Special Topic for 973 Program

# Clinical observation on the correlation between moxibustion sensation and distance of moxa stick

艾条温和灸的灸感与施灸距离关系的临床观察

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## Abstract

**Objective:** To explore the correlation between moxibustion sensation and distance of moxa stick and provide reference for clinical practice.

**Methods:** A total of 16 healthy volunteers aged 18-35 years old in college were recruited and given mild moxibustion at Shousanli (LI 10), Zusanli (ST 36), Shenshu (BL 23) and Tianshu (ST 25) with moxa stick, and the occurrence and frequency of moxibustion sensation were recorded at distances of 5 cm, 4 cm, 3 cm and 2 cm. Mild moxibustion scale was used to count the score.

**Results:** Warm was the main moxibustion sensation, burning pain and soreness decreased with the rise of distance; for the same acupoint, score of mild moxibustion scale increased with the decrease of distance; score ranged between 5.5 and 6.5 at distance 3 cm, which was the most comfortable distance for volunteers.

**Conclusion:** The distance of 3 cm is the most comfortable distance in mild moxibustion.

**Keywords:** Moxibustion Therapy; Moxa Stick Moxibustion; Point, Zusanli (ST 36); Point, Shousanli (LI 10); Point, Shenshu (BL 23); Point, Tianshu (ST 25); Healthy Volunteers

【摘要】目的:探讨艾条温和灸的灸感与施灸距离的关系,为临床施灸时的适当灸距提供参考。方法:校园招募 18~35岁健康志愿者 16 名,在手三里、足三里、肾俞、天枢穴分别施行艾条温和灸,记录施灸距离分别为 5 cm、 4 cm、3 cm 和 2 cm 时的灸感出现情况及频数分布,运用温和灸量表统计灸感得分。结果:温和灸的灸感以温热 感为主,灼痛感及酸胀感随距离减少而增加;随着施灸距离的减小,同一穴位温和灸评分相应增加;施灸距离为 3 cm 时的温热感评分为 5.5~6.5 分,人体感受最为舒适。结论:艾条温和灸施灸距离为 3 cm 时的灸感最舒适。

【关键词】灸法; 艾条灸; 穴, 足三里; 穴, 手三里; 穴, 肾俞; 穴, 天枢; 健康受试者

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Moxibustion is an external therapy for disease treatment and prevention. It consists of burning dried mugwort at particular points on the body, with function of warming meridians and dissipating cold, supporting yang and resolving stasis, conducting fire out<sup>[1-3]</sup>. The effect and biological mechanism of moxibustion are the research priority in recent years, in which thermal effect is the main factor during moxibustion and an important role for its therapeutic effect<sup>[4-6]</sup>. Thermal effect of moxibustion is related to temperature in a certain degree, and closely linked with distance. In this study, we applied mild moxibustion to different acupoints at distances of 5 cm, 4 cm, 3 cm and 2 cm to observe

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the occurrence and frequency of sensation under different circumstances, and evaluated with mild moxibustion scale to explore the correlation between sensation and distance.

## 1 Clinical Materials

## 1.1 Inclusion criteria

Participants who met all the following criteria at the same time were included in this study: aged between 18 and 35 years; healthy; regular diet; no addiction to cigarette, alcohol, tea or coffee; normal sleeping pattern; without a history of claustrophobia or other mental illness; score of anxiety below 50 points; score of depression below 50 points.

#### 1.2 Exclusion criteria

Participants would be excluded for any one of the following criteria: uncomfortable feeling in the past 1

week; consciousness disturbance, or serious vision, hearing, aphasia disorder that affect health evaluation; abnormity in circulatory, respiratory or nervous system during physical examination or with serious liver, kidney, hemopoietic or endocrine system disease; with mental disorder or epilepsy, diabetes, heavy drinking, abusive of drugs or cancer; who had participated in other clinical trials; failed to cooperate.

#### 1.3 Drop-out criteria

Participants could drop out for any one of the following circumstances: participant who didn't conform to the inclusion criteria; poor compliance; occurrence of serious adverse event or complications; cannot finish the whole treatment; occurrence of special biological changes; participant who asked to drop out by themselves; failed to cooperate or obey the rule during study.

