

## In Vivo Human Middle Cerebral Artery Wall Imaging using High Resolution Magnetic Resonance Imaging.

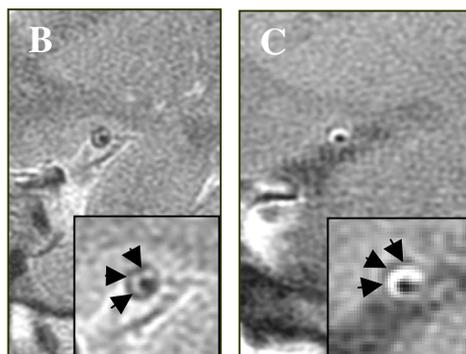
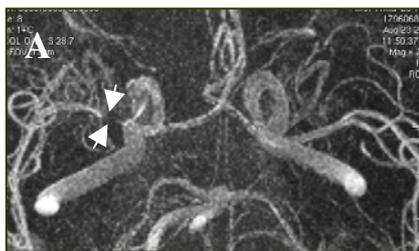
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**Background:** Patients with symptomatic middle cerebral artery (MCA) stenosis are at high risk of recurrent stroke<sup>1</sup>. Only indirect imaging of intracranial atherosclerosis is currently available. We aimed at studying high-resolution MRI (HR-MRI) as direct and non-invasive imaging of MCA plaques<sup>2-3</sup>.

**Methods and results:** HR-MRI was performed in six patients, with MCA atherosclerotic stenosis as documented by angiographic indirect methods (Figure A). For direct imaging of the vessel lumen and wall, we followed a black blood and multicontrast approach using high spatial resolution (0,41 mm of in plane resolution and 2.5 mm slice thickness). HR-MR, short-axis, images were acquired at the level of MCA stenosis and of normal MCA segments with the following parameters: MRA 3D-TOF images were obtained in an axial plane and used as a localizer (TR/TE 27/6.9, field of view [FOV] 24x16, thickness 1.6 mm, matrix 320x256, number of excitations [NEX] 1). To avoid flow artefacts, black-blood T2- and PD-weighted images were acquired along MCA short axis (10 sections, TR/TE 3500/70 for T2-weighting, TR/TE 2600/15 for PD-weighting, [FOV] 12x12 cm<sup>2</sup>, thickness 2.5 mm, matrix 288x288, [NEX] 5), a post-contrast sequence was obtained 5 minutes after gadolinium injection (TR/TE 1500/15, [FOV] 12x12 cm<sup>2</sup>, thickness 2.5 mm, matrix 288x288, [NEX] 5). A long TR was used to increase contrast and to reduce flow artefacts. A presaturation pulse was also applied transversely to saturate incoming arterial blood flow. To accurately delineate and estimate MCA stenosis, a high-resolution contrast-enhanced 3D MRA was performed (TR/TE 6.5/1.7, field of view [FOV] 24x19, thickness 0.8 mm, matrix 512x416, [NEX] 1). Data imaging and analysis showed a significant, focal, arterial wall thickening underlying each MCA stenosis (Figures B & C). The mean wall (plaque) area was 6.99 mm<sup>2</sup> (range 4.42 mm<sup>2</sup> to 12.06 mm<sup>2</sup>). No significant wall thickening was measured in normal segments of the MCA.

**Conclusion:** HR-MRI provides a non-invasive method to study, in vivo, the burden and pathogenesis of intracranial atherosclerosis<sup>4</sup>. Further studies on larger population of patients are required to confirm these data.



### References:

1. Kern R, et al. *Neurology*. 2005.
2. Fuster V, et al. *J Am Coll Cardiol*. 2005.
3. Yuan C, et al. *J Magn Reson Imaging*. 2004.
4. Klein I, et al. *Neurology*. 2005.