

LOW LEVEL LASER AS AN ADJUNCT THERAPY FOR POST BURN SCARS: IS IT HELPFUL?

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ABSTRACT

Context: Immature scars are a major problem in post burns patients. Pressure therapy is the only proven therapy for immature scars. Low Level Laser Therapy (LLLT) is claimed to be beneficial for immature scars and can be used as an adjunct in post burn immature scar management.

Aim: To assess effect of LLLT on severity of post burn immature scars.

Settings and design: Preliminary results of an ongoing single institute randomized control study.

Methods and Materials: Two groups are being studied: (1) Group 1 (study group) is the scars to be treated with combination therapy (LLLT and conventional therapy); and (2) Group 2 (control group) is the scars to be treated with conventional therapy alone. Vancouver Scar Scale (VSS) is being used as the tool for assessment of severity of the scar. Pre and post therapy VSS scores of scars in control group and study group are compared. 9 scars in each group are studied. Sample size is small for statistical analysis.

Results: The preliminary results of the study are not showing any benefiting effects of LLLT over post burn immature scars. Out of nine set of scars only one subject has shown improvement in VSS score of study scar compared to control scar. We have not found any adverse effect of LLLT in any subject.

Conclusion: Preliminary results of the study are showing no effect of LLLT on severity of post burn immature scars. Confirmatory results will come after statistical analysis once the study is completed.

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INTRODUCTION

A mature scar is flat, soft, and supple with color-matching with that of the surrounding skin. An immature scar is a red, sometimes itchy, or painful and slightly elevated scar in the process of remodeling. Immature scars undergo repeated scar breakdown. This is a major problem in the post-burn patients during rehabilitation phase.^{1,2}

Only clinically accepted therapy at present for an immature burn scar is pressure therapy. Various other modalities exist as an adjuvant to pressure therapy for immature scar management. Low-level Laser Therapy (LLLT) is one of the proposed modalities to improve scar quality but evidence of beneficial effects of these methods is not sufficient. Limited clinical studies are

available on the effect of LLLT on the severity of post burn scars.³ We are conducting a single-blind randomized control study to assess effect of LLLT on severity of post-burn immature scars. Here we present preliminary results of the study.

MATERIALS AND METHODS

The study design is a single institute randomized control study. The study is being performed at the tertiary burn care center of our institute. The duration of the study is one and a half years. Subjects with post-burn immature (vascular, raised, non-pliable or itchy) scars are included. Exclusion criteria are following: (1) Subjects with acute burn wounds (<1month old), (3) Subjects with diabetes/ radiation exposure, (4) Scars near eyes, (5) Scars >4 square feet area and (5) Subjects not willing to participate in the study.

Two similar scars of discrete locations in every subject are being selected for the study. One scar of every subject is included in each group. Two groups are being studied: (1) Group 1 (study group) is the scars to be treated with combination therapy (LLLT and conventional therapy); and (2) Group 2 (control group) is the scars to be treated with conventional therapy alone. The calculated sample size is 45 scars in each group. Group is allotted to the scar using a simple randomization technique. Follow up of 9 scars in each group has been completed until writing this report.

Specifications of the low-level laser used are the following: Gallium Arsenide (GaAs) diode red laser of wavelength 650 nm, frequency 10 kHz, energy density 4 J/cm² and output power 100 mW. Laser therapy is given as a continuous beam for duration 125 sec every time with scanning mode (non-contact delivery) from a distance of 60cm between laser source and scar. Therapy is given twice a week (not less than 3 days interval between two therapies) for 8 weeks.

After taking written informed consent, patient selection, and scar selection for the study is done by the investigator based on inclusion and exclusion criteria. In every subject two discrete patches of post-burn

immature scar is selected. Selected patches should be similar in area and VSS score (± 1) at the time of presentation. Scar situated more towards the right side of the midline is marked as "scar A" and the other scar is marked as "scar B". In case when both scars are on right side and equidistant from the midline, the scar which is more cephalad is marked as "scar A". One scar of each patient will be included in the study group and one in the control group. Thus, each group will have the same number of scars and the same set of the patients. Which scar of the patient (Scar A or scar B) is to be included in the study group will be decided by the random number table (simple random sampling).

Modified Vancouver Scar Scale (VSS) (Table-1) is being used as the tool for assessment of the severity of the scar. The VSS score of the scars is recorded at the time of presentation. Scars in the study group and the control group receive combination therapy and conventional therapy respectively for 8 weeks. After 8 weeks VSS score is recorded again for each scar. The observer who evaluates the VSS is kept unaware of the fact that which scar has been treated with LLLT (single- blind study).