#### 1.4 Statistical methods

The data were processed using the SPSS 18.0 version software. One-way ANOVA was used for comparison of enumeration data, and the mean ± standard deviation ( $\overline{x} \pm s$ ) was used to describe the measurement data in normal distribution and equal variance; the median (minimum-maximum) [M (min, max)] was used to describe measurement data not in normal distribution and equal variance. Set the inspection level  $\alpha$ =0.05, and a *P*-value of less than 0.05 indicated a statistical significance.

## 1.5 General data

A total of 16 healthy volunteers were included, 8 male and 8 female, aged between 18 and 35 years, the average age was (26.9±2.6) years, the average height was (163.0±7.3) cm, and the average weight was (54.6±8.6) kg. All volunteers were informed of the details in the research and signed the informed consent to take part and permit the publicity of the data in the form of paper.

## 2 Treatment Methods

## 2.1 Acupoints and the locations

Acupoints: Shousanli (LI 10), Zusanli (ST 36), Tianshu (ST 25) and Shenshu (BL 23).

Location: This was based on the location in *Science of Acupuncture and Moxibustion*<sup>[7]</sup>. Shousanli (LI 10) is on the radial side of the dorsal forearm, in the line between Yangxi (LI 5) and Quchi (LI 11), 2 cun below the cubital crease; Zusanli (ST 36) is on the anterolateral side of the tibia, 3 cun below Dubi (ST 35), a cross finger away from the anterior of the tibia; Tianshu (ST 25) is 2 cun lateral to the navel; Shenshu (BL 23) is below the spinous process of the second lumbar vertebra, 1.5 cun away from the midline.

#### 2.2 Moxa stick

Hwato-med moxa stick of 18 mm imes 200 mm in size, 15.5 g in weight (10 sticks per box) was used in this

study, produced by Hunan Branch of China Meheco Group Co., Ltd.

#### 2.3 Moxibustion manipulation

Before experiment, adjusted the indoor temperature at  $(23\pm1)$  °C with air conditioner, closed the door and windows, volunteers took a 20-minute break before moxibustion manipulation, during break, they were familiarized with the indoor environment to reduce the mental disturbance. The manipulation was done at 1 particular acupoint (right side only) a day for 4 d. The moxa stick was fixed at a ruler. After ignition, the distances of 5 cm, 4 cm, 3 cm and 2 cm were kept for 3 min separately from far to near, and then the color of the skin and the mild moxibustion scale were recorded; the manipulation would be stopped if the unbearable burning pain occurred above the distance of 2 cm.

#### 2.4 Practitioner

All practitioners involved were licensed acupuncture practitioner who had received the training of this research to make sure the location and manipulation. The point locating and manipulation were done by a same practitioner.

## **3 Effect Observation**

## 3.1 Observation indicators

3.1.1 Moxibustion sensation

Refers to the warming, penetrating, spreading of heat or non-heat feelings including soreness, numbness, creeping or burning pain during moxibustion manipulation; while warm, soreness, numbness, swelling and pain were the main manifestations of moxibustion sensation, the presence of the above sensation usually indicates a better therapeutic effect. Therefore, we chose warm, burning pain, soreness and numbness as the specific sensations in this study and recorded their frequency.

#### 3.1.2 Mild moxibustion scale

Visual analogue scale (VAS) was used to grade the sensations of warm, burning pain, soreness and numbness, and the grades ranged 0-10 points, 0 point for no feeling, 10 points for unbearable feeling. Let volunteers select the most adequate score according to the acupoint and distance.

