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EFFICACY OF POLARIZED LIGHT VERSUS LOW INTENSITY LASER ON HEALING OF THE VENOUS ULCERS

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Abstract

Purpose: to assess the efficacy of the polarized light versus low intensity laser in improving healing of the venous ulcers. Methods of assessment (wound surface area and colony count). **Methods: -** Forty-five (25 males and 20 females) patients with leg venous ulcers were divided randomly into three group. Group (A) received the polarized light .Group (B) received the low intensity laser, both groups received also the conservative ulcer care .Group (C) (Control group) received only the conservative ulcer care. **Results: -** The result showed that the polarized light is more effective in decreasing ulcer surface area and colony count as well as enhancing the healing of venous ulcers than the low intensity laser. **Conclusion: -** both the polarized light (to larger extent) and the low intensity laser (to lesser extent) were effective in improving ulcer healing in venous ulcers.

Key words: - venous ulcerations, Polarized light therapy, Low intensity laser, wound surface area and Colony count.

INTRODUCTION: -

Venous ulcers are wounds that are thought to happen because of inappropriate working of valves in the veins usually of the legs. They are the significant reason for chronic wounds, happening in 70% to 90% of chronic wound cases. Venous ulcers are exorbitant to treat, and there is a noteworthy chance that they will reoccur subsequent to recuperating; up to 48% of venous ulcers

had repeated by the fifth year after healing [1,7,10].

Venous ulcers are a huge problem among older and obese population. There are many studies about the etiology, natural history, and epidemiology of skin breakdown. There is relatively little data about factors that affecting the repair of body tissues after break down [2,5,14].

The use of light for therapeutic purposes goes back to the ancient Egyptians, Greeks and Romans. Recent researches into the physiological advantages of light therapy have built up an area of great interest which is the laser. Most research in the utilization of laser was reported by European sources. Only during the past decade have American researchers started to add the results of their studies [3,9,17].

The thought that light, in the visible and near infrared ranges, has photo chemical and photo biological changes that improve pain and inflammation as well as enhance tissue repair was first seen in the late 1960s. At this time the predominant notion was that lasers were uniquely photo destructive, fostering attempts to produce powerful lasers that may yield military superiority. Thus, the disposition was not right and neither were medical researchers ready to accept the idea that a tool that can cut, vaporize, and destroy tissue could be utilized for advantageous purposes [4,19,20].

The healthy effect of laser therapy in medical practice connects with the improvement of microcirculation and the activation of cell proliferation. The concepts of free radical mechanism of low-level laser irradiation (LLLI) stimulating action to the endogenous porphyrins, which are chromophores of LLLI in the red spectral range and known as photo sensitizers, localized in blood cells membrane and absorb photons of the LLLI. This process is the basis for initiation of photosensitized free radical reaction including lipid peroxidation of blood leukocyte membranes with subsequent formation of lipid hydroperoxides. Peroxidative modification of membrane lipids increases cell membrane ionic permeability for calcium ions [5,13,18].

LLLI increased the time required for loss of excitability and increased recovery from the ischemic injury as a result of ATP deficiency. Laser stimulation increased calcium release from mitochondria to cytoplasm, together with increased ATP production in the mitochondria. This ATP also became available to the surrounding cells, both directly and indirectly by the

altered chemical and enzyme levels as a consequence of the increased cellular activity and membrane potential [6,11,16].

MATERIALS AND METHODS

This study was carried out by 45 patients who had venous leg ulcers just above medial malleolus, their age was ranged from 45to 55 years, they were free from any diseases that can affect healing process and influence the results and they were selected from inpatient department of vascular surgery unit at Teaching Hospitals in Cairo.

Patients were selected according to these Criteria: - all patients were approximately the same age, all patients had venous leg ulcers just above medial malleolus. The common cause of ulcers for all cases was venous insufficiency, all patients had no diabetes or blood problems, all patients were conscious.

