

## 論文の内容の要旨

論文題目 : Impaired Hemodynamic Response in Ischemic Brain Assessed with BOLD fMRI

(血中酸素濃度依存機能的磁気共鳴画像を用いた虚血性脳血管障害における脳血管反応障害の  
評価)

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### **Objectives**

The study aims to investigate the effect of ischemia or hypoperfusion in the evaluation of neural activity with Blood-oxygen-level dependent (BOLD) functional magnetic resonance imaging (fMRI), and to examine whether the severity of the compromised hemodynamic status in patients with major cerebral artery diseases could be, conversely, assessed with use of neural activity as endogenous vasodilator.

### **Materials and Methods**

28 neurological impairment-free patients with anterior circulation territory ischemia performed a bimanual hand-grasping task. Magnitude and temporal shift of evoked BOLD

response, baseline cerebral blood flow (CBF) and its increment under task, severity of hemodynamic impairment stratified by blood flow pattern were evaluated. In fMRI analysis, both a conventional analysis with canonical HRF and an HRF-model-free analysis employing a Fourier transform were performed.

## **Results**

Severity of hemodynamic impairment was significantly correlated ( $p < 0.0001$ ) with baseline CBF, CBF increment, and magnitude and response delay of BOLD response. BOLD response delay was also significantly correlated ( $p < 0.0001$ ) with baseline CBF, CBF increment, and response magnitude. In 10 out of 45 ischemic motor cortices, conventional analysis completely failed to detect areas of activation that were demonstrated by HRF-model-free analysis.

## **Conclusions**

Delay and reduced magnitude of BOLD responses assessed with a simple motor task can be an indicator of the severity of compromised hemodynamic status. Reduced regional baseline CBF and its increment under task underlie impaired BOLD response in ischemic patients, which necessitates an alternative approach to conventional analysis with any single HRF.