

## Time-resolved MR-angiography of the hand with a 8-channel surface coil and parallel acquisition technique (PAT)

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### Introduction:

Contrast material-enhanced three dimensional (3D) magnetic resonance angiography (MRA) of the vessels of the lower extremities has become well established as a safe, reliable and accurate means for the evaluation of pathologies of this region. However, imaging the small vessels of the wrist and hand is much more challenging and places special demands on this technique. The vessels in the hand are of a much smaller caliber and the delay between injection and delivery of contrast material to the distal extremity is highly variable. Additionally, arterial and venous collaterals as well as vascular variants are more commonly making images difficult to interpret. Therefore, MRA of the hand requires high resolution to accurately depict the superficial and deep palmar arches and short scan times are mandatory to avoid venous contamination. Parallel acquisition techniques (PAT) allows a substantial reduction of scan time and may be helpful to fulfil these contradictory requirements. The aim of our study was to introduce a protocol for dynamic high resolution contrast-enhanced MR-angiography of the hand arteries using an 8-channel surface coil and parallel acquisition techniques (PAT).

### Methods and Materials:

5 Patients (3 men, 2 women, mean-age: 52 years) with digital ischemia and 5 healthy volunteers (3 men, 2 women, mean-age: 31 years) were examined. All MRI examinations were performed on a 1.5T System (Magnetom Avanto, Siemens AG, Erlangen) using an 8-channel receiver coil. Following automatic injection (flow rate 4ml/s) of 0.1 mmol/kg Dotarem® (Guerbet, Roissy, France). 8 consecutive 3D-data sets were collected using a T1-w 3D gradient echo sequence (TR: 2.6 ms, TE: 0.92 ms, FA: 20°, voxel size: 1.2 x 1.2 x 1.5 mm<sup>3</sup>). The MR data sets were evaluated of overall image quality and visualization of vascular details.

### Results:

The 8-channel surface coil combined with a PAT-factor (GRAPPA) of 6 results in a scan time of only 3 seconds per 3D-data set. The radial and ulnar artery showed simultaneous enhancement with subsequent filling of the meta- and intercarpal vessels. In all volunteers the superficial and the deep palmar arches and the metacarpal vessels could be evaluated without venous overlay. 4/5 patients showed dysfunction of the arterial vessels of the forearm and/or the hand. The high temporal resolution of the dynamic MRA protocol allowed visualization of retrograde filling of the ulnar or radial artery (Fig. 1). The spatial resolution was sufficient to evaluate the palmar arches and the metacarpal vessels.

### Discussion:

Multi channel surface coils combined with high PAT-factors allow time resolved 3D MRA of the hand and wrist with high spatial resolution. This protocol providing morphologic and functional information might be helpful especially in patients with arteriovenous malformations and for arterial mapping prior to surgery.

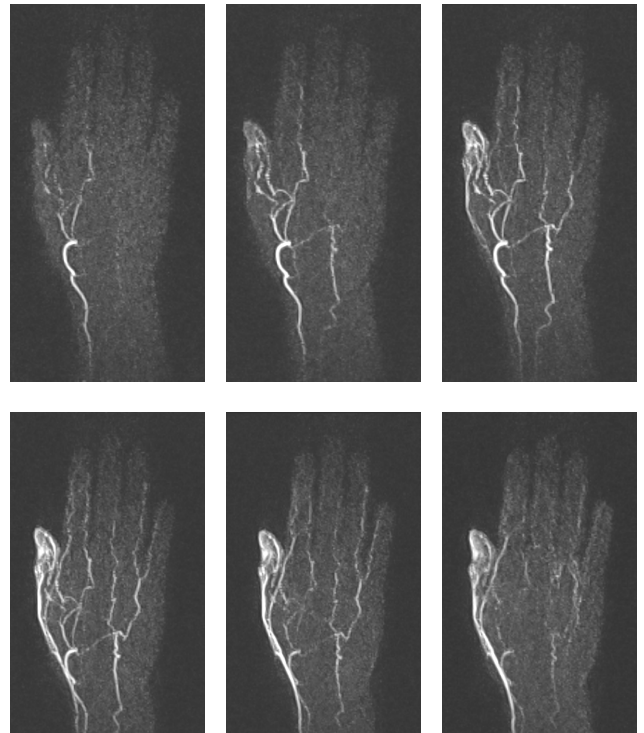


Fig. 1: Time-resolved MRA of the right hand shows a retrograde filling of the ulnar artery