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A case series studying the effect of low level laser therapy in osteoarthritis knee in elderly population of northeastern India

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Abstract

Background: Osteoarthritis knee affects a large portion of the population and it is the leading cause of disability worldwide. The increase in life expectancy further added to the burden of the disease. Joint replacement surgery is in accessible to most people in this region. Our objective is to study the effectiveness of low level laser therapy in primary osteoarthritis knees in the north-eastern elderly population of India.

Materials and methods: This is a prospective cohort study in 30 patients attending orthopaedic outpatient department with primary osteoarthritis knee. All selected patients including both male and female were managed with low level laser therapy (wavelength of 905 nm and a power that varies from 27 Wp to 100 Wp) for 4 consecutive weeks. Scoring using WOMAC (Western Ontario and McMaster University Osteoarthritis Index) and VAS (Visual analog scale) were taken during first enrolment and then at 4 and 8 weeks of follow up.

Results: There was a significant improvement in both WOMAC and VAS scores both at 4 weeks and 8 weeks of follow up. Improvement from baseline WOMAC mean score (enrolment 58.8, 79.36 at 4 weeks and 93.1 at 8 weeks ($p < 0.05$)). Similarly VAS mean score improved (enrolment 7.3, 3.36 at 4 weeks, and 1.33 at 8 weeks ($p < 0.05$)).

Conclusion: Based on the results of our study we may conclude that low level laser therapy is an effective treatment for short-term improvement in patients suffering from OA knees.

Keywords: Osteoarthritis knee, elderly, low level laser therapy

Introduction

Osteoarthritis (OA) is the most common musculoskeletal pain and disability in the elderly population. With the number of ageing population increasing, the burden of this disease becomes a high priority health care problem. Osteoarthritis is expected to be the fourth leading cause of disability by the year 2020. Osteoarthritis of the knee can cause symptoms ranging from mild to disabling. According to the latest bulletin of WHO January 28th 2013 moderate to severe disabilities as a result of osteoarthritis cover 10 million of the population in developed countries and 33.5 million of the population in countries with lower income. In general 43.4 million of the world population with OA are disabled, this defines the medical and social importance of osteoarthritis [1-3].

OA being a chronic disease results in long term treatment. Chronic medication especially in elderly leads to many undesirable side effects due to drugs toxicity. Operative procedures including joint replacement surgery are promising, however in our scenario many patients are poor and cannot afford.

Laser (light amplification by stimulated emission of radiation) is a light source of a single wavelength. The laser therapy effects the photochemical reaction in the cells. Laser therapy have gain acceptability in treating many ailments in the field of orthopaedics ever since the pioneering works of Endre Mester. Its usage have shown to have a positive benefits to fibroblast and osteoblast proliferation, collagen synthesis, and bone regeneration [4-6].

Low level laser therapy (LLLTT) takes place at low radiation intensities with an output up to 500 milliwatt (mW) which have been reported to have stimulatory, anti-inflammatory and analgesic effects [7]. The aim of this study is to gather evidence the analgesic effects of laser in OA knees.

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Materials and methods

Forty patients attending orthopaedics out- patient department were selected for the study including 25 females and 15 males between January and June 2017. Age group range between 45 to 70 years and all had mild to moderate OA. Diagnosis of OA was based on clinical symptoms and x ray findings.

Exclusion criteria were post traumatic knees, infection, previous surgery around the knee, deformity (varus or valgus), stage 4 kellgren Lawrence as detected from x-ray, and contraindications of laser therapy.

From the 40 patients selected only 30 (17 females and 13 males) completed the study. During the study proper history taking including detailed examination and consent were taken. No analgesics in any form were allowed during the study. All patients included in the study were counselled and consent was taken for participation (Table 1- demographic details).

