

MEASUREMENT AND ANALYSIS OF OPTICAL PROPERTIES OF ACUPUNCTURE POINTS AND CHANNELS

*Sang Min Lee, **Chunho Choi, **Kwang-Sup Soh, *Gilwon Yoon

*Medical Application Project Team, Samsung Advanced Institute of Technology
P. O. Box 111, Suwon, 440-600, Korea, (Tel) +82-31-280-6527, (FAX) +82-31-280-9208

*E-mail: smleel@sait.samsung.co.kr

**School of Physics, Seoul National University

ABSTRACT

We are researching the optical properties of acupuncture points and channels as another index of diagnosis. We measured the reflected photons on acupuncture points and non-acupuncture point and the propagated photons on acupuncture channel and non-acupuncture channel respectively. We used a light source of laser in NIR region and Si photodiode as a detector. Light is modulated in several tens of Hz to remove interference noise and its consumption power is maintained below 5mW.

Our in-vivo experimental results show that the acupuncture point has different optical reflectance distributions compared to non-acupuncture point and different propagation characteristics between acupuncture channel and non-acupuncture channel.

1. INTRODUCTION

Acupuncture and meridian (channels) systems have important roles in diagnosis and treatments of many diseases. Functional states and of human bodies and internal organs can be shown on the meridian systems. Imbalance of internal organs and the symptoms of diseases can be detected and treated by acupuncture and moxibution. Since 1950's, scientific evidence and properties of meridian systems and APs (Acupuncture Points) have been investigated. Now, APs have been known to have lower conductivity than non-APs. Many researches have been executing for measuring and analyzing the electrical conductivity of APs. But the measurement of electrical conductivity has been suffered from the lack of repeatability and the needs for alternative measurement modality (such as temperature, elastic wave, carbon dioxides emission, radio isotropy injection, and MRI) are increasing. Recently, the possibility of optical methods has been reported [1,2] and optical characteristics

of meridian and APs are expected to be another index of diagnosis.

In this research, two confirmation experiments for optical properties of meridian systems and APs have been developed. In the first experiment, diffuse reflectance of skin area surrounding APs have been tested and compared with that of APs within the area. Second experiment, light delivery property of meridian system has been tested by irradiating light on one point of meridian line and detecting propagated light on one AP of the meridian. The results for meridian line were compared with those for 'reference line' near to the meridian line.

2. METHODS AND EXPERIMENTS

2.1 Diffuse Reflectance of APs

In this experiment, diffuse reflectance property was chosen as a parameter which can discriminate APs against normal skin. To make uniform source and detector coupling, specially designed two-leg optical fiber was used. Source fiber was located one center and 6 detector fibers were located surrounding the source fiber. Detector fibers were connected to Si photodiode and InGaAs photodiode. 2cm*2cm area including PC6 (6th AP of Pericardium Meridian) was chosen as region of interest, and scanned by the above source-detector fiber couple with the step size of 0.2mm.

2.2 Light Delivery Properties of Meridian

All measurements were carried out under dark room and experimental setup is shown in Fig.1.

Non-coherent white light generated by Tungsten-Halogen lamp was used as a light source. Irradiation light was modulated in 10 Hz by the optical chopper and delivered to the point along pericardium meridian. PMT with a spectral range of 165~850 nm was used as a photon detector. Signals from PMT were discriminated and amplified by DSP Lock-in Amplifier and recorded on the digital storage oscilloscope.

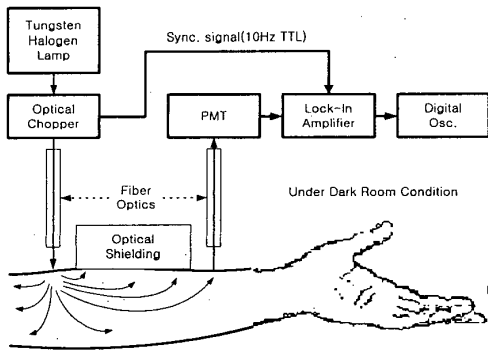


Fig.1 Experimental Setup

APs were defined anatomically by traditional acupuncture chart. Fig.2 shows measuring points on meridian and reference line. Detector was located on PC6 and ref.4, and other points along each line were irradiated by the source fiber respectively.

