

Experimental Research

Effect of electroacupuncture at ear and body acupoints on the instant fasting blood glucose level of machins with type 2 diabetes mellitus *

电针耳穴体穴对2型糖尿病猴即时空腹血糖的影响*

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ABSTRACT

Objective To observe the effect of electroacupuncture at ear and body acupoints for the instant fasting blood glucose of model machins with type 2 diabetes mellitus (T2DM). **Methods** For 10 machins with type 2 diabetes, the electroacupuncture was applied at “Zusanli” (足三里 ST 36), “Sanyinjiao” (三阴交 SP 6) and three “Jiangtangdian” (降糖点) in the ear continuously for 5 days, with the frequency of 2/15 Hz (The 2 Hz and the 15 Hz were transferred every second) and current of 2 mA. The treatment was given once every day for 30 min. The fasting blood glucose was measured before acupuncture, after acupuncture for 15 min and 30 min in the 5 days. **Results** On the first day, after 30-minute acupuncture the fasting blood glucose was reduced obviously compared with that before treatment ($P<0.01$). On the third and the fifth days, after acupuncture for 15 min and 30 min the fasting blood glucose was apparently lower than that before acupuncture (all $P<0.05$). On the fourth day, after acupuncture for 30 min the fasting blood glucose was decreased markedly than that before acupuncture ($P<0.05$). After 30-minute acupuncture on the fifth day, the fasting blood glucose was lower obviously than that before treatment on the first day ($P<0.05$). **Conclusion** ① The electroacupuncture at ear and body acupoints can reduce the instant fasting blood glucose of T2DM machins apparently. ② There is time effect on instant fasting blood glucose of T2DM machins treated by electroacupuncture. The efficacy of 30-minute stimulation is superior to that of 15-minute acupuncture. After acupuncture continuously for 4 days, the effect is better than that with acupuncture for 3 days successively.

KEY WORDS: electroacupuncture; ear points; body acupoints; type 2 diabetes mellitus; fasting blood glucose; instant

Type 2 diabetes mellitus (T2DM) is a kind of disease with disturbance of carbohydrate metabolism, which is concurrent with hyperglycemia and hyperinsulinemia caused by insulin resistance. Usually

being found in adults, so T2DM is also called adult diabetes mellitus. According to the data in 2010, the morbidity of diabetes mellitus in adult population in China was 9.7%, reaching up to 92.4 million

people and over 90% of the people suffered from T2DM^[1]. In recent years, the morbidities of obesity, insulin resistance and T2DM have increased at an amazing rate, and the onset of T2DM has a tendency of attacking young people. Among teenagers in developed countries, T2DM has accounted for a half of the total cases. Commonly used hypoglycemic drugs are certainly effective, however, with high price, more adverse effects, and it is hard to control the dosage. Therefore, it is urgent to find out a simple and economical control method with fewer adverse effects. To strengthen the observation on therapeutic effect of acupuncture on T2DM and its mechanism research will contribute to slow down the tendency of rapid growth and the trend of attacking young people, prevent complications, relieve or treat existing cases. In this study, T2DM model machins were selected as subjects to observe the changes of immediate fasting blood glucose after electroacupuncture for 15 min and 30 min, so as to provide data support to clinical treatment and prevention of T2DM.

MATERIAL AND METHODS

Animals and grouping

Ten machins, at the age of 9 to 11 years old, with the weight of 5–12 kg, were selected as type 2 diabetes mellitus (T2DM) models. There were 5 female machins and 5 male machins (provided by Research center of Quadrumana in Southern China/Guangdong Landao Biotechnology Co., Ltd., Guangzhou). Modeling method: continuous illumination was applied for three months to disturb the biological rhythm of model machins, and fodder with high fat and high glucose was fed which resulted in hyperlipidaemia in machins. Modeling was successful when the indexes of fasting blood glucose, insulin and insulin resistance increased prominently, positive result was found in urine glucose detection, glucose tolerance was damaged, and the level of fasting blood glucose was higher than 7 mmol/L^[2]. Electroacupuncture intervention was conducted in 10 T2DM machin models. All the machins were fed in separate cage, and adaptively domesticated for 30 days. The disposal of animals during study conformed to *Regulations for the Administration of Affairs Concerning Experimental Animals* and *Guidance Suggestions for the Care and Use of Laboratory Animals* stipulated by Ministry of Science and Technology of the People's Republic of China in 2006.

Reagents and instruments

LH-2000 type HAN's electroacupuncture device (Nanjing Jisheng Medical Technology Co., Ltd.);

Hwato disposable sterile acupuncture needle (Suzhou Medical Appliance Factory Co., Ltd.); brand of glucometer: Johnson & Johnson, model: one touch ultr; pentobarbital sodium intravenous anesthetic.

Methods

Pentobarbital sodium anesthetic was injected intravenously in T2DM model machins, and after anesthesia, they reposed for 20 min to eliminate the influence of stress response on blood glucose level. After 20 min, finger-tip blood was obtained to measure the fasting blood glucose. The machins were in lateral position, after routine disinfection on auricle, the needle was inserted by twirling method at the cavity of auricular concha at the inferior margin of the midpoint of crus of helix. After the needle was inserted, medium stimulus was conducted, and the needle was twirled clockwise for 1 min. Then electroacupuncture was applied to stimulate continuously (Figure 1). “Zúsānlǐ” (足三里 ST 36) and “Sānyīnjiāo” (三阴交 SP 6) were selected for this study, and the acupoints were positioned according to *Anatomical Atlas of Experimental Animal* and the national standard *Nomenclature and Location of Acupuncture Points*. ① Electroacupuncture: 1.5 *cun* acupuncture needle was inserted into the site of left cavity of auricular concha, with the depth of inserting into the perichondrium without penetration, and the acupoints at “cymba of auricular concha” and “cavity of auricular concha” were selected. The electroacupuncture instrument was applied, with the frequency of 2/15 Hz (2 and 15 Hz were transformed per second) and the intensity of 2 mA. ② Manual acupuncture: “ST 36” and “SP 6” were selected. The needle was twirled once every five minutes, and 1 min for each time. The speed of twirling was 200 revolutions /min. Even reinforcing and reducing was applied, and intervention was conducted for five consecutive days. During the period of intervention, the electroacupuncture stimulus on cavity of auricular concha and manual acupuncture at “ST 36” and “SP 6” were performed concurrently for



Figure 1 Auricular vagus nerve distribution area and “ST 36” and “SP 6”

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