



Efficacy of Low-Level Red-Light Therapy for Body Contouring and Spot Fat Reduction

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ABSTRACT

Background

Low-level red-light therapy is commonly used in medical applications, but scientific studies of its efficacy and the mechanism by which it causes loss of fat from fat cells for body contouring are lacking. This study examined the effectiveness and mechanism by which 660nm red light therapy acts as a non-invasive body contouring intervention method. For this study the Trim and Tone FB Professional System unit was chosen to conduct the test. The Trim and Tone FB Professional unit uses LED red light at 660nm and 48 power combines with Electronic Muscle Stimulation (EMS.)

Methods

Fifty-nine healthy men and women ages 18-75 years were tested 1:1 to red light. Subject's waistlines and mid sections were treated for 30 minutes one time. Test subjects were measured in three locations once at the umbilicus and all the way around and once 2-3 inches above umbilicus and around and once 2-3 inches below the umbilicus and around. Standardized waist circumference measurements and photographs were taken before and after treatments. Subjects were asked not to change their diet or exercise habits.

Results

Data were analyzed and measurements were taken before and after each treatment during the one-time testing study. Each treatment gave an average 2.69-inch loss in waist girth per treatment. An evaluation of standardized subjects showed statistically significant cosmetic improvement after the red-light treatment.

Conclusions

Low-level red-light therapy combined with EMS achieved safe and significant girth loss over 59 test subjects consisting of 45 females and 14 males. The girth loss from the waist gave clinically and statistically significant cosmetic improvement.

BACKGROUND

Red light therapy in a range of 635nm to 660nm are used in a broad array of medical and surgical applications and their biological effects have been documented for over 20 years. More recently, low-level red-light wave devices have been used to facilitate tissue repair and healing processes. Although physiological methods responsible for augmented cell proliferation and pain relief are unknown, well-controlled clinical trials have demonstrated that low-level red-light therapy provide therapeutic relief of pain. Low-level red-light therapy is defined as management with a dose rate that causes no immediate demonstrable temperature rise of the treated tissue and no macroscopically visible change in tissue structure. The dosage is a magnitude used to define the red-light beam energy applied to a particular area of the body tissue measured in joules per square centimeter.

The Trim and Tone FB Professional System is a red light, low level therapy device that combines EMS and are operated simultaneously. The Trim and Tone FB Professional System was developed for use and is now being rigorously evaluated for its effectiveness in reducing areas of local fat accumulation for cosmetic purposes. The Trim and Tone FB Professional System emits red light at 660nm and EMS in the range of 20mH to 50mH. It is non-thermal and does not heat the tissues. As such, it is considered to be a non-invasive treatment.

Neira et al [2] evaluated the effect of a 635-680nm, 10-mW diode red light radiation with exclusive energy optics on treated fat cells in biopsy specimens. Fat cells were treated in vivo with 1.2-3.6 J/cm² of energy from the red light for 2 to 6 minutes. The cells were then removed by lipectomy, examined by electron microscopy and compared to cells removed by lipectomy that were not treated with the red light. Fat cells that were not



exposed to the red-light treatment looked like round grapes. Eighty percent of the fat was released from the fat cells after 4 minutes of red-light, light exposure and 99% was released after 6 minutes of exposure. After exposure to the red-light, light, pores in fat cells were visible by scanning electron microscope. It was presumed, but not demonstrated, that the fat was released from these pores, taken up in the lymphatics and re-esterified in other tissues or metabolized for energy [2].

Several studies have recognized that low level light therapy accelerates repair processes, stimulates cell proliferation, and promotes vascularization in injured tissues [3-8]. However, clinical application to body fat reduction as a minimally invasive option is an evolving field which is not well studied. We conducted a clinical trial to describe the application of low-level red-light therapy to local fat reduction for cosmetic purpose. As a secondary objective we also investigated the mechanism by which the red light causes fat loss from fat cells.

METHODS

Clinical Trial

Fifty-nine healthy men and women between the ages of 18-75 years, to a control red light treatment; subjects could not be using light sensitizing agents or diuretics, or undergoing photodynamic therapy. Subjects were required to have a stable weight, gaining or losing no more than 5 pounds in the 6 months prior to the trial. Subjects could not be on a weight reduction regimen, and they were asked not to change their diet or exercise habits during the trial. Written informed consent was obtained from all participants prior to study participation.

The red-light therapy device consisted of a wraparound belt housing most electronics, the controls for the device and head of multi-probe diodes that housed red lights emitting visible red light at a wavelength of 660nm. Additionally, EMS was simultaneously operated in a range of 20mH to 50mH. Each subject had 1 treatment. Each treatment session lasted approximately 30 minutes. The red-light head was placed over the waist and the red light was activated for 10 minutes, if the head did not cover the entire front waist line the head was moved to encompass the waist from side to side.

