International Journal of PharmTech Research
CODEN (USA): IJPRIF, ISSN: 0974-4304, ISSN(Online): 2455-9563
Vol.9, No.10, pp 60-65, 2016

Effect of laser puncture combined with a diet-exercise intervention on obese polycystic ovarian females

Asmaa M. El-Bandrawy[1], Hassan O. Ghareeb[2]

[1]Department of Physical Therapy for Obstetrics and Gynecology, Cairo University, Giza, Egypt,
[2]Faculty of Medicine, Department of Obstetrics and Gynecology, Cairo University, Giza, Egypt.

Abstract : Background: Polycystic ovary syndrome (PCOS) is a common endocrine disorder, affecting 8–12% of women. Lifestyle modification is the first-line approach in managing PCOS. Acupuncture has been shown to have also beneficial effects on PCOS. Purpose: To evaluate the effect of laser acupuncture combined with a diet-exercise intervention on obese polycystic ovarian females. Methods: Sixty obese females diagnosed with PCOS. They were divided into study (N=30) and control (N=30) groups. The control group received the diet-exercise intervention and the study group received the same intervention and sessions of laser acupuncture, 2 times /week for three months. The tools used to assess the outcome were anthropometric measurement, fasting blood insulin, endocrine hormones and follicular size. Results: The results of the study show that participants in the study group revealed a significantly greater decrease in (BMI, waist / hip ratio, fasting insulin level, LH, LH/FSH) and significant more increase in FSH and follicular size as compared to the control group , while AMH was significantly decreased after treatment only in the study group**.** Conclusion: Laser acupuncture combined with the diet-exercise intervention decreases BMI, waist hip circumferences, improves both metabolic and endocrine features as well as increasing the follicular size in obese polycystic ovarian women.
Keywords: Diet, Exercise, Laser acupuncture, Obesity, Polycystic ovarian syndrome.

Introduction

Polycystic ovary syndrome (PCOS) is a complex heterogeneous endocrine disorder. It is a common disorder affecting 4-12% of women of reproductive age [1, 2]. PCOS is also associated with obesity, insulin resistance and type II diabetes, dyslipidemia, hypertension, cardiovascular disease in addition to endometrial carcinoma [3-5]. Approximately 50-60% of women with PCOS are overweight or obese compared to 30% of women in the general population [6, 7].

Intervention studies have suggested that reducing weight either by diet alone or by a combination of diet and exercise improve hirsutism, fertility, endocrinal hormones as well as metabolic features of PCOS[8]. Dietary and exercise interventions also have some impact on enhancing insulin sensitivity. In general, therapeutic modalities that decrease insulin levels and insulin resistance and lead to weight loss may prove useful for treating PCOS [9, 10]. Laser acupuncture has been widely used in medical fields for over 30 years. Clinical research on the efficacy of laser acupuncture has also increased [11, 12]. Several studies have proved that laser acupuncture could be an effective therapy for obesity [13, 14].

Methods

This study included 60 obese females diagnosed with PCOS according to the revised 2003 Rotterdam ESHRE/ASRM consensus criteria and exclusion of associated disorders, with the age between 23 - 35 years and BMI >30 kg /m^2 . Patients were referred from the outpatient clinic of Gynecology department at Kasr Al -Aini University Hospital. All females were free from any medical disorders as diabetes mellitus, renal or hepatic impairment and none of them was under hormonal treatment for at least 3 months prior to the start of the study or throughout the entire study period.

Patients were distributed into two groups using envelop method. The control group (A) followed an energy-restricted diet, and engaged in a supervised aerobic exercise training program on bicycle ergometer 3 times/week for three months; while the study group (B) received the same diet-exercise intervention in addition to laser acupuncture for 3 months.

The baseline characteristics of the participants are presented in Table 1 and it does not show any significant difference between the characteristics of both groups. Assessment of all patients in both groups (A&B) was carried out before and after the end of the treatment program (3 months) through assessment of BMI, waist/hip ratio, fasting blood insulin, level of Antimullerian hormone (AMH) , female reproductive hormones (LH, FSH) , LH/FSH ratio as well as follicular size. Before participation into the study, all patients were given a full explanation about the treatment protocol and informed consent form had been signed from each subject. The study has been approved by the ethical committee of faculty of physical therapy, Cairo University.