Treatment was given five times a week for a period of 4 weeks with an IR27 ELETRONICA PAGANI laser (figure1). It is equipped with a diode operating at a wavelength of 905 nm, a frequency adjustable from 5 to 7,000 Hz and a power that varies from 27 Wp to 100 Wp. This laser was equipped with a large library of predefined therapeutic programs to which the operator can access, and in our case we select the parameters well suited and most appropriate (arthritis knee).

In every session the patient was given laser therapy for 15minutes. Before application of the laser marking was done for the most tender points and then the patient applied by him or herself using a probe over the marked areas (Figure 2).

Results

SPSS for Windows software (version 10; SPSS, Chicago, Illinois) was used for data management and statistical analysis. Wilcoxon signed-rank test was used for statistical analysis as the data is non parametric. The level of significance was set at 0.05 for all statistical tests.

The mean WOMAC score at time of enrolment was 58.8, 79.36 at 4 weeks and 93.1 at 8 weeks. (Table 2)

A Wilcoxon signed-rank test showed that at 4 weeks and 8 weeks post laser therapy, a statistically significant improvement of WOMAC score ($Z = -4.765, p < 0.05$) (Table 2). The mean VAS score at time of enrolment was 7.3, at 4 weeks 3.36, and 8 weeks 1.33. There was a significant reduction in pain and reduction of VAS score at 4 weeks and 8 weeks post treatment ($Z = -4.746, p < 0.05$) (Table 3).

The analysis of the results in the test group found that LLLT was effective for reducing pain in patients with osteoarthritis of the knee. There was an immediate effect after each procedure, which was demonstrated with clinical improvement of patients. The effect of laser therapy regarding pain reduction lasted for 8 to 10 weeks. (Figure 3, 4)

Discussion

The results from this study provide the effectiveness of LLLT in primary OA knees with improvement in all evaluated parameters. The possibility of laser therapy in OA knees is promising as a safe, non-invasive, viable and cost effective treatment in elderly individuals.

Osteoarthritis is not just degeneration of articular cartilage but it was found to be a result of intensive mechanical stress and lysis with the participation of mediators such as metalloproteinases, synthesized by chondrocytes: interleukin-1, prostaglandin E2, and proteinases 1, 3, and 13. In OA inadequacy of the chondrocytes to synthesize the main components of the extracellular matrix and the collagen fibrils with quality, necessary to fulfil its primary biological role,

hydrophility, elasticity, and compressivity of cartilage hyaline. The pathological process involves not only the cartilage and the underlying bone and synovial tissue, but also all the intra-articular and periarticular structures [8-10].

There are some major biological effect of laser which plays an important role in pathogenesis of OA (thermal, mechanical, electrical and bio stimulating).The thermal effect of laser increases the temperature of liquids and increases intracellular pressure. Mechanical effect leads to mechanical change in kinetic and ultrasonic. Laser also induces electrical changes in structure of molecules in cell membrane which increase permeability. The bio stimulating effect supplies quantum energy to the cell without histological changes. The analgesic, anti-inflammatory effect of laser is due to the blockage of cyclooxygenases and lipooxygenases, by modulating the components of inflammatory reaction. This impact on prostaglandin and prostacyclin synthesis. All the mechanism leads to a positive effect in OA [11].

The effectiveness of this therapy persisted till 8 to 10 weeks after treatment. The weakness of our study is that there is no control group for comparison and the number of subjects is less. Also we were not able to record the change in temperature in the irradiated joints due to non-availability of thermography camera. However with the parameters calculated we believed that laser reduces pain and improves the activity of daily living in OA patients.

