Experimental Research

Effects of acupuncture on blood-lipids, anti-oxidizing ability and vascular endothelial protective function in hyperlipemia mice *

针刺对高脂血症小鼠血脂、抗氧化能力及血管内皮保护功能的影响 *

WANG Zhi-bo (王志波)[1], **XIAO Hong-ling** (肖红玲)[2], **YANG Ji-jun** (杨继军)[2]✉

1. *Hospital of Huabei Science and Technology College, Langfang 065201, Hebei Province, China;* 2. *Acupuncture and Moxibustion Department, College of TCM, Hebei Medical University* (1. 华北科技学院医院，河北廊坊 065201，中国；2. 河北医科大学中医学院针灸系)

ARTICLE INFO

First author: WANG Zhi-bo (1977-), male, lecturer, attending doctor.
Research field: TCM gerontology.
E-mail: wzhb770907@163.com

✉ Corresponding author: YANG Ji-jun (1952-), female, professor, chief physician, tutor of master degree student.
Research field: TCM gerontology, sub-healthy state, acupuncture for slimming.
E-mail: 1952yjj@163.com

* Supported by The Hebei Province TCM Administration Bureau Foundation for Tackling Key Problems of Science and Technology: 2009058

Accepted on Janunry 5,2012

ABSTRACT

Objective To observe therapeutic effects of acupuncture on the mouse of hyperlipemia and to explore the mechanisms. **Methods** One hundred and twenty Kunming mice, male, sanitary degree, were randomly divided into normal group (n=40), a model group (n=40), an acupuncture group (n=20) and a medicine group (n=20). Except the normal group, the mice were fed with high fat forage to prepare mouse hyperlipemia model. On the 15th day of modeling, serum total cholesterol (TC), triglyceride (TG), low density lipoprotein-cholesterol (LDL-C), high density lipoprotein-cholesterol (HDL-C) levels were detected in 20 normal mice and 20 model mice; electroacupuncture was given at bilateral "Fēnglóng" (丰隆 ST 40), "Qūchí" (曲池 LI 11), "Sānyīnjiāo" (三阴交 SP 6) in the acupuncture group, once a day, for 10 consecutive days; in the medicine group, the mice were intragastrically administrated with Simvastatin, once daily , for 10 consecutive days. After the end of treatment, serum TC, TG, LDL-C, HDL-C, malondialdehyde (MDA), nitric oxide (NO) and endothelin (ET) contents and superoxide dismutase (SOD) activities were detected in the groups. **Results** On the 15th day of modeling, in the model group serum TG, TC, LDL-C contents were significantly higher (all P<0.05) and HDL-C content was significantly lower (P<0.01) than those in the normal group. After treatment for 10 days, in the acupuncture group and the medicine group serum TG, TC, LDL-C, MDA and ET contents were significantly lower and serum HDL-C and NO contents and SOD activities were significantly higher than those in the model group (P<0.05, P<0.01), and the improving action in the acupuncture group was better than that in the medicine group (P<0.05, P<0.01). **Conclusion** Acupuncture can regulate fat metabolism, resist lipid peroxidation and protect vascular endothelial function in the mouse of hyperlipemia.

KEY WORDS: acupuncture therapy; hyperlipemia; fat metabolism; anti-oxidation; free radical; vascular endotheliocyte

Hyperlipemia (HLP) is a disease of lipid metabolic disturbance. Studies indicated that HLP can lead to decrease of anti-oxidizing power in the organism, occurrence of lipid peroxidation, increase of malondialdehyde (MDA) level, decrease of superoxide dismutase (SOD) activity[1], and macrophage activation, further injury of endothelial cells, decrease of serum nitric oxide (NO) content and increase of serum endothelin (ET) content[2-4]. The authors have treated HLP with acupuncture at Fēnglóng (丰隆 ST 40), Qūchí (曲池 LI 11), Sānyīnjiāo (三阴交 SP 6), which is a point prescription summarized according to

World Journal of Acupuncture-Moxibustion (WJAM)
Vol. 22, No.2, 30th Jun. 2012

clinical experiences of many years. In order to further study the mechanism, effects of the acupuncture method on blood fat, serum ET, NO, MDA contents and SOD activity in HLP mice were investigated. It is reported as follows.