## 3.2 Result

#### 3.2.1 Moxibustion sensation

Frequency of warming at Shousanli (LI 10), Zusanli (ST 36), Shenshu (BL 23) and Tianshu (ST 25) was 100.00%, without numbness. At the distance of 2 cm, the frequency of burning pain at Zusanli (ST 36) was 12.50%, soreness 6.75%; burning pain at Shousanli (LI 10) was 19.25%, soreness 6.75%; burning pain at Tianshu (ST 25) was 31.25%, soreness 12.50%; burning pain at Shenshu (BL 23) was 12.50%, soreness 6.75%. At the distance of 3 cm, the frequency of burning pain at

Zusanli (ST 36) was 6.75%, soreness 12.50%; burning pain at Shousanli (LI 10) was 6.75%, soreness 12.50%; burning pain at Tianshu (ST 25) was 6.75%, soreness 6.75%; burning pain at Shenshu (BL 23) was 0, soreness 6.75%. At the distance of 4-5 cm, occasional burning pain and soreness occurred at Shousanli (LI 10), and soreness at Tianshu (ST 25), no burning pain and soreness at other acupoints. Therefore, warm sensation existed at all acupoints at distance 2-5 cm, and burning pain and soreness increased with the decrease of distance (Figure 1).

#### 3.2.2 Warm sensation

For warm sensation score, at the distance of 2 cm, Zusanli (ST 36) was 7.31 points, Shousanli (LI 10) was 7.37, Tianshu (ST 25) was 8.06, and Shenshu (BL 23) was 9.25; at the distance of 3 cm, Zusanli (ST 36) was 5.50 points, Shousanli (LI 10) was 6.00, Tianshu (ST 25) was 6.43, and Shenshu (BL 23) was 5.82; at the distance of 4 cm, Zusanli (ST 36) was 4.31 points, Shousanli (LI 10) was 4.56, Tianshu (ST 25) was 4.68, and Shenshu (BL 23) was 4.43; at the distance of 5 cm, Zusanli (ST 36) was 3.06 points, Shousanli (LI 10) was 3.25, Tianshu (ST 25) was 3.18, and Shenshu (BL 23) was 3.06. The result of the scale indicated that at the distances of 2 cm, 3 cm, 4 cm and 5 cm, score increased with the decrease of the distance. The score of the same acupoint varied at different distances, showing statistical significances (P < 0.001), indicating that the sensation may change at different distances at one acupoint by moxibustion (Table 1).



**Figure 1. Sensation and frequency of different acupoints at different distances** Note: A=Distance of 2 cm; B=Distance of 3 cm; C=Distance of 4 cm; D=Distance of 5 cm

Table 1	. (	Comparison	of warm	sensation at	different	acupoints at	t different	distances	[M (	min,	max)	)I
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Distance	п	Zusanli (ST 36)	Shousanli (LI 10)	Tianshu (ST 25)	Shenshu (BL 23)
2 cm	16	7.31 (4.00, 10.00)	7.37 (6.00, 10.00)	8.06 (3.00, 10.00)	9.25 (4.00, 10.00)
3 cm	16	$5.50(3.00, 9.00)^{1)}$	$6.00 (4.00, 10.00)^{1)}$	$6.43 (2.00, 10.00)^{1)}$	5.81 (2.00, 9.00) <sup>1)</sup>
4 cm	16	4.31 (2.00, 7.00) <sup>1)2)</sup>	4.56 (2.00, 8.00) <sup>1)2)</sup>	4.68 (0, 7.00) <sup>1)2)</sup>	4.43 (2.00, 7.00) <sup>1)2)</sup>
5 cm	16	3.06 (1.00, 6.00) <sup>1)2)3)</sup>	3.25 (1.00, 8.00) <sup>1)2)3)</sup>	3.18 (0, 6.00) <sup>1)2)3)</sup>	3.06 (0, 6.00) <sup>1)2)3)</sup>

Note: Compared with the same acupoint at the distance of 2 cm, 1) P<0.001; compared with the same acupoint at the distance of 3 cm, 2) P<0.001; compared with the same acupoint at the distance of 4 cm, 3) P<0.01

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#### 4 Discussion

Moxibustion has a wide range of indications and has special irreplaceable therapeutic effect<sup>[8]</sup>. As one of the commonly used moxibustion manipulation, mild moxibustion is popular in clinical practice. By igniting one end of the moxa stick and targeting at certain acupoints or affected areas within a certain distance, it can generate a warm feeling without burning pain on local skin<sup>[9]</sup>. Therefore, during the mild moxibustion process, the sensation and distance are closely linked and they are the crucial factors during manipulation which will influence the therapeutic effect and shed light on the development of moxibustion instrument.

