

## To Compare the Effectiveness between LASER and Neuromuscular Electrical Stimulation in Knee Osteoarthritis

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### ABSTRACT

**Introduction and Aim:** The aim of the study is to compare the efficacy of LASER, and conventional Exercise versus Neuromuscular Electrical Stimulation and conventional Exercise in the treatment of subjects with osteoarthritis of the knee joint in terms of pain relief and improving the functional activities. Osteoarthritis is the most common form of Arthritis. It is a disease caused by the breakdown of cartilage in the joints. The layers of the cartilage become damaged, and with time they lose the function of smoothing the contact between the bone surface and the joints. The pain is a result of the attrition of one bone against the other in the absence or decreased cartilage in the joints. The knee joint supports nearly the whole weight of our body. This study helps to increase the Range of motion, Muscle strength and Recovery of Muscle Mass.

**Materials and Methods:** The study was done at Outpatient Physiotherapy Department ACS Medical College and Hospital. This experimental study design had a sample size of 30, between the age group of 40 to 60 years. The patients were allocated to Group A and Group B by simple random sampling, duration of study 6 Session in a week, for 4 weeks. The material used a LASER, NMES, Bicycle Ergometer, Treatment couch and Assessment sheet and outcome measures Visual analogue scale [VAS] and Western Ontario and Mc Master Osteoarthritis Index [WOMAC]

**Results:** A Total number of 30 patients with osteoarthritis of the knee joint were taken between 40- 60 years of age, both males, and females. Group A -was treated with LASER and conventional exercise, Group B – received NMES with Conventional Exercise for 4 weeks. VAS and WOMAC scale was recorded before and after treatment session as pre and post-test score after 4 weeks of treatment. Group -B proved better improvement than Group A. Hence Null hypothesis is rejected.

**Conclusion:** The present study concluded that 4-weeks treatment program using LASER and NMES in subjects with osteoarthritis of the knee joint showed that both the interventions were effective in reducing pain intensity and improves the functional activities.

**Key Words:** Osteoarthritis, LASER, NMES, WOMAC

### INTRODUCTION

Osteoarthritis is a musculoskeletal condition characterized by the loss of cartilage (1). It is a chronic degenerative disorder of multifactorial etiology associated with the loss of articular cartilage, hypertrophy of the bone at the margins, subchondral sclerosis, and range of biochemical and morphological alteration of the joint capsule and the synovial membrane (2). Osteoarthritis is the 2nd most common Rheumatologic problem. In India, osteoarthritis is the most frequent joint disease with the prevalence of 22% to 39% (3). Osteoarthritis is more common in women than men but the prevalence of the OA increases dramatically with age (4,5).

The cartilage provides impact resistance, low friction and bearing that contributes to efficient pain-free stability in the posture and locomotion (6). The cartilage like any other material or tissue is damaged by the high pressure or repetitive loading.

Knee OA is associated with the symptoms of pain, instability, stiffness, swelling and decreased the range of motion (8). These symptoms result in functional impairment, increasing the risk of morbidity and mortality (9). The wear and tear of cartilage can be prevented by lowering the stress across the joint so as to allow the functional healing of the bone and articular surface to take place (10). Stress in the joint can be diminished by reducing the overall load on

the joint and by increasing the surface over which the load acts.

The LASER therapy has promoted for effects on tissue healing and for the pain relief. It refers to the production of a beam of radiation which differs from the ordinary light. The laser has an analgesic effect as well as the biomodulatory effect on microcirculation (11). The laser exerts a positive influence on fibroblast and osteoblast proliferation, collagen synthesis, bone metabolism and cartilage damage. The laser has an effect on prostaglandin synthesis and thus it reduces inflammation (12). It is found to be effective in the healing of connective tissues in the knee OA. Laser therapy has bactericidal effects because of increased phagocytosis by the leukocytes (13).