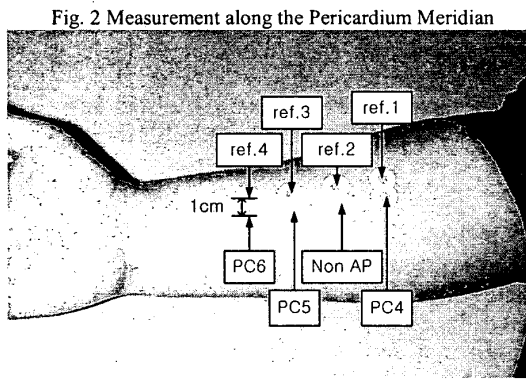


Fig. 2 Measurement along the Pericardium Meridian

and Non-meridian Reference Path

3. RESULTS AND DISCUSSION

3.1 Diffuse Reflectance of APs

13 healthy subjects have been tested. Same experiments have been repeated 3 times for each subject, and correlation analysis of the 3 results has been adapted. Typical result of a subject is shown in Fig.3. The minimum region of the parameter is almost corresponding to PC6 on the skin. The results of 10 subjects show similar pattern: lower diffuse reflectance on PC6. For another 3 subjects, no correlated minimum region has been detected.

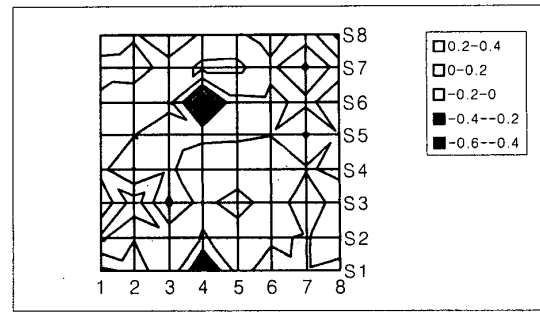


Fig. 3 Experiment Result of one Subject

3.2 Light Propagation along Pericardium Meridian

The measurement procedures stated above were repeated three times for 14 healthy subjects.

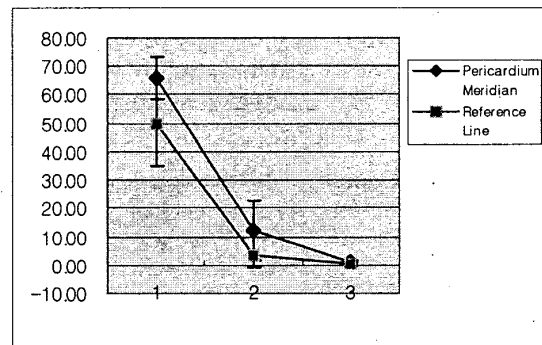


Fig.4 Experimental Results. Average of Results over 14 Subjects.

Numbers on x-axis (1,2,3) means the irradiating points: PC5, NonAP, PC4 along pericardium meridian, and ref.3, ref.2, ref.1 along non-meridian reference line, respectively. Values on y-axis values are detected light intensity on PC6 for meridian and ref.4 for reference line. The propagation of light along the meridian is stronger than reference line by the amount of 26%.

These preliminary experiments show positive results as shown above. But there still remain many problems to confirm the optical properties of meridian and APs. More controlled measurements are to be carried out on many subjects.

4. REFERENCES

- [1] S.Kaznachiev, L.Molchanova, *Light from Living Life and Human*, pp. 101-105, Novosibirsk, 1998.
- [2] H.Lazoura, M.Cohen, E.Lazoura and I.Cosic, "Do Acupuncture Points Have Different Absorption Properties to Laser Light than Surrounding Skin?", *Proc. 2nd IEEE Int. Conf. Bioelectromagnetism*, pp. 172-173, 1998.