

## Influence of Using Gloves and Finger Stalls During Operations of Acupuncture Needles. Observation Under an Electron Microscope: A Pilot Study

Tsunematsu Mikako<sup>1)</sup>, Imai Motoyuki<sup>2)</sup>, Imai Kenji<sup>1)</sup>

1) Department of Acupuncture and Moxibustion, Faculty of Health Care, Teikyo Heisei University

2) Department of Electrical Engineering, Faculty of Engineering, Tokyo University of Science

### Abstract

The aim of this study is to evaluate by a scanning electron microscope (SEM) whether using gloves and finger stalls can prevent foreign bodies adhering to the acupuncture needle from the fingers of the acupuncturist. After attaching sodium bicarbonate to their fingers, the acupuncturist touched the acupuncture needles under three conditions: bare hands, using powdered latex finger stalls and using powder-free nitrile gloves.

The acupuncture needles were observed by an SEM. Additionally, the elemental components of the foreign bodies on the surface of the needle were analyzed with energy dispersive X-ray spectrometry. After touching the acupuncture needle with bare hands, we observed that there was adhesion of foreign bodies containing elements of sodium to the surface of the acupuncture needle. After touching the acupuncture needle using powdered latex finger stalls, we observed that there was adhesion of foreign bodies containing elements of silicon and magnesium to the surface of the acupuncture needle. After touching the acupuncture needle using powder-free nitrile gloves, we did not observe that there was any adhesion of foreign bodies to the surface of the acupuncture needle. In conclusion, using powder-free gloves prevents foreign bodies from adhering to the acupuncture needles from the fingers of the acupuncturist.

**Key words:** *Gloves, Finger Stalls, Scanning electron microscope (SEM)*

### I. Introduction

Kanshin-ho (needling with tube method) is an acupuncture technique devised in Japan in the 17th century, and the technique made it possible to insert a thinner acupuncture needle with safety and less pain<sup>1,2)</sup>. Even today, Kanshin-ho is widely used in Japan. However, Kanshin-ho is also a technique that often requires directly touching the acupuncture needle while inserting it into the body with the acupuncturist's fingers. In recent years, medical gloves and finger stalls are recommended during acupuncture treatment<sup>3)</sup>, however, there are few reports on its effectiveness in the acupuncture field. This study aims to evaluate by a scanning electron microscope (SEM) whether using medical gloves and finger stalls can prevent foreign bodies adhering to the acupuncture needle from the fingers of the acupuncturist or not.

#### . Materials and Methods

The subject was an acupuncturist. The acupuncturist put their thumb and index finger in sodium bicarbonate (NaHCO<sub>3</sub>) from a clean sheet to act as a model of

foreign bodies, and then rubbed their fingers together to get any excess NaHCO<sub>3</sub> off. Next, they touched an acupuncture needle with their fingers. After attaching the NaHCO<sub>3</sub>, the acupuncturist ran their fingers over acupuncture needles made of stainless steel (φ0.20mm, Nissin Medical Instrument Co., Ltd, Osaka, Japan) 5 times from the base to tip with their fingers under three conditions: bare hands, using talc powdered latex finger stalls (Clean finger stall, Meikensha Co., Ltd, Tokyo, Japan) and using powder-free nitrile gloves (Glacier zero, Moraine Co., Ltd, Tokyo, Japan). When using the finger stalls and the gloves, the acupuncturist put them on so as to have as little skin-to-glove contact as possible.

After touching the needles, the acupuncture needles were observed by an SEM (Supra40; Carl Zeiss Microscopy GmbH Co., Ltd, Jena, Germany) at a magnification of 300 x. In addition, the elemental components of the foreign bodies on the surface of the needle, and the surface of the needle itself, were analyzed with energy dispersive X-ray spectrometry (EDS) (XFlash 6|10; Bruker Co., Ltd, Massachusetts, USA). This is an analytical method to investigate elements constituting an object from X rays generated when an object is irradiated with an electron beam.

This study was carried out with the approval of the ethics committee of Teikyo Heisei University (Approval No. 29-116).