All females in both groups followed an energy-restricted diet (1200 K. cal/day) for 3 months. Dietary program was modified every two weeks for all patients in both groups. All females performed exercises two times per week for 3 successive months**.**

Aerobic exercise training program on bicycle ergometer for both groups (A&B):

Each subject was asked to sit on the adjustable seat of bicycle ergometer and asked to catch the modified handle bar; the ear sensor was connected to the ear lobe of the subject to measure pulse rate. Every subject was asked to start cycling "pedaling" by their lower extremities. The exercise performed as following:

First stage (Warming up): Consisted of 5 minutes in the form of cycling at speed of 60 revolutions per minute.

Second stage (Active stage): Consisted of 20 minutes cycling at speed of 60 revolutions per minute with incredible load until achieves 60% 0f maximal heart rate which was calculated by the following equation: Maximal heart rate= 220-age in years. The heart rate was measured through pulse meter attached to the subject's ear.

Third stage (Cooling down): Consisted of 5 minutes in the form of cycling at speed of 60 revolutions per minute.

Laser acupuncture for the study group (B):

For the study group (B), gallium Arsenide infrared (GaAlAs) laser, with a wavelength at 904nm and Maximum power output is 150 mW with a power density at 0.417 W/cm^2 and energy density of 4 J/cm^2 was applied for two minutes on the selected acupuncture points.

All subjects were informed and instructed about the treatment procedures to gain their confidence and co-operation as well as, they were advised to evacuate their bladders before starting the treatment session to be more relaxed then the patients sat on a plinth and the points of laser irradiation were mapped and cleaned by alcohol. Protective glasses were used by both the patient and researcher. A contact pressure technique was used where the probe was held firmly and the tip was pressed perpendicularly into the target acupuncture point.

The following acupuncture points were selected for laser irradiation: Cv4 (3 cun inferior to the center of the umbilicus); Cv9 (1 cun above the center of the umbilicus); Cv12 (4 cun above the center of the umbilicus); St25 (2 cun lateral to the midline of the umbilicus); St36 (one finger width lateral from the anterior crest of the tibia) and Sp6 (3 cun directly above the tip of the medial malleolus) [15]. The laser technique was applied 2times/week for 3 months.

Results

Results are expressed as mean ± standard deviation (SD).SPSS computer program (version 16 windows) was used for data analysis. P value ≤ 0.05 was considered significant.

The study group showed greater decrease in (BMI, waist / hip ratio, LH, LH/FSH and fasting blood insulin) and significant more increase in (FSH, and follicular size) as compared to the control group while AMH was significantly decreased after treatment only in the study group Table 1**.**

Table (1): Comparison between different variables measured pre- and post-treatment in the two studied groups.

Variable	**Group (A): Diet and exercise (n= 30)**	**Group (B): Diet , exercise and laser acupuncture (n= 30)**	P value
Age (yrs.)	28.80 ± 2.71	29.23 ± 2.92	0.554
BMI (kg/m^2)			
Pre-treatment	34.24 ± 0.81	34.40 ± 1.73	0.642
Post-treatment	29.45 ± 0.82 $^{\$}$	27.87 ± 1.07 $^{\$}$	0.001*
Waist/hip ratio			
Pre-treatment	0.92 ± 0.02	0.91 ± 0.02	0.127
Post-treatment	0.90 ± 0.02 $^{\$}$	0.87 ± 0.03 $^{\$}$	0.001 *
Follicular size (mL)			
Pre-treatment	10.93 ± 1.91	11.13 ± 1.74	0.673
Post-treatment	14.80 ± 2.34 $^{\$}$	17.97 ± 1.92 $^{\$}$	0.001 *
Insulin (mIU/L)			
Pre-treatment	24.21 ± 1.88	24.90 ± 1.97	0.170
Post-treatment	18.76 ± 1.94 $^{\$}$	16.18 ± 2.43 $^{\$}$	0.001 *
Endocrine variables **LH** (IU/L)			
Pre-treatment	10.28 ± 3.11	11.40 ± 2.22	0.114
Post-treatment	9.34 ± 3.21 $^{\$}$	7.02 ± 2.29 $^{\$}$	0.002 *
FSH (IU/L)			
Pre-treatment	4.26 ± 1.22	4.18 ± 1.40	0.822
Post-treatment	6.79 ± 1.90 $^{\$}$	7.80 ± 1.83$^{\$}$	0.040*
LH/FSH ratio			
Pre-treatment	2.51 ± 0.34	2.52 ± 0.43	0.947
Post-treatment	1.38 ± 0.19 $^{\$}$	1.07 ± 0.49 $^{\$}$	0.003 *
AMH (pmol/L**)** $^{\#}$			
Pre-treatment	75.88 ± 40.65	79.73 ± 35.67	0.698
Post-treatment	70.35 ± 33.76	63.67 ± 31.09 $^{\$}$	0.429

