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## **THE TREATMENT OF OBESITY BY ACUPUNCTURE**

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The present study is an investigation of the results of the studies on the effects of acupuncture application therapy on obesity. It has been reported that acupuncture application in obesity treatment is effective in procuring weight loss. It can affect appetite, intestinal motility, and metabolism, as well as emotional factors such as stress. Increases in neural activity in the ventromedial nuclei of the hypothalamus, in tone in the smooth muscle of the stomach and in levels of enkephalin, beta endorphin, and serotonin in plasma and brain tissue have also been observed with the application of acupuncture. It has been observed that acupuncture application to obese people increases excitability of the satiety center in the ventromedial nuclei of the hypothalamus. Acupuncture stimulates the auricular branch of the vagal nerve and raises serotonin levels. Both of these activities have been shown to increase tone in the smooth muscle of the stomach, thus suppressing appetite. Among other things, serotonin enhances intestinal motility. It also controls stress and depression via endorphin and

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dopamine production. In addition to these effects, it is thought that the increase in plasma levels of beta endorphin after acupuncture application can contribute to the body weight loss in obese people by mobilizing the body energy depots through lipolytic effect.

**Keywords** acupuncture, appetite, beta endorphin, enkephalin, obesity, Serotonin

## INTRODUCTION

Obesity could well become the most common health problem of the 21st century (Palou et al., 2000). Obesity is a disease resulting from the over storage of fat in the body. It is a problem concerning the balance of energy. An imbalance between energy input and energy consumption causes an increase in the body fat rate (Palou et al., 2000). It is known that the prevalence of obesity in adults and children has been increasing significantly around the world (Weinstock et al., 1998). In this century, obesity has been seen especially in industrial countries (Leonhardt et al., 1999). The over-consumption of delicious, high-calorie food and decrease in physical activity play major roles in increasing the prevalence of obesity in industrial countries (Campfield et al., 1996; Hill & Peters, 1998). The cost of treatment of obesity and obesity-related diseases is significant in general health expenditures in the United States (Bray, 1998).

The general principles of obesity treatment are to obtain weight loss, to maintain the reduced body weight after this loss, and to control the risk factors of disease. At the onset of obesity treatment, a 10% body weight reduction is targeted. After a one to two kg per week weight loss is observed over 6 months, new goals can be determined (Lyznicki et al., 2001).

Treatments for obesity include: diet restriction, regulation of physical activity, behavior treatment, pharmacotherapy, operation, or acupuncture application or the use of any of these methods in combination (Cabýoglu & Ergene, 2005; Ernst, 1997; Richards & Marley, 1998).

Complementary medicine is more popular than ever before. About one third to one half of the general population uses some type of complementary treatment. Acupuncture is among the most popular complementary treatments.

## TREATMENT OF OBESITY BY ACUPUNCTURE APPLICATIONS

Cabýoglu and Ergene (2005) applied body and ear acupuncture for 20 days to 22 women who had a body mass index (BMI) between 30 and 40 while a

1425 Kcal diet program was prepared for 21 women under the same circumstances. Besides, there was a control group including 12 women. In this study, associated with body weight, levels of the serum total cholesterol, triglyceride, HDL cholesterol and LDL cholesterol in obese women were examined. In acupuncture treatment, the Hungry and Shen Men ear points, and the Hegu (LI 4), Quchi (LI 11), Tianshu (St 25), Zusanli (St 36), Neiting (St 44) and Taichong (Liv 3) body points were used. There was a 4.8% weight reduction in obese women with electroacupuncture application, whereas obese women in diet restriction had a 2.5% weight reduction. There were significant decreases in total cholesterol and triglycerides levels in EA and diet groups compared with the control group. Furthermore, there was a decrease in LDL levels in the EA group compared with those in the control group.

Huang et al. (1996) applied auricular acupuncture and diet and aerobics exercise programs for 8 weeks to 8 men who had a body mass index (BMI) over 30 and body fat rate over 25% and to 37 women who had a BMI over 30 and body fat rate over 30%. In the auricular acupuncture application, the points Shen Men, Stomach, Sanjiao, and Hungry were chosen. Weekly application was made to a single ear each session, using one ear in one session and the other ear in the next session. The diet program was prepared by a dietician to meet the daily needs of the people participating in the study by calculating their anticipated daily activities, as well as other factors. The exercise program was arranged to be 3 to 5 times per week and to burn 300 to 500 kcal of energy in each session. As a result of this triple application, an average 4.4 kg body weight loss and a 5.6% reduction in body fat rate were observed.