### . Results

Fig. 1 shows the acupuncture needle after touching with bare hands. We observed that there was adhesion of foreign bodies to the surface of the acupuncture needle

(Fig 1a). The EDS image showed that the foreign bodies contained the element of sodium (Fig. 1b).

Fig. 2 shows the acupuncture needle after being touched by powdered latex finger stalls. We observed that there was adhesion of foreign bodies to the surface of the acupuncture needle (Fig. 2a). In addition, the EDS image showed that the foreign bodies contained elements of silicon and magnesium (Fig. 2b and c respectively).

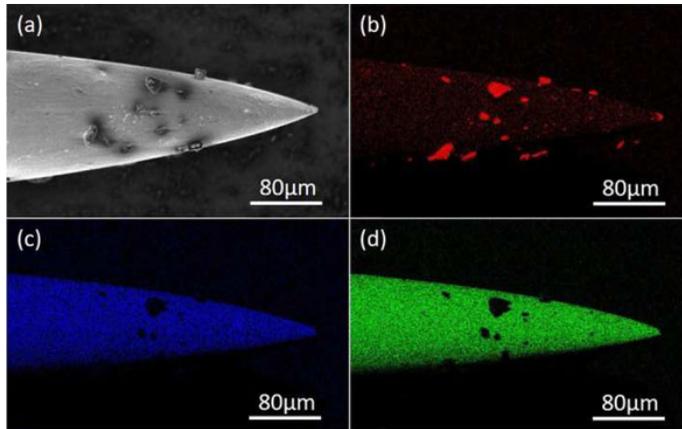


Fig. 1. (a). SEM image of the acupuncture needle after touching with bare hands, and EDS elemental maps of the same needle for (b) sodium, (c) nickel and (d) iron.

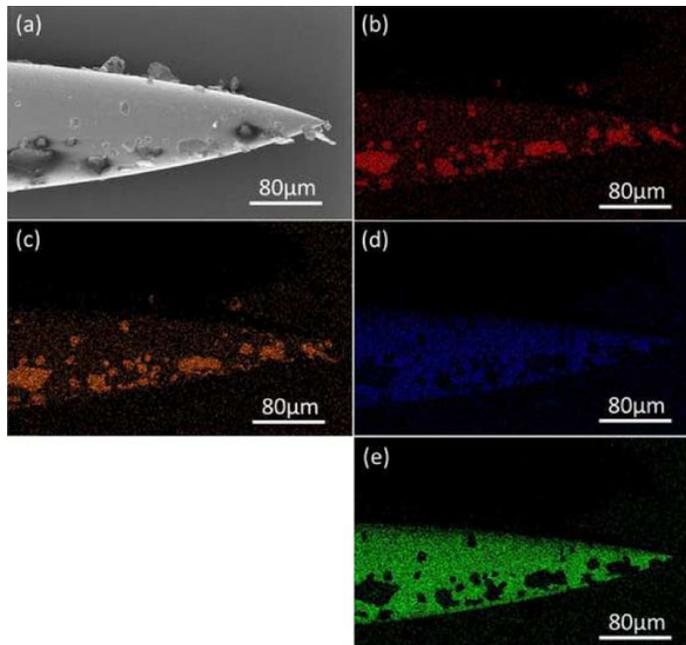


Fig. 2. (a). SEM image of the acupuncture needle after touching using powdered latex finger stalls, and EDS elemental maps of the same needle for (b) silicon, (c) magnesium, (d) nickel and (e) iron.

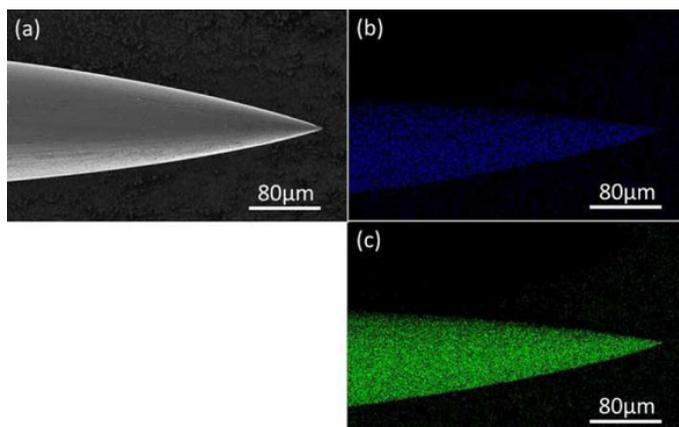


Fig. 3. (a). SEM image of the acupuncture needle after touching using powder-free nitrile gloves, and EDS elemental maps of the same needle for (b) nickel and (c) iron.

