



Short Communication

Minimisation of variations in locating an acupuncture point using a laser-device

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ABSTRACT

Background: Identifying accurate acupoint is an essential component in clinical practice. A laser device can provide us with a visual guide for locating acupoints by dividing the space equally between two landmarks on the body. In this study, we compared the accuracy between the naked-eye and a laser device to locate an acupoint.

Methods: Twenty-two participants were asked to mark acupoint PC5 on a male volunteer's arm using two different methods: without a laser device (naked-eye) and with a laser device. The distributions of the acupoints were estimated by the kernel density estimation methods.

Results: The overall distribution of acupoints was less when the laser device method was used, compared to the naked-eye method. We found significant differences in the longitudinal axis between the two methods, but no significant differences in the horizontal axis.

Conclusions: Our findings suggest that direct measurement of the acupoint location using a laser device can reduce variations in locating points. Laser-assisted tools will help practitioners locate the acupoints more accurately and should be considered as standard practice, especially in acupuncture research and education.

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1. Introduction

Despite the progress in acupuncture research over recent decades, research on the anatomical or physiological features of acupoints has yet to reach any conclusive results.^{1,2} Accurate location of an acupoint has been considered an essential component in clinical practice.³ However, the location of acupoints is often varied among practitioners.⁴ Agreement between the junior acupuncturists and an expert acupuncturist was much less robust.⁵ Experienced acupuncture practitioners showed a high degree of variation in the localization of acupoints.⁶ Many researchers have raised concerns in which variance in acupoint location might affect treatment outcomes.^{5,6}

Because of the poor reliability of the finger cun method, also known as the directional method, the level of accuracy in locating acupoints is not guaranteed.⁷ A recent critical systematic review showed that the directional method was inaccurate and imprecise in locating acupoint.³ Compared with traditional methods, variations in locating acupoints were reduced when using assistive

devices.⁸ However, it can take a while for a practitioner to locate the acupoints and the conventional ruler method is not used in clinical practice. An elastic ruler is also difficult for one person to use when placing it around two landmarks and locating a point between them.⁹ Acupuncture teachers need to identify the most efficient point location methods for implementation in training and practice.

A laser device can provide us with a visual guide for locating acupoints by dividing the space equally between two landmarks on the body. This method will be one of the most useful for accurate acupoint determination. This study was performed to compare the accuracy between the naked-eye and a laser device to locate an acupoint.

2. Methods

2.1. Participants

Twenty-two 4th-year acupuncture students at the College of Korean Medicine at Kyung Hee University, Seoul, Republic of Korea, were enrolled to take part in this study. They received a detailed explanation of the experimental procedure and provided written informed consent. The study was conducted in accordance with the Declaration of Helsinki and approved by the Institutional Review Board of Kyung Hee University (KHSIRB-19-062).

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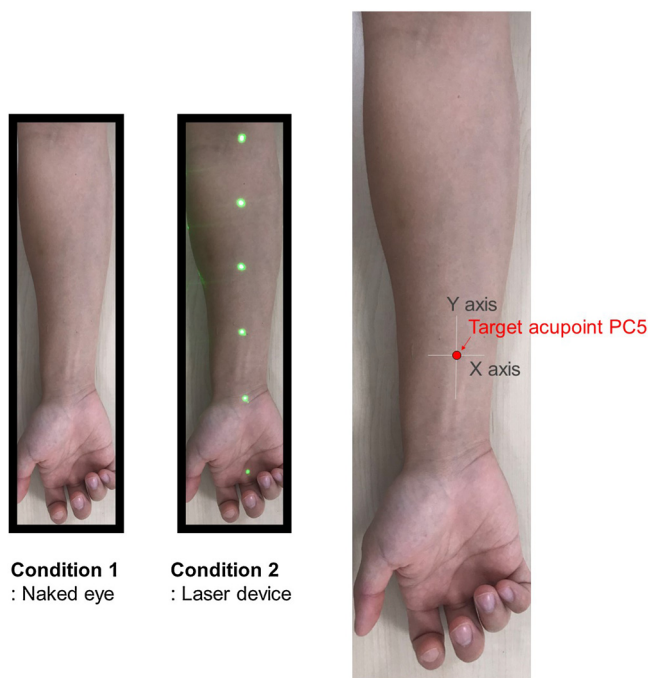


Fig. 1. A. Twenty-two students were asked to mark acupoint PC5 on a male volunteer's arm using two different acupoint positioning methods: Condition 1, without a laser device (naked-eye), and Condition 2, using a laser device. B. The x-axis refers to the short part of the arm, parallel to the wrist fold, and the y-axis refers to the longitudinal axis.

2.2. Experimental procedures

According to the WHO standard acupuncture point location, acupoint PC5 is located between the tendons of the palmaris longus and the flexor carpi radialis, 3 B_{cu} proximal to the palmar wrist crease on the anterior aspect of the forearm. A male healthy subject volunteered to use his right arm for acupoint measurements. The participants were asked to identify the acupoint PC5 using the proportional method (B-cun, bone proportional cun).