Sun and Xu (1993) applied auricular and body acupuncture therapy to 110 obese patients. In this study, a small, spherical seed, a method employed in traditional Chinese acupuncture, was applied to the auricular acupuncture points, Mouth, Esophagus Stomach, Shen Men, Lung, and Endocrine in sessions three to five days apart. This application was made first on one ear and then on the other ear in the following session. Additional application was made to the body acupuncture points Tianshu (St 25), Zusanli (St 36), Sanyinjiao (Sp 6), Neiguan (P 6), and Fenglong (St 40). This application was performed once every 3 to 5 days, in 15 min sessions over 3 months. As a result of these applications, a 5.0 kg loss in body weight was observed.

Shafshak (1995) performed a study with 30 obese females, dividing them into three groups each including 10 females. He applied electroacupuncture to the Stomach points on both ears of the subjects in the first group, to the

Hungry points on both ears of the subjects in the second group, and to placebo points on both ears of the subjects in the third group. These applications continued once a day, five days a week, for three weeks. Also a diet of 1000 kcal/day was advised to patients. In the first group, 80% of the patients managed to apply the diet. The rate of diet application for the second group was 70%, whereas that of the third group was 20%. In all patients applying the diet, the observed body weight loss was 1 to 4 kg in the first group, 1.5 to 3.5 kg in the second group and 1 to 3 kg in the third group. According to the results of this study, it was observed that the auricular acupuncture points Stomach and Hungry were effective in weight loss when compared with placebo points.

Through electroacupuncture to obese people, increases in the serum triglyceride and LDL cholesterol levels and a decrease in the serum HDL cholesterol levels were reported by Lyznicki and his colleagues (2001). These two levels are thought to have particular ties to cardiovascular disease. Liu et al. (1992), using the ear and body acupuncture points of traditional Chinese acupuncture, applied acupuncture to 102 obese people and studied the changes in body weight and plasma levels of total cholesterol, triglycerides, HDL cholesterol, and LDL cholesterol. Ear acupuncture was applied once every 5 days and body acupuncture was performed once every 3 days in 20-min sessions over a 1 month period. In Liu's study, a weight loss with a mean value of 3.3 kg was noted. Also, decreases in plasma levels of total cholesterol, triglyceride, and LDL cholesterol levels and an increase in the HDL cholesterol level were observed. Sun and Xu (1993) performed ear and body acupuncture to obese people and analyzed the changes in body weight and levels of total cholesterol, triglyceride, and HDL cholesterol. They applied acupuncture to the Mouth, Esophagus, Stomach, Shen Men, Endocrine, and Lung acupuncture points on one ear once every three or five days, and on the other ear in the next session by using small seeds that are used in some traditional Chinese acupuncture methods. They also applied acupuncture to the St 25, St 36, Sp 6, P 6, and St 40 body points once every three or five days using acupuncture needles. In their study, it was observed that decreases in plasma levels of total cholesterol and triglyceride corresponded with weight loss. Therefore, they concluded that EA therapy may be a useful approach to treatment of obesity and potentially decrease the risk factors associated with obesity.

Stimulation of the Hungry point creates an increase of the fullness feeling and a repression of the hunger feeling (Asomoto & Takeshige, 1992). Stimulation of the Shen Men point regulates cerebral cortex function and has

a sedative effect (Wang & Kain, 2001). Stimulation of the Stomach point stimulates the auricular branch of the vagal nerve, which has been shown to increase tone in the smooth muscle of the stomach, thus suppressing appetite (Richards & Marley, 1998). Stimulation of the LI 4, LI 11, and St 25 body acupuncture points has a regulatory effect on intestinal motility (Maciocia, 1989), whereas stimulation of St 36 and St 44 increases excitability of the satiety center in the ventral medial nucleus of the hypothalamus (Zhao et al., 2000). In traditional Chinese medicine, the St 36 body acupuncture point has been used for the treatment of both diarrhea and constipation. This point has been reported to regulate gastrointestinal motility by increasing motility in people with hypoactive intestinal motility and conversely by decreasing motility in people with hyperactive intestinal motility (Li et al., 1992). Stimulation of this point also increases the amplitude and frequency of gastric peristalsis that shortens gastric emptying time and delays the contraction time in regular people (Li et al., 1992).