Pigmentation	0	Normal
	1	Hypopigmentation
	2	Mixed pigmentation
	3	Hyperpigmentation
Vascularity	0	Normal
	1	Pink
	2	Red
	3	Purple
Pliability	0	Normal
	1	Supple
	2	Yielding
	3	Firm
	4	Banding
	5	Contracture
Height	0	Normal
	1	>0-1 mm
	2	>1-2 mm
	3	>2-4 mm
	4	>4 mm
Pain	0	None
	1	Occasional
	2	Requires medication
Itchiness	0	None
	1	Occasional
	2	Requires medication

Table 1: Modified Vancouver scar scale (VSS)

RESULTS

Until now 9 subjects have been included in the study and their follow up has been completed as per study protocol. The results for these cases are presented in Table-2. (Figures1-6)

DISCUSSION

As the burn wound begins the healing process, collagen fibers develop to bridge the wound, forming an immature (active) scar, which appears as a red, raised, and rigid mass. Burn scars may take up to two years or longer to mature. ¹ There are high chances of hypertrophic scarring in burn wounds. Longer the time taken for scar maturation higher is the risk of hypertrophic scarring. ^{1,2}

Only clinically accepted therapy at present for immature burn scar is pressure therapy through pressure garments, scar massage, or inserts. There are many problems associated with pressure therapy.⁴ LLLT is claimed to have analgesic, anti-inflammatory effects and stimulates wound healing and remodeling.^{5, 6} LLLT can be used as an adjunct in the management of immature burn scar.³

Table 2: Results

Case Number	Age (years)	Sex	Date of registration	Time since burn injury (months)	VSS score before and after LLLT		Change in VSS score during study	
					Control scar	Study scar	Control scar	Study scar
1	5	M	08/08/18	6	11→11	12→12	0	0
2	26	F	29/08/18	18	10→10	10→10	0	0
3	24	F	29/08/18	36	9→8	9→9	-1	0
4	45	F	06/09/18	54	6→6	5→5	0	0
5	30	F	18/09/18	10	9→9	8→8	0	0
6	10	F	20/09/18	4	12→7	12→7	-5	-5
7	24	F	27/09/18	4	8→8	8→4	0	-4
8	12	M	04/10/18	4	3→1	3→1	-2	-2
9	34	F	18/10/18	8	7→6	8→7	-1	-1



Figure 1: (Subject-1) Before LLLT. Right breast scar is control scar and left breast scar is study scar. The study scar is marked with arrow.



Figure 3: (Subject-1) After completion of 8 weeks LLLT. The study scar is marked with arrow.

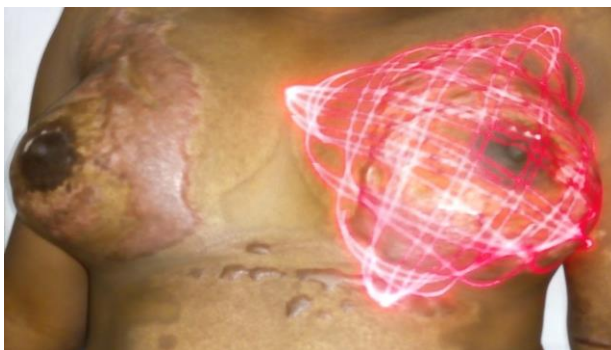


Figure 2: (Subject-1) LLLT being given to study scar (During procedure)

LLL has dose 0.01 to 100 J, wavelength 300-10,600 nm, pulse rate 0- 5000 hertz, and power output 0.001-0.1 watts.⁷ In contrast to ablative or cutting lasers, LLL does not produce any heat and hence are also known as cold lasers. The commonly used lasers for LLLT are Helium-Neon (HeNe), Gallium Arsenide (GaAs), Indium-Gallium-Aluminium-Phosphorous (InGaAlP), and

Gallium Aluminum Arsenide (GaAlAs). Gallium Arsenide (GaAs; 904 nm) is the commonest therapeutic laser with the greatest depth of penetration. The depth of penetration is directly proportional to the wavelength.⁸



Figure 5: (Subject-2) Before LLLT. Right side scar is control scar (yellow arrow) and left side scar is study scar (black arrow).



Figure 6: (Subject-2) LLLT being given to study scar



Figure 4: (Subject-2) After completion of 8 weeks LLLT. Right side scar is control scar (yellow arrow) and left side scar is study scar (black arrow).

LLLT has acted through photo biomodulation effect. Animal studies have shown that LLLT acts on all stages of wound healing.⁹ Gaida et al have shown a beneficial effect of LLLT over burn scars in human beings.³ It is claimed that LLLT makes the scars softer and more pliable, relieves pruritus, and pain, and sometimes improves the pattern of scars within the mesh grafts. The effects of LLLT are sometimes limited and complete disappearance of the scars cannot be expected. A planned regime of treatment with LLLT can have significant benefit for a considerable proportion of patients during the rehabilitation phase.³ We used a similar dose and treatment protocol as that of Gaida et al³ and designed this randomized control study. We used the

modified Vancouver Scar Scale (VSS) score as the objective tool for scar quality assessment.^{10, 11} The preliminary results of the study are not showing any beneficial effects of LLLT over post-burn immature scars. Out of nine set of scars only one subject has shown improvement in the VSS score of study scar compared to the control scar. We have not found any adverse effects of LLLT on any subject.

The limitation of the study is that it does not consider the time since burn (confounding factor). Also, this study is based on a total VSS score and it does not assess the effect of LLLT individually over height, pliability, color, vascularity, itching, or pain of the scar. Age, gender, socio-demographic characteristics, clinical characteristics, treatment history, and presence of co-morbidities are the independent variables.

Conclusion

Preliminary results of the study are showing no effect of LLLT on severity of post burn immature scars. The study is going on and the confirmatory results are awaited.

Conflict of Interest Statement-

There is no conflict of interest.

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