CRYO LIPOLYSIS VERSUS COLD LASER ON LIPID PROFILE AND BODY COMPOSITION IN WOMEN WITH CENTRAL OBESITY

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ABSTRACT

Purpose: The purpose of this study is to compare the effect of CRYO lipolysis and cold laser on body composition and lipid profile in women with central obesity.

Methods: Sixty women patient with central obesity their ages ranged from 35 to 45 years old they was received from outpatient clinic of ALMABARA hospital on Mit-Ghamr, Dakahlia. their BMI was between 30 kg/m² to 39.9 kg/m² considered class I and class II obesity with dyslipidaemia with waist circumference more than 88 cm, they were assigned into two groups equal in number Group A: thirty patient received CRYO lipolysis on the abdomen for 35 to 45 minutes (1 session every 3 weeks) for three months and Group B: thirty patient received cold laser on the abdomen for 35 to 45 minutes (2 sessions/week) below the umbilicus for 3 months evaluated by: a) In body device (in body 120) was used for measuring weight, BMI, body composition, fat mass, fat free mass, water, segmental fat and segmental lean pre and post treatment of both groups b) Unstretchable tape Was used to measure height and waist circumference pre and post treatment c) Laboratory analysis Serum analysis, for estimation of serum lipid (cholesterol, triglycerides, LDL-C, HDL-C), pre and post treatment.

Results: Statistical analysis revealed that CRYO lipolysis (group A) has significant effect on triglycerides (decreased 9.02%), on high density lipoprotein (increased 9.97%), waist circumference (decreased 7.28%) on abdominal fat (decreased 10.7%). In cold laser (group B) there was a significant decrease in Triglycerides level (18%) on high density lipoprotein (increased 10.2%) Waist Circumference (WC) (decreased 9.38%) abdominal fat (decreased 4.52%) and no significant difference between groups.

Conclusion: cryo lipolysis and cold laser can be used to improve lipid profile as well as decrease of the waist circumference and abdominal fat in women with abdominal obesity. Keywords: cryolipolysis – cold laser – lipid profile – central obesity – Waist Circumference

I. INTRODUCTION:

Obesity is a medical condition by the accumulation of fat, which is tending to cause damage for health. Energy-rich food intake, bodily inactivity, and genetic susceptibility are the main causes of obesity[1].

Waist circumference (WC) has also been used as one measure of sarcopenic obesity related to metabolic syndrome. Moreover, WC is positively associated with the homeostasis model assessment of insulin resistance (HOMAIR), and patients with lacunar infarction and atherothrombotic infarction have been shown to have...
higher insulin resistance. Thus, it is important to evaluate WC to prevent the emergence of ischemic heart disease or stroke.\textsuperscript{[2]}

A raised waist circumference is defined as greater than 102 cm in men and greater than 88 cm in women central obesity is now an established cardio metabolic risk factor. Indices of abdominal adiposity such as waist-to-hip ratio (WHR) and waist circumference (WC), predict coronary heart disease and stroke better than BMI.\textsuperscript{[3]}

Adipose organ has been regarded as a powerhouse of energy. It is now seen as an interactive unit of the body involved in inflammatory system and the vascular wall. It not only manages energy flux but also is involved in homeostasis of the body interplaying with sympathetic nervous system, rennin-angiotensin pathway, liver metabolic pathways and other vital organ systems. It has an easy access to liver via the portal circulation. In case of hyper lipolytic conditions in adipose tissue present in abdominal region (abdominal obesity), it may deliver excess amounts of non-sterified free fatty acids to the liver. Excessive uptake of free fatty acids by the liver leads to biosynthesis of VLDLs (very low density lipoproteins) and LDLs (low density lipoproteins). Hence, plasma concentrations of triglycerides, LDLs and VLDLs rises remarkably. If such conditions prevail in the body for long duration of time, it may lead to hyperlipidemia, insulin resistance, CVDs, hypertension and other related health problems. Also, people suffering from AO(abdominal obesity) are seen to have low level of HDL (high density lipoprotein) cholesterol. Visceral adipose depots secrete large amount of interleukin-6, leading to production of C-reactive protein (CRP) being strongly associated with heart diseases.\textsuperscript{[4]}

