

## **High Resolution arterial MRA of the lower limb by hybrid k-space reconstruction before and after administration of Vasovist bloodpool contrast agent**

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**Problem:** Resolution in arterial CE MRA is limited by the time the contrast agent is not distributed into venous vessels. Using the bloodpool contrast agent gadofosveset trisodium a long time is available for the acquisition of high resolution MRA with arteries and veins. The latter, however, hinder the assessment of the arteries. The calculational combination of both may generate images with higher diagnostic value [1]. This paper shows a method to combine the two data sets to create high resolution arterial MIPs of the lower limb.

**Materials and Methods:** 3D CE MRA was performed using a 1.5T MR scanner (Magnetom Avanto, Siemens) for 18 patients after informed consent was obtained. 10 ml of the bloodpool contrast agent gadofosveset trisodium (Vasovist, Schering) (initial experience [2]) was applied at a flow rate of 1 ml s<sup>-1</sup>. 8-channel parallel imaging was performed before contrast agent administration, during the first pass (both isotropic resolution 1.3 mm) and in steady state (isotropic resolution 0.65 mm) phases of the contrast agent. First pass and steady state volumes were 3D Fourier transformed and central k-space of the high resolution data was replaced by low resolution data after adjustment of intensities. From the inverse transformed hybrid volume the interpolated native intensities were subtracted to create high resolution arterial MRAs without venous contributions. Contrast enhanced arteries were then displayed as MIP images.

**Results:** For 8 patients the method was successfully applied resulting in high resolution arterial MRA MIPs with good contrast and sharpness. Contributions of the veins were almost completely erased. One example is shown in Figure 1. For 1 patient the first pass images did not exhibit contrast enhancement and could not be used. For 3 patients veins were contrast enhanced in first pass images due to ulcers and could not be used to cast only arteries. For 2 patients the images were corrupt by motion during acquisition. For 4 patients considerable motion of the legs occurred in-between subsequent measurements resulting in blurred hybrid images.

**Conclusion:** The bloodpool contrast agent Vasovist can be used to acquire high resolution steady state MRAs of the lower limb that can be combined mathematically with first pass images and native volumes to produce high resolution arterial MRA MIPs. The main source of failure of the method is patient motion.

### **References:**

- [1] Hartmann M, Wiethoff AJ, Hentrich HR et al., Eur Radiol Suppl 16, B15-B23 (2006).
- [2] Nikolaou K, Kramer H, Grosse C et al. Radiology 241(3), 861-872 (2005).

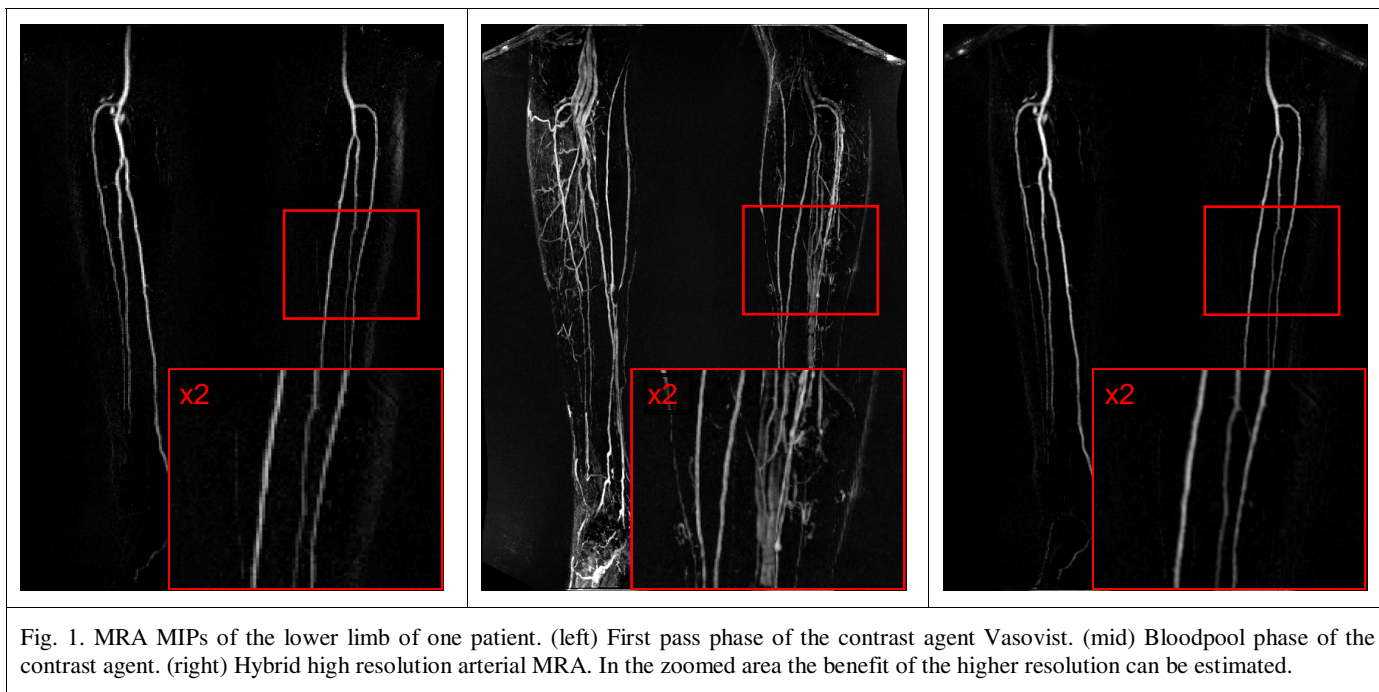


Fig. 1. MRA MIPs of the lower limb of one patient. (left) First pass phase of the contrast agent Vasovist. (mid) Bloodpool phase of the contrast agent. (right) Hybrid high resolution arterial MRA. In the zoomed area the benefit of the higher resolution can be estimated.