

High-Resolution Black-Blood Contrast-Enhanced T1-Weighted Images for the Diagnosis of Intracerebral Arteritis: Preliminary Results

T. Saam¹, C. C. Cyran¹, K. Bochmann¹, O. Dietrich², M. F. Reiser¹, and K. Nikolaou¹

¹Institute of Clinical Radiology, LMU University Munich, Munich, Bavaria, Germany, ²Josef Lissner Laboratory for Biomedical Imaging, Dept. of Clinical Radiology, Josef Lissner Laboratory for Biomedical Imaging, Munich, Bavaria, Germany

Purpose: Primary arteritis of the central nervous system (CNS) is a heterogeneous group of CNS disorders which is characterized by nonatheromatous inflammation and necrosis of blood vessel walls. The clinical presentation of this disease is highly variable and the most common symptom is a stroke from vascular involvement. Conventional angiography is considered to be the best imaging tool to diagnose the disease, however, angiographic findings are often unspecific and brain biopsy is therefore often needed to confirm the diagnosis¹. The purpose of this study was to evaluate high-resolution black-blood T1-weighted pre- and post-contrast sequences with fat suppression for the diagnosis of CNS arteritis.

Material & Methods: 10 subjects had their intracranial arteries imaged at 3.0T (Magnetom Verio, Siemens Healthcare, Erlangen, Germany) using an 12-channel head coil and a high-resolution multi-sequence protocol (contrast-enhanced MRA, T2 and pre- and post-contrast black-blood T1-weighted images with fat suppression; best in-plane resolution $0.2 \times 0.2 \text{ mm}^2$, slice thickness 3 mm, total scan time 22:52 minutes). One subject had a focal inflammation of the right vertebral artery diagnosed by PET-CT, one subject with a history of pontine strokes had a high clinical suspicion of having CNS arteritis and 8 subjects with arterial dissections in their cervical arteries had no suspicion of inflammatory changes of their intracranial vessel walls.

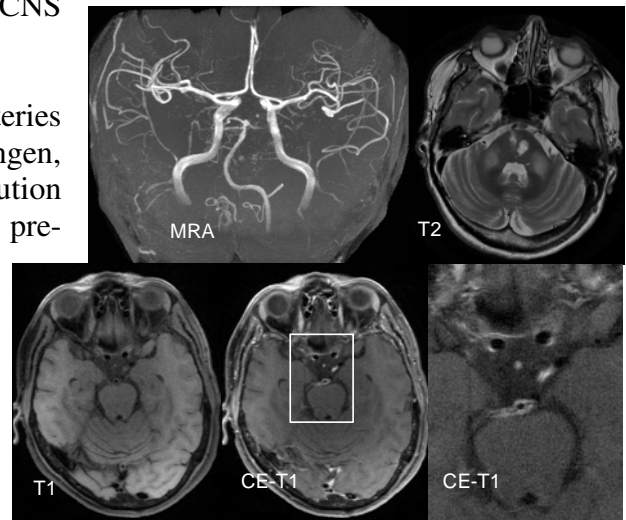


Figure 1. 56 year old subject with a history of pontine strokes, unclear neurological symptoms and inflammatory cells in the liquor. The MRA shows some lumen irregularities in the distal basilar artery and the right SCA, however, findings are unspecific and no definite diagnosis can be made. Post contrast T1W images show a strong uptake of contrast media in the distal basilar artery and the posterior cerebral artery, confirming the diagnosis of a CNS arteritis.

Results: All MRI exams were of diagnostic image quality. Figure 1 shows images of a 56-year-old subject with unclear neurological symptoms, a history of pontine strokes and inflammatory cells in the liquor. MR angiography showed unspecific lumen irregularities in the basilar and right SCA artery. Post contrast T1-weighted images showed strong contrast enhancement in the distal basilar artery and the posterior cerebral arteries, confirming the diagnosis of CNS arteritis. Figure 2 shows images of a 47-year-old subject with a history of cerebellar strokes and a dissection in the left vertebral artery. PET-CT in this patient showed inflammatory changes with pathological FDG-uptake in the dissected vertebral artery (images not shown). Contrast-enhanced T1w images showed strong contrast enhancement in the dissected left vertebral artery, indicating focal arteritis. All other scanned subjects did not show any contrast enhancement in their arterial walls.

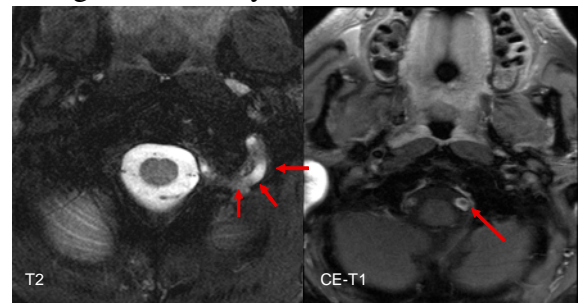


Figure 2. 47 year old subject with a history of left cerebellar infarction and an arterial dissection the left vertebral artery. T1-weighted contrast enhanced images show strong contrast uptake in the dissection left vertebral artery, indicating focal arteritis. T2-weighted images show the hematoma of the arterial wall.

Conclusion: First experience indicates that contrast-enhanced, black-blood T1-weighted images with fat suppression might be useful for the diagnosis of CNS arteritis. This information might be useful to avoid invasive procedures, such as conventional angiography and / or brain biopsies. Further studies are needed to confirm these initial promising results.

References:

¹ Osborn et al. *Diagnostic Imaging*. 2004 First Edition