and 81-100%: bed-bound/ridden [11]. All outcome measures were assessed at day 1 (pre-assessment), as well as on 1st and 2nd weeks (post-assessment), and one week after completion of therapy and are documented in assessment proforma.

The hip AROM was assessed at baseline for right limb. The ROM for hip flexion, extension, internal and external rotation, abduction, and adduction was 0-30°, 0°-10°, 0°-10°, 0°-10°, 0°-20°, and 0°-20°, respectively. There was significant improvement in right hip ROM after completion of treatment, as shown in [Table/Fig-5].

Pre- and post-outcome measures showed improvement in NPRS and ODI as shown in [Table/Fig-7]. Pain significantly decreased from severe to moderate after two weeks of treatment, and after one week of completion of therapy, it reduced to mild. The score of ODI was improved from severe disability to minimal disability after one week of completion of therapy.

Outcome variables	Baseline (1st day)	After 1 week of initiating therapy	After 2 weeks of initiating therapy	1 week after completion of therapy
NPRS	8/10	6/10	4/10	1/10
Oswestry low back disability questionnaire (ODI)	34/50 (68%)	20/50 (40%)	05/50 (14%)	01/50 (6%)

[Table/Fig-7]: Pre and post outcome measures.

DISCUSSION

Frequently, piriformis syndrome remains undiagnosed due to its resemblance to lumbar radiculopathy [12]. In the present case, authors diagnosed the case at an early stage and framed a physical therapy protocol. Patient showed a significant improvement in all the assessed outcomes, with complete recovery during follow-up visit.

Cryotherapy was used in the treatment to reduce the underlined inflammation over and around impinged nerve. According to existing literature, the effects of cryotherapy tend to neutralise after 8-10 minutes [13]. Manual therapy and TENS are widely used in physiotherapy for managing musculoskeletal conditions and are effective in pain management through the pain-gate theory mechanism, demonstrating positive outcomes in piriformis syndrome [14,15]. Class IV LASER therapy has been recognised as highly effective and is recommended for many orthopaedic disorders, including rheumatoid and osteoarthritis, carpal tunnel syndrome, fibromyalgia, and trigeminal neuralgia, due to its analgesic effects derived from photochemical reactions [16]. A study by Bettencourt F concluded that seven sessions of Class IV LASER therapy were effective in reducing pain in patients with knee osteoarthritis [17]. In a similar study by Haladaj R et al., high-intensity LASER therapy was shown to be more efficacious for cervical spondylosis than the Saunders traction device [18]. Fiore P et al., conducted a study on patients with low back pain, revealing that fifteen sessions of high-intensity LASER therapy showed significant improvement compared to therapeutic ultrasound [19].

The current report highlights the significant clinical importance of Class IV LASER therapy as a crucial electrotherapeutic modality for treating piriformis syndrome, thereby facilitating patient recovery and overall health status. The synergistic application of these therapeutic modalities expedited the recovery process within a reduced time frame and prevented extraneous screening tests, time saving and cost-effective.

Nevertheless, it is important to note that this investigation is based on a single case study, and simultaneous administration of LASER therapy in conjunction with other therapeutic approaches may obscure the isolated effect attributable solely to LASER therapy, this represents a limitation of our research. Future randomised controlled trails should be conducted on a larger cohort to assess the efficacy of LASER therapy in isolation.

CONCLUSION(S)

In present study, authors concluded that two weeks of LASER therapy shows significant improvement in patients with piriformis syndrome along with conventional physical therapy.

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