

Title: Visualization of pulsatile csf motion around membrane-like structures with both 4d velocity mapping and time-slip technique

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Abstract: Purpose: We compared the depiction of pulsatile CSF motion obtained by 4-dimensional phase-contrast velocity mapping (4D-VM) with that by time-spatial labeling inversion pulse (time-SLIP) technique in the presence of membrane structures. Materials and Methods: We compared the 2 techniques using a flow phantom comprising tubes with and without a thin rubber membrane and applied the techniques to 6 healthy volunteers and 2 patients to analyze CSF dynamics surrounding thin membrane structures, such as the Lilliequist membrane (LM), or the wall of an arachnoid cyst. Results: Phantom images exhibited propagation of the flow and pressure gradient beyond the membrane in the tube. In contrast, fluid labeled by the time-SLIP technique showed little displacement from the blockage of spin travelling by the membrane. A similar phenomenon was observed around the LM in healthy volunteers and the arachnoid cyst wall in a patient. Conclusion: Four-dimensional phase-contrast velocity mapping permitted visualization of the propagation of CSF pulsation through the intracranial membranous structures. This suggests that 4D-VM and the time-SLIP technique provide different information on flow and that both techniques are useful for classifying the pathophysiological status of CSF and elucidating the propagation pathway of CSF pulsation in the cranium.