Cryolipolysis is a technique developed for destruction fat cells by icing., at a temperatures from +5 to −5 °C, to diminish non-invasive local fat deposits, causing in body reshaping. Contact to cooling may cause apoptosis (programmed cell death) of hypodermal fat tissue, without any clear damage to the overlying skin.\textsuperscript{[1]}

laser Therapy is the satisfying application of laser light at low intensity. It is commonly achieved using lasers in the near infrared or noticeable, it may suppress cholesterol genesis and thereby decrease cholesterol and triglyceride serum levels by changing gene expression and encouraging cellular modifications. Lipoprotein subpopulations as well as low-density lipoproteins (LDL), very low-density lipoproteins, triglycerides, and high density lipoproteins (HDL) are assessed to evaluate patient risk. Positive relations have been found between body fat and lipid.\textsuperscript{[5]}

Bioelectrical impedance study is a method that measures the resistance (impedance. The method has long been used to evaluate body water. Bio impedance used to evaluate fat-free mass in healthy adults, there has been an increase in the number of publications per year correlated to the technology.\textsuperscript{[6]}

II. SUBJECTS AND METHODS

Study design

A randomized controlled trial was conducted in the period from June 2019 to October 2020 human used analysis has been copied with all applicable national regulations and policies.

All subjects enrolled in the study were informed about the study all risks and expected benefits of the study before participation Approval of faculty of physical therapy, Cairo university Written informed consent was signed before participation.

Participants:

Sixty women patient with central obesity their ages ranged from 35 to 45 years old they were received from outpatient clinic of ALMABARA hospital on Mit-Ghamr, Dakhilia. Their BMI was between 30 kg/m$^2$ to 39.9kg/m$^2$ considered CLASS1 and CLASS2 obesity with waist circumference more than 88 cm and with dyslipidemia (high cholesterol "high triglycerides" high LDLC" low HDLC) the Exclusion Criteria was Body Mass Index (BMI) less than 30 kg/m$^2$ or greater than 40 kg/m$^2$, cardiovascular disease, Cardiac surgery or pacemakers, Prior surgical intervention for body sculpting, Current use of medication(s) known to affect weight levels, Diagnosis of and / or taking medication for irritable bowel syndrome, Active infection, wound or other external trauma to the areas to be treated with the LASER. or CRYO therapy Known photosensitivity disorder, Current active cancer or currently receiving treatment for cancer, Serious mental health illness pregnant or planning pregnancy prior to the end of study participation, Post-menopausal women and Patient with low back pain.

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Women who met the inclusion criteria were assigned randomly into two groups equal in number both groups received Aerobic exercise 3 times per week (60-70%MHR), starting with 60% and increasing gradually to 70% of maximal heart rate at the end of the study for 30 minutes each treatment coarse finished after 3 months all participants were informed about the materials, objectives, execution of the study, and each signed a consent form before conduction of the study.

Figure 1: Flowchart demonstrates the study design.

Outcome Measurements

1. Anthropometric measure
   a) In body device (in body 120) was used for measuring weight, BMI, body composition, fat mass, fat free mass, water, segmental fat and segmental lean.
   b) Unstretchable tape Was used to measure height and waist circumference.

2. Laboratory analysis
   Serum analysis (STATFAX4500) for estimation of serum lipids (cholesterol, triglycerides, LDL-C, HDL-C).
**Intervention for Group A**

30 patient received cryolipolysis application on the abdomen for 35 to 45 minutes with temperature -3°C to -5°C below the umbilicus each session was done every 21 days for 3 months.

**for Group B**

30 patient received cold laser on the abdomen for 35 to 45 minutes with 2 sessions/week below the umbilicus sessions were done twice weekly for 3 months.

**Statistical Analysis**

Data collected before initiation of the study and after 3 months of treatment. The data was collected from subject and classified into pre and post test values. Data was statistically described in terms of mean ± standard deviation (± SD). Paired (t) test was used to compare the results pre and post treatment within the group (A) or group (B). Unpaired (t) test was used to compare the result between groups, Group (A) and Group (B); level of significance was measured at P value ≤ 0.05 All statistical analysis was conducted through the statistical package for social studies (SPSS) version 25 for windows (IBM SPSS, Chicago, IL, USA).

**III. RESULTS**

As show from (table1) there was no significant difference between both groups in mean age, weight and height).

