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Impact of High-Level Laser Therapy on Pain and Functional Mobility in an Older Female with Knee Osteoarthritis: A Case Report

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ABSTRACT:

Introduction: Osteoarthritis is the wear and tear of a joint that results in cartilage loss and subchondral bone changes. The patient presents with complaints of pain with movement, morning stiffness, and difficulty walking and doing daily activities. It is one of the leading causes of disability in individuals diagnosed with arthritis. Although strong evidence supports the preventive measure, there is no specific curative treatment related to knee osteoarthritis management. Exercises usually support increasing muscle strength and flexibility along with non-pharmacological treatment such as magnetic field therapy, transcutaneous electrical nerve stimulation, and therapeutic ultrasound focusing on improving pain. Laser therapy is a non-invasive measure that is usually used in treating several conditions. High-level Laser therapy is a painless measure with high radiation density useful in increasing local blood circulation, facilitating tissue regeneration, and gradual reduction in pain and edema.
Method: The conventional exercise program helps in reducing the pain, along with the functional mobility of the individual enhancing the walking in the patient with knee osteoarthritis. The intervention was given for 12 days with the laser therapy on alternate days at the various aspect of the knee. The high-intensity laser was focused on the medial condyle and other areas of high pain intensity.
Outcome Measure: The pre and post treatment measure of pain was assessed using numerical pain rating scale also the functional mobility was assessed using the WOMAC, sit and reach test along with 2 min walk test which are valid and reliable.
Conclusion: High intensity Laser therapy has shown to be effective in improving the joint pain over the knee joint and also enhancing the functional status of individual in accordance with the conservative treatment of knee osteoarthritis.

Keywords: Knee osteoarthritis, Laser therapy, physical therapy.

1. Introduction

Knee osteoarthritis is a prevalent degenerative joint condition, predominantly affecting the older population. Characterized by the progressive wear and tear of the joint, this condition leads to significant cartilage loss and subchondral bone alterations. These changes often result in inflammation and swelling of the synovial membrane.(1) Clinically, patients with knee osteoarthritis present with a spectrum of symptoms, including joint stiffness, chronic pain, and swelling, contributing to a restricted range of motion and an abnormal gait. (2) Evidence indicates that conservative management is the primary approach for treating knee osteoarthritis, often supplemented by pharmacological agents. Electrotherapeutic modalities, such as Transcutaneous Electrical Nerve Stimulation (TENS) and ultrasound therapy, are employed to alleviate joint pain. Additionally, light amplification by stimulated emission of radiation (LASER) is another pain-reducing modality used in musculoskeletal conditions. LASER therapy is classified into two types: low-level laser therapy (LLLT) and high-level laser therapy (HLLT)Previous studies have demonstrated that High-Intensity Laser Therapy (HILT) has positive effects on osteoarthritis, attributed to its deep tissue penetration capabilities. High-intensity laser therapy (HILT) enhances local blood circulation, promotes tissue regeneration, and effectively reduces pain and edema. These therapeutic benefits are primarily due to its ability to alleviate pain, decrease inflammation and swelling, and facilitate tissue healing.(4,5) This report delves into the case of a 73-year-old female diagnosed with knee OA.

2. Case Presentation

We present the case of a 73-year-old Indian female, a retired doctor, who visited the outpatient department with a chief complaint of left knee pain persisting for two years. The patient reported associated symptoms including knee stiffness and difficulty sitting cross-legged or on the floor. The pain, which had a gradual onset, was localized to the medial aspect of the knee, with an intensity of 4 at rest and escalating to 8 during activity. The pain was described as throbbing, aggravated by walking and sitting on low surfaces, and relieved by rest and medication. She experienced morning stiffness lasting 30-40 minutes. Despite being advised by an orthopedic surgeon to undergo knee replacement surgery, the patient opted for physiotherapy treatment for osteoarthritis, given her medical background. She had no history of major trauma or falls in the past two years and is a known case of borderline type 2 diabetes for the past 12 years, with no other known ailments. The patient had previously attended a week of physiotherapy treatment at a neighborhood clinic, which she discontinued.

