

**Experimental Study about Optimization of Parameter Values for Magnetic Resonance
Angiography (MRA) using Ulcerated Model of Stenotic Internal Carotid Artery**

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Purpose: MRA was proved to be an unreliable study for the evaluation of a subtle change of ulceration due to its inherent signal loss by static or turbulent flow. To improve the detectability of the ulceration within atheroma, we filled a vascular phantom with gadolinium solution, having various concentrations, during various MR sequences.

Materials and Methods: Imaging was performed on a 1.5 Tesla Magnetom Vision (Siemens Medical System, Erlangen, Germany) with 2D-TOF (TR/TE/FA=25/9/25) and 3D-TOF (TR/TE/FA=30/6/20) MRA sequences. Several vascular phantoms made of elastic silicon mimicking ulcerated stenotic internal carotid artery (ICA) were constructed, and gadolinium solution with different concentration (1:1000 and 1:200 of Gd-DTPA) and distilled water were introduced into the vascular phantoms using a computerized pulsatile pump. To evaluate the maximum intensity projection (MIP), multiple planar reconstruction (MPR) and source images, axial and coronal images of MRA with 2D-TOF and 3D-TOF were reviewed. Each images of various sequences were compared with plain x-ray films of each phantom filled with barium.

Results: The images of the phantom of the normal carotid bifurcation were superior to the images of ulcerated and stenotic phantoms on all MR sequences. MPR was the best image followed by MIP and coronal source images for detecting and defining ulceration and stenosis. Better quality images were obtained when a higher concentration of Gd-DTPA was used and when 3D-TOF technique instead of 2D-TOF technique was applied.

Conclusion: This study revealed that a combination of a higher concentration gadolinium with MPR on 3D-TOF technique could be optimal for the evaluation of an ulceration or/and stenosis at the bifurcation of the carotid artery.