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## Case Report: The Role of Multilead Laser Needle and Laser Pen with Dietary Interventions on Grade 2 Obesity

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### ABSTRACT

**Background:** Obesity is an accumulation of excessive fat tissue that can affect health. Acupuncture has a positive effect on leptin, ghrelin, insulin resistance, glucose metabolism, lipids, serum immunoglobulin levels, and decreased appetite. Laser as an acupuncture modality can be a good option because it is easy to apply, noninvasive, and painless. Laser acupuncture works using a laser pulse to stimulate acupuncture points with a therapeutic effect similar to needle acupuncture.

**Case:** A 19-year-old woman came to the acupuncture clinic of Cipto Mangunkusumo Hospital (Jakarta, Indonesia) wanting to lose weight and slim down. Acupuncture was done at the following points CV12, ST25, SP15, ST40, ST36, and SP6 with a laser needle multilead continuous wave 4J for each point with power density 40 mW for 7 minutes. Acupuncture was done with a laser pen RJ-Laser continuous wave 0.5J for each hunger point with power density 50 mW for 25 seconds, therapy was performed 3 times a week for 2 months.

**Results:** Decrease in body weight and a decrease in abdominal circumference were noted after 24 sessions. The highest peak of weight loss at the 18th session was 11.5 cm in the umbilicus circumference, above the umbilicus by 6.5 cm, below the umbilicus by 9 cm, then stable with the final result of a decrease in the umbilicus circumference of 10 cm, above the umbilicus by 4 cm, and under the umbilicus by 5 cm. Decrease in random blood sugar was noted from 122 to 100 mg/dL.

**Conclusion:** A combination of laser needle multilead and laser pen had good results in this case and may be useful for weight loss and a decrease in abdominal circumference in obese patients.

**Keywords:** obesity, acupuncture, laser needle multilead, laser pen

### INTRODUCTION

**O**BESITY IS A CONDITION of excessive fat accumulation in adipose tissue, and when it reaches a certain state can cause various health problems.<sup>1</sup> Based on the World Health Organization (WHO) and the National Heart Lung and Blood Institute of the United States, obesity has reached

crisis proportions wherein ~30% of the population is obese or overweight and is expected to affect nearly half of the adult population by 2030.<sup>2,3</sup>

The prevalence of obesity in Indonesia continues to increase from year to year. Based on data from Riskesdas Indonesia, there was an increase in obesity from 2007 to 2018 with a prevalence from 10.5% to 21.8%, prevalence of

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central obesity also increased from 18.8% to 31%.<sup>4</sup> At Dr. Cipto Mangunkusumo Hospital (in Jakarta, Indonesia) in 2020 there were 1,943 obesity cases in outpatient polyclinics and 365 obesity cases in inpatients. In 2021, outpatient cases increased to 7,370 and 657 were hospitalized.<sup>5</sup> Based on a survey, the prevalence of obesity in women is greater than that of men.<sup>6,7</sup>

Acupuncture is a nonpharmacologic therapy that has various modalities as therapeutic options. One type of acupuncture modality is laser acupuncture that is easy to apply, noninvasive, and painless. Laser acupuncture works through laser pulses that stimulate acupuncture points with an effect similar to needle acupuncture (manual acupuncture), so it has the same therapeutic effect. Manual acupuncture uses fine needles that are inserted at certain acupuncture points and may not be safe in patients taking antiplatelet drugs.

Acupuncture has a positive effect on obesity-related peptide hormones, such as leptin and ghrelin, insulin resistance, glucose metabolism, lipids, serum immunoglobulin levels, and decreased appetite.<sup>8</sup> With acupuncture stimulation there is a release of histamine, bradykinin, and adenosine triphosphate, which causes depolarization of acupuncture points. It is transmitted through afferent fibers to the brain, which activate areas of the hypothalamus and limbic system. It is able to regulate the appetite center in the hypothalamus.<sup>6</sup> Acupuncture causes the release of endorphins and suppresses appetite due to decreased stress and depression.

Regulation in the hypothalamus will induce the release of adrenocorticotropin hormone (ACTH). ACTH activation increases the enzyme adenylate cyclase in the liver, which then activates the phosphorylation process that triggers lipolysis, lowering triglyceride levels. Acupuncture also produces serotonin, which then produces pro-opiomelanocortin to reduce appetite.

