Impact of Weight Loss on Psychological Well Being and Biochemical Modulation in Obese Patients: A Comparison of Two Treatment Protocols

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ABSTRACT

Obesity is a serious health issue by itself; it is also associated with other health problems including psychiatric illnesses. The psychological effects of dieting and weight loss have been a matter of controversy in the field of obesity management. The aim of this study was to compare the impact of weight loss as a result of two types of treatment protocols included physical training and dietary measures with acupuncture or electroacupuncture on psychological well being and biochemical modulation in obese females. Forty obese females participated in the study, and were included in two equal groups. The first group (A) received physical training combined with dietary measures and acupuncture. The second group (B) received physical training combined with dietary measures and electroacupuncture. The program consisted of three sessions per week for three months. There was a significant decrease in Body Mass Index (BMI), Leptin, Total Cholesterol (TC), Low Density Lipoprotein Cholesterol (LDL-c), Triglycerides(TG), Beck Depression Inventory (BDI) & Profile of Mood States(POMS) and increase in High Density Lipoprotein Cholesterol (HDL-c) & Rosenberg Self-Esteem Scale (RSES) in both groups after treatments, but the changes in group (B) were greater than in group (A). However, there was no significant difference between mean levels of the investigated parameters in group (B) and group (A) at the end of the study. Physical training and dietary measures with electroacupuncture can be used as methods of choice for psychological well being and biochemical modulation in obese females.

Key words: *Obesity, physical training, electroacupuncture, psychological well being, biochemical modulation*

Kilo Kaybının Obez Hastalarda Psikolojik İyi Hal ve Biyokimyasal Modulasyon Üzerine Etkisi: İki Tedavi Protokolünün Karşılaştırması

ÖZET

Obezite kendi başına önemli bir sağlık problemidir; bu aynı zamanda psikiyatrik hastalıkları da içeren diğer sağlık problemleri ile birliktedir. Diyet ve kilo kaybının psikolojik etkileri obezite yönetimi alanında bir tartışma konusu olmaktadır. Bu çalışmanın amacı obez kadınlarda fiziksel egzersiz ve akapunktur veya elektroakapunktur gibi diyet önlemlerini içeren iki çeşit tedavi protokolüyle kilo vermenin psikolojik iyi hal ve biyokimyasal modülasyonlar üzerine etkisini araştırmaktı. Kırk obez kadın çalışmaya alındı ve iki eşit gruba ayrıldı. Birinci gruba (A) diyet önlemleri ve akapunktur ile birlikte fiziksel egzersiz uygulandı. İkinci gruba (B) diyet önlemleri, elektroakapunktur ve fiziksel egzersiz uygulandı. Program haftada üç uygulama içeren 3 ay süre uygulandı. Her iki grupta tedavi sonrası Vücüt kitle indeksi (VKİ), leptin, total kolesterol (TK), düşük dansiteli lipoprotein kolesterol (LDL-c), trigliserid (TG), Beck Depresyon Skalası (BDS ve duygu durum profilinde belirgin düşüş ve yüksek dansiteli lipoprotein kolesterol (HDL-c) ve Rosenberg self-Esteem Skalasında (RSES) belirgin yükselme izlendi, fakat grup (B) deki değişiklikler grup (A)'dan daha fazlaydı. Ancak çalışmanın sonunda grup (A) ve grup (B) arasında araştırılan parametrelerin ortalama düzeyleri arasında belirgin farklılık saptanmadı. Obez kadınlarda fiziksel egzersiz ve diyet ölçümleri ile birlikte elektroakapunktur psikolojik iyi hal ve biyokimyasal modülasyonlar için tercih edilecek yöntem olabilir.

Key words: *Obezite, fiziksel egzersiz, elektroakapunktur, psikolojik iyi hal, biyokimyasal modülasyon.*

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INTRODUCTION

Obesity is rising throughout Europe and at least 135 million European citizens are affected. More than half of European population is overweight (BMI greater than 25 kg/m2) and obese (BMI greater than 30 kg/m2) and almost a third are estimated to be obese. During the past 25 years, the incidence of obesity in Europe increased in different proportions from country to country. In several countries obesity is more common in women (1). Psychologically, obese women experience greater weight-related stigma and discrimination and are at increased risk for depression than obese men (2). Women are also particularly susceptible to psychological stress, sleep debt, and lack of physical activity, all of which are risk factors for the development of excess weight (3).

