

Appendix 1

The whole brain diffusion-weighted imaging was performed using a bipolar spin echo imaging sequence with consistent parameters: three b values (0, 1000, 2000 sec/mm²) with diffusion encoding in 30 directions for non-zero b value.

Conventional MRI included transversal T2-weighted images [repetition time (TR): 4000 ms; echo time (TE): 100 ms; field of view (FOV): 230 mm × 230 mm; slice thickness: 5 mm; slice gap: 0.5 mm; voxel resolution: 0.7 mm × 0.6 mm × 6.0 mm], transversal T1-weighted images (TR: 400 ms; TE: 8.9 ms; FOV: 230 mm × 230 mm; slice thickness: 5 mm; slice gap: 0.5 mm; voxel resolution: 0.9 mm × 0.7 mm × 6.0 mm) and transversal fluid-attenuated inversion recovery images (FLAIR: TR/TE: 9000 ms/110 ms; inversion time: 2500 ms; FOV: 260 mm × 260 mm; slice thickness: 5 mm; slice gap: 0.5 mm; voxel resolution: 0.9 mm × 0.7 mm × 6.0 mm) were obtained. Post-contrast sagittal three-dimensional (3D) T1-weighted images (TR: 1880 ms; TE: 2.62 ms; section thickness: 1 mm; FOV: 256 mm × 256 mm; voxel resolution: 0.7 mm × 0.7 mm × 0.7 mm) were obtained after whole brain advanced DWI imaging. Contrast medium (0.1 mmol/kg body weight of Gd-DTPA, Magnevist, Schering, Berlin, Germany) was injected at 2 mL/s, followed by a 20 mL 0.9% saline flush using the same injection speed.

The specific imaging processing and regions of interest (ROI) placement methods were as described in our previous studies (17,48,49). All the diffusion data were converted to NIFTI format, and the diffusion-weighted images were co-registered to the non-diffusion-weighted (b=0) images to minimize the artifacts by eddy current correction (eddy correct, FSL) (36,37). The corresponding NODDI metric maps (including Ficvf, Odi and Fiso) were exported using NODDI's Matlab Toolbox (http://www.nitrc.org/projects/noddi_toolbox). DTI and DKI fitting were performed using diffusion-weighted images with different b values. DKE software (<http://www.nitrc.org/projects/dke>, version 2.5.1) was used to calculate DKI metric maps (including Kmean, Kr and Ka) and DTI metric maps (including MD and FA).

A voxel-based nonlinear registration method registered each metric map with an axial FLAIR or 3D-T1 MPRAGE image. The ROIs were manually drawn on tumor parenchyma on the slice of maximum tumor size by consensus between two experienced neuroradiologists.