

# VISUALIZATION OF CEREBROSPINAL FLUID DYNAMICS USING MAGNETIC RESONANCE IMAGING - TIME SPATIAL SPIN LABELING TECHNIQUE

Yamada S

Division of Neurosurgery, Toshiba Rinkan Hospital

Kanagawa, Japan

[shinyakoro@gmail.com](mailto:shinyakoro@gmail.com)

**Introduction:** The ideal tracer for studying CSF dynamics is CSF itself. In time spatial labeling inversion pulse (Time-SLIP), MR radiofrequency pulses convert specific volumes of CSF into an endogenous tracer. CSF dynamics can then be observed under physiological and pathophysiological condition. A gate-free and fast image acquisition technique like Time-SLIP is necessary to visualize natural CSF motion, whose behavior varies with cardiac pulsation and respiration.

**Aim:** To visualize CSF motion using the MRI Time-SLIP method under physiological and pathophysiological condition. **Methods:** Cardiac gated Time-SLIP fast spin echo (FSE) sequence and a real-time Time-SLIP balanced steady state free precession (bSSFP) sequence were used on 1.5T and 3T MRI scanners. Serial images were obtained one to five seconds after the labeling pulse. 4D Time-SLIP sequence was also applied to visualize CSF motion in the physiological brain.

**Result:** Considerable pulsatile CSF motion was observed in normal physiological brains as well as pathophysiological (hydrocephalus) brains.

**Conclusion:** Real-time MR imaging is necessary to investigate natural pulsatile CSF motion. Averaging over multiple pulsatile CSF motions potentially wipes out natural physiological variability in CSF motion. CSF dynamics in normal brain as well as alteration of CSF related disease will be shown.