Photobiomodulation is the effect of laser irradiation on cells and tissues that can affect cell behavior.<sup>9</sup> Photobiomodulation is known as low-level laser therapy that can increase local vasodilation, increase blood circulation thereby reducing tissue damage, neuroinflammation, and lowering proinflammatory cytokines such as interleukin (IL)-6 and tumor necrosis factor- $\alpha$  (TNF- $\alpha$ ).<sup>7</sup>

CASE REPORT

A 19-year-old woman came to the clinic wanting to lose weight and slim down. Her weight had increased in the past 2 years from 75 to 101 kg. The patient had been on a low carbohydrate diet and exercised regularly, but it did not last long. The patient’s daily activities at home include sitting at the computer and online lectures. Sleep patterns tend to be late at night, but there were no signs of sleep disorders. Signs of food craving not found. The patient reported normal bowel movements, no history of weight loss drugs, no history of hypercholesterolemia, and others. The patient’s mother has hypertension and the patient’s father has type 2 diabetes mellitus.

From the physical examination, the body shape was apple-shaped obesity, weight 101 kg, height 162 cm, body mass index 38.5 kg/m<sup>2</sup>, and was diagnosed obesity grade II. Circumference of the umbilicus was 107 cm, circumference of 5 cm above the umbilicus was 98 cm, and circumference of 5 cm below the umbilicus was 117 cm. Random blood sugar was 122 mg/dL. The patient had menarche for the first time when she was 12 years old. The patient reported that she had started having irregular menstruation in the past few years, with a cycle of 50–90 days. Follow-up of the patient was done 3 months post-therapy.

METHODS

Acupuncture therapy at points CV12, ST25, SP15, ST40, ST36, and SP6 using laser needle multilead continuous wave with power density of 40 mW, a wavelength of 658 nm and a laser pen RJ continuous wave with power density of 50 mW, and a wavelength of 785 nm, both are classified as 3B lasers (infrared). The calculation of treatment time on a multilead laser needle is based on Ref.<sup>10</sup>:

$$\text{Treatment time} = \text{TT} = \frac{\text{Dose (joule)} \times 1000}{\text{Power (mW)}}$$

Dosage and treatment time on laser needle and laser pen are calculated using the applicable reference due following Table 1, Table 2, and Table 3.<sup>10</sup>

TABLE 1. LASER NEEDLE: DOSE AND TREATMENT TIMES (MIN:SEC) FOR CONTINUOUS WAVE MODE<sup>10</sup>

Dose/power	5 mW	10 mW	15 mW	20 mW	25 mW	30 mW	40 mW	50 mW
0.5J	3:20	1:40	1:07	0:50	0:40	0:33	0:25	0:20
1.0J	6:40	3:20	2:13	1:40	1:20	1:07	0:50	0:40
2.0J	13:20	6:40	4:27	3:20	2:40	2:13	1:40	1:20
3.0J	20:00	10:00	6:40	5:00	4:00	3:20	2:30	2:00
4.0J	26:40	13:20	8:53	6:40	5:20	4:27	3:20	2:40
5.0J	33:20	16:40	11:07	8:20	6:40	5:33	4:10	3:20
6.0J	40:00	20:00	13:20	10:00	8:00	6:40	5:00	4:00
7.0J	46:40	23:20	15:33	11:40	9:20	7:47	5:50	4:40
8.0J	53:20	26:40	17:47	13:20	10:40	8:53	6:40	5:20

TABLE 2. LASER PEN: STANDARD TREATMENT TIMES (MIN:SEC)<sup>10</sup>

	Tissue	Joule	CW standard	Resonance standard
Acupuncture point	Ear	0.5	20 mW/0:25	40 mW/0:25
Acupuncture point	Skin surface	1–2	40 mW/0:25–0:50	80 mW/0:25–0:50
Acupuncture point	Deep	3–6	50 mW/1:00–200 mW/0:30	100 mW/1:00–200 mW/1:00
Trigger point	Muscle layer	4–8	50 mW/1:20–200 mW/0:40	100 mW/1:20–200 mW/1:20
Tender point	Epidermis, subcutis, ligaments, joints, vessels, nerves	2–8	40 mW/0:50–200 mW/0:40	80 mW/0:50–200 mW/1:20
Paraspinal point	muscles, nerves	4–8	50 mW/1:20–200 mW/0:40	100 mW/1:20–200 mW/1:20

CW, continuous wave.

Laser needle multilead continuous wave 4 J for each point with power density 40 mW obtained a duration of 3 minutes 20 seconds multiplied by 2, total duration 6 minutes 40 seconds, so the therapy was 7 minutes. With the laser pen RJ, continuous wave acupuncture 0.5 J for each ear acupuncture *hunger point* with power density 50 mW obtained for a duration of 25 seconds, therapy 3 times a week for 2 months with a total of 24 sessions.<sup>11</sup>

## RESULTS

There was a decrease in body weight from 101 to 98 kg. Circumference of the umbilicus was from 107 to 97 cm; circumference 5 cm above the umbilicus was from 98 to 94 cm; and a circumference of 5 cm below the umbilicus was from 117 to 112 cm.