Recent evidence has described an increased risk of psychological distress especially in obese females. Depression, low self-esteem and poor psychological wellbeing are over-represented in clinical samples obese individuals (4). Weight loss is generally associated with psychological benefit (5). Also; achieving a 5–10% weight reduction is associated with meaningful improvements in health (e.g., glycemic control, blood pressure, cholesterol) (6).

Weight management program must include dietary adjustment, increase physical activity and behavior modifications. Nutrition modification should take into account the diet's energy content, composition and suitability for individual patient (7). Acupuncture can provide good therapeutic effects for simple obesity, as after twenty sessions the body weight, waistline, and the serum total cholesterol (TC), the fasting triglyceride (TG) and low-density lipoprotein (LDL) were significantly changed (8). On the other hand, electroacupuncture was found to reduce body mass, decrease fatty tissues content and normalization of blood serum lipids (9).

The aim of this study was to compare the impact of weight loss as a result of two types of treatment protocols included physical training and dietary measures with acupuncture or electroacupuncture on psychological well being and biochemical modulation in obese females.

MATERIALS AND METHODS

Subjects

Forty obese women with BMI ≥ 30 Kg/m2, free from respiratory, kidney, liver, metabolic and neurological disorders. Subjects were not smokers and not receiving drugs. Their age ranged from 20 to 35 years. The subjects were included into 2 equal groups; group (A) received physical training combined with dietary measures and acupuncture. The second group (B) received Physical training combined with dietary measures and electroacupuncture. This study was approved by the Scientific Research Ethical Committee, Faculty of Applied Sciences, King Abdulaziz University. Informed consent was obtained from all participants. All participants were free to withdraw from the study at any time. If any adverse effects had occurred, the experiment would have been stopped, with this being announced to the Human Subjects Review Board. However, no adverse effects occurred, and so the data of all the participants were available for analysis.

Chemical analysis

Blood sample after fasting for 12 hours was taken from each women in clean tubes containing few mg of K2EDTA, centrifuged and plasma was separated and stored frozen at -20° used for estimation of plasma leptin level by immunoradimetric assay (IRMA), Leptin, TC, Low Density Lipoprotein Cholesterol (LDL-c) , TG and High Density Lipoprotein Cholesterol (HDL-c)

Evaluation of anthropometric parameters

All measurements were performed at pretreatment and after three months at the end of the study. The participants were measured whilst wearing their undergarments and hospital gowns. Height was measured with a digital stadiometer to the nearest 0.1 cm (JENIX DS 102, Dongsang, South Korea). Body weight was measured on a calibrated balance scale to the nearest 0.1 kg (HC4211, Cas Korea, South Korea), and BMI was calculated as BMI = Body weight / (Height)2.

Psychological well-being

Data were collected at baseline and at the end of treatment. Participants were required to attend two laboratory sessions in order to complete all psychological assessments, in each evaluation period. Self-esteem was assessed with the Rosenberg Self-Esteem Scale (RSES), composed by 10 items answered on a 4-point Likert scale. Higher scores of the RSES represent greater self-esteem (α = .84). Mood disturbance was assessed with the Profile of Mood States (POMS), which measures the transient emotional state through 65 items on a 5-point Likert scale. The questionnaire assesses 6 dimensions

Table 1. *Mean value and significance of BMI, Leptin, TC, HDL-c, LDL-c, TG, RSES, BDI and POMS in group (A) before and after treatment.*

	Before	*After*	*T-value*	*P-value*
BMI (Kg/m2)	*33.82 ±5.34*	*30.25± 5.61*	*6.53*	*0.007*
Leptin (Ng/ml)	*39.81± 6.17*	*36.48 ±6.19*	*9.85*	*0.006*
TC (mg/dl)	*196.24 ±16.11*	*174.15± 15.47*	*10.81*	*0.003*
HDL-c (mg/dl)	*35.23 ±2.98*	*37.81± 2.66*	*8.54*	*0.008*
LDL-c (mg/dl)	*134.11 ±14.26*	*118.15 ±13.44*	*8.31*	*0.004*
TG (mg/dl)	*157.25± 17.05*	*124.82 ±15.36*	*9.26*	*0.009*
Self-esteem (RSES)	*22.83±3.27*	*25.41±3.11*	*5.34*	*0.008*
Depression (BDI)	*7.26±4.01*	*5.12±3.35*	*4.98*	*0.005*
Total mood disturbance (POMS)	*23.22 ± 6.33*	*19.78 ± 5.17*	*5.02*	*0.004*

