

Limitations of NIRS measurements in chronic stroke patients with abnormal cerebral cortices

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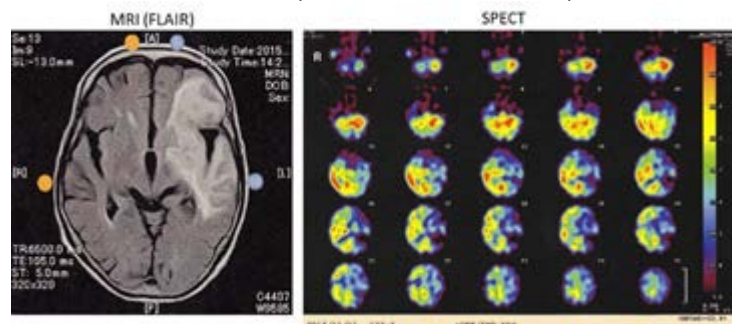
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Abstract: Near infrared spectroscopy (NIRS) has been applied to measurements of cerebral blood oxygenation (CBO) in normal subjects and patient with various brain disorders psychological diseases and cerebrovascular diseases. However, it is not known whether NIRS allow us to measure CBO correctly in patients with abnormal cortices where optical characteristics including optical pathlength (OP) differ from those in normal cortex. In the present study, employing Time resolved NIRS (TNIRS), we measured hemoglobin concentrations and optical characteristics in chronic stroke patients with abnormal cerebral cortices. TNIRS, employing pico-second light pulses and the photon diffusion equation, enables us to determine the mean OP, which provides quantitative values of Hb concentration changes in the cerebral cortex. We studied five patients with chronic cerebral infarction (two males, three females, age 59.8 ± 27.0 years) who were admitted to the Department of Neurology of Fukushima Prefectural Medical University. Employing TNIRS (TRS-20, Hamamatsu Photonics), we measured baseline Hb concentrations and OPs (760, 800, 830 nm) at various positions on the head.

The right figure shows examples of MRI and SPECT of a chronic stroke patient, demonstrating abnormal cerebral cortex and reduction of cerebral blood flow in the left middle cerebral artery territory. Employing TNIRS, we



compared Hb concentrations and OPs on the normal side and the affected side. On average, the deoxy-Hb concentration on the normal side was significantly higher than that on the disease side ($p = 5.7 \times 10^{-5}$), and the oxygen saturation was significantly lower than that on the affected side ($p = 2.5 \times 10^{-4}$). On the other hand, the OPs were significantly lower on the normal side. The present results suggest that NIRS should be performed on the patients with abnormal cerebral cortices, giving special consideration to the possible difference in optical characteristics of the normal and abnormal brain tissues.

I prefer: oral presentation poster presentation