Patients were randomly divided into 3 equal groups in number: 2 study groups and control group.

- **Group 1:** (first study group), this group was composed of 15 patients who received the polarized light therapy and the regular ulcer care through the treatment period.

- **Group 2:** (second study group) that was composed of 15 patients who received the low intensity laser and the regular ulcer care through the treatment period.

- **Group 3:** (control group) that was composed of 15 patients who received the same regular ulcer care only through the treatment period.

The equipments and tools that used in this study are described as following. The treatment equipments: -

1- Bioptron Compact III polarized light therapy system (PAG-860 manufactured in Switzerland) (Figure 19 and 20).

2- The laser unit (Figure 21) is a small hand held machine, class III laser product under the existing requirements of the United States food and drug association regulation. It manufactured by Laserex technology pty ltd Australia.

The tools were used to assess the ulcer healing:

1- Ulcer surface area (USA) measurement.

2- Colony count.

In this study, the mean, the standard deviation and the standard error were calculated for all patients (3 groups of the study) after the detected time of the study.

The mean, the standard deviation and range were used as a primary source of connecting facts about each parameter to measure central tendency, Paired t-test to compare within each group to detect level of significance in each group. Unpaired t-test to compare the variable between groups was used to detect significance level between two groups (comparison). The statistical package for social science (SPSS) was utilized for data analysis and the level of significance was set at the 0.05 level **(Pipkin, 1984).**

Results: -

As observed in table (1) there was no significant differences in AGE between the first and second groups, between the first and third groups and between the second and third groups (P> 0.05).

	Group (B)	Group (A)	Group (C)	Group (A)	Group (C)	Group (B)
Mean of AGE in years	52.0667	52.000	52.1333	52.000	52.1333	52.0667
± standard deviation	3.0347	3.2293	3.3352	3.2293	3.3352	3.0347
Standard error	0.7836	0.8338	0.8612	0.8338	0.8612	0.7836
Mean difference	0.066667		0.133333		0.066667	
t. value	0.25		0.46		0.20	
p. value	0.806		0.653		0.843	
Level of significance	Non significant		Non significant		Non significant	

Table (1): Shows the statistical analysis of AGE mean difference.

As observed in table (2): there was non-significant difference in the first pre-treatment records of USA, between the first experimental and the control group, between the second experimental and the control group, as well as between the first and the second experimental group (P > 0.05).

	First experimental group	Control group	Second experimental group	Control group	First experimental group	Second experimental group
Mean in cm^2	6.709	6.640	6.775	6.640	6.709	6.775
Standard deviation	1.406	1.426	1.252	1.426	1.406	1.252
Standard error	0.363	0.368	0.323	0.368	0.363	0.323
t. value	-0.445		-0.653		0.365	
p. value	0.642		0.602		0.532	
Level of significance	Non significant		Non Significant		Non Significant	

Table (2): Shows comparison between the first records of USA on the three groups

As shown in table (3): there was a highly significant decrease in the second records of USA, between the first experimental and the control group (P < 0.0001), also there was a highly significant decrease in the second records between the second experimental group and the control group (P < 0.0001), while there was only significant decrease between the first and second experimental groups (P < 0.05).

	First experimental group	Control group	Second experimental group	Control group	First experimental group	Second experimental group
Mean in cm^2	4.719	6.633	5.011	6.633	4.719	5.011
± Standard deviation	1.890	1.389	0.635	1.389	1.890	0.635
Standard error	0.488	0.359	0.164	0.359	0.488	0.164
t. value	1.419		1.262		0.692	
p. value	0.0001		0.0001		0.0344	
Level of significance	Highly significant decrease		Highly significant decrease		Significant decrease	

Table (3): Shows comparison between the second records of USA in the three groups

As revealed from table (4): there was a highly significant decrease in the third records of USA, between the first experimental and control group (P < 0.0001), also there was a highly significant decrease in the third records between the second experimental and the control groups (P < 0.0001), while there was only significant decrease between the first and second experimental groups (P < 0.05).

