

# 不同灸质、灸量对实验性阳虚大鼠中枢 及外周 5-HT 代谢的影响

张京英\* 刘农虞\* 张蕊\* 卞慧敏\*

**摘要** 本文采用荧光检测方法观察了不同灸质、灸量对利血平化脾阳虚大鼠外周和中枢 5-羟色胺(5-HT)神经递质及其代谢产物含量的影响。实验结果显示,实验性脾阳虚大鼠外周及中枢 5-HT 含量均显著下降( $P<0.05$ ),艾灸“足三里”穴可使其含量升高。其中强刺激可明显升高中枢大脑皮层 5-HT 含量( $P<0.05$ ),弱刺激能使外周血中 5-HT 含量明显提高( $P<0.05$ )。烟条强弱刺激对实验性脾阳虚大鼠外周和中枢 5-HT 含量均无调整作用。提示艾灸的作用明显优于烟灸,其作用产生和强弱与艾灸的药、热等多重刺激及刺激量的强、弱有关。

**关键词** 阳虚/针灸疗法 血清素/代谢 穴,足三里

临床及实验研究证明,艾灸足三里穴能够调节胃肠功能,现代研究业已证明,中枢 5-羟色胺(5-HT)能和肾上腺素能系统对调控胃肠运动有密切关系。为此,我们观察了不同灸质、灸量刺激利血平化脾阳虚大鼠“足三里”穴后,对大鼠中枢及外周 5-HT 及其代谢产生 5-羟吲哚乙酸(5-HIAA)的影响,从而探讨不同灸质、灸量与灸效的内在关系。

## 1 材料与方法

1.1 实验动物与分组:实验选用体重  $200\pm 30\text{g}$  SD 大鼠(由本院动物实验中心提供),雌雄各半,随机分为正常对照组、造模对照组、艾灸弱刺激、强刺激组、烟灸弱刺激、烟灸强刺激组,共 6 组。

1.2 脾阳虚造模方法:参照有关文献报道的方法<sup>[1,2]</sup>造模。对照组:腹腔注射利血平( $1\text{mg/ml}$ ,上海医科大学红旗制药厂生产) $0.2\text{mg/ml/kg}$ /日,连续给药 13 天。艾灸、烟灸组:腹腔注射利血平(剂量同上),连续给药 13 天,给药后第 8 天至第 13 天,分别在“足三里”穴处艾条或烟条施灸。正常对照组:腹腔注射生理盐水  $1\text{ml/kg}$ /日,连续注射 13 天。

1.3 治疗方法:在大鼠“足三里”穴(胫骨粗隆下缘与腓骨小头下缘连线的中点)处,剪去鼠毛,左手固定大

鼠,右手持直径 3mm,长 80mm,重 1g 的烟或艾条,点燃施灸。弱刺激:烟或艾条距穴 1cm,持续悬灸 3 分钟;强刺激:烟或艾条距穴 0.5cm,持续悬灸 5 分钟;正常对照组与造模对照组不施灸,余均同烟及艾条组。

1.4 样本采集:各组在给药后第 14 天眼球采血,其后立即处死,迅速取脑,去掉小脑,在冰台上解剖出大脑皮层、延脑及中脑部分,称重后加入冷酸化正丁醇匀浆,离心后取上清液进行生化分析。血浆去蛋白后,供生化检测使用。

1.5 生化检测方法:脑组织匀浆检测参照 Curzon G、王孝媛等方法<sup>[3,4]</sup>。血浆检测参照 Shellenberger、刘冰怀等方法,略加改进进行含量测定。

