# High resolution time-of flight MRA using slice selective saturation transfer contrast and water excitation technique for the visualization of the Lenticulostriate arteries at 1,5T

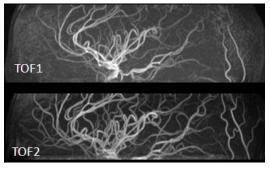**F. Admiraal-Behloul[1], E. Blink[1], B. Zhang[1], and M. Miyazaki[2]**

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**Purpose:** the aim of this preliminary study was to investigate the ability of high resolution 3D time-of flight (TOF) angiography to visualize the Lenticulostriate arteries (LSAs) at 1,5 T ,using a Slice-Selective Off-Resonance Sinc Pulse-Saturation Transfer Contrast (SORS-STC) with inclined profile selective excitation (ISE) and water excitation technique.
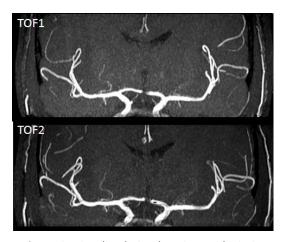
**Material and Methods**: we scanned 10 healthy volunteers (6 man, mean age 38,3 y range: 20-55 y) on a 1,5T MR system (Vantage Titan, Toshiba medical systems, Tokyo, Japan), using the Atlas speeder head coil (11 elements). For each subject, we acquired and compared 2 TOF MRA images: TOF1 with the following parameters: TE=6.8 ms, TR= 28ms, FA (ISE)=10-30, fat saturation : CHESS, speeder factor=2 and Nb acq= 1; TOF2: TE=8ms, TR= 30 ms, FA (ISE)=10-30, Fat saturation= WET (water excitation technique) using a 1-1 binomial RF pulse, speeder factor=2 and Nb acq= 1,. Both TOF1 and TOF2 were acquired with the following spatial resolution: Matrix= 336x336, FOV= 22x22, slice thickness=0,8 mm, acquired voxel resolution = 0.65 x0.65x 0,8 mm , reconstructed to 0,32 x 0,32 x 0,4 mm, number of slices = 56. Acq Time= 5min 45s. Contrast to noise ratio was measure in both images. The visualization of the LSAs was scored on a 3 point scale (1 not visible, 2: visible but very low contrast, 3: visible with fair contrast, 4: visible with a good contrast) on both images. The length of the perforating arteries was measured (when visible) on both images.



**Figure 1**: Sagital MIP reconstructions of TOF1 and TOF 2

**Results**: Figure 1 shows the images obtained using TOF with a CHESS fat saturation technique (TOF1)and WET (TOF2). The contrast to noise ratio was 36,5 ± 5,69 for TOF1 and 80,73±17,45 for TOF 2 . The average score for the visualization of the LSAs was 1,8 ± 0,8 for TOF1 and 2,9 ± 1,1 for TOF2. The average LSA length on the right was 17,74±6,46 mm for TOF1 and 23,12±3,8 mm for TOF2. On the left LSAs the average length was 17,8±5,3 mm for TOF1 and 19,1 ± 6,4mm for TOF2.



**Figure 2**: Visualized LSAs by TOF1 and TOF2 on Coronal MIP reconstructions with a slab thickness of 15 mm.

**Conclusion**: It has been well accepted that LSAs are nearly impossible to visualize on 1,5T and very difficult at 3T clinical MR systems in healthy volunteers. Therefore, LSAs are mainly studied at 7T. This preliminary study shows that is it possible to visualize LSAs at 1,5T clinical scanners using optimized high resolution TOF MRA protocol. Besides the known improvements that SORCS_STC [1] and the inclined profile excitation slab bring to TOF MRA, the use of WET technique improves considerably the CNR compare to CHESS which, unlike WET, uses pre-pulses that could attenuate the blood signal. Further improvements are still possible at 1,5T however this protocol would be even more promising at 3T.

**References:** Miyazaki, M, et al. MRM 32: 52-59, 1994