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

C. C. Cyran[1], T. Saam[1], S. Soubron[1], J. G. Raya[1], K. Bochmann[1], M. Hacker[2], A. Rominger[2], P. Bartenstein[2], T. Pfefferkorn[3], M. Dichgans[3], M. F. Reiser[1], and K. Nikolaou[1]

[1]Department of Clinical Radiology, University Hospitals Munich - Grosshadern, Munich, Germany, [2]Department of Nuclear Medicine, University Hospitals Munich - Grosshadern, Munich, Germany, [3]Department of Neurology, University Hospitals Munich - Grosshadern, Munich, Germany

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.

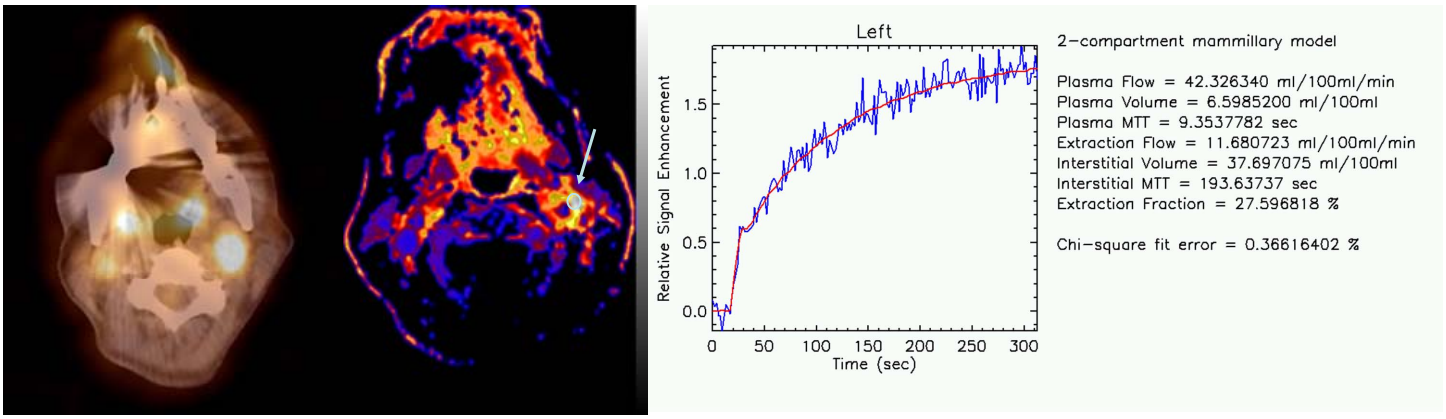

Figure 1: Images of a 46 year old female patient with Takayasu Arteriitis. Images on the left show the PET-CT images with a substantial FDG-uptake in both carotid arteries. The image in the middle show the DCE images and the output file with the quantitative MR parameters

References

(1) Kerwin WS et al. Radiology. 2006 Nov;241(2):459-68.
(2) Brix et all. MRM 2004, 52: 420-429.