EFFICACY OF LOW LEVEL LASER THERAPY ON WOUND HEALING IN PATIENTS WITH TYPE 2 DIABETIC FOOT ULCERS

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ABSTRACT

Objective: The aim of this study was to find the effect of low level LASER therapy on wound healing in patients with type 2 diabetic foot ulcers.

Methodology: Quasi experimental pretest–posttest type, Inclusion criteria was patient with type 2 Diabetic foot ulcer of both gender, Age 50–70 and exclusion criteria was osteomyelitis and traumatic scars. Applying inclusion and exclusion criteria, 10 subjects with type 2 Diabetic foot ulcer were selected and consent was taken, Ulcer area was calculated by obtaining the impression of ulcer on a sheet of cellophane paper and then transferring the imprint onto a graph paper. LASER was given with duration of exposure calculated to deliver 2–4 J/cm2 at 60mW, 5kHz, daily for 15 days.

Results: Initial mean size of ulcer was 911.4580mm2, the final area of ulcer after the treatment with LASER for a duration of 15 days was 835.4430mm2. Mean reduction in ulcer area was 76.0150mm2. There was a significant reduction in the size of ulcer post the treatment of LASER and the p-value was p<0.001 shows the size of ulcer was significantly reduced. CONCLUSION: Low Level LASER therapy is effective modality to facilitate wound healing in patients with Type 2 Diabetic foot ulcers.

Key word: Diabetes mellitus, type 2 Diabetic foot ulcers, LASER.

INTRODUCTION

Wounds are among the most common health problems worldwide. Traumatic scars and surgical wounds form a wide range of acute and chronic wounds, associated with increased morbidity. The significant impacts of wounds depend on physical and mental health usually drive scientists to find efficient treatments. The classification of wounds into acute and chronic types is a key to know the medical guidelines and especially the quality of therapeutic cycles in wound treatment. More specifically, surgical wounds are superficial or deep wounds on skin, mucous membranes, fascia, and muscle layers. In conventional wound treatment some specific drugs such as topical administrative ones are used. Relative high prevalence of wounds and high costs of conventional methods as well as emergence of drugresistance of chronic wounds have boosted therapist for alternative wound healing methods. During the last decade several methods like LASER, electric and magnetic fields, light, and ultrasound have been developed as an alternative or adjunctive treatment for chronic and acute wound treatment. To evaluate the wound tissue, study of four basic topics is necessary: history of wound, history and types of previous therapeutic methods, history and types of health-care procedures for wound management, history of previous wound. Despite the limited therapeutic window of low level LASER therapy (LLLT) in some patients, LASER seems to be a promising hope for many patients. The number of cases of Diabetes mellitus (DM) worldwide is estimated to be around 150 million. This is predicted to double by 2025 with the greatest number of cases. Diabetic foot ulcer (DFU) is known as the long lasting chronic skin ulcer, it is a serious complication of Diabetes mellitus and is the single most important risk factor for lower limb amputations. More than 60% of all non-traumatic lower limb amputations are due to Diabetes foot ulcer complications. Diabetic foot ulcers are the serious complications of Diabetes mellitus thus triad of neuropathy, infections and ischaemia are considered as the most common causes, but the fundamental pathophysiological factors remains understood. The common risk factors associated with foot ulcers includes peripheral neuropathy, peripheral arterial disease, previous history of ulcers or amputations, and poor glycemiccontrol. Abnormal foot structure, Diabetes mellitus of more than 10 years duration and smoking. Foot ulcers will develop as a complication in about 15% of patients during their lifetime and amputation is required as an completion for about 10–40% of them. The main cause of delayed healing in Diabetes mellitus is due to deficient growth factor and reduced angiogenic response. Lot of literature supports the use of Ultrasound, Electrical stimulation, Hyperbaric oxygen, Vacuum-assisted closure, and other forms of photobiomodulation which plays a major role to stimulate healing process in patients with non-healing Diabetic foot ulcers as resistant to conventional treatment. United States Food and Drug Administration has given clearance to Low-level LASER therapy (LLLT) Thus Low Level LASER therapy (LLLT) has been proved to be clinically effective in stimulating and significantly reducing the time of wound healing.

AIM

The aim of this study was to find the effect of low level LASER therapy on wound healing in patients with type 2 Diabetic foot ulcers.

NEED FOR THE STUDY

There is lot of studies supporting the treatment of type 2 Diabetic foot ulcers with various treatment modalities and procedures, but studies supporting treatment of type 2 Diabetic ulcers with Low Level LASER therapy was minimal and its effectiveness was not known because of reduced research support. LASER has a good tissue healing effect as literature says than the other modalities, but still no strong evidence prevails and no sound practice of LASER was followed among the society especially India, So this study was designed to find out the efficacy of low level LASER therapy on wound healing in patient with type 2 Diabetic foot ulcers.

