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Low-level Laser Therapy in Knee Osteoarthritis: A Prospective Analytical Study

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Abstract

Background/Aims: Osteoarthritis (OA) is the second common rheumatologic disorder and the most prevalent joint disease in India, affecting 20–40% of the population. Low-level laser therapy (LLLT) has been used to alleviate pain in musculoskeletal conditions. Despite the fact that LLLT is extensively used, the consequences from both experimental and medical research continue to be inconsistent. This study aims to assess the pain-relieving effectiveness of LLLT in patients with Kellgren–Lawrence Grade I and II knee OA, using the Visual Analog Scale (VAS) and the Western Ontario McMaster Osteoarthritis Index (WOMAC).

Materials and Methods: The study was carried out at a tertiary care center in Bengaluru. Fifty patients were recruited primarily based on the following inclusion criteria:

1. Idiopathic knee OA
2. Grade I or II bilateral knee OA confirmed by X-ray
3. Average pain intensity of 40 or greater on a 100-mm VAS
4. Age: 45–65 years, of both sexes.

Patients attended weekly therapy sessions. Each session included isometric quadriceps muscle contractions and 10 repetitions of active range of motion exercises for the knee joint, following a 5-min LLLT application.

Results: On X-ray, 52% (22 patients) had Grade I OA knee, and 48% (20 patients) had Grade II OA knee. There was a significant reduction in VAS and WOMAC post-treatment scores compared to pre-treatment.

Conclusion: OA is a long-term, degenerative condition that causes deterioration of joint tissues, resulting in excessive pain, stiffness, and restricted mobility. Treatment strategies for OA continue to be crucial for research. Our study suggests a widespread improvement in pain alleviation with LLLT. Further studies are needed to compare the efficacy of LLLT with other pain management strategies and explore combined treatment plans.

Keywords: Low-level Laser, OA knee, VAS, WOMAC

Introduction

Osteoarthritis (OA) is a common and debilitating condition characterized by damage of articular cartilage, affecting 20–40% of the population [1]. It also entails subarticular bone remodeling, osteophyte formation, periarticular muscle weakening, and synovial inflammation [2]. OA can be diagnosed based on subjective, radiological, or clinical techniques. In radiological OA, the Kellgren–Lawrence (KL) rating is typically used to grade disease severity [3].

OA analysis entails clinical symptoms of joint pain in conjunction with radiological or subjective evidence. Non-steroidal anti-inflammatory drugs are frequently used to manage OA symptoms; however, their prolonged usage is associated with gastrointestinal consequences, restricting their

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Figure 1: Laser instrument with two probes used in this study.

Figure 2: Application points of low-level laser therapy.

effectiveness [4]. To mitigate these consequences, physical therapy modalities consisting of ultrasound, transcutaneous electrical nerve stimulation, and muscle-strengthening sporting activities are frequently used [5, 6, 7, 8].

Low-level laser therapy (LLLT) has been used in musculoskeletal pain management, although its effectiveness remains debated. Variations in laser traits, consisting of wavelength, power, and pulse duration, may additionally affect outcome. This study investigates the analgesic effect of LLLT in patients with KL grade I and II knee OA using the Visual Analog Scale (VAS) and Western Ontario McMaster Osteoarthritis Index (WOMAC) OA index.

Materials and Methods

The study was carried out at a tertiary care center in Bengaluru. Fifty patients recruited with idiopathic knee OA (KL Grades I and II) confirmed by X-ray, based on the following inclusion criteria:

1. Idiopathic knee OA
2. Grade I or II bilateral knee OA confirmed by X-ray
3. Average pain intensity of 40 or greater on a 100-mm VAS
4. Age: 45–65 years, of both sexes.