## 2 结果

2.1 不同灸质、灸量对中枢 5-HT 含量的影响:由表 1、2、3 可见,连续小剂量注射利血平后,大鼠中枢 5-HT 含量均明显低于正常对照组( $P<0.01$ ),5-HIAA 含量变化不明显;延脑及中脑部分的脑组织体积缩小,重量较正常对照组明显减轻( $P<0.05$ );大脑皮层重量基本不变。采用灸法治疗可使利血平化脾阳虚大鼠大脑皮层中 5-HT 含量升高,但其作用的强弱与灸质、灸量有关。艾灸作用明显优于烟灸,尤其是艾条强刺激作用最强,与造模对照组相比具有显著差异( $P<0.05$ )。而对大鼠延脑、中脑中 5-HT 含量及脑组织重量,无论何种灸法均无调节作用。提示艾灸能改善利血平所造成的大脑皮层 5-HT 代谢障碍,其中强刺激好于弱刺激,烟灸则无此作用。

表 1 各组延脑、中脑 5-HT、5-HIAA 含量比较( $\mu\text{g/g}$ )

| 组别     | 动物数 | 5-HT             | 5-HIAA         |
|--------|-----|------------------|----------------|
| 正常对照组  | 13  | $0.58\pm 0.22$   | $0.68\pm 0.32$ |
| 造模对照组  | 13  | $0.33\pm 0.15^*$ | $0.81\pm 0.36$ |
| 艾条强刺激组 | 10  | $0.34\pm 0.05$   | $0.90\pm 0.12$ |
| 艾条弱刺激组 | 8   | $0.38\pm 0.12$   | $1.01\pm 0.21$ |
| 烟条强刺激组 | 9   | $0.35\pm 0.12$   | $0.91\pm 0.25$ |
| 烟条弱刺激组 | 8   | $0.41\pm 0.13$   | $1.12\pm 0.40$ |

注:(1)表中数据为均值±标准差,下同

(2)与正常对照组比较 \*  $P<0.01$

\* 南京中医学院针灸系,南京市汉中(210029)

收稿日期:1994-05-21

表2 各组大鼠皮层5-HT、5-HIAA含量的比较( $\mu\text{g/g}$ )

| 组 别    | 动物数 | 5-HT               | 5-HIAA    |
|--------|-----|--------------------|-----------|
| 正常对照组  | 13  | 0.32±0.09          | 0.39±0.12 |
| 造模对照组  | 12  | 0.14±0.05*         | 0.40±0.15 |
| 艾条强刺激组 | 11  | 0.19±0.04 $\Delta$ | 0.43±0.06 |
| 艾条弱刺激组 | 8   | 0.17±0.03          | 0.44±0.13 |
| 烟条强刺激组 | 9   | 0.15±0.07          | 0.39±0.12 |
| 烟条弱刺激组 | 8   | 0.17±0.04          | 0.50±0.20 |

与正常对照组比较 \*  $P<0.01$ ; 与造模对照组比较  $\Delta P<0.05$

表3 各实验组大鼠脑重比较(g)

| 组 别    | 动物数 | 延脑中脑       | 大脑皮层      |
|--------|-----|------------|-----------|
| 正常对照组  | 12  | 0.31±0.04  | 0.50±0.05 |
| 造模对照组  | 12  | 0.26±0.04* | 0.49±0.03 |
| 艾条强刺激组 | 10  | 0.27±0.04  | 0.45±0.08 |
| 艾条弱刺激组 | 8   | 0.28±0.03  | 0.48±0.05 |
| 烟条强刺激组 | 9   | 0.29±0.02  | 0.44±0.08 |
| 烟条弱刺激组 | 8   | 0.27±0.03  | 0.47±0.10 |

\* 与正常对照组比较  $P<0.01$

2.2 不同灸质、灸量对外周5-HT递质的影响:表4示,利血平化脾阳虚大鼠外周血中5-HT、5-HIAA含量与正常对照组相比呈显著下降( $P<0.05$ ),艾灸可使其上升,作用明显强于烟灸,其中艾条弱刺激作用最强,与造模对照组相比有显著差异( $P<0.05$ )。说明利血平可阻碍5-HT在细胞内的合成和储存,因而使血中5-HT、5-HIAA含量下降。艾灸尤其是艾条弱刺激可明显改善5-HT代谢障碍使其含量升高。