Neuromuscular Electrical Simulation is defined as the application of electrical current to the neuromuscular junction and the surrounding muscle fibers to produce a visible muscle contraction due to the activation of intramuscular nerve branches (14). It is used for the preservation of muscle mass and the function during prolonged periods of disuse or immobilization, improvement of the muscle function in different healthy populations, the recovery of muscle mass and preoperative strengthening (15). It is an effective therapy for quadriceps strengthening in individuals with knee OA. Due to the Non-Selective recruitment of motor units, muscle fibers type 1 & 2 are simultaneously recruited through the NMES, even at the relatively low intensities of stimulation, potentially producing the structure and functional changes in the neuromuscular system (16). The Conventional Exercise helps in decreasing the pain, improving range of motion, strength, and endurance (17). The connective tissue elasticity, as well as exercise, decreases the functional limitation by improving speed, walking, physical activity and gait (18). The exercise decreases the depression and anxiety.

**MATERIALS AND METHODS**

30 patients who reported to outpatient Physiotherapy department ACS Medical College and Hospital were randomly grouped into Group-A, Group-B based on Inclusion and Exclusion criteria. A detailed demography data, past medical history were collected from the patient. After detailed explanation about the treatment procedure, an informed consent was obtained. The outcome measures, VAS, WOMAC was recorded before and after the treatment as pre and post test score. Group-A: Consists of 15 subjects

and they received LASER and Conventional Exercise. Group-B: Consists of 15 subjects were treated with LASER, Neuromuscular Electrical Stimulation, and Conventional Exercise which consists of Bicycle ergometer, stretching of hamstrings muscles with the aid of an Thera band, and knee Isometric exercises, straight leg raise, knee extension, hip abduction.

**Data Analysis**

The collected data were tabulated and analyzed using both descriptive and inferential statistics. All the parameters were assessed using statistical package for social science (SPSS) version 24. Paired t-test was adopted to find statistical difference within the groups & Independent t-test (Student t-Test) was adopted to find statistical difference between the groups.

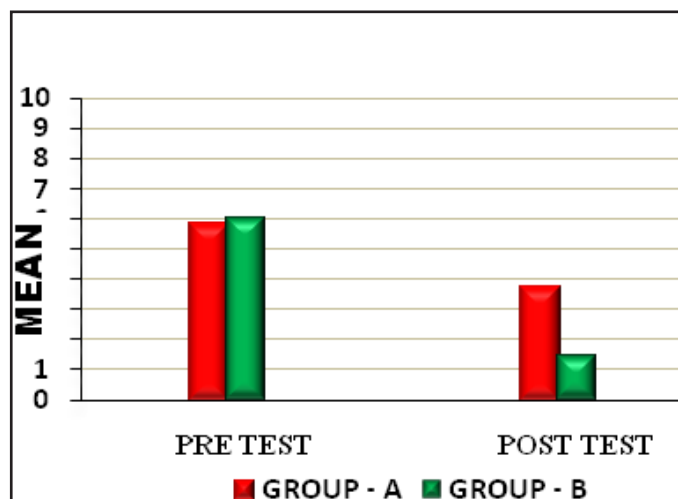
**Table 1: Comparison of VAS Score Between Group - A and Group - B an Pre and Post Test**

VAS	GROUP - A		GROUP - B		t - TEST	SIGNIFICANCE
	MEAN	S.D	MEAN	S.D		
PRE TEST	5.80	.676	6.06	.883	-.928	.361*
POST TEST	3.73	.593	1.46	.516	11.15	.000***

(\* - P > 0.05)(\*\*\* - P ≤ 0.001)

The above table reveals the Mean, Standard Deviation (S.D), Student t-test, and p-value of the VAS score between (Group A) & (Group B) in pre test and post test weeks. This table shows that there is no significant difference in pre test values of the VAS score between Group A (5.80) & Group B (6.06) (\*P > 0.05). Group-B (1.46) which has the Lower Mean value is more effective than Group-A (3.73)