The students participating in this study were asked to mark acupoint PC5 on a male volunteer's arm using two different methods: without a laser device (naked-eye) and with a laser device (JD-303, Duze[®], India) (Fig. 1A). In condition 1 (naked eye condition), the students were required to identify the acupoint by dividing the space equally between the two landmarks on the body through mental imagination without a visual guide. In condition 2 (with a laser device condition), they can more easily locate the acupoint

by dividing the space equally between two landmarks on the body through a visual guide. The two landmarks on the body were PC3 (on the anterior aspect of the elbow, at the cubital crease, in the depression medial to the biceps brachii tendon) and PC7 (on the anterior aspect of the wrist, between the tendons of palmaris longus and the flexor carpi radialis, on the palmar wrist crease).

The x-axis refers to the short part of the arm, parallel to the wrist fold, and the y-axis refers to the longitudinal axis (Fig. 1B). All marks made by the participants were plotted onto a thin, flexible transparent plastic film using three previously marked reference dots. The three reference dots can provide orientation on the skin surface for applying subsequent labels in the same locations. Identified points were converted to coordinates.

2.3. Data analysis

The distributions of the acupoints were further estimated by the kernel density estimation methods using R software (ver.3.6.0, <http://r-project.org>). This enabled the estimation of the probability density function of a random variable. The target acupoint PC5 was provided by a professor, with experience in acupuncture education and research, using the ruler method. Distances between the participants' markings and the target acupoint identified by the professor were analysed using the Student's *t*-test.

3. Results

3.1. The overall distribution of acupoints

The kernel density estimation showed the distribution of acupoints PC5. The overall distribution of acupoints was less when the laser device method was used, compared to the naked-eye method (Fig. 2A).

3.2. The differences in the horizontal and longitudinal axis

There were significant differences in the longitudinal axis between the two methods, but no significant differences in the horizontal axis (Fig. 2B).

4. Discussion

The present study estimated the probability density of acupoint distribution using kernel density estimation. This methods can provide inference about the population are made based on a finite data sample. Kernel density estimation showed that laser device made students identify acupoints with smaller distribution of

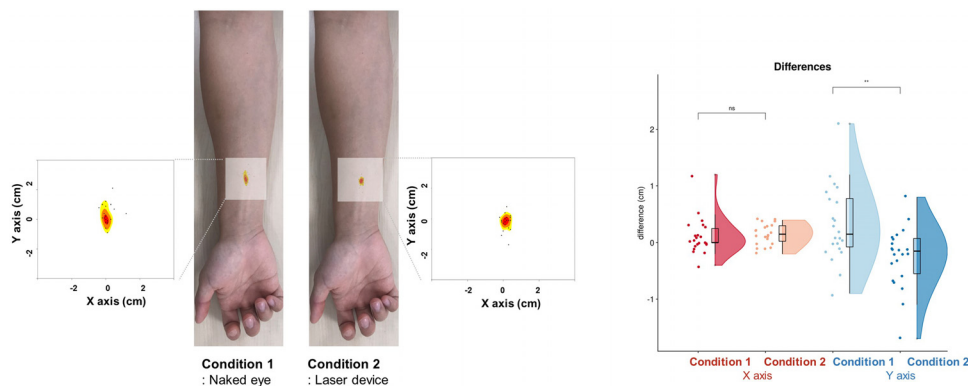


Fig. 2. The distribution of the acupoints were estimated by Kernel density estimation methods. A. The overall distribution of acupoints on the map was smaller when the laser device method (condition 2) was used compared to the naked-eye method (condition 1). B. There were significant differences in the longitudinal axis between the two methods but no significant differences in the horizontal axis.

acupoints. Without a laser device, participants had greater variations in locating the acupoint. In the current study, direct measurement of the acupoint location using a laser device can minimize variations in locating points without any inconvenience. Therefore, we strongly believe that laser device can be one of the most efficient point location methods in acupuncture training and practice.

There were significant differences in the horizontal axis between the two methods used in this study. The acupoint PC5 is located between two distinct anatomical structures: the tendons of the palmaris longus and the flexor carpi radialis. These anatomical landmarks might enable students to locate the acupoint between the two tendons without causing a large variation in the distribution.⁶ Second, the curvature of body surfaces should be considered. Acupoints are known to be anatomically located in clefts between muscle fibers, muscles, bones, ligaments, and/or tendon.^{10,11} Since acupoints are located in depressions on the body surface, as palpated by a practitioner, the use of film over the observed area could potentially interfere with locating an accurate point. Moreover, a laser device also has limitations when considering the curvature of the body. Finally, palpation was used only to confirm the location between the two tendons in this experiment. It is generally necessary for a practitioner to find the point by palpating the finger until the sensitive depression in the body is located after looking in the approximate region of the acupoint.¹⁰ Further research is needed to identify a precise acupoint location through palpation.

Our findings suggest that direct measurement of the acupoint location using a laser device can minimize variations in locating points. Laser-assisted tools will help practitioners locate the acupoints more accurately and should be considered as standard practice, especially in acupuncture research and education.

Conflict of interest

The authors have declared that no competing interests exist. The funders had no role in study design, data collection and analysis, decision to publish, or preparation of the manuscript.

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Ethical statement

The study was conducted in accordance with the Declaration of Helsinki and approved by the Institutional Review Board of Kyung Hee University (KHSIRB-19-062).

Data availability

The data will be made available upon request.

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