<table>
<thead>
<tr>
<th></th>
<th>Group A</th>
<th>Group B</th>
<th>MD</th>
<th>t-value</th>
<th>p-value</th>
<th>Sign</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>38.53 ±2.66</td>
<td>38.46 ± 3.1</td>
<td>0.07</td>
<td>0.08</td>
<td>0.92</td>
<td>NS</td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>92.08 ±11.8</td>
<td>91.01 ± 10.62</td>
<td>1.07</td>
<td>0.36</td>
<td>0.71</td>
<td>NS</td>
</tr>
<tr>
<td>Height (cm)</td>
<td>162.3 ± 5.96</td>
<td>163.06 ± 6.55</td>
<td>-0.76</td>
<td>-0.47</td>
<td>0.63</td>
<td>NS</td>
</tr>
<tr>
<td>BMI (kg/m²)</td>
<td>34.91 ± 3.85</td>
<td>34.14 ± 2.41</td>
<td>0.77</td>
<td>0.92</td>
<td>0.36</td>
<td>NS</td>
</tr>
</tbody>
</table>

**Statistical analysis of CRYO lipolysis and Cold Laser pre and post treatment on serum triglycerides**

In both groups, there was a statistical significance decrease in mean value of triglycerides level measured pre and post treatment with no significant difference between groups.

**Table2. serum triglyceride pre and post treatment of the group A and B.**

<table>
<thead>
<tr>
<th>Serum triglyceride (mg/dl)</th>
<th>Pre</th>
<th>Post</th>
<th>MD</th>
<th>% of change</th>
<th>P-value</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>X ±SD</td>
<td>X ±SD</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group A</td>
<td>105.8 ±36.7</td>
<td>96.26 ± 20.23</td>
<td>9.54</td>
<td>9.02</td>
<td>0.01</td>
<td>S</td>
</tr>
<tr>
<td>Group B</td>
<td>109.75 ±26.26</td>
<td>89.93 ± 28.25</td>
<td>19.82</td>
<td>18.06</td>
<td>0.0001</td>
<td>S</td>
</tr>
<tr>
<td>MD</td>
<td>-3.95</td>
<td>6.33</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P-value</td>
<td>0.63</td>
<td>0.32</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sig</td>
<td>NS</td>
<td>NS</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

X: mean  SD: Standard deviation  MD: mean difference

**Table: Descriptive statistics of group A and B.**

1. **Statistical analysis of CRYO lipolysis and Cold Laser pre and post treatment on serum triglycerides**

In both groups, there was a statistical significance decrease in mean value of triglycerides level measured pre and post treatment with no significant difference between groups.

**Table2. serum triglyceride pre and post treatment of the group A and B.**
1. **Statistical analysis of CRYO lipolysis and Cold Laser pre and post treatment on serum high density lipoproteins (HDL)**

In both groups, there was a statistical significance increase in mean value of HDL C level measured pre and post treatment with no significant difference between groups.

Table 3. HDL pre and post treatment of the group A and B.

<table>
<thead>
<tr>
<th>HDL (mg/dl)</th>
<th>Pre</th>
<th>Post</th>
<th>MD</th>
<th>% of change</th>
<th>P-value</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$\bar{X} \pm SD$</td>
<td>$\bar{X} \pm SD$</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group A</td>
<td>50.63 ± 8.83</td>
<td>54.16 ± 8.87</td>
<td>-3.53</td>
<td>6.97</td>
<td>0.02</td>
<td>S</td>
</tr>
<tr>
<td>Group B</td>
<td>49.53 ± 13.3</td>
<td>54.58 ± 9.34</td>
<td>-5.05</td>
<td>10.2</td>
<td>0.002</td>
<td>S</td>
</tr>
<tr>
<td>MD</td>
<td>1.1</td>
<td>-0.42</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P-value</td>
<td>0.7</td>
<td>0.85</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sig</td>
<td>NS</td>
<td>NS</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

$\bar{X}$: Mean  
SD: Standard deviation  
MD: Mean difference

Statistical analysis of CRYO lipolysis and Cold Laser pre and post treatment on waist circumference:

In both groups, there was a statistical significance decrease in mean value of waist circumference level measured pre and post treatment with no significant difference between groups.

Table 4. WC pre and post treatment of the group A and B.

