

Asymmetric interhemispheric fiber tracts in patients with hemimegalencephaly on diffusion tensor MRI

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Objective. - The internal structures of cerebral white matter in patients with hemimegalencephaly (HMG) have not yet been investigated except for one which evaluated aberrant fibers. We examined interhemispheric fiber tracts (FTs) passing through the corpus callosum by magnetic resonance (MR) diffusion tensor imaging (DTI).

Methods. - MR studies including DTI were performed in 9 consecutive patients with HMG and 11 patients with West syndrome as disease controls. The interhemispheric FTs passing through the corpus callosum were evaluated in 6 regional geometric subdivisions (Fig 1) each of the 9 HMG and 11 West syndrome patients (54 and 66 subregions, respectively), and the distributions and volume differences between affected and unaffected hemispheres were compared in all subjects.

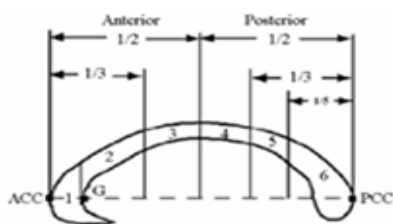


Fig 1

Results. - In patients with HMG, interhemispheric FTs were symmetrically distributed in 27 of 54 corpus callosum subregions (50%). However, the FTs were distributed to different areas in the same lobes in 22 subregions (40%)(Fig 2), and to different lobes in 5 subregions (9%)(Fig 3). FT volumes were symmetric in 35 subregions (65%), while FT volumes on the affected side were greater (Fig 3) and less (Fig 2) than those on the unaffected side in 14 (26%) and 5 subregions (9%), respectively. However, in West syndrome patients, interhemispheric FTs showed symmetric distribution and volume in all regions.

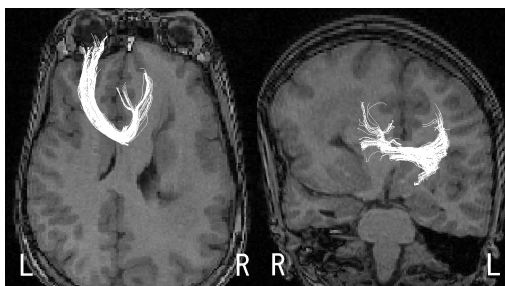


Fig 2 An 11-year-old boy with right HMG. (Left) 3D superior, (Right) 3D anterior views on FT reconstruction demonstrate fibers passing through the genu of the corpus callosum. The FTs run toward different areas in each frontal lobe. The FTs on the affected side run more medially than do those on the unaffected side. In addition, the FTs on the affected side are poorer than those on the unaffected side.

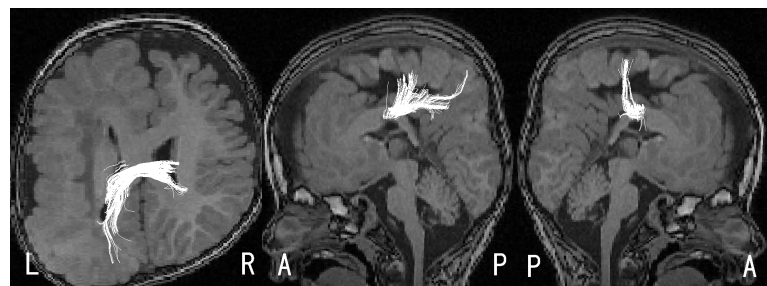


Fig 3. An 8-year-old boy with left HMG. (Left) 3D superior, (Middle) 3D left lateral, (Right) 3D right lateral views on FT reconstruction show fibers penetrating the posterior midbody of the corpus callosum. FTs on the affected and unaffected sides run toward different lobes. The FTs on the affected side are connecting the posterior frontal lobe and the parietal lobe, while the FTs on the unaffected side run toward the posterior frontal lobe. Furthermore, the the FTs on the affected side are richer than those on the unaffected side.

Conclusions. - Asymmetrical interhemispheric FTs were often observed in patients with HMG, and DTI was useful for elucidating the white matter internal structures.