$^{\#}$ = Non parametric statistics, p> 0.05= not significant;
*p< 0.05 significance relative to control A, $^{\$}$p< 0.05 relative to (versus) pre-treatment within the same group.

Discussion

The first-line treatment for women with polycystic ovarian syndrome (PCOS) is lifestyle modification (diet, exercise, behavioral, or combined treatments), which has been proved to reduce ovulatory dysfunction,

improve body composition, decrease hyperandrogenism, and enhance insulin sensitivity in women with PCOS [16, 17]. This finding agreed with other studies [18, 19] which have shown that, all women with PCOS should be encouraged to follow a healthy diet and to engage in regular exercise. This is because visceral fat is metabolically more active, and weight loss of a few percent is associated with significant decrease of visceral fat.

Aerobic exercise and diet adjustment can decrease the body weight and waist hip ratio (WHR) of patients with simple obesity, while the effect of acupuncture combined with diet adjustment and aerobic exercise is more obvious in the early stage of the treatment for body weight and WHR than two treatments (diet adjustment and aerobic exercise only) [20].

Improvement in WHR suggests that laser acupuncture has a valuable role in reducing the abdominal and gluteal adiposity. Low-level laser therapy stimulates the mitochondria in the adipocytes, resulting in activation of the cytoplasmic lipase. This enzyme converts the triglycerides into the fatty acids and glycerol that pass into the extracellular space [21].These findings are in contrast with a previous study, which concluded that acupuncture combined with diet and exercise for 8 weeks don't generate larger reductions in body weight, fat mass or body mass index than diet and exercise alone[22], the short duration of this study may explain this disagreement.

Acupuncture may modulate reproductive hormone levels and the effects seem to last for at least 12 weeks after treatment with no significant side effects[23]. Explanation of this improvement is that, acupuncture could significantly improve the basic temperature of patients with polycystic ovary syndrome, and regulate both reproductive and endocrine hormone [24].

In the present study, laser acupuncture group has showed a greater decrease in the insulin level. The mechanism, by which laser acupuncture affects the insulin sensitivity, is still unknown. Laser decreases intercellular levels of cytokines [21], which are inflammatory products, released from adipocytes and lead to the insulin resistance [25].

Repeated low-frequency EA reduces circulating androgen levels in women with PCOS compared with both exercise and an untreated control group. This may in part explain the significant reduction of AMH levels observed in the EA group[26].

The results of the present study revealed significant improvement in reproductive hormones in the control group. Aerobics on PCOS showed that it changed reproductive hormones in addition to body fats indicating that the mechanisms related to ovarian disorder can improve with exercise [16, 27].

It was reported that prolonged running lower the pulsatile secretion of serum LH level in rats [28]. Moreover, exercise training was accompanied with increased serum cortisol concentration and decreased LH concentration with normal FSH concentration in mares [29]. However, it was reported that an 8-week moderate endurance exercise did not affect LH[30], this may be related to the short duration of this study.

In this study there was significant improvement in both fasting blood insulin and follicular size in the control group this may be explained by that, IR is associated with reproductive function in PCOS with previous lifestyle modifications showing improvements in ovulation and menstrual frequency with improved IR [9,10]. Exercise improves ovulation rates and restores reproductive function. Enhanced insulin sensitivity underpins restoration of reproductive function through hormonal improvements, including reduced androgens. This improves the ovarian hormones allowing maturation of follicles thereby restoring ovulation[31].

