Effect of Electro-Acupuncture on Serum Level of Leptin Hormone in Diabesity Female

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Abstract

Objectives: To investigate the effect of electro-acupuncture on leptin hormone, Impaired Fasting Glucose (IFG) and body mass index in diabetic obese female.

Methodology: 40 obese women participated in this study; their age ranged from 40-50 years old had BMI over 30Kg/m$^2$ and less than 34.9Kg/m$^2$ and Fasting Plasma Glucose (FPG) levels $>126$ (mg/d) but $<160$ (mg/dl), they were selected from Agouza Rheumatology and Rehabilitation Armed Forces Center. They received low-calorie diet (1000Kcal/day) and electro-acupuncture sessions for 3 sessions per week, each session took 30 minutes for eight weeks. The BMI, leptin hormone and fasting blood glucose were measured before and after the program.

Results: There was a significant reduction of leptin hormone, fasting blood glucose and BMI after 6 weeks of electro-acupuncture therapy.

Conclusions: The electro-acupuncture is an effective tool to decrease insulin resistance and BMI and this effect is mediated, in part, by reduction in a leptin among obese diabetic women which consequently helps in management and controlling blood glucose level among those subjects.

Key Words: Diabesity – Diabesity – A leptin.

Introduction

OBESITY is an excess of body fat that frequently results in a significant impairment of health. It results when the size or number of fat cells in a person's body increases. A normal-weight person has between 30 and 35 billion fat cells. When a person gains weight, these fat cells first increase in size and later in number. One pound of body fat represents about 3500 calories. When a person starts losing weight, the cells decrease in size, but the number of fat cells generally stays the same.

This is part of the reason that once you gain a significant amount of weight it is more difficult to lose it. However, some recent studies seem to imply that fat cells can be destroyed as a result of certain medications and that a decrease in fat cell number may occur if a lower body weight is maintained for a prolonged period of time [1].

Diabetes mellitus is a metabolic disorder characterized by the presence of hyperglycemia due to defective insulin secretion, defective insulin action or both. The chronic hyperglycemia of diabetes is associated with significant long-term sequel, particularly damage, dysfunction and failure of various organs especially the kidneys, eyes, nerves, heart and blood vessels [2].

Obesity and type II diabetes are diseases that can substantially decrease life expectancy, diminish quality of life and increase healthcare costs. The incidence of obesity and diabetes continues to rise by epidemic proportions. So the term “Diabesity” has been coined to describe obesity-dependent diabetes [3].

The major role of leptin hormone in body weight regulation is to signal satiety to the hypothalamus and, thus, reduce dietary intake and fat storage while modulating energy expenditure and carbohydrate metabolism to prevent further weight gain. Unlike the Ob/Ob mouse model in which this peptide was first characterized, most humans who are obese are not leptin deficient but rather leptin resistant. Therefore, they have elevated circulating levels of leptin [4].

The effect of electro acupuncture therapy in reducing body weight, and the improvement of serum leptin level of the patient is possibly one of the mechanisms of acupuncture in reducing body weight [8].
Research has found acupuncture to be effective both in weight loss and suppression of appetite. The research team examined the effects of body electroacupuncture and a low-calorie diet on plasma leptin in obese and found that body electroacupuncture with a low-calorie diet can reduce plasma leptin concentration [6].

Material and Methods

Forty diabetic women with class (I) obesity were selected from Agouza Rheumatology and Rehabilitation Armed Forces Center (Jan. 2016 to April 2016) to participate in the study, their ages ranged from 40-50 years old. They were divided into two groups equal in number. Group A (study group): This group composed of 20 women received low-calorie diet (1000Kcal/day) and electroacupuncture sessions for 3 sessions per week, each session take 30 minutes for eight weeks, Group B (control group): This group composed of 20 women received low-calorie diet (1000Kcal/day) only for eight weeks.

Inclusive criteria:

- Women from 40-50 years old.
- Obese women diagnosed as diabetic (type II), fasting blood glucose ranged from (126-160) mg/dl.
- Their BMI is more than 30Kg/m^2 and less than 34.9Kg/m^2.
- Their abdominal circumference >88cm [7].
- They assumed sedentary life and they were not athletes.
- None of them take medication that might affect their performance or their appetite.
- A written informed consent from the patients to participate in our study.

Exclusion criteria:

- Their body mass index more than 34.9Kg/m^2 or less than 30Kg/m^2.
- Patient who couldn't follow electro-acupuncture sessions (missing 2 sessions).
- Subjects who practice exercise in aregular base.
- Patient take medication affect appetite.
- The smokers.
- Epilepsy or mental disorders.

A- Assessment material:

- Before selecting the patients, their body mass index was calculated which calculated as weight (kg)/height ^2 (m) [8].
- Their a leptin level in the blood was measured and recorded.
- Their fasting blood glucose level after 8 hours fasting was measured and recorded.
- All the parameters were considred as a base line and repeated for follow-up comparison after the programme.

