

## Evaluating Peripheral Artery Disease (PAD) with ECG Gated (FS-FBI) Non Contrast-MRA (NC-MRA)

BZ Cooper<sup>1</sup>, R Singh<sup>1</sup>, R Griffith<sup>1</sup>, M Grimaldi<sup>1</sup>, PV Viswanath<sup>2</sup>, E Wilson<sup>1</sup>  
<sup>1</sup>Pocono Medical Center, <sup>2</sup>Pace University

**PURPOSE:** Lower extremity PAD is the third leading cause of atherosclerotic cardiovascular morbidity<sup>1</sup>. The benefit of a noninvasive, non-contrast diagnostic tool to comprehensively assess peripheral vessels in patients with PAD is clear<sup>2</sup>. NC-MRA has been used to evaluate PVD but its ability to accurately detect the severity of stenosis and occlusion has not been well documented in the literature. The purpose of this work is to evaluate the sensitivity, specificity and accuracy of ECG gated NC-MRA in the detection of clinically significant (>50%) stenosis, occlusions, reconstitution of flow and identification of target vessels for revascularization.

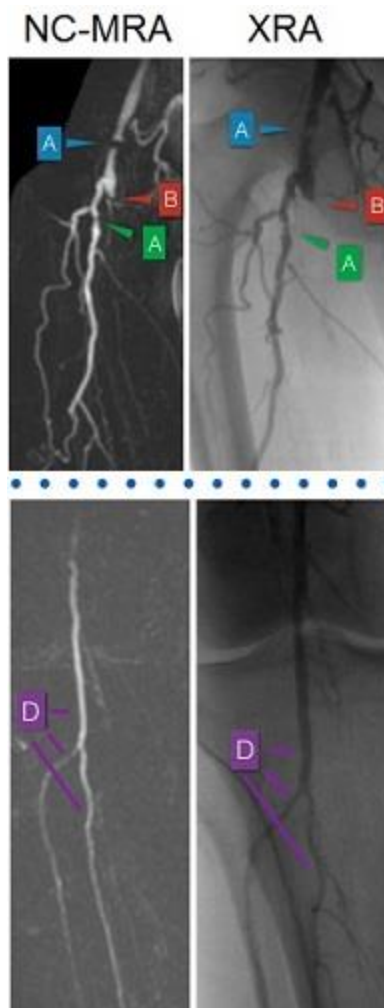
**METHODS:** Ten (10) patients with symptomatic PAD who were referred for peripheral XRA underwent NC-MRA of the bilateral lower extremities using a 1.5 Tesla MRI (Vantage Titan™, Toshiba) immediately prior to undergoing XRA. A three-station runoff was performed using auto-ECG. Appropriate flow-spoiling gradient pulses on the readout axis were used to optimize the separation of arteries and veins. Source, subtracted and MIP data sets were reviewed in order to define image quality (IQ), disease location, and severity. Severity of stenosis of arterial segments as demonstrated by NC-MRA and corresponding XRA were scored using a 4 point scale; No stenosis (<50%), Moderate stenosis (50-79%), severe stenosis (>80%) and occluded. IQ was assessed with a three point scale (1-Poor/inadequate, 2-Acceptable, 3-Excellent). Sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV) and accuracy were calculated.

**RESULTS:** 216 segments were evaluated. The sensitivity, specificity, PPV, NPV and accuracy in the detection of stenoses (>50%) was 95.0%, 94.2%, 73.1%, 99.1%, 94.3%. The sensitivity of NC-MRA in the detection of occlusions, reconstitutions and identification of target vessels was 100%, 92.3% and 40.0%. Diagnostic information provided by MRA was sufficient in 9/10 patients. MRA provided additional valuable information that was not provided by XRA in 6/10 patients. The average Quality of MRA images was 2.72 (165-3, 42-2, 9-1). Average time for three-station runoff was 44 (Max 56/Min 30) minutes.

**CONCLUSION:** We have demonstrated that NC-MRA is a valuable diagnostic imaging modality that may be used to comprehensively assess the severity and location of PAD. NC-MRA may be used as a guide in preoperative planning of interventional procedures. The limitations of NC-MRA include its limited ability to confidently identify target vessels when revascularization is needed and its limited ability to image severity of disease within a vascular stent.

**REFERENCES:** (1) Fowkes FG et al. *Lancet* 2013; 382(9901):1329-40. (2) Pollak AW et al. *Circ Cardiovasc Imaging* 2012;5:797-807.

**Figure 1:** NC-MRA and XRA images of the same patient at corresponding locations (A) Severe stenosis Common Femoral Artery (B) Occlusion of Superficial Femoral Artery (C) Moderate stenosis Deep Femoral Artery (D) Reconstitution of popliteal artery and three target vessel for revascularization



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