The results of this study proved non-significant decrease in AMH ($P > 0.05$) after the treatment in the control group. Previous studies on lifestyle modifications including exercise and diet and their impact on AMH in women with PCOS have reported contradictory results .In a pilot trial, exercise during 12 weeks decreased AMH in anovulatory women with PCOS [16].Serum AMH levels decreases by diet intervention in association with decreased androgen levels and improvement of menstrual regularity in overweight/obese women with PCOS, whereas physical exercise did not affect AMH[32].

Conclusion

Laser acupuncture combined with the diet-exercise intervention decreases BMI, waist hip circumferences, improves both metabolic and endocrine features as well as increasing the follicular size in obese polycystic ovarian women.

Acknowledgements

Many thanks, to all patients who participated in this study for their co-operation.

Competing interests

Authors have declared that no competing interests exist.

References

1. Sheehan MT. Polycystic ovarian syndrome: diagnosis and management. Clin Med Res., 2004,2:13–27.
2. Azziz R, Woods KS, Reyna R, et al. The prevalence and features of the polycystic ovary syndrome in an unselected population. J Clin Endocrino Metab., 2004,89:2745–49.
3. Carmina E, Lobo RA. Polycystic ovary syndrome (PCOS): arguably the most common endocrinopathy is associated with significant morbidity in women. J Clin Endocrino lMetab., 1999,84:1897–9.
4. Dahlgren E, Janson PO, Johansson S, et al. Polycystic ovary syndrome and risk for myocardial infarction. Evaluated from a risk factor model based on a prospective population study of women.Acta Obstet Gynecol Scandinav, 1992,71:599–604.
5. Dunaif A, Segal KR, Futterweit W, et al. Profound peripheral insulin resistance, independent of obesity, in polycystic ovary syndrome. Diabetes, 1989,38:1165–74.
6. McKittrick M. Diet and polycystic ovary syndrome. Nutr Today, 2002,37: 63–9.
7. Flegal KM, Carroll MD, Ogden CL, et al. Prevalence and trends in obesity among US adults, 1999-2000. JAMA., 2002,288:1772–3.
8. ACOG. Management of Infertility caused by Ovulatory Dysfunction. *Pactice Bulletin*. 2002, 99(2):347-65.
9. Moran LJ, Noakes M, Clifton PM, Tomlinson L, Norman RJ. Dietary composition in restoring reproductive and metabolic physiology in overweight women with polycystic ovary syndrome.J ClinEndocrinolMetab.,2003, 88:812–19.
10. Huber-Buchholz MM, Carey DGP, Norman RJ. Restoration of reproductive potential by lifestyle modification in obese polycystic ovary syndrome: role of insulin sensitivity and luteinizing hormone. J Clin Endocrinol Metab., 1999,84:1470–74.
11. Siedentopf CM, Koppelstaetter F, Haala IA, Haid V, Rhomberg P, Ischebeck A, et al. Laser acupuncture induced specific cerebral cortical and subcortical activations in humans. Lasers Med Sci., 2005, 20(2):68–73.
12. Whittaker P. Laser acupuncture: past, present, and future. Lasers Med Sci., 2004,19(2):69–80
13. Wozniak P, Stachowiak G, Pieta-Dolinska A, Oszukowski P. Laser acupuncture and low-calorie diet during visceral obesity therapy during menopause. Acta Obstet Gynecol Scand., 2003,82:67–73.
14. Hu WL, Chang CH, Hung YC. Clinical observations on laser acupuncture in simple obesity therapy. Am J Chin Med. 2010;38(5):861–7.
15. Abdi H, Zhao B, Darbandi M, Ghayour-Mobarhan M, Tavallaie S, Rahsepar AA, et al. The effects of body acupuncture on obesity: anthropometric parameters, lipid profile, and inflammatory and immunologic markers. ScientificWorld Journal, 2012, 603539.
16. Moran LJ, Hutchison SK, Norman RJ, Teede HJ. Lifestyle changes in women with polycystic ovary syndrome. Cochrane Database Syst Rev., 2011,7:CD007506
17. Thessaloniki ESHRE/ASRM-Sponsored PCOS Consensus Workshop Group. Consensus on infertility treatment related to polycystic ovary syndrome. Fertil Steril., 2008, 89:505–22.
18. Knowler WC, Barrett-Connor E, Fowler SE, et al; Diabetes Prevention Program Research Group. Reduction in the incidence of type 2 diabetes with lifestyle intervention or metformin. N Engl J Med., 2002, 346:393-403.