Diet: Low-calorie diet (1000Kcal/day) contained 30% of calories from fat, 50% from carbohydrate, 20% from proteins.

B- Treatment material:

- Electro-acupuncture:
  - Mode: Electro-acupuncture sessions.
  - Duration: 30min.
  - Rate of session: Three times/week (day after day).
  - Intensity: (2-5) mA according patient tolerance.
  - Frequency: (0.8-3) Hz.

Methods:

Patient was in supine position and after cleaning of acupuncture points with alchol, needles were inserted on specific acupuncture points (LI4, SP6, ST36, ST44, CV12 and CV4 bilaterally) [9] along the body, the needles were then attached to the device that generates continuous electric pulses using small clips, these device were used to adjust the frequency and intensity of impulses being delivered according to patient tolerance for 30 minutes at one session.

Statistical analysis:

- The measured variables were described as mean (age, weight, height and BMI) and standard deviation.
- Un paired t-test was conducted for comparison of BMI, fasting blood glucose and adiponectin hormone between both groups before and after the study.
- Paired t-test was conducted for comparison between pre and post treatment mean values of BMI, fasting blood glucose and a Leptin hormone in each group.
- The level of significance for all statistical tests was set at p<0.05.
- All statistical measures were performed through the Statistical Package for Social Studies (SPSS) Version 19 for windows.
Results

Descriptive analysis of the anthropometric measures (age, height, weight and BMI) of all the subjects:

The mean age, weight and height of all the subjects participating in this study (20 one in the study group and 20 one in the control group) are listed in (Table 1). There was no significance difference between both groups in the mean age, weight, height, and BMI (p>0.05).

Comparison between the mean values of all variables of the study (BMI, fasting blood glucose level and a leptin level before and after treatment in the two groups (study and control):

From the data listed in (Table 2) we can see that there was a significant decrease in Leptin, BMI and fasting blood glucose level of both study and control groups post treatment compared with pretreatment.

Comparison between control group and study group in both pretreatment and post treatment values of (BMI, fasting blood glucose level and adiponectin level):

From the data listed in (Table 3) we can see that there was no significant difference in the mean values of BMI, fasting blood glucose level and a leptin level between both groups (study and control) pre-treatment, while comparison between the study and control groups post-treatment showed a significant decrease in the mean values of a leptin level BMI and fasting blood glucose level of the study group compared with the control group.
Discussion

Many studies found that serum leptin levels reduced paralleling to weight loss with EA treatment. Furthermore, it is thought that in the EA applied group, increasing serum Beta Endorphin (BE) level probably enhanced the lipolitic activity which may have caused weight loss in obese people by mobilizing energy stores. It may be considered that the EA application with diet restriction in obesity treatment is more effective than the diet restriction alone [10].

This result supported by results achieved by Cai et al., [11], by 12th week of their study to study the relationship between serum leptin and insulin resistance, and to analyze the effect of acupuncture on serum leptin level in patients with type-II Diabetes Mellitus (DM), they found fasting insulin (FINS) and fasting leptin (FLP) levels in the acupuncture group were decreased significantly ($p<0.01$) and acupuncture therapy is effective in lowering fasting leptin (FLP) level, which may contribute to its clinical effect in improving type-II DM.

Gong et al., [12], studied the effects of electroacupuncture (EA) on body weight and sensitivity of leptin in diet-induced obese rats were examined and the underlying mechanisms were explored. After feeding with high-fat (HIF) diet for 12 weeks, the diet-induced obese rats received electroacupuncture stimulation three times per week for four weeks. The expression of the leptin receptor in the hypothalamus was measured using immunohistochemistry. The plasma leptin was detected with ELISA. The leptin and leptin receptor mRNA was examined with real-time PCR. Results showed that electroacupuncture treatment led to a reduction of body weight, decrease in the plasma leptin levels, and an increase in leptin receptor expression in the hypothalamus. Their results suggested that regulating the expression of leptin and the leptin receptor might be one of the molecular mechanisms underlying the reduction of body weight in diet-induced obese rats by electroacupuncture treatment.

Also, gucel et al., [9], investigated the effect of 10 sessions of acupuncture therapy at LI4, HT7, ST36, ST44 and SP6 bilaterally on serum insulin and leptin, and they found that acupuncture treatment decreased insulin, leptin levels and induced weight loss, these findings suggested that acupuncture may help to regulate weight owing to its beneficial effects on hormones such as insulin, leptin, ghrelin and cholecystokinin (CCK) in obese subjects even after a few weeks of treatment.

Present findings are in agreement with Darbandi et al., [6] who demonstrated that body electroacupuncture with a low-calorie diet can reduce plasma leptin concentration and found a significant reduction in plasma leptin (24.96%, $p<0.001$) and Body Fat Mass (BFM) (8.29%, $p<0.001$) after 6 weeks of electroacupuncture therapy with a low-calorie diet.