BMI= Body Mass index, TC: Total cholesterol, HDL-c: High density lipoprotein cholesterol, LDL-c: Low density lipoprotein cholesterol, TG: Triglyceride, RSES: Rosenberg Self-Esteem Scale, BDI: Beck Depression Inventory, POMS: Profile of Mood States.

of mood that can be used to calculate a Total Mood Disturbance score (sum of the negative emotions subtracted by the positive Vigor dimension, α = .92), which was used in the present study (higher scores represent greater total mood disturbance). Questions pertain to emotional states of the previous month. Depression was evaluated with the Beck Depression Inventory (BDI), a 21-item inventory measuring several symptoms of depression. It uses a 4-point ordered scale and results in a total score (α = .80), where higher scores represent greater level of depressive symptoms (10).

The physical training program

The aerobic treadmill-based training program (Enraf Nonium, Model display panel Standard, NR 1475.801, Holland) was set to 60% of the maximum heart rate (HRmax) achieved in a reference ST performed according to a modified Bruce protocol. This rate was defined as the training heart rate (THR). After an initial, 5-minute warm-up phase performed on the treadmill at a low load, each endurance training session lasted 30 minutes and ended with 5-minute recovery and relaxation phase. All patients performed three weekly sessions (i.e. a total of 36 sessions per patient over a 3-month period).

The prescribed low calorie diet

The interview-based food survey was performed for all patients by dieticians to specify previous food habits and possible anomalies in dietary behavior. The prescribed low calorie diet was balanced, with 15% as protein, 30 to 35% as fat and 50 to 55% as carbohydrate, on average, in order to provide about 1000 calories daily for three months for whole participants in this study. The prescribed diet included the breakfast consisted of 2 boiled eggs (80.calorie), 50 gm cheese (100 calorie) and one bread (105 calorie), where the lunch consisted of 2 pieces of boiled meat 100gm (240 calorie) or chicken (300), 500 gram salad (105 calorie), 300 gram boiled vegetables (110 calorie) 100 gram and banana (100 calorie), However, the dinner consisted of 200 gram light milk (120 calorie).

Acupuncture

The obese females were treated by pressing stainless steel needles (Dong-Bang Medical, South Korea) in one ear, the needles were changed every 7 days for sterilization and to prevent adaptation, the auricular points were shenman, stomach, endocrine, duodenum, hunger and spleen points. Also subjects were treated by pressing needles in meridian acupuncture body points used in reduction of body weight. The meridian body acupuncture points were stomach ST 36, large intestine 4, lungs 5 and stomach 25. Each session was continued for 30 minutes; 3 sessions / week for 3 months. Where the auricle needle was 0.5 inches in length and 2.7 mm in diameter and body needles which varied in length, between 2.0 inches to 3.0 inches in length and 5.8 mm in diameter to 76 mm.

Electroacupuncture

An electric stimulator (model III Acupuncture Anesthesia, Tokki, Japan) to provide simulation for the acupuncture needle. The standardized acupuncture points were chosen according to the theory of Chinese medicine and

***Table 2**. Mean value and significance of BMI, Leptin, TC, HDL-c, LDL-c, TG, RSES, BDI and POMS in group (B) before and after treatment.*

	Before	After	T-value	P-value
BMI (Kg/m2)	33.59 6.40	31.88 5.14	7.03	0.006
Leptin (Ng/ml)	40.50 5.52	35.76 6.21	10.78	0.005
TC (mg/dl)	198.63 15.90	168.21 13.26	12.04	0.001
HDL-c (mg/dl)	33.25 2.48	39.54 2.66	9.23	0.004
LDL-c (mg/dl)	134.89 13.72	115.11 15.23	8.98	0.003
TG (mg/dl)	161.72 16.54	120.18 14.91	11.02	0.007
Self-esteem (RSES)	23.09 ± 3.48	26.22 ± 3.75	6.77	0.006
Depression (BDI)	7.54 ± 3.93	4.97 ± 3.09	5.56	0.002
Total mood disturbance (POMS)	23.75 ± 5.31	18.20 ± 4.73	5.91	0.005