METHODOLOGY

This Study design was quasi experimental design, study type was pretest -posttest type, sampling method was Convenient sampling sample size was 10 subjects, study setting was Department of Surgery, SRM Medical College Hospital and Research center, SRM Institute of science and technology, Kattankulathur. Inclusion criteria was Type 2 Diabetes mellitus patients with Wagner grade 1 Diabetic foot ulcer of at least 4 weeks duration. Both men and women were included. Mean age of the patients was 50 to 70 years. Osteomyelitis and Traumatic scars were Excluded.
PROCEDURE

Subjects with type 2 diabetes mellitus of Meggitt-Wagner grade 1 Diabetic foot ulcers with duration of 4 weeks’ were approached and the procedure was explained and informed consent were taken to participate in the study before enrollment. Patients are subjected to fasting blood sugar (FBS) level measurement. The sample size was 10. Cellophane paper was used to obtain the impression of ulcer floor and the impression was transferred onto a graph paper to calculate the area of the ulcer. Thus the calculation of uneven surface was done by using the formula that uneven surface area = width X height in mm². Size of the ulcer was measured pre and post the LASER treatment on the day 1 and day 15. Osteomyelitis were excluded from the study with the help of radiological investigations. Low Level LASER therapy (LLLT) was commenced only after the glycemic and infection control had been achieved with the help of systemic antibiotics prescribed by physician. Patients were treated with low level LASER therapy (LLLT) device under constant care of therapist with a multi diode cluster probe and scanning method. Thus patient position was supine lying with adequate support and the therapist position was stride standing on the side of patient to ensure the treatment of LASER. Both the patients and therapist wore LASER safety goggles to prevent damage to their eyes. On the basis of the ulcer size, the duration of exposure was calculated to deliver 2–4 J/cm² at 60 mW, 5 kHz, daily for 15 days. The ulcer floor and edge were concentrated more. Patients were also given conventional treatment like antibiotics, saline dressings, slough excision, contact cast immobilization as and when required. The ulcer was covered with saline or moist dressings every day after treatment. Healing or reduction in the ulcer size over a period of 15 days after treatment with low level LASER therapy (LLLT) was noted as the end point of the study and it was documented. The patients were also taught various aspects of Diabetes mellitus and its hygiene including exercise, foot care and dietary restrictions in order to prevent recurrence.

RESULTS

Table 1: Pretest And Posttest Size Of Ulcer Among Type 2 Diabetic Patients Post Laser Management

<table>
<thead>
<tr>
<th>VARIABLES</th>
<th>MEAN</th>
<th>AGE</th>
<th>N</th>
<th>STD. DEVIATION</th>
<th>STD. ERROR MEAN</th>
<th>t</th>
<th>SIG.</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRE TEST ULCER SIZE</td>
<td>911.45</td>
<td>50</td>
<td>10</td>
<td>490.35942</td>
<td>155.0652</td>
<td>5.34</td>
<td>0</td>
</tr>
<tr>
<td>POST TEST ULCER SIZE</td>
<td>835.44</td>
<td>50</td>
<td>10</td>
<td>460.5897</td>
<td>145.6512</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

P<0.05

In this table size of the ulcer before LASER management was 911.4580 which had reduced significantly to 835.4430 post LASER management among type 2 diabetic patients.
In the size of ulcer post the treatment of LASER led significant reduction of the size, strengthening, and assigning temporary by the main physiological and high doses of LASER are suppressive and pro-inflammatory. The energy is absorbed primarily by the cell membrane and it produces intracellular effects through cascade type response or a second messenger. The photo response was primarily absorbed by starving cells then the well fed ones and is summarized as ‘starving cells are more photosensitive than well fed ones’. Cell metabolic process is altered by photo signal transduction through LASER light irradiation of the tissues. Several clinical trials have been accompanied to investigate and progress the low level LASER therapy (LLLT) for chronic wounds. Numerous studies were carried out for Diabetic wound management because the hyperglycemia sets the necrotic tissue in a highest range of morbidity due to venous and arterial obstruction as superficial and deep wounds. Among the various non-invasive treatment modalities, low level LASER therapy (LLLT) is gaining increasing interest. Research findings to date based on animal, human studies have shown that low level LASER therapy (LLLT) can play a useful role in healing type 2 Diabetic ulcers resistant to conventional treatment.

CONCLUSION

In conclusion, the wounds in subjects treated with low level LASER therapy (LLLT) was healed and reduced significantly (p < 0.001), which indicates that low level LASER therapy (LLLT) is effective to facilitate wound healing in patients with Diabetes and can be used as an assistant to conventional mode of treatment (dressings and debridement) for healing of type 2 Diabetic wounds, and the limitations of the study was Sample size was small, Study duration was short, and recommendations were a comparative analysis with conventional treatment should be done. Effectiveness of treatment in chronic type 2 Diabetic foot ulcers with a longer follow up should be done, effectiveness of treatment for pressure sores should be done.

REFERENCES


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