	First experimental group	Control group	Second experimental group	Control group	First experimental group	Second experimental group
Mean in cm^2	1.882	6.627	2.673	6.627	1.882	2.673
± Standard deviation	1.552	1.331	0.564	1.331	1.552	0.564
Standard error	0.401	0.344	0.146	0.344	0.401	0.146
t. value	4.418		3.697		0.967	
p. value	0.0001		0.0001		0.0331	
Level of significance	Highly significant decrease		Highly Significant decrease		Significant decrease	

Table (4): Show comparison between the third (final) records of USA in the three groups

As observed in table (4): there was non-significant differences in the first pre treatment records of CC, between the first experimental and the control groups, between the second experimental and the control groups, as well as between the first and the second experimental groups (P> 0.05).

	First experimental group	Control group	Second experimental group	Control group	First experimental group	Second experimental group
Mean in cells	25360	25347	25353	25347	25360	25353
± standard deviation	4864	4879	4871	4879	4864	4871
Standard error	1256	1260	1258	1260	1256	1258
t. value	- 0.812		- 0.752		- 0.874	
p. value	0.531		0.633		0.573	
Level of significance	Non- Significant		Non- Significant		Non -Significant	

Table (5): Shows comparison between the first pre- treatment records of the CC in cells of the three groups

As shown in table (6): there was a highly significant decrease in the second records of CC, between the first experimental and the control groups (P< 0.0001), as well as between the second experimental and the control groups (P< 0.0001), but only a significant decrease between the first and second experimental groups (P< 0.05).

	First experimental group	Control group	Second experimental group	Control group	First experimental group	Second experimental group
Mean in cells	527.7	25343	814.3	25343	527.7	814.3
± standard deviation	79.9	4647	73.6	4647	79.9	73.6
Standard error	20.6	1200	19.0	1200	20.6	19.0
t. value	24.33		23.13		2.649	
p. value	0.0001		0.0001		0.0441	
Level of significance	Highly Significant decrease		Highly Significant decrease		Significant decrease	

Table (6): Shows comparison between the second records of the CC in cells of the three groups

As revealed from table (7): there was a highly significant decrease in the third records of CC, between the first experimental and control groups (P< 0.0001), as well as between the second experimental and control groups (P< 0.0001), but only a significant decrease between the first and second experimental groups (P < 0.05).

	First experimental group	Control group	Second experimental group	Control group	First experimental group	Second experimental group
Mean in cells	240.7	25333	667.3	25333	240.7	667.3
± standard deviation	120.9	4894	75.3	4894	120.9	75.3
Standard error	31.2	1264	19.4	1264	31.2	19.4
t. value	12.52		10.899		3.281	
p. value	0.0001		0.0001		0.0531	
Level of significance	Highly Significant decrease		Highly Significant decrease		Significant decrease	

Table (7): Shows comparison between the third (final) records of the CC in cells of the three groups

Discussion: -

These significant differences, between the first experimental (polarized light application) and the control (Regular ulcer care application) groups, between the second experimental (Low intensity laser application) and the control (Regular ulcer care application) groups, as well as between the first experimental (polarized light application) and the second experimental (Low intensity laser application) groups, which were in the form of a highly significant decrease in the USA and CC, were consistent with those observed and recorded by Bolton et al., 2008; Brem et al., 2004; Bucalo et al., 2003; Calvin, 2008; Coce et al., 2003; Depuydt et al., 1999; Harding et al., 2002; Hoeksema et al., 2002; Iakubenia et al., 2006; Iordanou et al., 2007; Lichtenstein and Morag, 2007; Martin, 2003; Medenica and Lens, 2003; Monstrey et al., 2002; Sakurai et al., 2000; Sattayut et al., 2008 and Simic et al., 2001.

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