Quantification of arterial wall inflammation in patients with arteriitis using high resolution DCE-MRI: A Correlation Study with 18F-FDG PET-CT

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Purpose: To compare 18F-FDG-PET-CT, which is used clinically to detect inflamed arteries and to monitor anti-inflammatory treatment in patients with arteriitis, to high resolution dynamic contrast-enhanced MRI (DCE-MRI) in its ability to measure and quantify inflammation in carotid and vertebral arteries (1). Results of DCE-MRI were correlated with the gold standard 18F-FDG-PET-CT.

Methods and Material: DCE-MRI of the carotid/vertebral arteries of 12 patients with suspected arteriitis was acquired at 3T (2D-SR-SGRE) using a dedicated 4-channel surface neck coil. Patients underwent 18F-FDG-PET-CT within one week of the MRI scan. The maximum standardized uptake value (SUV) was measured on PET-CT images at the identical location as the ROIs were set on the MR images. Time curves were fitted to a two-compartment kinetic model (2) for the MR images to generate values, among others, for the following parameters: plasma flow (PF), plasma mean transit time (PMTT) and extraction flow (EF) across the capillary wall.

Results: 6 out of 12 patients were diagnosed with arteriitis. SUV was significantly higher in patients with than in patients without arteriitis (1.9 vs. 1.2; p<0.001). SUV correlated positively with EF (r=0.71; p<0.001) and PMTT (r=0.6; p<0.001) and correlated negatively with PF (r=-0.49; p<0.002). Patients with arteriitis as diagnosed by PET-CT had significantly larger EF compared to patients without arteriitis (p<0.05).

Conclusion: DCE-MRI is applicable to non-invasively measure and quantify arterial inflammation with good correlation to 18F-FDG-PET-CT. This method might be useful in the diagnosis of arteriitis and in monitoring anti-inflammatory therapy.

Figure 1: Images of a 46 year old female patient with Takayasu Arteritis. Images on the left show the PET-CT images with a substantial FDG-uptake in both carotid arteries. The image in the middle show the DCE images and the output file with the quantitative MR parameters.

References