Abstract Submitted
for the DFD20 Meeting of
The American Physical Society

Multi-Slice 2D MR Flow Imaging to Improve Signal-to-Noise Ratio and Velocity Noise in Assessment of Cerebrospinal Fluid Flow[1]

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Flow-encoding MRI techniques have been increasingly applied to quantitatively and qualitatively assess changes in cerebrospinal fluid (CSF) flow dynamics in various neurological conditions, such as Chiari I malformation, hydrocephalus, and syringomyelia/hydromyelia. Conventional flow-encoding MRI strategies have been hampered by low signal-to-noise ratio (SNR) and high velocity noise due to the long T1 relaxation time of CSF and the typical short repetition times (TR) of phase-contrast MRI (PC-MRI). We propose a strategy for a multi-slice 3-directional 2D PC-MRI sequence that increases the TR for each slice. To ensure a longer TR acquisition, slice encoding was designed to be interleaved with each cardiac cycle. The results of the phantom scan with water (T1 ˜3000ms) demonstrated that the proposed strategy provided 140% increase of SNR and 33-47% decrease of velocity noise, when compared to corresponding 2D and 4D flow MRI acquisitions.

[1]This research was supported by the MOTIE (Ministry of Trade, Industry, and Energy) in Korea, under the Fostering Global Talents for Innovative Growth Program (P0008748) supervised by the Korea Institute for Advancement of Technology (KIAT)

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Date submitted: 02 Aug 2020 Electronic form version 1.4