# Susceptibility-weighted imaging (SWI) delineates the whole length of the optic radiation

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**Introduction:** It was recently reported that some white matter tracts including the optic radiation (OR) are delineated as low signal-intensity bands (LSBs) on T2*-weighted images at 7T, assumedly due to susceptibility effect caused by myelin [1]. Susceptibility-weighted imaging (SWI) is more sensitive to magnetic susceptibility than T2*-weighted imaging. This study examined whether the LSBs lateral to the lateral ventricles (LVs) on 3T SWI represented the OR.

**Methods:** Seven healthy volunteers (3 men, 4 women, mean age of 28 years) entered. On 3T MR (Trio, Siemens), transaxial SWI were acquired with the following parameters: repetition time (TR) / echo time (TE), 27msec / 20msec; flip angle (FA), 15°; matrix, 352–384×448; FOV, 180-197mm×230mm; voxel size, 0.51mm×0.51mm; 88 slices, with 1.2mm thickness. Oblique coronal SWI orthogonal to the plane of the inferior horn of the LVs were also acquired with the same parameters except the number of slices (96 slices) in order to cover the entire OR. For quantification of the LSBs, B: breadth and T: thickness of LSB, and D: distance between medial border of the LSB and wall of the LV were measured in the plane including 1) the tip of inferior horn of the LV, 2) the lateral geniculate body, 3) the trigone of the LV, and 4) the posterior horn of the LV, respectively (Figure, lower row). Also diffusion tensor (DT) tractography (DTT) of the OR were acquired as reference. Diffusion-weighted images were acquired following parameters: TR / TE, 6700msec / 77msec; FA, 90°; matrix, 128×104; FOV, 256mm×208mm; voxel size, 2mm×2mm; 60 slices without intersection gap, with 2mm thickness; b=0, 700 seconds/mm$^2$; MPGs were applied in 40 independent directions. DT calculation and DTT were executed on DTI studio software [2]. DTT parameters and the regions of interest for the OR are described elsewhere [3] (Figure, upper row).

**Results:** Mean measurements of LSBs were, B: 1) 8.4mm; 2) 18.1mm; 3) 20.1mm; 4) 24.9mm, T: 1) 1.5mm; 2) 3.8mm; 3) 3.8mm; 4) 3.2mm, D: 1) 1.5mm; 2) 1.7mm; 3) 2.3mm; 4) 1.7mm, respectively, which were consistent with the anatomical literature regarding the OR [4]. All 14 DTTs of OR overlapped the LSBs posterior to lateral geniculate body, while in the anterior potion (Meyer's loop) all DTTs were sparse compared to LSBs, and 5 of 14 DTTs were not visualized at the tip of inferior horn of the LV.

**Discussion**: Since there is no iron accumulation in the OR [5], there should be other reasons for susceptibility effect of the OR. One of the potent explanations for the LSB are the relatively denser myelination of the OR than surrounding white matter, which was sophisticatedly shown by modified myelin staining [6]. Another possible reason for LSB may be the characteristic vascular structure in the area of OR, where both local arterial and venous networks are layered parallel to the LV [7]. As for DTT, crossing fiber problems with other fiber bundles such as uncinate fascicles or acoustic radiations may have caused the poor visualization of Meyer's loop, while SWI constantly and evidently depicted Meyer's loop, which may have clinical relevance in the preoperative planning and neuronavigation for temporal lobe lesions.

**Conclusion:** SWI delineates the whole length of the OR.

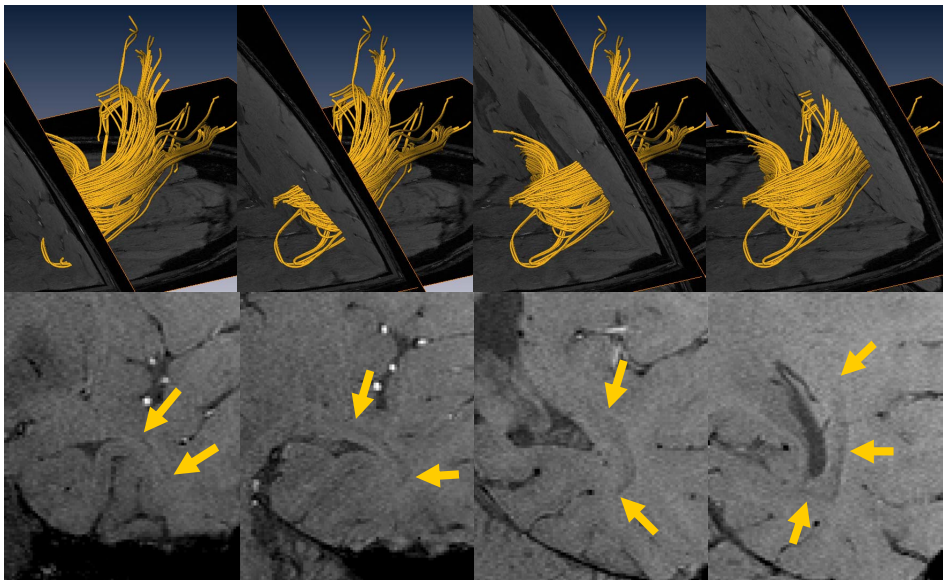

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**Figure.** Upper row, DTT-overlaid SWIs, showing 4 planes of the measurements described in the text; lower row, oblique coronal SWI (corresponding to upper low) clearly show the LSB of OR.