Clinical examination revealed swelling on the anterior aspect of the knee, crepitations, and tenderness graded at 2 on both the anterior and medial aspects. Further, the patient's patellar mobility was reduced, and the end feel at the knee was empty. The range of motion and strength at the knee and hip were diminished. Clark's test was found to be positive. Outcome measures included the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) score, Numerical Pain Rating Scale for pain assessment, sit to reach test and 2 min walk test.

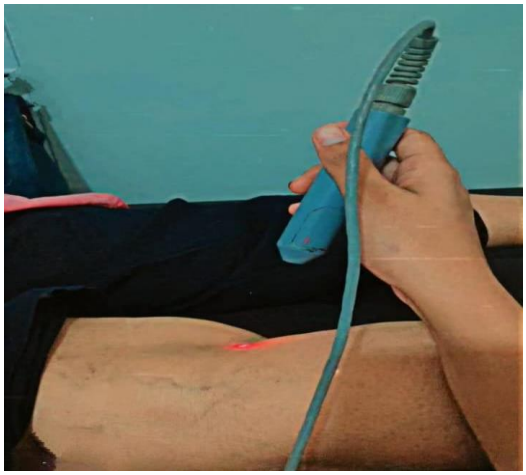
Radiographic imaging of the left knee revealed grade 3 osteoarthritic changes characterized by moderate osteophytes, definite joint space narrowing, and some sclerosis according to Kellgren and Lawrence's classification(6). Bone mineral density was found to be normal. The differential diagnoses considered for this case included patellofemoral pain syndrome, bursitis, and ligament injury. However, the clinical presentation, including the chronic nature of the pain, morning stiffness, presence of crepitations, and the specific pattern of tenderness and swelling, along with the radiographic findings, strongly supported a diagnosis of knee osteoarthritis.

Therapeutic Intervention

Days	Electrotherapy	Exercise Therapy	Dosage
0-4 days	**Ultrasound** **Site**: anterior and medial aspect of left knee 7 mins, continuous mode, frequency 1 MHz intensity 0.8 W/cm^2 **Laser Therapy** on alternate days **Site:** Medial aspect of the knee	Static exercises for- quadriceps, hamstrings and adductors. Pelvic bridging. Straight leg raise supine Straight leg raise side lying Myofascial release to adductors and abductor Dynamic quadriceps exercise. Resisted isometrics for knee	10 sec hold,10 rep x3 sets 5 sec hold,10 rep x3 sets. 10 reps, 3 sets 15 mins 10 reps x 3 sets 5 reps with 5 sec hold
4-8 days	**Ultrasound** **Site:** anterior and medial aspect of left knee 7 mins, continuous mode, frequency 1 MHz intensity 0.8 W/cm^2 **Laser Therapy** on alternate days **Site:** At the postero – medial aspect of left knee.	Static exercises for Adductors. Pelvic bridging. Straight leg raise supine with 0.5kg weight Straight leg side lying with 0.5kg weight Myofascial release to adductors and abductor Dynamic quadriceps exercise with 0.5kg weight Resisted isometrics for knee Mini wall squats. Resisted walking: forward, backward, sideways	10 reps x 5-sec hold. 5 sec hold,10 rep x3 sets. 10 reps, 3 sets 15 min 10 reps x 3 sets 5 reps with 5 sec hold 10 reps x 1set

8-12 days	**Ultrasound:** anterior and medial aspect of left knee 7 mins, continuous mode, frequency 1 MHz intensity 0.8 W/cm^2 **Laser Therapy** on alternate days. **Site :** At the medial aspect of the left knee.	Pelvic bridging. Straight leg raise supine with 1 kg weight Straight leg raise side lying with 1 kg weight Myofascial release to adductors and abductor x15 min Dynamic quadriceps exercise with 1kg weight Resisted isometrics for knee Mini wall squats. Resisted walking: forward, backward, sideways	10 sec hold,10 rep x3 sets 10 reps, 3 sets 15 mins 10 reps x 3 sets 5 reps with 5 sec hold 10 reps x 1set