At the time of this acupuncture therapy, the patient said that she had not menstruated since 3.5 months ago, but after the third therapy, the patient had a menstrual period for 6 days, 2–3 sanitary napkins per day, watery, and dark red color. Follow-up was 3 months post-therapy, the decreased size of the abdominal circumference and weight remained, and the patient was still on the same diet.

## DISCUSSION

The current patient was afraid of needles (manual acupuncture), so therapy using laser acupuncture modalities had an advantage of being painless, not causing trauma to the skin, lower risk of infection, and a shorter duration of therapy than manual acupuncture. After the course of 24 therapy sessions, the patient felt comfortable and relaxed, but due to her lack of discipline and motivation regarding her diet, the diet was adjusted because the weight loss and abdominal circumference were still less than optimal. The recommended diet

pattern from the nutrition division was adjusted to the intake needs of 1,500 kilo calories per day with regular exercise recommendations 30–45 minutes for 3 to 4 times a week.

The following acupuncture points, CV12, ST25, SP15, ST40, ST36, and SP6, are evidence-based points that have proven effective in regulating high-density lipoprotein (HDL), triglyceride levels, and appetite scores. Acupuncture at CV12 and ST36 is able to reduce levels of TNF- $\alpha$  and IL-6 that can reduce triglycerides because fatty acids are not converted into triglycerides through the acetylCoA carboxylation pathway, and HDL levels can increase because pro-HDL is converted to HDL. In addition, these 2 points have been shown to reduce leptin levels, which causes a decrease in appetite.

Especially at the point CV12, gastric acid secretion was shown to decrease through the sympathetic pathway. Laser stimulation at the CV12 point has also been shown to stimulate the secretion of  $\beta$ -endorphins through lopioid receptor found in the brain, liver, and pancreas, so that they are able to have an effect on insulin secretion that can then reduce fasting blood glucose levels. At this point, reduced levels of TNF- $\alpha$  and IL-6 lead to an increase in insulin signaling pathways through insulin receptor substrate 1 (IRS-1)/glucose transporter 4 (GLUT4).<sup>12</sup>

ST25 acupuncture point has been shown to reduce levels of nuclear factor kappa beta (NF $\kappa$ B), which decreases the transcription of DNA proinflammatory cytokines such as

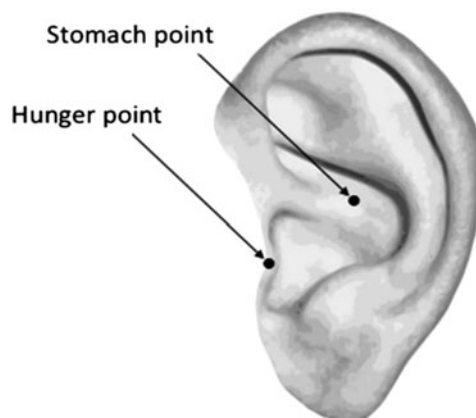


FIG. 1. Ear acupuncture hunger point is located on the tragus of the ear.<sup>11</sup>

TABLE 3. TREATMENT TIME LASER NEEDLE AND LASER PEN<sup>10</sup>

Treatment times	Continuous mode	Resonance mode
Laser needle	TT×2	TT×4
Laser pen	TT×1	TT×2

those involved with TNF- $\alpha$  and IL-6.<sup>13</sup> It is also known that the ST25 acupuncture point can act through the production of superoxide that can cause lipolysis. This mechanism is known from the observation of photostimulating processes involved in cytochrome C oxidase in mitochondria, which releases hydrogen and calcium ions.

Changes in calcium ions will stimulate cells to produce lysosomal acid lipase enzymes that can break down triglycerides and then store them in adipose tissue that turns into fatty acids and glycerol. Triglycerides can be released easily through transporter proteins, it is often unstable that causes temporary holes to form in adipocyte cells so that fat will be released into the interstitial space. This hole does not damage the cells but still drains the contents of the cells (fat) into the interstitial space, which will be removed from the body through the lymph vessels. Then these adipose cells collapse and there is a contraction of the body's adipose cells that can then reduce triglyceride levels and lead to weight loss.<sup>14</sup>

In laboratory results, ST40 can increase the activity of peroxisome proliferator activator receptor- $\gamma$  (PPAR $\gamma$ ) that will stimulate adipose tissue to secrete adiponectin, thus activating PPAR- $\alpha$  in the liver that plays a role in fat metabolism. PPAR $\alpha$  will upregulate apolipoprotein-I (apoA-I) and apolipoprotein-II (apoA-II) genes and downregulate apolipoprotein C-III (ApoC-III) that increases catabolism of lipoprotein lipase.