BMI= Body Mass index, TC: Total cholesterol, HDL-c: High density lipoprotein cholesterol, LDL-c: Low density lipoprotein cholesterol, TG: Triglyceride, RSES: Rosenberg Self-Esteem Scale, BDI: Beck Depression Inventory, POMS: Profile of Mood States.

clinical experience. Eight acupuncture points on the abdomen were selected: CV 6 (Chi Hai), CV 10 (Hsia Wan), CV 12 (Ching Wan), CV 13 (Shang Wan), left and right side of SP 15 (Ta Heng), and both side of ST 25 (Tien Shu). Stainless-steel acupuncture needles were inserted to a depth of approximately 2.5 cm after skin sterilization. Each needle was rotated back and forth until the subject experienced the sensation of De-Qi. The acupuncture needle was then connected to an electric stimulator that provided simulation for 50 min with 15-mA, 0.05-ms square waves at a rate of 3 Hertz. All subjects were asked to receive three treatments per week for a total of 3 weeks for 3 months.

Statistical analysis

The mean values of BMI, Leptin, TC, HDL-c, LDL-c, TG, RSES, BDI and POMS obtained before and after three months in both groups were compared using paired "t" test. Independent "t" test was used for the comparison between the two groups ($p<0.05$).

RESULTS

In order to detect impact of weight reduction as a result of two treatment protocols on psychological well being and biochemical modulation in obese females. Forty obese females participated in the study, and were included in two equal groups. The first group (A) received physical training combined with dietary measures and acupuncture. The second group (B) received physical training combined with dietary measures and electroacupuncture.

There was a significant decrease in BMI , Leptin , TC, LDL-c , TG , BDI and POMS and increase in HDL-c and RSES in both groups after treatments, but the changes in group (B) were greater than in group (A) (Table 1 and 2). However, there was no significant difference between mean levels of the investigated parameters in group (B) and group (A) at the end of the study (Table 3) ($p<0.05$).

DISCUSSION

A growing number of individuals are seeking obesity treatment and much attention has been directed towards improving treatment outcomes due to the extensive and expanding list of deleterious health outcomes associated with obesity. So, the aim of this study was to compare the impact of weight loss as a result of two types of treatment protocols included physical training and dietary measures with acupuncture or electroacupuncture on psychological well being and biochemical modulation in obese females.

The results of the present study concerning BMI showed that there was a significant reduction in BMI of group (A) received physical training and dietary measures with acupuncture and group (B) received physical training and dietary measures with electroacupuncture, while the difference between both groups after therapy was not a significant.

Reduction of BMI in this study agreed with Liu who stated that regulation of body mass index was reported in obese subjects received acupuncture therapy (11).However there was a higher efficiency of low caloric diet and acupuncture than low caloric diet only in lowering of BMI and body weight of obese persons (12). Stimulation of mouth, Shenman, stomach, hunger, and spleen au-

Table 3. *Mean value and significance of BMI, Leptin, TC, HDL-c, LDL-c, TG, RSES, BDI and POMS in group (A) and group (B) after treatment.*

	Group (A)	Group (B)	T-value	P-value
BMI (Kg/m2)	30.25 5.61	31.88 5.14	0.87	0.94
Leptin (Ng/ml)	36.48 6.19	35.76 6.21	0.98	0.87
TC (mg/dl)	174.15 15.47	168.21 13.26	1.34	0.07
HDL-c (mg/dl)	37.81 2.66	39.54 2.66	1.89	0.06
LDL-c (mg/dl)	118.15 13.44	115.11 15.23	1.95	0.08
TG (mg/dl)	124.82 15.36	120.18 14.91	2.11	0.09
Self-esteem (RSES)	25.41 ± 3.11	26.22 ± 3.75	0.75	0.43
Depression (BDI)	5.12 ± 3.35	4.97 ± 3.09	0.64	0.52
Total mood disturbance (POMS)	19.78 ± 5.17	18.20 ± 4.73	1.36	0.08

