

Non-Contrast MRA

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In this lecture, I will review the basis and applications of several recently developed non-contrast-enhanced MRA techniques. These offer the potential for evaluation of central and peripheral arteries without the need for exogenous contrast agents, particularly important in vascular patients who have concurrent renal impairment (1). Techniques to be reviewed include subtraction based techniques using fast spin echo (FSE) and balanced steady state (SSFP) readout, and non-subtraction based SSFP techniques that rely on fresh arterial inflow into the acquisition.

The following techniques will be discussed:

1. FSE based MRA (FSE MRA):

- a. Theory: exploitation of arterial flow differences during systole and diastole to create subtraction bright blood images (2)
- b. Scan technique
- c. Optimizing flow sensitivity (3) and potential pitfalls
- d. Clinical applications and performance

2. SSFP with flow sensitized dephasing gradients (FSD-SSFP MRA):

- a. Theory: application of a dephasing gradient during arterial systole with subtraction of systolic from diastolic images for bright blood MRA (4)
- b. Scan technique including appropriate selection of dephasing gradient strength
- c. Pitfalls
- d. Clinical performance

3. Inversion recovery 3D MRA:

- a. Theory: inversion pulse(s) suppress background and inflowing venous blood, while fresh inflowing arterial blood provides bright arterial signal (5)
- b. Challenges of inflow techniques: respiratory motion suppression, adequate arterial inflow
- c. Clinical applications and performance

4. Quiescent interval single shot MRA (QISS MRA):

- a. Theory: 2D technique employing slice-selective saturation and a quiescent time interval for inflow of arterial blood (6)
- b. Scan technique
- c. Clinical applications and performance

References:

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