Diffusion Tensor Imaging of the Acoustic Radiation

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Purpose
The purpose of this study was to examine if it is possible to differentiate between the subcortical white matter of the primary auditory cortex (first Heschl gyrus [HG]) and the surrounding white matter in the superior temporal gyrus (STG) by measuring the fractional anisotropy (FA) on high-resolution diffusion tensor images (DTI) in healthy individuals.

Materials & Methods
Six healthy volunteers (three males and three females), aged 26 to 41 years (mean, 32 years) were included in this study. All MR examinations were performed on a GE Signa 1.5 T MR scanner. We used a single-shot pulsed-gradient spin-echo echo-planar sequence and the following parameters: repetition time = 1500 ms, echo time = 116 ms, matrix size = 256 x 256, field of view = 220 x 220 mm, total scan time = 6 min 28 sec with 11 repetitions in each diffusion orientation. Diffusion weighting was applied in 20 orientations with b value = 0 and 1000 s/mm². Two 5 mm thick coronal slices were chosen to include HG. FA maps were created on distant computer console (Sun and SGI). For quantitative analyses of these images, regions of interest consisting 3 x 3 pixels were placed in the HG and STG bilaterally.

Results
The HG was detected on DTI in all volunteers. The mean +/- standard deviation of fractional anisotropy was 0.37 +/- 0.02 and 0.38 +/- 0.01 in the subcortical white matter of the right and left HG and they were higher than that in ipsilateral STG (0.26 +/- 0.02 and 0.28 +/- 0.02 in the right and left STG, respectively). There were significant statistical differences among ipsilateral HG and STG. (P = 0.002 and 0.005 for the right and the left side, respectively) and were no statistical differences in HG and STG compared to the contralateral side. (P = 0.43 and 0.45 in HG and STG, respectively.)

Conclusion
In this study of normal volunteers we found the FA in the subcortical white matter of the HG to be higher than that of the STG in both hemispheres. The difference may be
explained by the auditory radiation near the primary auditory cortex.

References