	LLLT			
	Mean	SD	Median	P value
Pre T_x	68.09	8.27	68.55	
Post T_x	55.80	10.17	56.75	<0.001*

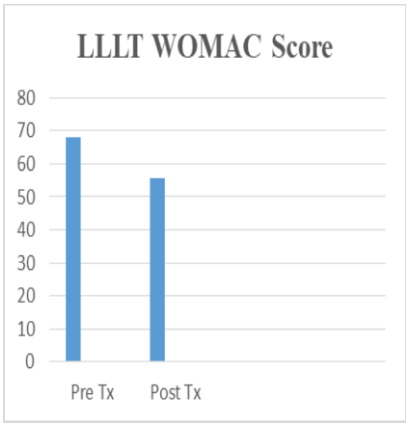


Figure 3: Pre and post low-level laser therapy treatment visual analog scale rating.

Patients attended weekly therapy sessions. Each session included isometric quadriceps muscle contractions and 10 repetitions of active range of motion exercises for the knee joint, following a 5-min LLLT application.

The LLLT used was a low-energy laser with a wavelength of 830 nm with an energy output of 1 mW, and a laser beam diameter of 1 mm (Fig. 1).

Laser treatment procedure

Laser energy was applied to the medial and lateral epicondyles of the tibia and femur, the medial and lateral knee joint gap, and the medial fringe of the tendons of the biceps femoris and semitendinosus muscles in the popliteal fossa (Fig. 2). A dose of 5 Hz for 5 min per tender point was applied across 20 sessions.

Results

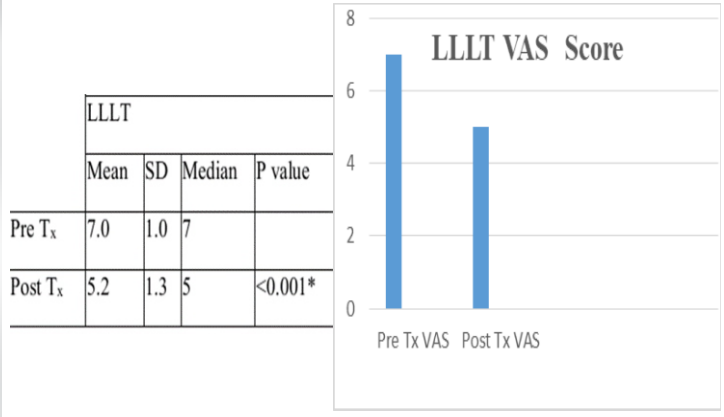
On X-ray, 52% (22 patients) had Grade I OA, and 48% (20 patients) had Grade II OA knee. The median VAS score pre-treatment was 7, which decreased to 5 post-treatment, indicating a significant reduction in pain (Fig. 3).

The mean WOMAC score pre-treatment was 68.09 ± 8.27, and post-treatment was 55.8 ± 10.17, displaying a significant reduction in functional impairment (Fig. 4).

Discussion

Laser radiation traits, including wavelength, energy density, pulse structure, and power density, determine its effectiveness [9]. Previous research has proven conflicting outcomes concerning the analgesic results of LLLT in musculoskeletal disorders, with a few reports displaying significant pain relief [10, 11], at the same time, others suggest a placebo effect [12, 13, 14].

In our study, a significant improvement in pain and function has been noted with LLLT,



	LLLT			
	Mean	SD	Median	P value
Pre T_x	7.0	1.0	7	
Post T_x	5.2	1.3	5	<0.001*

Figure 4: Pre and post low-level laser therapy treatment Western Ontario McMaster Osteoarthritis Index rating.

indicating its potential as an effective treatment modality for knee OA. However, similar researches are needed to evaluate LLLT with other pain alleviation strategies and explore the combined effects with different treatment procedures.

Conclusion

OA is a progressive disease causing joint degeneration, leading to pain, stiffness, and impaired physical function. LLLT has proven promising effects in improving pain and function in patients with knee OA. Further research is required to examine the efficacy of LLLT with different pain management modalities and to explore the potential benefits of combining LLLT with other therapies.

Declaration of patient consent: The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given his consent for his images and other clinical information to be reported in the Journal. The patient understands that his name and initials will not be published, and due efforts will be made to conceal his identity, but anonymity cannot be guaranteed.

Conflict of Interest: NIL; **Source of Support:** NIL

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