#### **ACUPUNCTURE APPLICATION AND SUPPRESSING APPETITE**

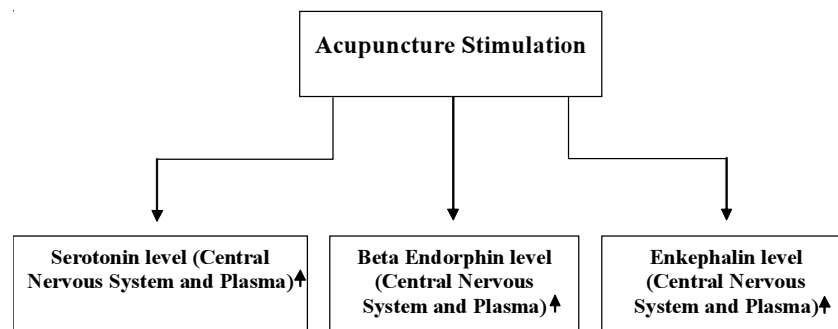
In the treatment of obesity, acupuncture applications, especially auricular acupuncture, are very effective for losing weight in obese people (Sun & Xu, 1993; Lei, 1988; Mulhisen & Rogers, 1999). Although diet application causes weight loss in obesity treatment, it has no effect on suppression of appetite (Richards & Marley, 1998). Many overweight people are aware that diets can help with weight loss but have difficulty in suppressing their appetite. However, it has been determined that acupuncture application is effective both in weight loss (Zhan, 1993; Sun & Xu, 1993) and in suppression of appetite (Shiraishi et al., 1995; Zhao et al., 2000).

Shiraishi et al. (1995) reported the changes in neural activity of the ventromedial (VMH) and lateral hypothalamus (LH) through auricular acupuncture application on normal and experimentally obese rats. One experimental group of obese rats was obtained by destroying the ventromedial hypothalamus and another through a high-calorie diet. Auricular acupuncture application was performed to the region that was innervated by the nervous vagus on a single ear. This region is called the cavum conchae on human beings. Although the neural activity of the LH is diminished in normal rats by auricular acupuncture application, the neural activity of the VMH is increased. Likewise, neural activity of the LH was reduced in both of the two experimental groups of obese rats, and neural activity of the VMH was increased in the group of high-calorie diet, obese rats. As a result, it was

determined that auricular acupuncture application is effective in the formation and protection of the satiety sense in both normal and obese rats.

Zhao et al. (2000) in their study on rats, applied electroacupuncture on one side of the body on 1 day and on the other side the following day, for 12 days in 5-min daily sessions. For this test, they chose the Zusanli (St 36) and Neiting (St 44) points. It was observed that electroacupuncture application on rats increased excitability of the satiety center in the ventromedial nucleus of the hypothalamus.

Wenhe and Yucan (1981) observed that the level of serotonin (5-HT) in the central nervous system increased with acupuncture application (Figure 1). Serotonin has been implicated in the control of eating behavior and body weight. Stimulants of this monoamine reduce food intake and body weight, increase energy expenditure (Curzon, 1990; Simansky, 1996), and enhance intestinal motility (Guyton & Hall, 2001). This effect of 5-HT that reduces food intake can be observed on 5-HT receptors of the satiety center in the ventromedial nuclei of the hypothalamus (Sarah et al., 1998). Besides that, it was noted that serotonin gave happiness, helped a person to feel good, controlled the sexual motivation, and had a role in obtaining the psychomotor balance (Guyton & Hall, 2001). Acupuncture stimulates the auricular branch of the vagal nerve and raises serotonin levels. Both of these activities have been shown to increase tone in the smooth muscle of the stomach, thus suppressing appetite (Richards & Marley, 1998). It is thought that an increase in the level of serotonin in the central nervous system with acupuncture application can provide weight loss, as it has a role in both reducing food intake and arranging the psychomotor balance (Figure 2).



**Figure 1.** Effects of acupuncture stimulation on the levels of neurotransmitter levels in the central nervous system and plasma.

