

Cerebrospinal fluid pulse wave velocity

Intracranial and intraspinal [compliance](#) are parameters of interest in the diagnosis and prediction of treatment outcome in patients with [normal pressure hydrocephalus](#) and other forms of [communicating hydrocephalus](#). A noninvasive method to estimate the spinal cerebrospinal fluid (CSF) pulse wave velocity (PWV) as a measure of compliance was developed using a multiband cine phase-contrast MRI sequence and a foot-to-foot algorithm.

Sonnabend et al. used computational simulations to estimate the accuracy of the MRI acquisition and transit-time algorithm. In vitro measurements were performed to investigate the reproducibility and accuracy of the measurements under controlled conditions. In vivo measurements in 20 healthy subjects and 2 patients with normal pressure hydrocephalus were acquired to show the technical feasibility in a clinical setting.

Simulations showed a mean deviation of the calculated CSF PWV of $3.41\% \pm 2.68\%$. In vitro results were in line with theory, showing a square-root relation between PWV and transmural pressure and a good reproducibility with SDs of repeated measurements below 5%. Mean CSF PWV over all healthy subjects was 5.83 ± 3.36 m/s. The CSF PWV measurements in the patients with normal pressure hydrocephalus were distinctly higher before CSF shunt surgery (33.80 ± 6.75 m/s and 31.31 ± 7.82 m/s), with a decrease 5 days after CSF shunt surgery (15.69 ± 3.37 m/s).

This study evaluates the feasibility of CSF PWV measurements using a multiband cine phase-contrast MRI sequence. In vitro and in vivo measurements showed that this method is a potential tool for the noninvasive estimation of intraspinal compliance ¹⁾.

¹⁾

Sonnabend K, Brinker G, Maintz D, Bunck AC, Weiss K. Cerebrospinal fluid pulse wave velocity measurements: In vitro and in vivo evaluation of a novel multiband cine phase-contrast MRI sequence [published online ahead of print, 2020 Jul 21]. Magn Reson Med. 2020;10.1002/mrm.28430. doi:10.1002/mrm.28430

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