

## Diffusion tensor tractography in unilateral polymicrogyria with involvement of the precentral gyrus.

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### Introduction

Diffusion tensor MR imaging provides information on diffusion anisotropy, which can be expressed with three-dimensional white matter tractography. This new technique can be used to investigate the macroscopic fiber connectivity of the human brain in vivo. Polymicrogyria is a malformation of cortical development in which neurons reach the cortex but distribute abnormally, resulting in the formation of multiple small gyri. Recent studies show that the primary motor area may be relocated from the precentral gyrus to other areas in patients with cortical malformation involving the precentral gyrus. The purpose of this study is to investigate the corticospinal tract in polymicrogyria for the presence of any macroscopic abnormality or deviation of the corticospinal tract

### Material and Method

Diffusion tensor MR imaging was obtained in two patients with unilateral polymicrogyria involving the precentral gyrus. Imaging was performed on a 1.5 tesla scanner with a single-shot spin-echo echo planar sequence (TR /TE = 6000/78, field of view 24 x 24 cm, matrix 128 x 128) acquiring 30 interleaved contiguous five-millimeter-thick images covering the entire brain. Diffusion gradients were applied in 13 non-collinear directions with b1000s/mm<sup>2</sup> as the peak diffusion gradient. Three-dimensional fiber-tract maps were created on a PC workstation by using our own software. ROI placements for fiber tracking were performed at two levels: internal capsule and the cerebral peduncle at the midbrain level. Tracking of crossing fibers were avoided by setting an obstruction in the mid-sagittal plane.

### Results

In both patients, diffusion tensor tractography depicted the corticospinal tract in the normal side and the affected side. In the first patient the corticospinal tract in the affected hemisphere was deviated medially in comparison with the normal side. In the second patient, the corticospinal tract in the affected hemisphere was deviated posteriorly.

### Discussion

Our cases show that the corticospinal tract in polymicrogyria involving the precentral gyrus may be deviated from the normal course. Diffusion tensor tractography is a promising tool to investigate the course of the macroscopic fiber tracts.

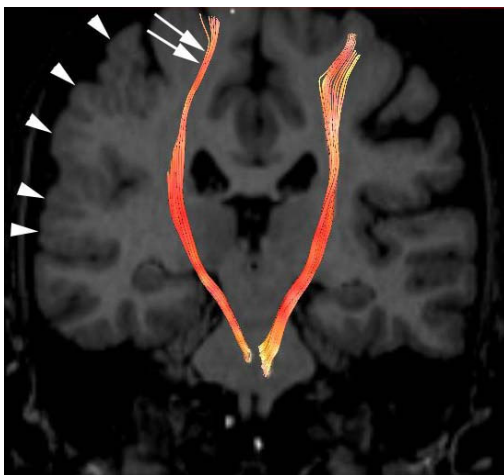


Figure 1. Corticospinal tracts against a coronal section. Polymicrogyria is seen on the right side (arrow heads). Corticospinal tracts on the affected side is deviated medially at high level (arrows).

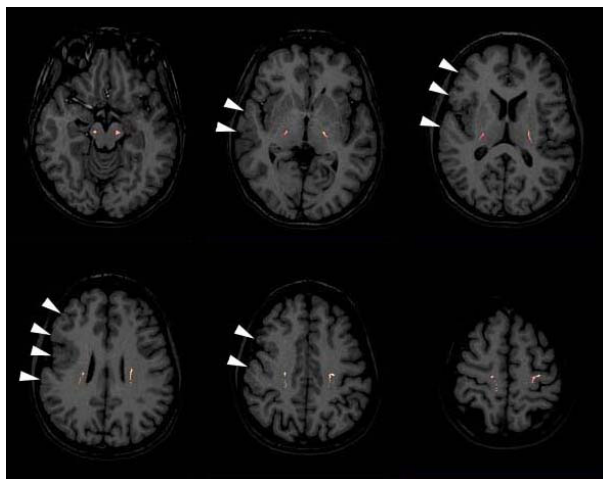


Figure 2. Voxelized corticospinal tracts in axial sections. Corticospinal tract in the affected side is almost normal except near the vertex. Polymicrogyria seen on the right side (arrow heads).