

# Highly accelerated contrast-enhanced, time-resolved peripheral three-dimensional magnetic resonance angiography with submillimeter spatial resolution at 3.0 Tesla

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## Purpose

To prove the feasibility and clinical relevance of a fast contrast enhanced, time-resolved three-dimensional magnetic resonance angiography (3D MRA) with submillimeter spatial resolution at high magnetic field strength.

## Methods and materials

15 patients (2 female, 13 male, mean age  $62 \pm 14$  years) were examined on a 3.0 Tesla whole body MR system (Achieva, Philips Medical Systems, Best, Netherlands) with an 8-channel head coil for preoperative evaluation of the pedal arterial system and its capability for pedal bypass surgery. Time resolved 3D MRA of the foot was performed after automatic injection of 0.1 mmol/kg gadobenate-dimeglumine (Multihance®, Altana-Pharma, Konstanz, Germany) using a sagittal T1-weighted gradient echo sequence (TR/TE 4.2/1.6 ms, flip angle 30°, field-of-view 290 mm, matrix 352, 120 slices, slice thickness 0.8 mm) with a spatial resolution of 0.8 x 0.8 x 1.6 mm, reconstructed to 0.6 x 0.6 x 0.8 mm and a temporal resolution of 3.9 seconds using keyhole and SENSE technology (SENSE factors 4 (in antero-posterior direction) and 2 (in right-left direction)). Dynamic subtractions and rotating maximum intensity projections were calculated. The original image data sets were transferred to a dedicated work station (View Forum, Philips Medical Systems, Best, Netherlands) for objective CNR analysis of the arteries. Subjective image analysis was done by two radiologists.

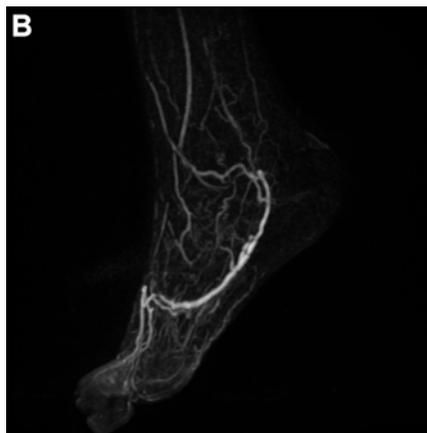
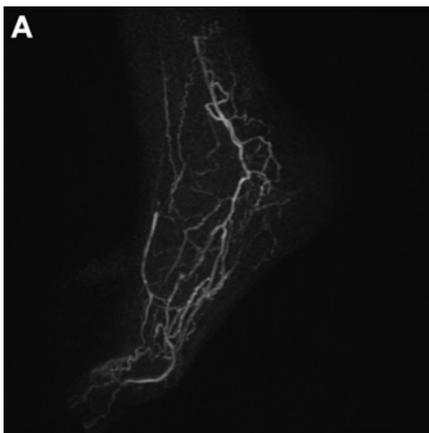
## Results

In all patients diagnostic quality was achieved. Despite the known limitations regarding signal intensity measurements in images acquired with the use of parallel imaging technique, signal-to-noise- and contrast-to-noise ratios proved to be excellent with 301 ( $\pm 177$ ) and 250 ( $\pm 161$ ), respectively.

Although most of the patients suffered from diabetic foot syndrome with arterio-venous shunting, in each case arteries and the potential vessel for bypassing could be clearly separated from veins due to the temporal information given by our study. The ability to reliably discriminate arteries from veins is of high clinical relevance in the preoperative planning prior to pedal bypass surgery.

## Conclusion

Fast contrast-enhanced, time-resolved 3D MRA of the foot at 3.0 Tesla is feasible and of high clinical value for the preoperative evaluation of the arterial supply of the foot.



Figures show a maximum intensity projection of the pedal vessels in an arterial (A) and a venous phase (B)