The aims of this study were to detect morphological changes in neuroanatomical components in adult survivors of acute lymphoblastic leukemia (ALL). Voxel-based morphometry (VBM) can be used to detect subtle structural changes in brain morphology and via analysis of fractional anisotropy (FA), diffusion-tensor imaging (DTI) can non-invasively probe white matter (WM) integrity. We used VBM and DTI to examine 20 long-term survivors of ALL and 21 healthy matched controls. Ten ALL survivors received chemotherapy and irradiation; ten survivors received chemotherapy alone during childhood. Imaging was performed on a 3.0-T MRI. For VBM, group comparisons of segmented T1-weighted grey matter (GM) and WM images from controls and ALL survivors were performed separately for patients who received chemotherapy alone and who received chemotherapy and irradiation. For DTI, FA in WM was compared for the same groups. Survivors of childhood ALL who underwent cranial irradiation during childhood had smaller WM volumes and reduced GM concentration within the caudate nucleus and thalamus. The FA in WM was reduced in adult survivors of ALL but the effect was more severe after combined treatment with irradiation and chemotherapy. Our results indicate that DTI and VBM
can reveal persistent long-term WM and caudate changes in children after ALL treatment, even without T2 changes in conventional imaging.