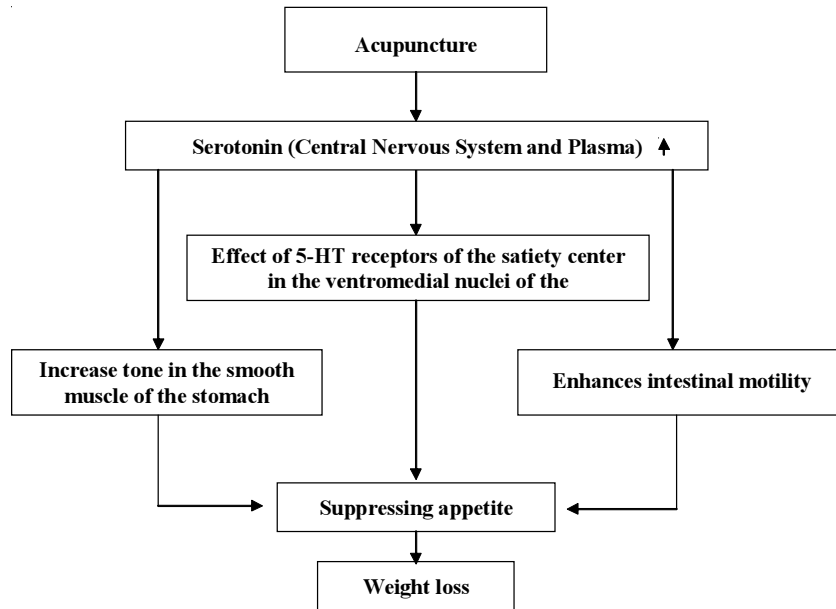
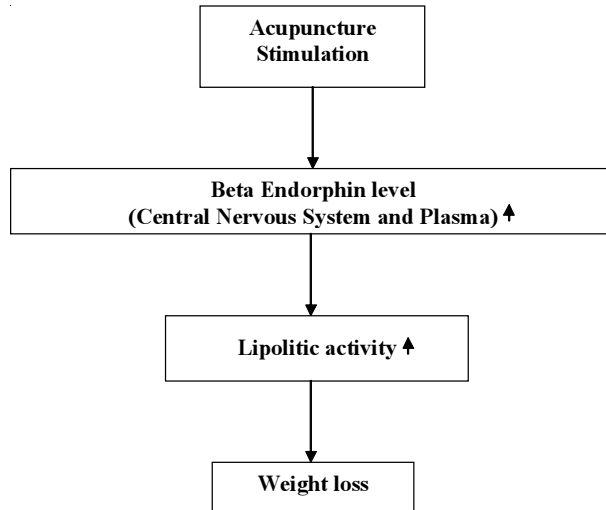


Figure 2. Acupuncture application and suppressing of appetite.

### ACUPUNCTURE, BETA ENDORPHIN, AND LIPOLITIC ACTIVITY

In many studies it has been observed that electroacupuncture application caused an increase in the levels of beta endorphin both in serum and in the central nervous system (Jin et al., 1996; Takeshige et al., 1992, 1993; Fu, 2000; Petti et al., 1998) (Figure 1). It has been determined that electroacupuncture application with different current frequencies causes the secretion of different endogenous opioids. It also has been observed that low current frequency (2 Hz) electroacupuncture application increases the concentration of endomorphins, enkephalins, and beta endorphin but high current frequency (100 Hz) electroacupuncture application increased the concentration of dynorphin in the central nervous system (Han et al., 1999) (Figure 1).

The studies that showed the lipolytic activity of pro-opiomelanocortin products were performed as *in vivo* and *in vitro* studies on animals (Schwandt, 1985; Richter et al., 1983; Richter & Schwandt, 1985). Richter et al. (1983) investigated the lipolytic activity of beta endorphin in the isolated fat cells of rabbits *in vivo*. It was determined that as a result of the effect of beta endorphin



**Figure 3.** Acupuncture application and lipolitic activity.

on fat cells, the levels of free fatty acid and glycerol increased in the rabbit plasma. This effect was blocked by naloxone. Vettor et al. (1993) studied the lipolitic activity of beta endorphin in isolated human fat tissue. In their study, it was observed that whereas BE application caused the increase of glycerol secretion from isolated fat cells, naloxone inhibited this effect.

According to the results obtained from these studies, it is thought that electroacupuncture, which increases the plasma beta endorphin levels, can contribute to the weight loss by increasing the lipolitic activity (Figure 3).

## CONCLUSION

It has been observed that acupuncture application depresses the appetite by activating the satiety center in the hypothalamus and increasing sympathetic activity through an increase in the concentration of serotonin in the central nervous system of obese people. Acupuncture stimulates the auricular branch of the vagal nerve, which has been shown to increase tone in the smooth muscle of the stomach, thus suppressing appetite. It also controls stress and depression via endorphin and dopamine production. In addition to these effects it is thought that the increases of plasma levels of beta endorphin naturally occurring after acupuncture application can contribute to body weight



loss in obese people. This is accomplished by mobilizing the body energy depots by lipolytic effect. Through these mechanisms, acupuncture application can be seen as an effective therapy in the treatment of obesity.

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