

In Vivo MREIT Conductivity Imaging of Canine Brain to Evaluate Brain Abscess

Keywords: MREIT; tissue property mapping; conductivity image; brain abscess

Abstract: Magnetic resonance (MR) based electromagnetic tissue property mapping is an emerging technique which uses MR to derive non-invasive information of tissue properties including electrical conductivity and permittivity. A newly developed magnetic resonance electrical impedance tomography (MREIT), which incorporates a constant current source to an existing MR scanner, provides conductivity contrast information of human body without using any contrast media and additional MR scan. Recently, MREIT has now reached the stage of in vivo animal and human experiments. To support its clinical significance, we should demonstrate that the conductivity image provides meaningful diagnostic information that is not available from other imaging modalities. Brain abscess is caused by inflammation and pus collection in the cerebrum coming from micro-organism such as bacteria. Though the survival rate was increased recently, brain abscess remains a diagnostic challenge. The purpose of this study is to show the feasibility of in vivo MREIT conductivity imaging in terms of its capability to provide the new tissue contrast information of abscess lesion and to characterize time-course variations by comparing the electrical conductivity before and after induction of abscess in the canine brain model. To investigate any change of electrical conductivity due to brain abscess, canine brains having a regional abscess model were scanned along with separate scans of canine brains having no disease model. Conductivity images shown in this study indicated that time-course variation of conductivity contrast between normal and abscess regions are distinguishable in a different way compared with conventional MR image techniques.

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