Intervention Images



Outcome Measures

Primary- 1

1. Numerical Pain Rating Scale (Nprs) -

The Numeric Pain Rating Scale (NPRS) is a tool used to assess pain intensity in adults. Individuals select a whole number between 0 and 10 to represent their pain level, where 0 indicates no pain and 10 signifies the worst pain imaginable. The NPRS shows high test-retest reliability, with correlation coefficients of 0.96 and 0.95. Moreover, it exhibits strong construct validity, demonstrated by its high correlation with the Visual Analog Scale (VAS), with coefficients ranging from 0.86 to 0.95.(7)

2. Womac Scale

The Western Ontario and McMaster Universities (WOMAC) Osteoarthritis (OA) Index is a validated, self-administered questionnaire consisting of 24 items divided into three subscales: pain, stiffness, and physical function. These subscales are combined to produce a total score ranging from 0 to 96, where 0 indicates the best health status and 96 indicates the worst. The test-retest reliability of the WOMAC Index is satisfactory, with intraclass correlation coefficients (ICCs) of 0.86 for pain, 0.68 for stiffness, and 0.89 for physical function.(8)

Secondary

1. Sit And Reach Test:

Functional Outcomes	Pre-Treatment	Post-Treatment
Womac	45	22
Sit and Reach Test	28	31.5
2 Min Walk Test	133.5	140.3

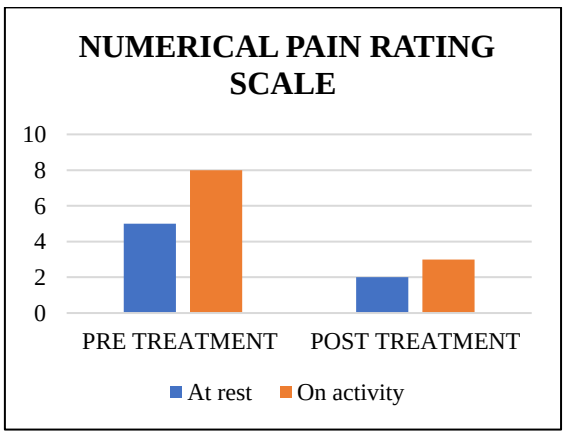
The Sit and Reach Test measures hamstring and lower back flexibility. To perform the test, a yardstick is placed on the floor with tape at a right angle at the 15-inch mark. The individual sits with their legs extended at right angles to the tape, heels touching the edge and 10 to 12 inches apart. The individual then slowly reaches forward with extended arms, one hand on top of the other and palms down, holding the position for about 2 seconds. Hands must remain parallel without leading with one hand. The score is the farthest point reached by the fingertips. This test has an intraclass correlation coefficient (ICC) of 0.92.(9,10)

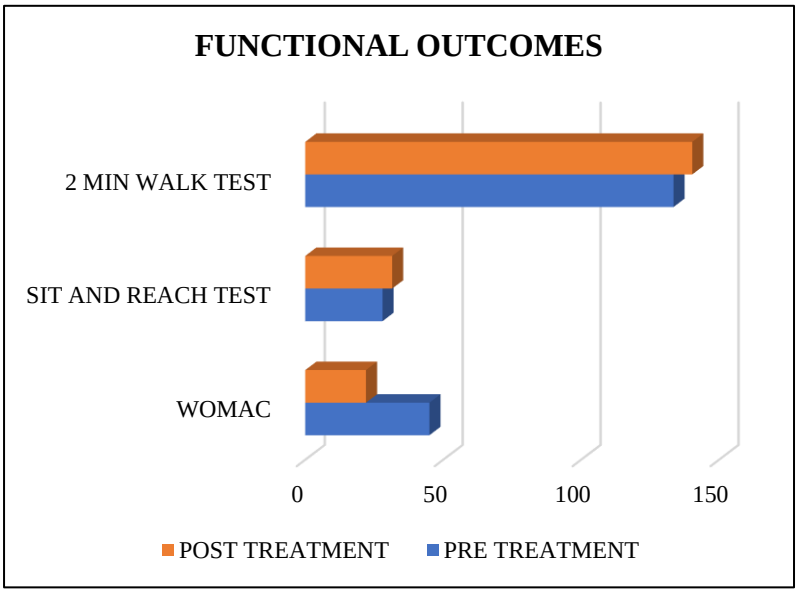
2. Minute Walk Test:

The 2-Minute Walk Test (2MWT) measures self-paced walking ability and functional capacity, particularly for individuals unable to complete the 6- or 12-minute walk tests. Participants are encouraged to walk as quickly and safely as possible for two minutes, and the distance covered is measured. The test has high test-retest reliability, with an intraclass correlation coefficient (ICC) of 0.985, and demonstrates strong construct validity, showing a strong correlation with the six-minute walk test across various populations.(11)

3. Results

Nprs	Pre-Treatment	Post-Treatment
At Rest	5	2
On Activity	8	3





4. Discussion

This case report highlights the importance of combining electrotherapy with conventional therapy for knee osteoarthritis. To decrease pain and improve functional capacity in cases of knee osteoarthritis, structured conservative management is necessary to enhance the quality of life and functional capacity. Knee osteoarthritis (OA) is a common condition, especially among the elderly, characterized by cartilage degradation, subchondral bone changes, and synovial inflammation. The patient's clinical presentation, radiographic findings, and treatment outcomes offer valuable insights into conservative management approaches for osteoarthritis. Using validated outcome measures such as the WOMAC score and NPRS further quantified the patient's pain and functional impairment, providing a baseline for evaluating treatment efficacy.

Based on previous articles, Siriratna et al. conducted a randomized controlled trial to evaluate the efficacy of high-intensity laser therapy (HILT) on pain reduction in patients with knee osteoarthritis (OA)(4). The main outcome measures were the Visual Analog Scale (VAS) and the modified Thai version of the Western Ontario and McMaster Universities Osteoarthritis Index (T-WOMAC). The overall analysis showed a significant decrease in VAS and T-WOMAC scores in both groups, with a greater decrease observed in the HILT group than in the control group.

In another study by Pekyavas et al., which investigated the short-term effects of high-intensity laser therapy, manual therapy, and kinesio taping in patients with subacromial impingement syndrome (SAIS)(12), the main outcome measures were VAS, range of motion (ROM) measured by goniometer, and Shoulder Pain and Disability Index (SPADI). The results indicated that HILT and manual therapy were more effective in reducing pain and disability and increasing ROM in patients with SAIS.

Additionally, a case report by Aceituno-Gómez et al. examined the long-term effect of high-intensity laser therapy for persistent shoulder pain, also showing positive results (13).

Furthermore, a similar systematic review focused on the efficacy of HILT in knee OA patients by Justyna et al. concluded that HILT seems to be efficient in reducing pain and providing functional improvements in patients with knee OA(1). Another article by Akaltun et al., which

supports our case report, aimed to investigate the effectiveness of high-intensity laser therapy on pain, functionality, flexion range of motion (FROM), and ultrasonographic cartilage measurement in patients with knee osteoarthritis. The main outcome measures were VAS, WOMAC, and ultrasonography for measuring cartilage thickness, and goniometer for ROM. This study concluded that the combination of HILT and exercise therapy was more effective in treating knee osteoarthritis.

The structured physiotherapy program resulted in significant improvements in pain levels, as evidenced by the reduction in Numeric Pain Rating Scale (NPRS) scores. Enhanced functional capacity was indicated by better performance in the sit-and-reach test and the 2-minute walk test. The decrease in Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) scores reflected overall improvements in pain, stiffness, and physical function. These positive outcomes highlight the effectiveness of combining electrotherapy with targeted exercise regimens in managing knee osteoarthritis (OA). Integrating electrotherapeutic modalities like ultrasound and laser therapy with comprehensive exercise programs can significantly alleviate symptoms and improve quality of life. Moreover, utilizing standardized outcome measures facilitates objective assessment and monitoring of treatment progress.
This case report is limited by its single-subject design and the short duration of follow-up, which does not allow for the assessment of the long-term effects of the physiotherapy regimen. Further research with larger sample sizes and extended follow-up periods is necessary to determine the sustained efficacy and potential benefits of these interventions for knee osteoarthritis over time. Additionally, a similar study could be conducted on rheumatoid arthritis (RA) patients to assess the efficacy of high-intensity laser therapy (HILT).