Table 1: Demographic details

	Male	female	Complications		
Number of patients	13	17	Diabetes mellitus	8	
Average age	60.53 years	61.29 years	Hypertension	6	
Kellgren Lawrence stage	1	5	2	Thyroid disorders	2
	2	3	9	Gynaecological problems	3
	3	5	6	Hyperlipidemia	1

Table 2: Descriptive analysis WOMAC score

	Number of patients	Mean	Standard deviation	Minimum	Maximum
Enrolment	30	58.8	18.03	22	85
4 weeks	30	79.36	8.75	64	97
8 weeks	30	93.10	2.89	83	96

Table 3: Descriptive analysis VAS score

	Number of patients	Mean	Standard deviation	Minimum points	Maximum points
Enrolment	30	7.3	1.02	5	9
4 weeks	30	3.6	1.10	2	6
8 weeks	30	1.33	0.47	1.0	2.0

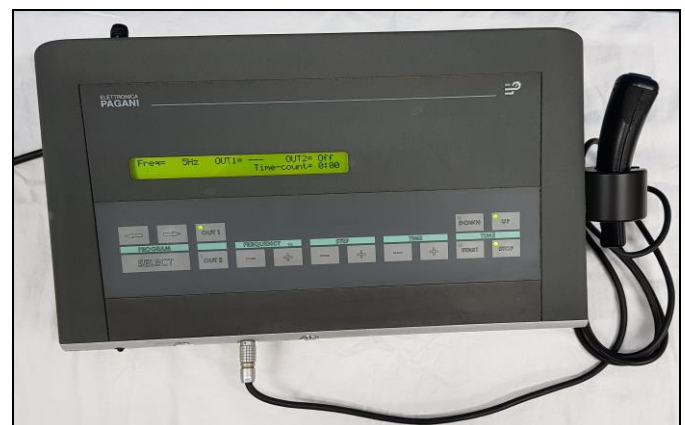


Fig 1



Fig 2

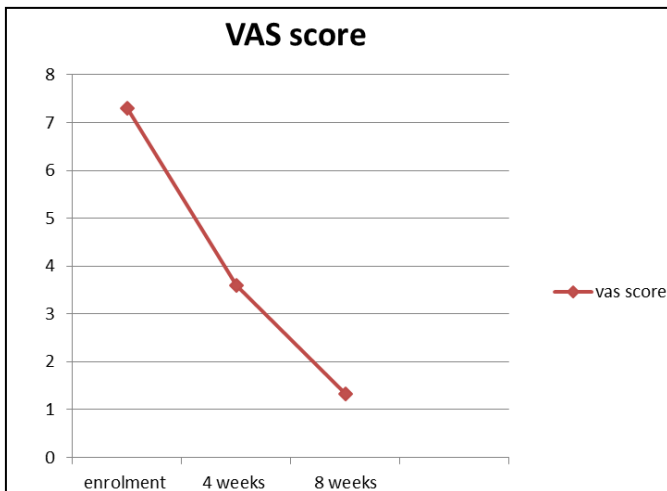


Fig 3: Vas Score

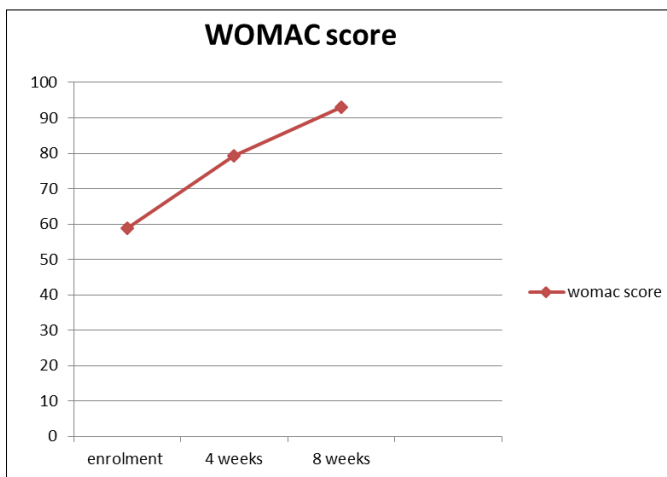


Fig 4: Womac Score

Conflict of interest

None to declare.

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Conclusion

In summary based on the results of our study we conclude that LLLT is an effective, cheap, non-invasive option in OA knees. Therefore it may be recommended as short term treatment for reduction of pain and improving of function in patients with osteoarthritis of the knee.

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