Development of a web-based decision support system for acupuncture treatment
-The selection of acupuncture points based on a web-based 3-D computer graphic model of the movement used to evaluate motion-induced pain –

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INTRODUCTION

One motion of any part of the human body includes the movement of many joints and axes of the whole body. When one part of our body moves, our whole body moves simultaneously. It enables us to perform such body movement ranging from the fine motions used in manual labor to the dynamic motions utilized in sport. When a factor exists that disturbs any part of this series of movements in any part of our body, then the whole motion loses its smoothness and thus causes such symptoms as pain. A new diagnostic method for acupuncture treatment which evaluates motion-induced pain[1] now makes it possible to identify a location that actually causes pain. This method can identify an affected meridian which thus enables us to select an appropriate acupuncture point to reduce pain based on the concept of meridians. The appropriate stimulation of the acupuncture point may help a patient to correct an abnormal motion[2]. In addition, the effect of a selected acupuncture point is identified by observing that the motion-induced pain decreases after stimulating the acupuncture point. This is a very simple but effective method for identifying the affected meridians and confirming the effect of the selected acupuncture point. To popularize this method, we have developed a web-based decision support system for this method by expressing the loads of movement, which therefore make it possible to precisely identify the exact location that causes a specific pain, using a 3-D computer graphic model for selecting the appropriate acupuncture points.

METHODS

A three-dimensional motion analysis device (Motion Analysis Expert Vision HiRES system) and high-speed camera (FALCON CAMERA) are used to accurately capture an optical motion on film. Next, 32 reflector markers are attached to the parietal region, the cervical vertebra, the lumbar vertebrae and other joints of the subject. Thereafter, the subject is asked to perform the movements similar to those done during orthopedic and neurological tests. Eight high-speed camera takes pictures of these movements which consist of 30 different kinds of movement; the extension of the neck, upper extremities, lower extremities and trunk.
The photographs taken with a high-speed camera are then developed into animation data which are then combined with human body modeling data. Next, such data are run on a human body modeling program using three dimensional computer graphics (hereafter, called 3DCG).
In addition, we also take photographs of all 36 acupuncture points which are each composed of twelve acupuncture points which are suitable for restoring the restriction of extension on either the front, the back or the side of the human body, respectively. We then established a home page in which 30 kinds of movement are connected with the photographs in order to indicate the appropriate acupuncture locations.

RESULTS AND DISCUSSION

The movements consist of the motions which extend from the front, back and side of our body. A total of thirty such movements are considered to exist when performing a physical assessment similar to those performed during orthopedic and neurological tests. Each individual motion influences the 14 meridians of the body. When a specific movement induces pain, then an affected meridian can be found. Next, the optimal acupuncture points to reduce such pain can then be selected based on the concept of meridians. The newly developed home page can show us how to follow such movements based on 3DCG modeling, thus allowing therapists to select the appropriate acupuncture points to reduce pain. When you click on any of the movements shown on screen, then the acupuncture points that need to be stimulated are shown. This tool greatly supports the therapist. Moreover, this system may also be utilized as a self-care tool of pain because it can show the appropriate points to reduce pain which can thus be performed by the patient himself. This system also provides new insight into Oriental Medicine. Further similar research on the motion-induced fluctuation of pulse waves[3] may therefore eventually lead to the compilation of scientific evidence supporting the theory of a pulse diagnosis in Oriental Medicine.

CONCLUSIONS

A newly developed homepage has been established as a support system for performing effective acupuncture treatment by therapists and also as a tool for self-care, since this homepage is able to clearly demonstrate the movements and thereby can help in selecting the most appropriate acupuncture points.

REFERENCES

1) Mukaino Y, et al. The Meridian Test，IshiIyaku Publishers. Tokyo，1999．
2) Kondo f, Amano K, Tanaka A, Mukaino Y. Evaluation of acupuncture effect on a motion of meridian test by three dimensional measurement. Technical Report of IEICE MBE 29, 9-12, 2002
3) Amano K. Scientific Grasp of Individual's Vital Information by Checking Pulse Waveform "Seiko Epson Corporation Advances the Basic Research for PULSENSE", Nature Interface, Vol.2, 60-67, Mar., 2001, http://www.natureinterface.com/e/ni02/