**Graph I: Comparison of VAS Between Group - A and Group - B in Pre & Post Test**



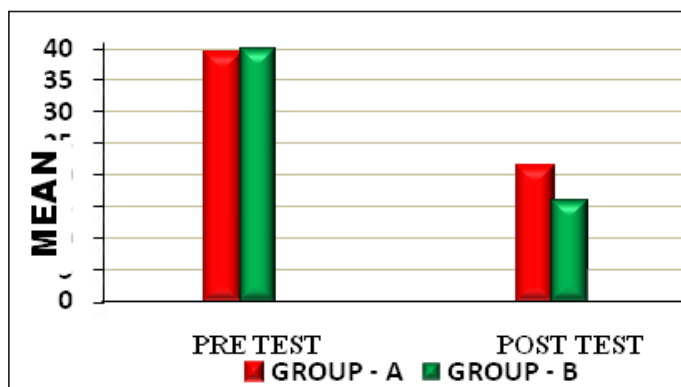
**Table 2:** Comparison of WOMAC Score between Group – A and Group - B In Pre & Post Test

WOMAC	GROUP - A		GROUP - B		t - TEST	SIGNIFI- CANCE
	MEAN	S.D	MEAN	S.D		
PRE TEST	39.33	1.49	40.06	1.62	-1.28	.209*
POST TEST	21.26	1.66	16.13	1.18	9.71	.000***

(\* - P > 0.05)(\*\*\* - P ≤ 0.001)

The above table reveals the Mean, Standard Deviation (S.D), Student t-test, and p-value of the WOMAC score between (Group A) & (Group B) in pre test and post test weeks. This table shows that there is no significant difference in pre test values of the WOMAC score between Group A (39.33) & Group B (40.06) (\*P > 0.05). Both the Groups shows highly significant decrease in the post test Means but Group-B (16.13) which has the lower mean value is more effective than Group-A (21.26)

**Graph II:** Comparison of WOMAC Score between Group – A and Group - B In Pre & Post Test



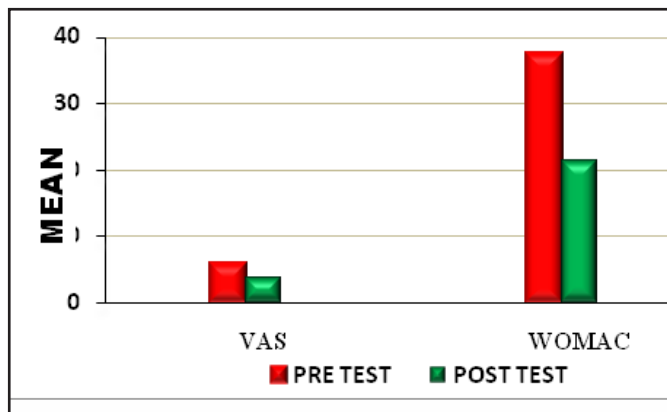
**Table 3:** Comparison of VAS, WOMAC Score Within Group – A Between Pre & Post Test Values

GROUP - A	PRE TEST		POST TEST		t - TEST	SIGNIFI- CANCE
	MEAN	S.D	MEAN	S.D		
VAS	5.80	.676	3.73	.593	11.37	000***
WOMAC	39.33	1.49	21.26	1.66	33.54	.000***

(\*\*\* - P ≤ 0.001)

The above table reveals the Mean, Standard Deviation (S.D), t-value and p-value of the VAS, WOMAC score between pre-test and post-test within Group – A. In the VAS score, there is a statistically highly significant difference between the pre test (5.80) and post test values (3.73) (\*\*\* - P ≤ 0.001). In the WOMAC score, there is statistically highly significant difference between the pre test (39.33) and post test values (21.26) (\*\*\* - P ≤ 0.001). (Graph-III)