Acupuncture at the SP6 acupuncture point has been shown to reduce levels of TNF- $\alpha$  and IL-6 that can reduce triglyceride levels, then an increase in HDL levels can occur due to the conversion of pro-HDL to HDL.<sup>15</sup> ST36 and SP6 significantly reduce food intake and body weight, increasing proto-HDL expression. Oncogene homologous retroviral oncogene v-fos (cFos) in several central regions is associated with appetite regulation. Stimulation of *hunger point* in ear acupuncture causes increased satiety and hunger repression.<sup>16</sup>

In this patient, SP6 also affects hormonal regulation through with a dermatomal mechanism innervated by the lumbar nerve segments 4–5 and sacral 2–3 which based on evidence-based can improve bloodflow and regulate the uterus and internal genitalia.

## CONCLUSIONS

The use of the acupuncture modalities laser needle multilead and laser pen may lead to a reduced body weight and abdominal circumference, and improve hormonal regulation in patients. The effects of weight loss and abdominal circumference remain up to 3 months. No serious side-effects were reported in this case.

## PATIENT PERSPECTIVE

Patient felt comfortable during acupuncture laser therapy because she did not have to worry about pain and short

therapy time even though there can be up to 24 therapy sessions, but it is not tiring and does not have other side-effects such as dizziness, redness, and others.

## INFORMED CONSENT

Patient has declared confirm and agreed statement of publication approval.

## AUTHOR DISCLOSURE STATEMENT

No competing financial interests exist.

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## REFERENCES

1. Sugiritama W, Wiyawan S, Arijana K. Body mass index, obesity and overweight on Banjar Demulih, Kecamatan Susut, Kabupaten Bangli civilization [in Thai]. Fk Udayana 2015;1:1–4.
2. Kumar RB, Aronne LJ. Obesity. In: Obesity Management: A Clinical Casebook. (Aronne LJ, Kumar RB. eds.) 1st edition. Springer; 2019; pp. 92–100.
3. Manyika J, Dobbs R. The obesity crisis. Cairo Rev 2015;18: 44–57.
4. The Indonesian Ministry of Health is a research and development agency. Main results of basic Health research. Ministry of Health Republic of Indonesia; 2018; pp. 1–100.
5. Data Rekam Medik RSCM. Rumah Sakit Cipto Mangunkusumo; Jakarta; 2020.
6. Prasad DS, Kabir Z, Revathi Devi K, et al. Gender differences in central obesity: Implications for cardiometabolic health in South Asians. Indian Heart J 2020;72(3):202–204; doi: 10.1016/j.ihj.2020.04.008.
7. Kanter R, Caballero B. Global gender disparities in obesity: A review. Adv Nutr 2012;3(4):491–498; doi: 10.3945/an.112.002063.
8. Kim SY, Shin IS, Park YJ. Effect of acupuncture and intervention types on weight loss: A systematic review and meta-analysis. Obes Rev 2018;19(11):1585–1596; doi: 10.1111/obr.12747.
9. Dompe C, Moncrieff L, Matys J, et al. Photobiomodulation underlying mechanism and clinical applications. J Clin Med 2020;9(6):1724; doi: 10.3390/jcm9061724.
10. Kreisel V, Weber M. A Practical Handbook Laser Acupuncture Successful Treatment Concept. Fuchtenbusch Verlag; Germany; 2012; pp. 63–67.
11. Ito H, Yamada O, Kira Y, et al. The Effects of auricular acupuncture on weight reduction and feeding-related cytokines: A pilot study. BMJ Open Gastro 2015;2(1):e000013; doi: 10.1136/bmjgast-2014-000013.

12. Chmielnicki B. Evidence Based Acupuncture-WHO Official Position. Available from:: [www.evidencebasedacupuncture.org/who-official-position](http://www.evidencebasedacupuncture.org/who-official-position)
13. Cao C, Wang J, Liao J, et al. Preliminary study on weight reducing of the obesity patients with semi conductor laser acupuncture. *Biomed Optic Laser* 2016;35(48):1-5. doi: 10.1117/12.317885.
14. El-Mekawy HS, ElDeeb AM, Ghareib HO. Effect of laser acupuncture combined with a diet-exercise intervention on metabolic syndrome in post-menopausal women. *J Adv Res* 2015;6(5):757-763. doi: 10.1016/j.jare.2014.08.002
15. Elkabwaly SMA, Emam ZM, Nagib S. Low level laser therapy versus ultrasonic cavitation in abdominal adiposity after gastric bypass in female. *Int J Pharm Tech Res* 2016;9(3):68-76.
16. Cabioglu MT, Ergene N, Tan U. Electroacupuncture treatment of obesity with psychological symptoms. *Int J Neurosci* 2007;117(5):579-590; doi: 10.1080/00207450500535545.

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