<table>
<thead>
<tr>
<th>WC (cm)</th>
<th>Pre</th>
<th>Post</th>
<th>MD</th>
<th>% of change</th>
<th>P-value</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$\bar{X} \pm SD$</td>
<td>$\bar{X} \pm SD$</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group A</td>
<td>104.4 ± 14.45</td>
<td>96.8 ± 8.95</td>
<td>7.6</td>
<td>7.28</td>
<td>0.0001</td>
<td>S</td>
</tr>
<tr>
<td>Group B</td>
<td>105.5 ± 15.07</td>
<td>95.6 ± 9.45</td>
<td>9.9</td>
<td>9.38</td>
<td>0.0001</td>
<td>S</td>
</tr>
<tr>
<td>MD</td>
<td>-1.1</td>
<td>1.2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P-value</td>
<td>0.77</td>
<td>0.61</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sig</td>
<td>NS</td>
<td>NS</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

$\bar{X}$: Mean  
SD: Standard deviation  
MD: Mean difference

2. **Statistical analysis of CRYO lipolysis and Cold Laser pre and post treatment on Abdominal fat:**

In both groups, there was a statistical significance decrease in mean value of abdominal fat measured pre and post treatment with no significant difference between groups.

Table 5. abdominal - Fat pre and post treatment of the group A and B.

<table>
<thead>
<tr>
<th>Abdominal - Fc (kg)</th>
<th>Pre</th>
<th>Post</th>
<th>MD</th>
<th>% of change</th>
<th>P-value</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$\bar{X} \pm SD$</td>
<td>$\bar{X} \pm SD$</td>
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</tbody>
</table>
### IV. DISCUSSION

The data of the present study was conducted to assess the effect of CRYO lipolysis (group A) versus Cold Laser (group B) on lipid profile and body composition on women with central obesity. Regarding lipid profile the results of the current study revealed significant decrease of Triglycerides in group A by 9.02% and in group B by 18%. While o HDL there was significant increase by 9.97% in group A and 10.2% in group B pre and post treatment and on body composition there is a significant decrease on waist circumference in group A by 7.28% and in group B by 9.38% pre and post treatment and while on abdominal fat there was significant decrease in group A by 10.7% and in group B by 4.52% pre and post treatment there is no significant difference between both groups pre and post treatment.

This explanation is in support with that of previous studies in that CRYO lipolysis with diet program show improvement in lipid profile and liver enzymes more than with diet only .decrease abdominal fat and more over waist circumference[7] also with scientific studies that after one treatment session, cryolipolysis reduced hypodermal fat at the treatment area by up to 25%. Improvement was seen in 86% of treated body. The patient pleasure is higher than with other techniques used for lipolysis[8]. A significant reduction in the waist circumference and abdominal fat in this study supported by previous studies showed an average decrease of 4.45 cm by the end of the treatment period. investigations have shown a 20-80% drop in the superficial fat layer depth, after a single cryolipolysis management[9][1].

The findings of this study is contradicted with Kenneth et al (2009) who confirmed that: cryolipolysis, used for decrease of subcutaneous flank fat, is not related with changes in serum lipids[10].

This study also supported with studies who proved Cold Laser diminish waist circumference in women with central obesity and improve lipid profile[5][1][12] and explanation study which showed fat and cellulite reduction and improvement of serum lipid profile based upon production of transient pores in adipocytes, allowing fats to leak out so fat released following cold laser treatment may appear in the bloodstream where it would affect the lipid profile[13].

The results showed by Elm et al, (2011) opposed with the results of this study they evaluated the efficacy of cold laser for body contouring and waist circumference measurements and revealed no statistically significant drop at either 7 days or 1 month post treatment so the difference between his study and the results of the current study may be due to different duration[14]. Marek Jankowski et al, (2017) study is contradicted with the present study as it show that Cold Laser doesn't reduce subcutaneous adipose tissue by local adipocyte injury but by modulation of systemic lipid metabolism[15].

### V. CONCLUSION

CRYO lipolysis and cold laser improves blood lipid profile as well as decrease of the waist circumference and abdominal fat in women with abdominal obesity aged from 35-45 years after 3 months.

It is recommended to use CRYO lipolysis or Cold Laser to improve lipid profile, waist circumference and abdominal fat in women with central obesity. further studies with increased number of participants and in men to enhance generalizability and incorporates other community groups with different lifestyle.

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DISCLOSURE STATEMENT:
No author has any financial interest or received any financial benefit from this research.

CONFLICT OF INTEREST
The author s state no conflict of interest.

REFERENCE