**Graph III:** Comparison of VAS and WOMAC Score within Group – A Between Pre & Post Test Values



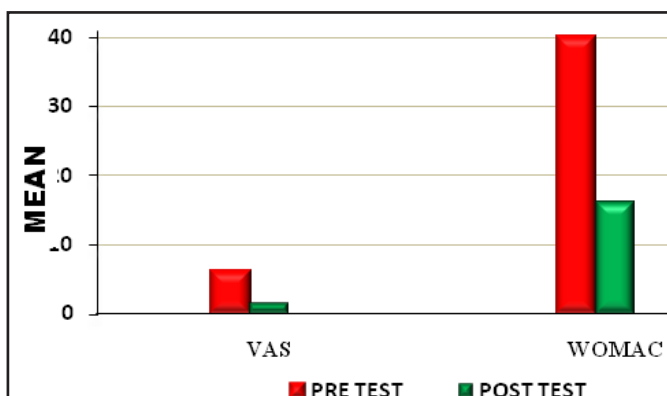
**Table 4:** Comparison of VAS, WOMAC Score Within Group – B Between Pre & Post Test Values

GROUP - A	PRE TEST		POST TEST		t - TEST	SIGNIFI- CANCE
	MEAN	S.D	MEAN	S.D		
VAS	6.06	.883	1.46	.516	28.16	000***
WOMAC	40.06	1.62	16.13	1.18	50.62	.000***

(\*\*\* - P ≤ 0.001)

The above table reveals the Mean, Standard Deviation (S.D), t-value and p-value of the VAS & WOMAC score between pre-test and post-test within Group – B. In the VAS score, there is a statistically highly significant difference between the pre test (6.06) and post test values (1.46) (\*\*\* - P ≤ 0.001). In the WOMAC score, there is statistically highly significant difference between the pre test (40.06) and post test values (16.13) (\*\*\* - P ≤ 0.001). (Graph-IV)

**Graph IV:** Comparison of VAS and WOMAC Score within Group – B Between Pre & Post Test Values



**RESULTS**

A Total number of 30 patients with osteoarthritis of the knee joint were taken within the age of 40- 60 years both males and females were included in this study.

Group A -was given LASER with Conventional Exercise and Group B – was given NMES, with Conventional Exercise for 4 weeks. Pre and post test were taken and compared from VAS and WOMAC and after 4 weeks of treatment Group -B proved better improvement than Group A. Hence Null hypothesis is rejected.

## DISCUSSION

This study evaluated the effects to compare the effectiveness of LASER and Conventional Exercise versus Neuromuscular Electrical Stimulation and Conventional Exercise in the treatment of subjects with Osteoarthritis of the Knee Joint.

The result of this study showed strong evidence that Neuromuscular Electrical Stimulation with Conventional Exercise, in reducing pain. The result of the study was statistically significant as the descriptive data's such as mean and standard deviation which indicated that improvement in terms of pain and Functional Activity at the end of the treatment session in both the Groups. Comparing the result obtained from the two Groups, the result of the study showed that Neuromuscular Electrical Stimulation with Conventional Exercise showed significant improvement than LASER and Conventional Exercise. This result supported by Mônica de Oliveira Melo et al. (2016) who concluded that LASER, Neuromuscular Electrical Stimulation with Conventional Exercise are helpful for treating a patient with Osteoarthritis knee Pain, as well as Functional Activity. The pre-test mean value of Visual Analogue Scale (VAS) between Group-A (5.80) and Group-B (6.06) does not show a significant difference. However, the post-test mean value showed a significant difference between Group-A (3.73) and Group-B (1.46). The pre-test mean value of Western Ontario McMaster Osteoarthritis Index (WOMAC) between Group-A (39.33) and Group-B (40.06) does not show a significant difference. At the end of the treatment session, the post-test mean value of WOMAC between Group-A (21.26) and Group-B (16.13) showed a significant difference.

## CONCLUSION

The present study concluded that 4-weeks treatment program using LASER and NMES in subjects with Osteoarthritis of the knee Joint showed that both the interventions were effective in reducing pain intensity and improves the functional activities. This study suggested that NMES with Conventional Exercise

showed statistically high significant improvement than LASER and Conventional Exercise. The study reveals there is a significant difference in Group-A and Group-B in the treatment of subjects with osteoarthritis of the knee joint.

**Ethical Consideration:** This study was conducted after obtaining the approval from the Institutional Review Board of faculty of Physiotherapy.

**Conflict of Interest:** None

**Fund:** Self funded project

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