Yang et al., [13], reported that acupuncture combined with dietary adjustments and aerobic exercise can reduce the body weight, BMI and serum leptin level, which is better than dietary adjustments plus aerobic exercise.

Cabio˘gl and Ergene., [14], found a 4.5% weight reduction, reduction of serum leptin levels ($p<0.000$) and an increase in the serum Beta Endorphin (BE) ($p<0.05$) in the patients were treated by Electroacupuncture (EA) application, and patients were treated by diet restriction only had a 3.1% weight reduction.

Wang et al., [15], reported that acupuncture and tapping therapy in the treatment of type 2 diabetes of deficiency pattern reduce fasting plasma glucose, fasting leptin, fasting insulin and body mass index (all $p<0.01$).

Garcia-Vivas et al., [16], found that Traditional Chinese medicine provides an effective and safe therapy for reduce risk of diabetes in obese women, they found significant reduction in body weight (3.1 ±0.2kg, $p<0.001$), BMI (1.3 ±0.1kg/m², $p<0.001$), insulin (3.5±0.8mcu/ml, $p<0.1$) after electroacupuncture (EA) therapy on obese women.

Obesity is one of the leading health risk factors worldwide and is associated with several other risk factors and health problems, acupuncture is utilized to treat a variety of health problems, one of which is obesity [17], they found that both manual acupuncture with massage therapy (MAMT) and manual acupuncture therapy could reduce body weight and BMI significantly compared with the pretreatment values ($p<0.001$) so the manual acupuncture therapy is a reasonable option in the treatment of overweight and obesity in adults.

Zhiyuan et al., [18] studied effect of electroacupuncture on patients with type 2 diabetes mellitus and found significant reduction in fasting serum insulin, body mass index, 2 hours postprandial glucose and triglyceride after 2 months of treatment so electro-acupuncture could improve the biochemical and physical state of patients with type 2 diabetes mellitus.

Also, Yang and Liu, [19], reported that abdominal acupuncture for obese type 2 diabetic patient
Body mass index but with increasing of serum leptin levels (BL 18-23) bilaterally (corresponding to the cavum conchae, and the limb group received electro-acupuncture to dorsal segmental points corresponding to the pancreatic segments innervating the pancreas), the ear group received electroacupuncture to ear points in the cavum conchae, and the limb group received electroacupuncture to points in the arms and legs (LI10-LI11, ST36-Zongping), and they found either decrease in kidney function (creatinine and uric acid), fasting blood glucose, so they thought that body acupuncture in combination with diet restriction is effective in weight loss and reduction of inflammatory reactions.

Obesity is an increasing global health problem, and current methods of management are limited so Belivani et al., [22] studied the effect of different electroacupuncture protocols on fasting blood glucose in obese patients, they found highly significant decrease in kidney function (creatinine and uric acid), lipid profile (cholesterol and triglycerides) and fasting blood glucose, so they thought that body acupuncture in combination with diet restriction is effective in weight loss and reduction of the inflammatory reactions.

On other hand, Kim et al., [23] reported that electroacupuncture with reduction of food intake in rats for four weeks can reduce body weight and body mass index but with increasing of serum leptin levels.

As Gao et al., [20], used a sample size of 52 rats with type 2 diabetes mellitus to study the effect of electro-acupuncture therapy at "Shenshu point" (BL23), "Pishu point" (BL20) and "Yishu point" (EX-B3), they found significant reduction in fasting blood glucose, body mass index, triglyceride, high density lipoprotein and low density lipoprotein after four weeks of treatment; so electro–acupuncture therapy at "Yishu point" (EX-B3) could more reduce the level of cortin to improve the insulin resistance, improve insulin sensitivity index and regulate blood lipid metabolism in rats with type 2 diabetes mellitus.

In addition, Ismail et al., [21], reported the effect of acupuncture with low calorie diet on body weight reduction and inflammatory mediators in Egyptian obese patients, they found highly significant decrease in kidney function (creatinine and uric acid), lipid profile (cholesterol and triglycerides) and fasting blood glucose, so they thought that body acupuncture in combination with diet restriction is effective in weight loss and reduction of the inflammatory reactions.

The results of Peplow, [24] come in contrast with results of the present study as they concluded that two weeks of electroacupuncture using the Zhongwan, the Guanyuanacupoints and bilateral Zuanshiacupoints on obese Zucker diabetic fatty rats didn't reduce serum leptin levels and also increaseglucose ratio, serum insulin and insulin: Glucose ratio.

Conclusion:
from The result of this study we concluded that electroacupuncture with low calore diet is an effective tool to decrease insulin resistance and BMI and this effect may be mediated, in part, by decrease of leptin. All findings represent the effective role of electroacupuncture with low calore diet todecrease of leptin hormone in women with diabesity which consequently helps in the treatment of diabesity.

References
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