High-resolution vessel wall MRI identifies the source of subarachnoid hemorrhage in patients with multiple aneurysms: preliminary results

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Introduction

High-resolution vessel wall MRI is increasingly being used to study intracranial vascular disease. Early experience has demonstrated potential utility of the technique in differentiating quiescent from active intracranial atherosclerosis, and reversible cerebral vasoconstriction syndrome from CNS vasculitis. We hypothesized that vessel wall enhancement would be demonstrated at points of intracranial vessel wall disruption, i.e., rupture. Herein, we report for the first time intracranial vessel wall imaging in the context of hemorrhagic stroke.

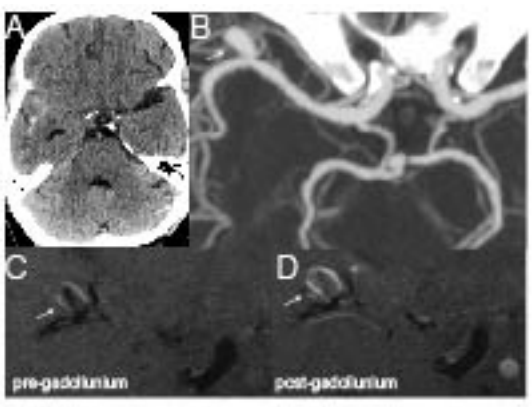
Methods

A total of 3 patients with ruptured aneurysms were imaged using a high-resolution (3T) vessel wall MRI protocol prior to endovascular treatment between November 2011 and March 2012. This included a T1-weighted black blood vessel wall sequence before and after intravenous gadolinium. The rupture status of an aneurysm was determined by the pattern of SAH on non-contrast CT and aneurysm morphology. Clinical and imaging data were prospectively analyzed.

Results

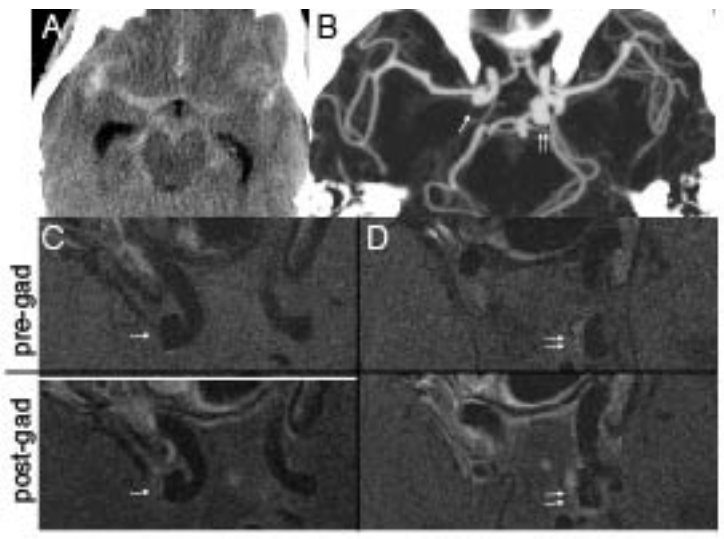
There were 3 patients who presented with aneurysmal SAH. In 2 of the 3 cases, multiple aneurysms were demonstrated on CT and conventional catheter angiography. All ruptured, and no unruptured, aneurysms showed thick vessel wall enhancement. All patients also demonstrated T1-weighted hyperintense blood product in the wall of the ruptured aneurysm (n=1), or immediately adjacent brain (n=3).

Patient 1



63F with ruptured R MCA aneurysm

Patient 2



52F with ruptured L PComA aneurysm in setting of mirror aneurysms

Conclusions

These 3 cases represent the first application of high-resolution vessel wall MRI in the context of hemorrhagic stroke. All cases of ruptured aneurysms demonstrated (1) thick vessel wall enhancement and (2) T1-hyperintense blood product in the wall of the ruptured aneurysm or immediately adjacent brain. These findings support the hypothesis that vessel wall imaging can identify points of intracranial vessel wall disruption. This may prove useful in determining the source of intracranial hemorrhage in patients with multiple aneurysms or ruptured AVMs.

Learning Objectives

By the conclusion of the session, participants should be able to: (1) Describe the technique and indications for high-resolution vessel MRI in the investigation of cerebrovascular disease and (2) Understand its emerging role in the identification of the source of SAH in patients with multiple aneurysms.