5. Conclusion

In conclusion, the case study demonstrates that High-Intensity Laser Therapy (HILT) effectively reduces localized pain in patients with knee osteoarthritis when integrated with a standard exercise regimen. The protocol combined range of motion exercises, stretching, strengthening, flexibility training, and gait training with targeted laser therapy, resulting in significant pain reduction and improved functional status as measured by the Visual Analog Scale and WOMAC scale. These findings suggest that HILT can be a valuable adjunct to conservative treatments, offering a non-invasive and efficient approach to managing knee osteoarthritis and enhancing patient outcomes.

6. References

1. Wyszyńska J, Bal-Bocheńska M. Efficacy of High-Intensity Laser Therapy in Treating Knee Osteoarthritis: A First Systematic Review. Photomedicine and Laser Surgery. 2018 Jul;36(7):343–53.
2. Dantas LO, Salvini TDF, McAlindon TE. Knee osteoarthritis: key treatments and implications for physical therapy. Brazilian Journal of Physical Therapy. 2021 Mar;25(2):135–46.
3. Kaya Mutlu E, Ercin E, Razak Ozdıncler A, Ones N. A comparison of two manual physical therapy approaches and electrotherapy modalities for patients with knee osteoarthritis: A randomized three arm clinical trial. Physiotherapy Theory and Practice. 2018 Aug 3;34(8):600–12.
4. Siriratna P, Ratanasutiranont C, Manissorn T, Santiniyom N, Chira-Adisai W. Short-Term Efficacy of High-Intensity Laser Therapy in Alleviating Pain in Patients with Knee

Osteoarthritis: A Single-Blind Randomised Controlled Trial. Wang XQ, editor. Pain Research and Management. 2022 Oct 21;2022:1–9.
5. Akaltun MS, Altindag O, Turan N, Gursoy S, Gur A. Efficacy of high intensity laser therapy in knee osteoarthritis: a double-blind controlled randomized study. Clin Rheumatol. 2021 May;40(5):1989–95.
6. Kellgren JH, Lawrence JS. RADIOLOGICAL ASSESSMENT OF OSTEO-ARTHROSIS. ANNALS OF THE RHEUMATIC DISEASES.
7. Bergh I, Sjöström B, Odén A, Steen B. An application of pain rating scales in geriatric patients. Aging Clin Exp Res. 2000 Oct 1;12(5):380–7.
8. Salaffi F, Leardini G, Canesi B, Mannoni A, Fioravanti A, Caporali R, et al. Reliability and validity of the Western Ontario and McMaster Universities (WOMAC) Osteoarthritis Index in Italian patients with osteoarthritis of the knee. Osteoarthritis and Cartilage. 2003 Aug;11(8):551–60.
9. Mayorga-Vega D, Merino-Marban R, Viciana J. Criterion-Related Validity of Sit-And-Reach Tests for Estimating Hamstring and Lumbar Extensibility: A Meta-Analysis.
10. Ayala F, Sainz de Baranda P, De Ste Croix M, Santonja F. Reproducibility and criterion-related validity of the sit and reach test and toe touch test for estimating hamstring flexibility in recreationally active young adults. Physical Therapy in Sport. 2012 Nov 1;13(4):219–26.
11. Johnston KN, Potter AJ, Phillips AC. Minimal important difference and responsiveness of 2-minute walk test performance in people with COPD undergoing pulmonary rehabilitation. COPD. 2017 Oct 9;12:2849–57.
12. Pekyavas NO, Baltaci G. Short-term effects of high-intensity laser therapy, manual therapy, and Kinesio taping in patients with subacromial impingement syndrome. Lasers Med Sci. 2016 Aug;31(6):1133–41.
13. Aceituno-Gómez J, García-Madero VM, Criado-Álvarez JJ, González-González J, Gómez-Soriano J, Avendaño-Coy J. Long-term effect of high-intensity laser therapy for persistent shoulder pain: A case report. BMR. 2020 Nov 11;33(6):947–51.