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The effectiveness of low-level laser therapy for grade 3 diabetic foot ulcer

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ABSTRACT

To determine the effectiveness of Low-level laser therapy (LLLT) for grade 3 diabetic foot ulcer. To determine the size of the wound with acetate tracing after the application of Low-level laser therapy. 40 subjects with grade 3 diabetic foot ulcers based on the inclusion and exclusion criteria were assessed these include subjects above the age of 35, ulcer without infections, ulcers grade 2 based on Wagner grading. The content of 40 participants, received low-level laser therapy for 4 weeks, 6 days/week. Outcome measures were taken at the baseline and after 4 weeks of the treatment protocol. This research work states that LLLT (40.65 SD 13.5) showed significant improvement in wound contraction after pretest and posttest of treatment. Hence from the above results, it was proved that LLLT is more significant and effective method for grade 3 diabetic wound healing. From the effect, it has been concluded that LLLT is more effective in decreasing the healing time and improving the quality of life.



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INTRODUCTION

Diabetes mellitus is the alarming disease outbreak in India with the incidence of 69.2 million (8.7%) among the total population in the year 2015 (Seema Abhijeet 2014). But it was assessed to be very high 62 million in the year of 2014 (Douglas Miller 2012). Diabetes mellitus is caused due to impaired glucose tolerance by the body. One of the major complications of diabetic patients is diabetic foot syndrome otherwise known as diabetic foot ulcer which is often the main cause for a non-traumatic foot amputation. This is the most

common health issue faced by an enormous number of people worldwide.

Diabetes mellitus is a problem which increases the blood glucose level due to reduced insulin production by pancreas, or it can also be due to reduced absorption of insulin by the body which leads to the destruction of the endothelial cells. These cells are responsible for various inflammatory actions of the cells (Saltrache AE 2008). If these cells are damaged the process of wound healing stops in the inflammatory phase and cell proliferation does not take place which leads to worsening of the wound and also causing delayed wound healing leading to non-healing chronic ulcers. Ultrasound and low-level laser therapy help in the proliferation of these cells thereby helping in healing.

Time taken for the healing of ulcers seems to be difficult. Medical management includes, cleaning of the wound, wound debridement, skin grafting, antibiotics, vasodilators, bandaging and pain management.

In physiotherapy, many studies have been conducted and stated that ultrasound and low-

level laser therapy can be given to enhancing the healing process of the wound. It is also a non-invasive painless technique hence any patient can undergo and it also helps in avoiding surgery. It is of low cost and readily available anywhere, therefore, the patient of any status can undergo this technique.

Low-level laser therapy also known as low-intensity laser or soft laser is known to supply direct biostimulative light energy to body cells. The absorbed laser energy causes a stimulatory effect on molecules and atoms of the body cells (Joseph E Grey 2006). Hence it increases the cell proliferation process thereby reducing the size of the wound.

MATERIALS AND METHODS

A Quasi-experimental study was conducted at Saveetha medical college hospital. Scientific review board approval and ethical committee approval was obtained prior to the study. Following the ethical clearance, data collection procedure was initiated. Detailed procedure was clearly explained to the patient by providing information sheet and written informed consent was taken from all the participants. A Consecutive sampling technique used to allocate the participants equally into two groups by lottery method.

40 subjects with diabetic foot ulcers based on the inclusion and exclusion criteria were assessed these include subjects above the age of 35, ulcer without infections, ulcers grade 3 based on Wagner grading.

40 subjects received low-level laser therapy for 4weeks, 6days/week. Outcome measures were taken at the baseline and after 4weeks of the treatment protocol.

Low Level Laser Therapy: Wavelength -632.8Nm, Duration-80secs,Energy -4J/cm²: Frequency - 5000Hz,Height -10cm, Sessions -6days/week (1dsession/day for 4weeks)

RESULT

From statistically analysis made with quantitative and qualitative data revealed the statistically significant difference between the pre-test and post-test.

Table 1: Comparison of the pre-test and post-test values of Group A & B (acetate tracing)

| Test | Mean | T value | P value |
|-----------|----------|---------|---------|
| Pre-test | 37.3±8.7 | 8.7 | <0.0001 |
| Post-test | 25.9±7.6 | | |

The post mean value of ACETATE TRACING in pretest is 37.3 and posttest is 25.9. This shows that the SIZE of the wound has significantly reduced.

Hence from the above statistical analysis, it has been proved that LLLT is an effective modality in treating a Diabetic foot ulcer.

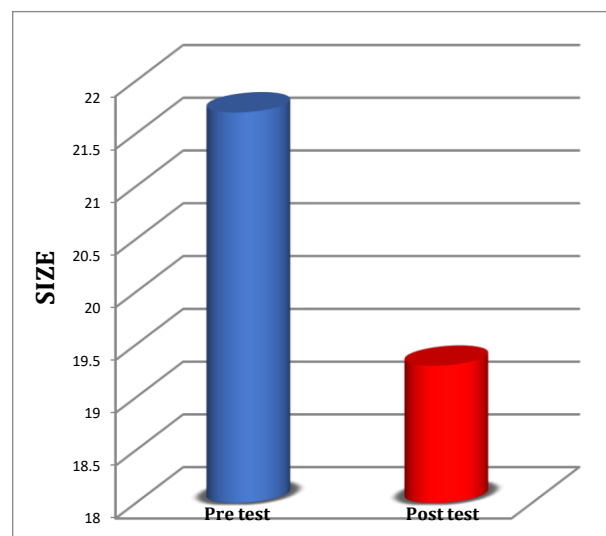


Figure 1: Graph showing pretest and post-test-Acetate tracing values

DISCUSSION

The diabetic foot ulcer is a major problem faced by patients with diabetes. It is the main cause of morbidity expense and non-traumatic foot amputation. The healing process of the wound is arrested in the inflammatory stage itself due to the destruction of epithelium the cell proliferation and granulation stops thus leading to chronic non-healing foot ulcers.

Many types of research have been conducted regarding the healing process and stated that UST and LLLT used in the field of physiotherapy helps in increasing the tissue granulation thus helping in wound healing.

Krzysztof Goraltchczyk et al., in 2016 formulated that the damage caused to the endothelium can be corrected by LLLT and they also concluded that LLLT increases the cell proliferation process thereby contracting the size of the wound.

It is to be noted that previously the size of the wound is being measured with either inch tape or digital planimetry which is not goal standard and of costlier too. It cannot be affordable and made available in all clinical setups

Hence Joseph E grey et al., 2006 concluded that acetate tracing method can be considered as the standard manual method of measuring the wound size. It is important to measure the size of the wound to know about the progression of healing and the effect of treatment.

So in this study, this standard manual method of wound measuring (ACETATE TRACING) which is affordable to all clinical setup is used.

By having outcomes that is the size we can able to say that treatment is effective in improving the physical ability by decreasing the size and also it improves functional and psychological ability in patients with grade 3 diabetic foot ulcer.

CONCLUSION

From the result, it has been concluded that low-level laser therapy has shown a significant reduction in the size of the wound. Hence it can be formulated that low-level laser therapy is an effective modality in the treatment of grade 3 diabetic foot ulcer thus reducing the expense and morbidity rate of patients.

Conflict of interest

There is no conflict of interest from other authors.

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