Pulmonary MR Angiography in 50 Patients: Clinical Experience

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Introduction

CT angiography (CTA) has become the dominant technique for investigating patients with suspected pulmonary embolus. The well documented limitations of ventilation-perfusion scans have led to the search for an alternative examination in patients with renal insufficiency or contrast allergy in whom CTA is contraindicated. We report on our experience of 50 patients who underwent MR angiography for suspected pulmonary embolus.

Methods

Pulmonary MRA was performed 50 patients with known or suspected pulmonary embolus between 11/2001 and 9/2003. Examinations consisted of a 3-plane localizer followed by sagittal MRA of each lung with a 0.1 mm/kg contrast dose. A test bolus was performed to determine the contrast arrival time in the pulmonary arteries. Typical parameters for the 3D SPGR MRA sequence included: TR/TE 3.4/1.2 ms, flip angle 30, bandwidth 82-125 kHz, FOV 34x26, acquisition matrix 256x192-224, section thickness 1.4-2.2 mm, 25-35 sections. Parameters were adjusted according to patient size and breath hold capacity. Typical acquisition times ranged from 12-20 seconds. In patients with severe shortness of breath a parallel imaging technique (ASSET) was employed to reduce the acquisition time. A third acquisition was performed in most patients, consisting of an axial fat-saturated 3D SPGR sequence (FAME) with section thickness 4 mm. 5-10 ml of contrast was injected for this final sequence. CTA correlation was available in 15 patients.

Results

Pulmonary MRA was successful in 45/50 patients, with 14 positive for pulmonary embolus and 31 negative. Studies were indeterminate in 5 patients secondary to respiratory motion artifact. In the 15 patients who had CT correlation, 12 examinations were positive for pulmonary embolus and 3 were negative (Fig. 1). There were no discrepancies between CT and MRA in these patients. Important additional findings were seen in 10 patients, and these included large effusions, pulmonary infiltrates, pulmonary vein occlusion, SVC occlusion, and lung cancer.

Discussion and Conclusions

Pulmonary MRA was well tolerated by most patients and appears to be a valid alternative in patients with suspected pulmonary embolus who have contraindications to CTA. Spatial resolution is lower than that achieved with multidetector CT, and therefore this technique may be less accurate in detecting small emboli in subsegmental arteries. The major limitation of MRA occurred in patients who were unable to suspend respiration, where motion artifacts were significant and severely compromised image quality. Time-resolved, lower resolution techniques may be helpful in this patient population. The axial FAME sequence was subjectively easier to interpret than sagittal acquistions, perhaps because of the familiarity of the imaging plane as well as slightly higher SNR.

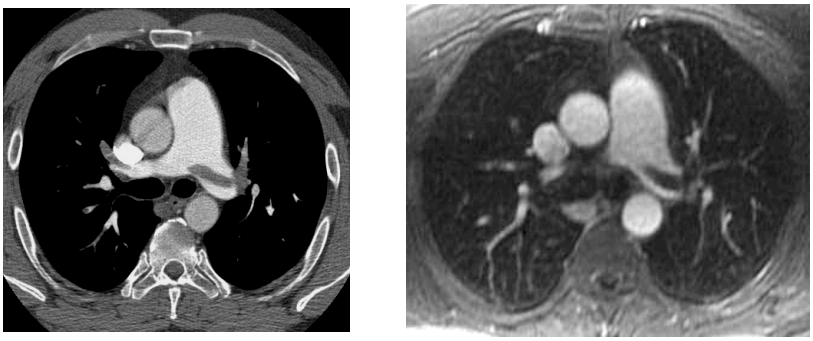

Fig. 1. Corresponding images from CTA (left) and MRA (right) reveal thrombus in the left main pulmonary artery and left upper lobe branches. Smaller emboli are also present in proximal right pulmonary arteries.