ricular points for 2 to 6 weeks resulted in weight loss in these patients varied from 2-16 pounds (13) as acupuncture stimulates the auricular branch of vagus nerve and raises serotonin levels, both of which have been shown to increase tone in the smooth muscles of the stomach, thus suppressing the appetite which leads to weight loss in overweight patients (14). Abdominal electroacupuncture stimulation reduced body weight by 5.3% as it might help redistribute or lyse abdominal fat tissue directly and also other body adipose tissue (15). Bilateral auricular acupuncture stimulation clearly modulates feeding-related hypothalamic neuronal activity of experimental (both hypothalamic and dietary) obese rats (16). Treatment by pellet pressure on auricular acupoint plus body acupuncture for 3 months was superior in reduction body weight and decrease in appetite than obese treated by diet in obese subjects (17).

The results of the current study concerning plasma leptin level showed that there was a significant reduction in both groups, and the decrease was greater in group(B) than group (A) , but the difference between the mean plasma leptin level in the 2 groups after therapy was not a significant. Reduced level of leptin as a result of weight loss confirmed with Mendez–Sanchez etal. who stated that increasing physical activity was associated with lower plasma leptin concentrations even after reduction of BMI. Physical activity may lower leptin concentrations not only due to the decreased body fat mass, but potentially through an increase in leptin sensitivity (18).

The results of this study concerning LDL-c , TC and TG showed that there was a significant reduction in both groups, and the decrease was greater in group (B) than group (A), but the difference in the total cholesterol level between the 2 groups after therapy was not a significant. Improved lipid profile as a result of weight reduction was approved by Di Buono etal. Who reported that energy restriction resulting in even modest weight loss suppresses endogenous cholesterol synthesis which leads to a decline in circulating lipid concentrations and increased insulin sensitivity that contributes in improving lipoprotein profile after treatment of obesity (19). Electroacupuncture can reduce the body weight by 4.5%, with a parallel reduction in the leptin level, total cholesterol, triglyceride, and LDL cholesterol by increasing the beta-endorphin level which stimulates lipolysis (20). Acupuncture has a good regulation effect on lipid metabolism and plasma cycling adenosine monophosphate (cAMP) that is involved in the activation of phosphorylase helping glycogenolysis and on lipase enzyme helping lipolysis (21).

The results of the study concerning HDL-c showed that there was a significant increase in both groups, and the increase was greater in group B than group A, and the difference between the two groups after treatments was a significant. Increased level of HDL-c as a result of treatment agreed with Bounds etal. who stated that exercise resulted in an increase in HDL-c (10.7%) and a concomitant fall in triglyceride (-25%) and total cholesterol (-3.5%) (22). Where, exercise-induced increases in HDL-c and decreases in triglyceride are similar in hyper- and normo-cholesterolemic men and may be mediated, at least in part, by an increase in lipoprotein lipase activity (23). The results of the study concerning psychological well being showed that there was a significant increase RSES and reduction in BDI and POMS in both groups, and the increase was greater in group B than

group A, and the difference between the two groups after treatments was a significant.

Improved psychological wellbeing as a result of weight reduction was approved by a previous study of Blaine et al. who reported that participants in weight loss programs often report improved life satisfaction and feeling more positive about their bodies and their new-learned abilities, such as being physically active and self-managing their weight (24). Also, psychosocial outcomes of surgery for morbid obesity include improvements in mood, reduction in depression and anxiety (25). Also, the amount of weight loss was positively associated with improved psychological distress (26). A recent study found that dietary treatment for obesity improved eating psychopathology, self-esteem and mood (27). A previous study on 142 overweight/obese women (BMI = 30.2±3.7 kg/m^2; age: 38.3±5.8 years) participants in a behavioral treatment program consisting of a 4-month treatment period and a 12-month follow-up. Psychosocial variables improved during treatment and these changes were correlated with 4-month weight reduction (10).

In conclusion, physical training and dietary measures with electroacupuncture can be used as methods of choice for psychological well being and biochemical modulation in obese females.

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