表4 各实验组血浆5-HT、5-HIAA含量的比较( $\mu\text{g/ml}$ )

| 组 别    | 动物数 | 5-HT               | 5-HIAA             |
|--------|-----|--------------------|--------------------|
| 正常对照组  | 17  | 0.95±1.25          | 0.17±0.15          |
| 造模对照组  | 16  | 0.14±0.15*         | 0.09±0.04*         |
| 艾条强刺激组 | 10  | 0.46±0.72          | 0.12±0.05          |
| 艾条弱刺激组 | 10  | 0.66±0.57 $\nabla$ | 0.14±0.06 $\Delta$ |
| 烟条强刺激组 | 12  | 0.33±0.41          | 0.09±0.04          |
| 烟条弱刺激组 | 12  | 0.33±0.33          | 0.09±0.07          |

\* 与正常对照组比较  $P<0.05$

与造模对照组比较  $\Delta P<0.05$   $\nabla P<0.01$

### 3 讨论

3.1 灸质与灸效的关系:临床研究表明,利血平可耗

竭动物体内的去甲肾上腺素和5-HT递质、降低脑内和外周神经中单胺类递质的含量,使出现副交感神经功能偏亢,胃肠蠕动加快,消化液分泌亢进,吸收功能障碍等病理变化。本实验大鼠连续小剂量注射利血平后均不同程度出现消瘦、食量减少、毛枯槁无光泽、少动嗜睡、恶寒肢冷、便软或便泻等症状,符合脾阳虚病理模型。

艾绒气味芳香,易于燃烧,火力温和持久,有通经活络、祛寒温阳等功效。本实验结果显示,艾条和烟条虽粗细、重量相等,但其刺激效应则有区别。对利血平所造成的脾阳虚大鼠,艾灸效果明显好于烟灸。艾灸对中枢及外周5-HT、5-HIAA含量有不同程度的升高,烟灸组则无此效应。由此可见,灸质的不同其效应也不同,这可能与艾灸的热性和药效作用有关。

3.2 灸量与灸效的关系:实验结果显示,艾灸的强、弱刺激均对利血平化脾阳虚大鼠5-HT具有调整作用。对外周血中5-HT含量,艾条弱刺激能使其明显升高,而强刺激则无此效应;对中枢大脑皮层5-HT含量,艾条强刺激能使其明显升高,而弱刺激效差。由此可见,虽同为艾灸,由于刺激量的不同,其效应也各不相同,说明灸效与灸量密切相关。

3.3 灸效与作用部位的相对特异性:连续小剂量注射利血平后大鼠大脑皮层、外周血中5-HT含量均明显下降,说明5-HT的生成和储存减少。外周血中其主要降解物5-HIAA含量亦明显减少。艾灸刺激“足三里”后,大鼠大脑皮层及外周血中5-HT含量均有不同程度升高,5-HIAA含量亦随之增加。说明艾灸能通过调节外周及大脑皮层5-HT能神经末梢中5-HT的代谢,改善大鼠脾阳虚的症状和体征。其中艾条强刺激灸对大脑皮层的作用最强,艾条弱刺激灸对外周血中5-HT含量的调节作用最强,而对中枢延脑、中脑5-HT能神经原的代谢,无论是艾条强刺激,还是弱刺激均无明显疗效,可能是利血平化大鼠延脑、中脑明显萎缩,重量减轻,5-HT能神经原受损的缘故。由此可见,灸质、灸量的不同,灸效的作用部位和作用途径具有相对特异性。

### 4 参考文献

- 李织. 利用利血平制造以肠功能紊乱为主的脾虚模型. 中医药信息 1985;(1):33.
- 陈祥贵. 四君子汤对利血平化小鼠体内某些机能变化的影响. 北京医学 1981;(5):293.
- Curzon G, et al. Br J Pharmacol 1970;(39):653.
- 王孝媛,等. 鼠脑和脊髓中5-羟色胺、5-羟吲哚醋酸、去甲肾上腺素和多巴胺的快速测定法. 苏州医学院学报 1985;(1):10.

