

Application of high-resolution intracranial vessel wall MRI for pediatric vasculopathy: institutional experience in 5 years

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Purpose: Pediatric vasculopathy usually presented with nonspecific symptoms, requiring a broad range of differential diagnosis. Pediatric arterial ischemic stroke (AIS), in particular, has a diverse set of etiologies. However, pediatric imaging is often challenging. Raising awareness and understanding of neuroimaging for pediatric vasculopathy is crucial for accurate etiological diagnosis and follow-up management. Traditional luminal angiography yields limited information on the pathology of the vessel wall, whereas the vessel wall MRI offers unique insights. This study aims to describe and review the 5-year UCSF clinical experience with high-resolution intracranial vessel wall MRI for pediatric vasculopathy.

Methods: Institutional database was searched with the code of vessel wall imaging/arterial wall imaging from 5/5/2014 through 5/7/2019. All identified pediatric cases (<18 years old) were reviewed for clinical indication and vessel wall imaging features. Both pre-and post-contrast isotropic 3D CUBE T1-weighted intracranial vessel wall images are included. Follow-up evaluation and clinical etiological diagnosis were analyzed when available.

Results: Fifty-three pediatric patients with 69 vessel wall MRI examinations were identified. The imaging resolution ranged from 0.5 mm to 1.1 mm. Vasculopathy was identified by imaging in 26/53 (49.1%) patients. A list of clinical indications is displayed in the table. In particular, among the 22 patients diagnosed with AIS, etiologies were identified as focal cerebral arteriopathy (also known as transient cerebral arteriopathy, n=3), inflammation subtype (n=4), thrombotic/embolic (n=4), dissection (n=3), post-chemotherapy/radiotherapy (n=1), moyamoya disease related (n=1), tubercular meningitis related (n=1), and the remaining were undetermined. Patients with focal cerebral arteriopathy, which required extensive differentiation according to the medical notes, most frequently presented with multiple arterial segment enhancement in the anterior circulation on the vessel wall imaging that resolved after recovery, and the MRA manifestation ranged from nonspecific to occlusion (shown in the figure). Vessel wall imaging was mentioned in medical record to have helped identifying stroke etiology in an acute setting in 11/22 patients.

Conclusion: High-resolution intracranial vessel wall MR has many potential clinical applications in pediatric patients, especially for etiological diagnosis and follow-up evaluation of AIS. Further standardization of imaging techniques and interpretation of imaging features are essential for its integration into the clinical workflow.

Clinical indication	No. of Patients
Ischemic stroke/TIA	28
Hemorrhagic stroke	1
Dissection (with no stroke)	3
Aneurysm	3
Vasculitis	2
Congenital vascular abnormality	2
Moyamoya (with no stroke)	1
Arteriovenous fistula	1
Tumor (initial or post-treatment evaluation)	4
Parenchymal signal abnormality	4
Others (PHASE syndrome, connective tissue disease, etc)	4

