Value of Non-Contrast MRA in Vasculopathic Patients

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Renal disease is common in patients with vascular disease. Comprehensive cross-sectional evaluation of the arteries becomes limited in such patients, due to concerns with contrast nephrotoxicity with iodinated contrast with CT angiography and Nephrogenic Systemic Fibrosis with gadolinium-based agents for MR angiography. I will provide a review of non-contrast-enhanced MRA techniques, focusing on some recently described newer methods utilizing fast spin echo (FSE) and balanced steady state free precession (SSFP) readouts, and their potential applications in clinical practice.

1. **Traditional techniques**
   - Time of flight angiography is a well-established technique which is particularly useful in neurovascular imaging.
   - Phase contrast MRA

2. **FSE-based MR angiography**
   - Theory: exploitation of arterial flow differences between systole and diastole to create subtraction bright blood MRA
   - Scan technique and challenges
   - FSE MRA for peripheral arterial disease and distal extremity imaging

3. **SSFP-based MR angiography**
   - Techniques for peripheral arterial disease:
     - Flow-sensitizing dephasing gradient prepared 3D SSFP MRA: a subtraction based technique similar to FSE MRA that utilizes dephasing gradients to dephase arterial blood in systole
     - Quiescent interval single shot 2D MRA: a single shot 2D technique that is simple to perform and relatively robust to patient motion
   - Central MRA:
     - 3D SSFP with fat suppression +/- T2 preparation: an effective technique for large central vessels, with breath-hold volumetric imaging possible using image acceleration
     - In-flow inversion recovery techniques: inversion pulses are used to suppress background tissue/venous structures, depending on fresh arterial inflow for arterial contrast. These are particularly effective for the abdominal aorta and visceral vessels

**References:**

1. Miyazaki M, Lee VS. Radiology 2008;