

## Single Finger Movement Trial using Human functional Near-infraredgraphy (fNIR)

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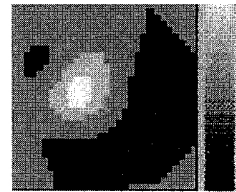
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### Introduction

Functional near-infraredgraphy (fNIR) can provide the real-time changes of the regional cerebral blood volume (rCBV), the regional Oxy-Hb and the regional Deoxy-Hb from skull at the bedside. We developed the principal method of human functional spectroscopy was using the scattering light NIR (I). Recently, it was reported the regional activation in the motor (2, 3) and the language experiments (4) using the blocked task. The regional activity and the sunounded activity may be modified by the blocked task. In this study, to understand the regional cerebral metabolism, we tested a single finger movement trial using fNIR.

### Methods

fNIR experiments: The rCBV = Oxy-Hb + Deoxy-Hb, HbO<sub>2</sub>, and Deoxy-Hb were estimated using a fNIR system with 24-channel or 48-channel (Hitachi Medical Corporation) (5). Light for the fNIR from two laser diodes was directed into the head through a fiberoptic bundle (1 mm in diameter). Near-infrared light with wavelengths of 780 and 840 nm was used. The distance between the photon probes was 3cm. The sampling time for each photon count was 0.5 sec. The changes in the Oxy-Hb and Deoxy-Hb concentration were calculated using the differences in the absorption indexes for the two wavelengths. The center of 48 or 24 channels (90 x 90 mm or 60x60/ square) was located in skull swilice related to knobs on the bilateral precentral gyros (6). A total of 9 imaging sessions with 7 normal volunteers were performed. The paradigm consisted of two control periods that embedded the simple tapping task period using the right index finger. The stimulus sign ("Go") was given audiotonly. Trials were performed during 7-10 ON/OFF epochs, each a 45s OFF period. Maps and time courses of functional activation were generated by the Hitachi Medical Corporation made software package (3). The time courses were averaged with 7-10 epochs. The data with the serious motion artifact were removed.



### Results

The real-time functional map of the Oxy-Hb in the motor cortex shows in the Fig. 1. Fig.2 show the time courses of the initial cerebral metabolism in the single motor trial. An initial slight increase in Deoxy-Hb and the delayed increase and the under-shoot in Oxy-Hb and rCBV following the onset of the "Go" sign were observed. The initial slight decrease in rCBV following the onset of the short visual stimulation was also observed.

### Conclusion

This observation indicate the increase of the oxygen consumption rate in the initial cerebral metabolism. fNIR is able to use for a single trial mapping.

### Acknowledgments

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