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Abdominal fat thickness response to low level laser therapy

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Obesity with excessive abdominal visceral and subcutaneous fat accumulation affects person's quality of life, increased rate of morbidity and mortality. Purpose of the study: to objectively evaluate effect of low level laser therapy (LLLT) on abdominal fat thickness. Sixty obese women with abdominal obesity were included, with ages ranged from 40-50 years. They were divided into two groups (study and control) of equal number group (each 30 women). The mean of BMI in the study group was 32.75±1.29 (Kg/m^2) and in the control group was 33.19±1.48 (Kg/m^2). Both groups received healthy low caloric diet, brisk walking one hour; three times per week. In addition, study group received LLLT, for 20 minutes, 3 times per week for 4 weeks as a total period of treatment. Abdominal visceral to subcutaneous ratio were measured by ultrasonography before and after finishing the study. There was a noticeable improvement in the mean of AVF and ASF after completion of the study within each group and in the mean of abdominal V/S fat ratio in the study group only. Low level laser therapy is an effective noninvasive & safe method for abdominal fat thickness loss in obese women

Keywords: obesity, ultrasonography and laser therapy.

INTRODUCTION

Abdominal fat (visceral and subcutaneous fat) has been shown to be an important risk factor for increased morbidity and mortality (Sandeep et al., 2010), increased risk for developing type 2 diabetes, dyslipidemia and cardiovascular disease (Lee et al., 2015). Low level laser therapy was successfully used for body contouring and fat reduction in the waist, hip and thighs (Ali, 2012).

MATERIALS AND METHODS

Participants

Sixty women, were selected from the outpatient clinic of Faculty of Physical Therapy at Delta University, attended the initial pre-treatment phase and completed study participation through the study endpoint

All subjects deemed eligible for participation in this clinical study satisfied each of the following inclusion criteria: obese female with abdominal obesity, they have abnormal body contouring & fat distribution at abdominal areas with waist to hip ratio >0.8 and waist circumference > 85cm; their

age ranged from 40 to 50 years.; their body mass index ranged from >30-35 kg/m2; women were able to follow instructions; all patients were conscious & cooperative.

All the patients participating in the study have received a detailed explanation about study procedure and consent from was signed by everyone. The study was approved by the Ethical Committee of the Faculty of Physical Therapy at Cairo University.

Evaluation

Ultrasound was used to measure abdominal visceral and subcutaneous fat thicknesses at two different times: pre-procedure and post-procedure (after 4 weeks) by a specialist (radiologist) to calculate abdominal visceral and subcutaneous fat ratio. Using the 3C MHz abdominal curved array transducer (GE Healthcare) (Rolfe et al., 2010).

Intervention

The treatment phase of study group started immediately after pre-procedure measurement. Subjects assigned to both study and control groups were designed to have dietary modification protocol in a form of healthy low caloric diet. The prescribed low calorie diet was balanced, with 15% as protein, 30 to 35% as fat and 50 to 55% as carbohydrate, on average for four weeks for whole patients in this study. Initial patient evaluation and supervision of healthy low caloric diet program and follow up to assess the impact of a dietary behavior modification intervention to reach the ideal weight. Through participation evaluation, eating a healthy low caloric diet, nutritional education and behavior modification are very important factors for weight reduction (Hassan et al., 2014).

The study and the control group also were described for brisk walking one hour daily for four weeks. The study group also were treated with diode red low level laser light (808 nm diod low level laser driver), emitting 808 nm generating 150mw power output. Total session time was 20 minutes, three sessions per week for four weeks (Caruso-Davis et al., 2011 and Hassan et al., 2014).

RESULTS AND DISCUSSION:

Sample size was calculated according to our pilot study and power analysis was done using G Power software v 3.0.10. We calculated that 27 patients in each group should complete the study if an α error of 0.05, a power of 0.8, and effect size of 1.018 (obtained from our pilot study). We add 10% for drop out during follow up, so the sample size will be 30 patients (women) in each group.

As shown in table (1) there was a highly significant difference between study group's pre and post treatment mean of AVF and ASF where P-values were <0.001.In addition, a highly significant difference between control group's pre and post treatment AVF and ASF where P-values were <0.001. There were no significant differences between both groups in their pre-treatment mean of AVF or ASF where their P-values were 0.141 and 0.285 respectively. There was a highly significant difference in post-treatment mean of AVF in study group compared to control group where the P-value was< 0.001. Also, there was a significant difference in post-treatment mean of ASF where the P-values were < 0.05.

As shown in table (2) There was a highly significant difference between pre and post treatment mean of abdominal V/S fat ratio in the study group where P-values were <0.00.

Table (1): Pre and post treatment mean of AVF and ASF of study and control groups

Variables	Study Group		Control group	
	Pre	Post	Pre	Post
AVF (cm)	6.76 ±1.11	4.26 ±1.02	7.16 ±1.03	6.50 ±1.05
ASF (cm)	3.09 ±0.88	2.58 ±0.73	3.30 ±0.64	3.02 ±0.61
Within groups (Pre Vs. Post)				
P-value	AVF (cm)		ASF (cm)	
Study Group	<0.001***		<0.001***	
Control group	<0.001***		<0.001***	
Between groups (Study Group Vs. Control Group)				
P-value	AVF (cm)		ASF (cm)	
Pre	0.141		0.285	
Post	<0.001***		<0.05*	

Test used: t-test (Paired & Unpaired) *: significance <0.05 ***: significance <0.00

Table (2): Pre and post treatment mean of abdominal V/S fat ratio of study and control groups

	Pre	Post	P-value
Study Group	**2.43 ±0.97**	**1.74 ±0.46**	**<0.001*** **
Control group	**2.28 ±0.70**	**2.20 ±0.59**	**0.37**
P-value	**0.499**	**<0.01****	

Test used: T-test (Paired & Unpaired) *: Significance <0.01 ***: Significance <0.001

On the other hands, there was no significant difference between pre and post treatment mean of abdominal V/S fat ratio in the control group where P-value was 0.37 and non-significant differences between both groups in their pre-treatment mean of abdominal V/S fat ratio where their P-value was 0.499, which changed into a significant difference in post-treatment mean of abdominal V/S fat ratio in favor of the study group where the P-values was 0.01

The results of the current study agree with the results of Da Silveira Campos et al., 2018, who investigated the benefits of LLLT (808 nm) to improve noninvasive body contouring treatments, insulin resistance and to reduce body fat as they reported an improvement in body mass, BMI, body fat mass, lean mass, visceral fat, waist circumference with higher significant change for the fat mass. When exercise trainings associated with LLLT it can cause an improvement in body composition.

On the other hand the results of the current study contradict the results of the study done by Jankowski et al., 2017 who studied the effect of low level laser on subcutaneous adipose tissue reduction, they found non statistically significant reduction of abdominal subcutaneous adipose tissue after LLLT treatment program. This difference in results from the current study results may be due to shorter treatment period (two weeks) or different laser wavelength (650 nm) while in the current study treatment period was four weeks and laser wavelength was 808 nm

In conclusion, LLLT can be recommended as a safe modality controlling both regional and global obesity.

CONCLUSION

Low level laser therapy is an effective noninvasive & safe method for improving in patient's abdominal fat thickness loss.

CONFLICT OF INTEREST

The authors declared that present study was performed in absence of any conflict of interest.

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AUTHOR CONTRIBUTIONS

MEE designed and performed the experiments and also wrote the manuscript. HMEEH, EEM, MMS, FAMH and ED designed experiments and reviewed the manuscript. All authors read and approved the final version.

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