19. Kitabchi AE, Temprosa M, Knowler WC, et al. Role of insulin secretion and sensitivity in the evolution of type 2 diabetes in the diabetes prevention program: effects of lifestyle intervention and metformin. Diabetes, 2005, 54:2404-14.
20. Yang JJ, Xing HJ, Xiao HL, Li Q, Li M, Wang SJ. Effects of acupuncture combined with diet adjustment and aerobic exercise on weight and waist-hip ratio in simple obesity patients. Chinese acupuncture &moxibustion, 2010,30: 555-8.
21. Yamaura M, Yao M, Yaroslavsky I, Cohen R, Smotrich M, Kochevar IE. Low level light effects on inflammatory cytokine production by rheumatoid arthritis synoviocytes. Lasers Surg Med., 2009, 41(4):282-90.
22. Nourshahi M, Ahmadizad S, Nikbakht H, Heidarnia MA, Ernst E. The effects of triple therapy (acupuncture, diet and exercise) on body weight: a randomized, clinical trial.Int J Obes (Lond), 2009,33(5):583-7.
23. Hao C, Zhang T, Qi J, Ji L. Acupuncture at Zhibian (BL 54) through Shuidao (ST 28) for polycystic ovary syndrome. Zhongguo Zhen Jiu., 2015,35(5):461-4.
24. Wang Y, Li Y, Chen R, Cui X, Yu J, Liu Z.Electroacupuncture for reproductive hormone levels in patients with diminished ovarian reserve: a prospective observational study. Acupunct Med. 2016 May 13. pii: acupmed-2015-011014. doi: 10.1136/acupmed-2015-011014.
25. Després J-P. Abdominal obesity: the most prevalent cause of the metabolic syndrome and related cardiometabolic risk. Eur Heart J Suppl. 2006;8 (suppl B):B4-12.
26. Jedel E, Labrie F, Oden A, Holm G, Nilsson L, Janson PO, et al. Impact of electro-acupuncture and physical exercise on hyperandrogenism and oligo/amenorrhea in women with polycystic ovary syndrome: a randomized controlled trial. Am J Physiol Endocrinol Metab., 2011,300:37–45.
27. Moro C, Pasarica M, Elkind- Hirsch K, et al. Aerobic Exercise Training Improves Atrial Natriuretic Peptide and Catecholamine-Mediated Lipolysis in Obese Women with Polycystic Ovary Syndrome. J Clin Endocr Metab., 2009, 94(7): 2579.
28. Manning J, Bronson F. (1991). Suppression of pubertyin rats by exercise: effects on hormone levels and reversal withGnRH infusion. Am J Physiol.,1991, 260:717-23.
29. Kelley D, Gibbons J, Smith R, Vernon K, Pratt- PhillipS, Mortensen C. Exercise affects both ovarian follicular dynamics and hormone concentrations in mares. Theriogenology, 2011, 76, 615- 22.
30. Bullen A, Skrinar S, BeitinsZ, CarrB, Reppert S, Dotson C et al. Endurance training effects on plasma hormonal responsiveness and sex hormone excretion. Journal of Applied Physiology,1984,56, 1453-63.
31. Luciano E, Carneiro M, Carvalho R, Carvalheira B, Peres B, Reis M, et al. Endurance training improves responsiveness to insulin and modulates insulin signal transduction through the phosphatidylinositol 3-kinase/Akt-1 pathway. Eur J Endocrinol., 2002, 147:149-157.
32. Nybacka A, Carlstrom K, Fabri F, Hellstrom PM, Hirschberg AL. Serum antimullerian hormone in response to dietary management and/or physical exercise in overweight/obese women with polycystic ovary syndrome: secondary analysis of a randomized controlled trial. Fertil Steril., 2013,100:1096–102.

*****