**Inhance 3D Phase Contrast Angiographic Magnetic Resonance Venography of the Brain: Initial Clinical Experience in 23 Patients.**

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**Target audience** – Clinical neuroradiologists who perform clinical magnetic resonance venography (MRV) of the brain. Physicists interested in developing alternative non-gadolinium requiring angiographic imaging of the brain.

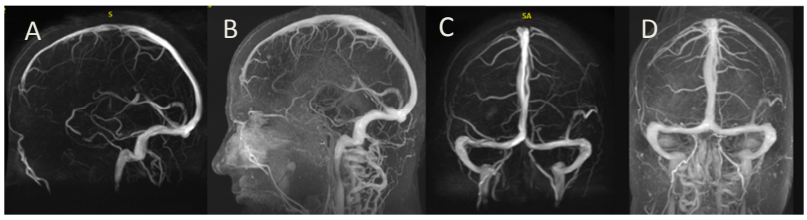
**Purpose** – The purpose of this work is to describe the clinical utility and merits of a non-gadolinium requiring brain MRV imaging technique obtained using a recently commercially available 3D Phase Contrast Angiographic technique that employs parallel imaging and optimized k-space sampling to acquire high resolution angiographic images with excellent background suppression in a short scan time.

**Methods** – Specific protocols for performing 3D PC MRV of the brain were optimized with respect to acquisition volume orientation, matrix size, velocity encoding gradient amplitude (VENC), and use of SAT bands to suppress arterial flow. Comparison with corresponding available 3D-TOF, 2D-TOF and gadolinium enhanced MRV techniques are provided in 23 clinical studies. The PC-MRV images were evaluated for accuracy in detection of vascular stenosis, as well as image quality and artifacts. The relative advantages/pitfalls of these angiographic techniques are presented.

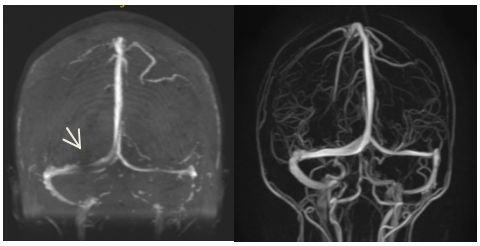
**Results** – Patients imaged ranged in age from newborn to 86 years old. 3D PC MRV acquisition was robust and successfully obtained in all patients. Bolus gadolinium MRV was unsuccessful in one newborn (two unsuccessful attempts). Differences in 3D PC MRV results obtained with differing VENC values, acquisition directions, before and after administration of IV gadolinium are presented. 3D PC MRA suffers from signal dropout compared to gadolinium enhanced techniques, but much less so than comparable 2D TOF MRA and MRV acquisitions.

**Discussion** - 3D PC MRV is recommended for imaging of patients who cannot receive gadolinium. 3D PC MRV is a superior alternative than 2D TOF MRV of the brain, with less saturation dropout and improved visualization of cortical veins. Saturation effects may be minimized with appropriate choice of volume orientation, with artifacts much more marked in the brain with axial acquisition compared to sagittal or coronal directions.

**Conclusion –** The 3D PC MRV technique is robust, no technical failure in acquisition in all 23 patients. As there is no need for IV gadolinium, 3D PC MRA is a great option for patients with gadolinium allergy or renal insufficiency. The technique works well for all ages ranging from neonate to geriatric. Bolus gadolinium MRA remains the "gold standard", however 3D phase contrast MRV technique can provide comparable results, and occasional superior results.




Corresponding sagittal and coronal MIP images from 3D PC MRV (A, C) and bolus gadolinium MRV (B, D) techniques. The MRV was normal in this patient. The results are comparable between these two techniques. There is no signal dropout from the transverse sinuses, and the larger cortical veins are well seen. The 3D PC-MRV technique has better background suppression.



2D-TOF MRV (left) and 3D PC MRV (right) in a 16 year old pregnant female with contraindication to IV gadolinium. The 2D-TOF MRV suffers from artifactual signal dropout in the right transverse sinus (arrow) which can potentially lead to erroneous diagnosis of dural venous sinus thrombosis.