MATERIALS AND METHODS

Animals and grouping

One hundred and twenty male Kunming mice, sanitary degree, weighing 18–22 g, were supplied by Department of Experimental Animals, Tongji Medical College, Huazhong Science and Technology University, certificate number: SCXK(E)2004-0007. They were raised in an animal laboratory of sanitary degree at 18–22 ℃ with a 12 h light-dark cycle, free access to water and food. After adaptive feeding for one week, they were randomly divided into 4 groups, normal group (n=40), model group (n=40), acupuncture group (n=20) and medicine group (n=20).

Main instruments and reagents

1–15 K centrifuge (Sigma, Germany); Humalyzer 2000 semi-automatic biochemical analyzer (Human, Germany); TGL-16B centrifuge (Shanghai, China); FJ-2020 γ-counter (China); LH 202 H Han's electroacupuncture instrument (Nanjing Jisheng Medical Science and Technology Co. Ltd, China).

Simvastatin capsules (Shangdong Lukang Medicine Co., Ltd, batch No:070101); the reagents for detection of serum triglyceride (TG), total cholesterol (TC), high density lipoprotein-cholesterol (HDL-C) and low density lipoprotein-cholesterol (LDL-C) levels (Zhongsheng Beikong Bio-Science and Technology Co. Ltd); ET radioimmunoassay kit (The First Branch of Nanjing Jiancheng Bioengineering Institute); NO (Beijing Puer Weiye Bio-Science and Technology Co. Ltd); MDA and SOD kits (Nanjing Jiancheng Bioengineering Institute, China).

Establishment of animal model

In reference to the literature[5], the modified high fat forage inducing method was used in the experiment. The mice in the four groups were raised in an animal laboratory of sanitary degree at 18-22 ℃ with a 12 h light-dark cycle, free access to water and food. The mice in the normal group were raised with common forage, and other 3 groups with high fat forage. After feeding for 15 days, 20 mice each in the normal group and the model group were selected and their blood were taken by decapitation, and then their serum TG, TC, HDL-C and LDL-C contents were detected to confirm success of modeling by comparison of the data between the two groups. After that, the experiment was continued. Formula of the high fat forage: cholesterol 1.5%, lard 10%, basic forage 88.5%. All the forages were supplied by the Center of Experimental Animals, Hebei Medical University.

Treatment methods

The acupuncture group: after successful modeling, the model mouse without anesthesia was fixed on a self-made mouse-binding instrument and bilateral "Fēnglóng" (丰隆 ST 40), "Qūchí" (曲池 LI 11), "Sānyīnjiāo" (三阴交 SP 6) were located by imitating human acupoint location in reference to *Compendium of Modern Chinese Veterinary Medicine*. After routine disinfection, 0.28 mm×15 mm acupuncture needle was inserted into the point and then connected to LH 202 H Han's electroacupuncture instrument, with sparse-dense wave, 2 Hz/15 Hz, output intensity 0–2, inducing a little vibration of the limbs and tolerable to the mouse, 10 min once, once a day; Distilled water of the same volume as the medicine group, 0.2 mL/10 g, was intragastrically administrated, once a day, for 10 consecutive days.

The medicine group: in reference to *Methodology of Chinese Drug Pharmacologic Researches*[6], Simvastatin 6.6 $mg \cdot kg^{-1} \cdot d^{-1}$ was intragastrically administrated after successful modeling, once a day; and the mouse was fixed in the mouse-binding instrument with the same method as that in the acupuncture group for 10 min, once daily, for 10 consecutive days.

The model group and the normal group: with the same method as the acupuncture group, after modeling, the mouse was fixed in the mouse-binding instrument for 10 min, once daily; and Distilled water 0.2 mL/10 g was intragastrically administrated, once daily, for 10 consecutive days.

Sampling and detection of the indices

At the 15th day of modeling, 20 mice in the normal group and the model group were taken respectively, fasting with free access to water for 12 h. After anesthesia with Ether, the blood was taken by decapitation and centrifugalized for 5 min and serum was cellected. Serum TG and TC contents were determined with zymologic end-point method, serum HDL-C content by phosphotungstic acid-magnesium precipitation method, serum LDL-C content by polyvinyl sulfuric acid precipitation method, serum ET content by radioimmunoassay, serum NO by nitric acid reductase method, serum MDA content by thio-barbituric acid colorimetric analysis and serum SOD activity by xanthine oxidase method. All detections