We have focused on the correlation between sensation and distance to provide experimental bases for this subject in this study. In consideration of that sensation may vary in different parts of body, we have chosen Shousanli (LI 10) on the upper limb, Zusanli (ST 36) on the lower limb, Tianshu (ST 25) on the abdomen and Shenshu (BL 23) on the back region separately, which are common and convenient for moxibustion manipulation. According to clinical practice, we have chosen different distances at 5 cm, 4 cm, 3 cm and 2 cm to apply moxibustion and recorded the sensation, frequency and degree. Moxibustion sensation is composed of warm, burning pain, soreness and numbness, in which warming is considered to be an important factor for its therapeutic and prevention effect. By radiation and conduction through skin tissue, it can activate neuro-endocrine-immune axis and start the immune response of cells and chemical compound in local skin and facilitate the release of histamine and P substance by mastocyte. Therefore, it can promote the degranulation of mastocyte and accelerate blood circulation in acupoint area. Through releasing neuropeptide, it can transmit signals to center nervous system ceaselessly and start target regulating system and thus is effective in the treatment and prevention of diseases<sup>[10-14]</sup>. Zhang JB, et al<sup>[15]</sup> held that warm stimulation played an important role in its therapeutic effect, and interpreted it from the curing characteristics, indications and effects of moxibustion. Mild moxibustion can deliver warm sensation to skin and elevate local temperature around acupoints, and thus accelerate blood circulation in tissues under acupoints<sup>[16-17]</sup>. Li L, et  $al^{[18]}$  used moxibustion at different temperatures to stimulate dorsal medulla subnucleus in rats and found that moxibustion was a

warm stimulation in nature, and thermal effect is crucial for the therapeutic effect. In this study, the frequence of warm sensation at distance between 2 cm and 5 cm is 100%, followed by burning pain and soreness; burning pain aggravated with the reduction of distance and normally happened at 2 cm; soreness reduced with the increase of distance, with a low frequency and happened occasionally; while no numbness occurred. Research has shown that distance is closely linked with temperature and skin temperature rises with the shortening of distance, along with burning pain, which may cause skin damage<sup>[19]</sup>. Xu PC, et al<sup>[20]</sup> applied different moxibustion manipulations to one same acupoint at different distances, and found that it would take 7 min before skin temperature exceeded 44  $^{\circ}C$  at a distance above 4 cm; at distance of 3 cm, it would take 10 min before skin temperature exceeded 44  $^{\circ}$ C; and when the distance was near 2 cm, the burning pain occurred and the manipulation had to stop. According to the research of Settle JAD<sup>[21]</sup>, skin cell may be injured at the temperature of 44  $^{\circ}$ C for a long duration of time, and at a temperature of 51°C, skin may be damaged in a short time. Therefore, the risk of skin lesion increases with the shortening of distance.

From the acupoint warm sensation grading graph, although warm sensation occurred at all distances at all acupoints, its score ranged from 1 to 10, and decreased with the increase of distance. At 2 cm, the top score of all acupoints exceeded 8, and at 5 cm, no one exceeded 5; at distance of 2 cm, the warm sensation score of Zusanli (ST 36) was 7.31 (6.00, 10.00), Shousanli (LI 10) was 7.37 (6.00, 10.00), Tianshu (ST 25) was 8.06 (3.00, 10.00) and Shenshu (BL 23) was 9.25 (4.00, 10.00), indicating that acupoints on abdominal and back areas were more sensitive than acupoints on limbs to mild moxibustion.

This study has proven that 3 cm is the most comfortable distance for mild moxibustion manipulation, and found that the sensitivity of acupoints on different location react differently during moxibustion manipulation, mild acupoints on abdominal and back area are more sensitive than points on limbs, and provided evidence for distance selection. While the moxibustion sensation scale largely depends on the subjective feeling of volunteers, lacking examination of equipment which is more objective, and the depth for warm stimulation is still restricted to skin tissue, not in deeper layers or organs, which requires further investigation.

#### **Conflict of Interest**

The authors declared that there was no potential conflict of interest in this article.

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#### **Statement of Informed Consent**

Informed consent was obtained from all individual participants included in this study.

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