However, we did not observe that there was any adhesion of foreign bodies to the surface of the acupuncture needle when the acupuncture needle was touched by powder-free nitrile gloves (Fig. 3).

#### IV. Discussion

In this study, after touching  $\text{NaHCO}_3$ , we observed acupuncture needles with an SEM under each of these three conditions: bare hands, using powdered latex finger stalls and using powder-free nitrile gloves.

Under conditions that the acupuncture needle was touched with bare hands, foreign bodies adhered to the surface of the acupuncture needle; furthermore, the foreign bodies contained sodium. This result indicates that the  $\text{NaHCO}_3$  on the hands had adhered to the acupuncture needle. Under conditions that the needle was touched using powdered finger stalls, foreign bodies also adhered to the surface of the acupuncture needle. However, the foreign bodies did not contain sodium, they contained silicon and magnesium; it seems to be talc ( $\text{Mg}_3\text{Si}_4\text{O}_{10}(\text{OH})_2$ ) which is coated on the finger stall surface. On the other hand, under conditions that the needle was touched using powder-free nitrile gloves, no foreign bodies were observed on the surface of the acupuncture needle. The results of our study demonstrate that the adhesion of  $\text{NaHCO}_3$  as a model of foreign bodies, attached to the fingers, transferring to the acupuncture needle was prevented under the condition of being touched using powdered finger stalls and powder-free nitrile gloves. Of course, hand hygiene operations; washing hands and disinfection of hands of acupuncturists before acupuncture treatment must be done thoroughly to keep acupuncture needles clean.

However, even if foreign bodies are attached to the acupuncturist's fingers, the gloves and finger stalls may be able to prevent the adhesion of foreign bodies from the fingers to the needles.

However, under the condition that the needle was touched using powdered finger stalls, talc that is coated on the finger stalls adhered to the acupuncture needle. In addition, talc powdered gloves were banned by the Food and Drug Administration because of potential harm to human health<sup>4)</sup>. Because of this announcement, medical gloves have been switching to ones without powder<sup>5)</sup>. Thus, using powder-free gloves prevents foreign bodies from adhering to acupuncture needles and it makes acupuncture procedures safe. In a clean and safe acupuncture procedure, it is important that no foreign bodies adhere to the needles. It is assumed that if harmful substances are attached to the fingers of acupuncturists, they may be inserted into the patients. Thus, in order to provide clean acupuncture, using powder-free nitrile gloves during acupuncture operations is the best of the three. However, the finger stalls also prevented the transferring of foreign bodies from the hand to the acupuncture needle, therefore the providing of powder free finger stalls is required.

Cases of infection that are considered to be caused by acupuncture have been reported<sup>6-9)</sup>. It is undeniable that the microorganisms attached to the fingers of the acupuncturist adhered to the acupuncture needles and passed on to the patients' bodies causing infection. If acupuncturists use clean gloves or finger stalls, it may also prevent infections related acupuncture operations. However, we examined using  $\text{NaHCO}_3$ , as a model of foreign bodies, not real bacteria in this study. The case of bacteriological examinations requires further

investigation of clean acupuncture procedures. In addition, this is a single case study. In order to establish a cleaner acupuncture procedure, more studies that increase the number of subjects and having a reproducibility check by repeating the same operations are required.

## V. Conclusion

Using clean gloves and finger stalls prevents foreign bodies from adhering to the acupuncture needles from the fingers of the acupuncturist.

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## Conflict of interest

The authors declare no conflicts of interest associated with this manuscript.

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