The individuals were photographed before and after the study was completed; at each treatment the subjects were measured in three locations; once at the umbilicus and all the way around, and once 2-3 inches above umbilicus and around, and once 2-3 inches below the umbilicus and around before and after each with the belly button being the center and measured all the way around the back. A case report form was used for each measurement and these forms were analyzed at the end of the study.

All subjects had photographs taken at a standardized distance with a standard background and lighting. Girth measurements of the waist were obtained in the manner recommended by the United States National Institutes of Health (NIH) guidance at the iliac crest using a tape measure with standardized tension and oriented parallel to the floor [9]. A reference point on the body for the pictures and measurements was relocated at each evaluation by measuring a distance from the floor that was determined in the first measurement at baseline. The specified measured distance was used to ensure all measurements and photographs were obtained in the same location. All adverse events were recorded in the case report forms.

There were four locations used for the testing with individual testing counts of 16, 12, 15 and 16 respectively. Testing was conducted one time per person whereas the subjects were measured before and after the treatment. Test subjects were measured in three locations once at the umbilicus and all the way around, and once 2-3 inches above umbilicus and around, and once 2-3 inches below the umbilicus and around.



RESULTS

Clinical Trial

Fifty-nine subjects participated in the clinical trial and were treated with the Trim and Tone FB Professional Systems. Mean weight and BMI did not change over the treatment period.

The cumulative girth loss at treatment end was a significant 159.00 inches. The average girth loss was 2.69 per the one treatment. Females reduced girth by 2.77 inches on average, the average age was 43.44 years of age and 45 females were test subjects. Males reduced girth by 2.41 inches on average, the average age was 50.43 years of age and 14 males were test subjects. There were 4 locations used for the study; site A with an average of 44.25 and average inch loss was 2.73, site B with an average of 44.50 and average inch loss was 2.35, site C with an average of 50.3 and average inch loss was 3.03, site D with an average of 41.5 and average inch loss was 2.55. The minimum girth reduction for all test subjects was 1 inch and the maximize girth reduction for all test subjects was 6 inches.

Table 1. Baseline demographic characteristics of study subjects in the Trim and Tone FB Professional System Red light study.

<u>Variable</u>	<u>Active</u>
No. enrolled	59
Female	45
Male	14
Average loss	2.69
Avg Age (yrs)	45.10
Cumulative loss	159.0 inches
Group A avg loss	2.73
Group B avg loss	2.35
Group C avg loss	3.03
Group D avg loss	2.55

DISCUSSION

A single Trim and Tone FB Professional System red light treatment yielded girth loss on one treatment, effective giving approximately a 1.0 to 6.0 inches girth loss per treatment. This difference was statistically significant. The 2.69-inch girth loss average suggests that the Trim and Tone FB Professional system red light treatment one time is effective on girth loss. It is likely that weight change over the course of treatment would change waist circumference and confound the results. The subjects selected for the study were asked not to lose or gain weight over the course of the study. Girth loss over the course of the study was greater than 2.69 inches and statistically significant.

Thus, the Trim and Tone FB Professional System red light gives a significant waist girth loss for one treatment. This waist girth loss was almost 2.69 inches on average in magnitude. Therefore, the Trim and Tone FB Professional System Red light gave a clinically meaningful, a cosmetically detectable, and a statistically significant improvement in appearance. The fat loss was probably a consequence of the red light creating temporary pores in the fat cells through which triglycerides were leaked, a process that requires serum, but is not complement-mediated.

The testing was done at four locations, testing location A was 16 individuals with an average age of 44.25 and an average girth loss of 2.73 per individual, with a standard deviation of 1.30. Testing location B was conducted with 12 test subjects with an average age 44.5 and lost an average girth of 2.35 inches per test subject and a standard deviation of 1.02. Testing location C was conducted with 15 test subjects with an average age of 50.3 that lost a total average girth loss of 3.03 inches per test subject and a standard deviation of 1.41. Test location D was conducted with 16 test subjects with an average age of 41.5 and an average girth loss per test subject of 2.59 inches and a standard deviation of 1.17. Overall in cumulative there were 59 test subjects with an average age of 45.1 who lost a total of 159 inches in girth for an average of 2.69 inches per test subject, with a standard deviation of 1.17. The minimum girth loss was 1 inch and the maximize girth loss was 6 inches in one 30-minute treatment with the Trim and Tone FB Professional System.

Current options for cosmetic body contouring include surgery or cream application [9, 14]. Although low-level red-light therapy appears to offer a non-surgical option to mobilize subcutaneous fat for body contouring without weight loss, future investigations should involve larger samples and explore the application of this technique to other body parts for cosmetic contouring.

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