## ABSTRACTS OF ORIGINAL ARTICLES

### **Clinical Observation on Active Rheumatoid Arthritis Treated with Qing—Bi Mixture.**

*Deng Zhaozhi, Chen Wei*

Thirty cases in the treated group showed a total effective rate of 90%, while that of 20 cases treated with Indomethacin mixture for control was 65%. Comparison on main symptoms and signs between the 2 groups revealed that for the degree of mitigation, the treated group was better, including swelling index of the joints 20meter walking speed, the difference between them being significant. In terms of lab indices, in the treated group the mitigation of ESR, RF, CRP, IgA, IgM, OKT<sub>4</sub>, OKT<sub>8</sub>, OKT<sub>4</sub>/OKT<sub>8</sub> were all better after treatment, that of the controlled group, all but IgA showed no obvious mitigation, again, the difference being significant. In terms of sideeffect, the Mixture yielded less adverse effect.

**Authors' address:** Second Affiliated Hospital, Guangzhou University of TCM, Guangzhou.

**Key words:** Arthritis, rheumatoid/TCM therapy @ Qing—bi Mixture

(Original article on page 93 )

### **Influence of Huoxue Huayu (Blood—activation Stasis—removal) Decoction on Blood Picture and Hemorrheology in Patients of Naso—pharyngeal Carcinoma Receiving Radiotherapy.**

*Hu Peili, Huang Huowen, Zhang Pei*

70 cases were randomly divided into treated group and controlled group treated with Huoxue Huayu and non—Huoxue Haoyu drugs respectively. Both groups were observed for their purplish tongue during radiotherapy and hemorrheology before and after radiotherapy. Results showed that, when compared with the controlled group, the rate of purplish tongue was much lower, with much delay of its occurrence in the treated group. However, it made no difference between the 2 groups in hemorrheology.

**Authors' address:** Oncology Hospital, Zhongshan Medical University, Guangzhou 510060.

**Key words:** Nasopharyngeal Carcinoma/radiotherapy tongue diagnosis @ Huoxue Huayu Decoction

(Original article on page 104 )

### **Molecular Studies on TCM Theory of "Kidney Generating Marrow"**

*Wu Zhikui, Wei Wei, He Zhongxiao, et al*

The level of methylation of DNA in liver cells of senile rats with physiological hypofunction of the kidney was analyzed by HPLC method. It was found that kidney—tonics and blood—tonics markedly increased the methylation level of DNA, thus, elevated the gene stability, and maintained the normal gene expression, delayed the starting of senile gene.

**Authors' address:** Guanganmen Hospital, China Academy of TCM, Beijing 100053

**Key words:** Kidney (TCM)/physiology, Molecular biology

(Original article on page 109)

### **Influence of Moxibustion in Different Qualities and Quantities on Metabolism of Central and Peripheral 5—HT in Rat of Experimental Yang—Deficiency.**

*Zhang Jingying, Liu Nongyu, Zhang Rui, et. al.*

By adopting fluorescence testing method, we observed the contents of central and peripheral 5—HT, nerve transmitter and its metabolites in reserpinized hyposplenic function rats by different qualities and quantities of moxibustion. Results showed that in experimental hyposplenic function rats, there was a marked lowering of contents of central and peripheral 5—HT ( $P < 0.05$ ). Moxibustion on Zusanli point greatly increased its contents. When strong stimulus was administered, 5—HT contents in cerebral cortex markedly increased ( $P < 0.05$ ), while weak stimulus markedly increased that in peripheral blood ( $P < 0.05$ ). Stimulation with cigarette didn't yield such results, suggesting the superior action of moxibustion to cigarette. The strength of action was related to the amount and intensity of stimulation.

**Authors' address:** Department of Acu—moxibustion, Nanjing College of TCM, Nanjing 2100029

**Key words:** Yang—deficiency/Acu—moxibustion therapy serotonin/metabolism, point/Zusanli

(Original article on page 111)