

Quantitative FA (fractional anisotropy) analysis in mid-sagittal CC (corpus callosum) by coregistration of DTI (diffusion tensor image) map onto T1 map using parametric grid model

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목적 : Due to the high inter-individual variability in size and shape, sex- and age- and psychiatric-disorder-related changes of the CC, there is an increased need for more objectively defining the regional areas of the midsagittal CC. The purpose of paper is to quantitatively assess the FA value of corpus callosum in healthy subject group by coregistered DTI map onto T1 image using parametric grid model.

대상 및 방법 : Ten healthy adult volunteers (mean age 30, 7 males, 3 females) participated in the study. Brain MRI was performed using a 3.0 GE scanner. A three-dimensional spoiled gradient echo pulse sequence was used to produce 240 0.7-mm-thick contiguous sagittal images. We used 25 directional diffusion gradients scheme for DTI. All DTI images were tri-linearly interpolated in order to obtain a isotropic volume. Mid-sagittal CCs were extracted manually by experts. Since EPI technique in DTI induce some mild distortion, the coregistration between two maps is a prerequisite for the quantitative FA analysis. We have developed IDL based in-house parametric grid-based co-registration procedures ; 1) Construction of parametric grids of both T1 image and FA map: The parametric grids consist of the medial axis and its division by their bisecting lines. 2) Estimation of the deformation field between two parametric grids: Statistical analysis on regional difference of FA value was performed using the median mean region from 40 segments of midsagittal CC generated by parametric grids.

결과 : FA map and T1 image have been coregistered to minimize the potential size and shape differences between the two maps. This ensured the correct assessment on the differences of mid-sagittal CCs. Then we compared the fractional anisotropy (FA) distribution between 40 segments generated by parametric grid description. Results of the coregistration, i.e., the regional division of the corpus callosum based on the FA values of the median mean region is presented by the similarities and differences of the FA values.

결론 : We successfully implemented a nicely working in-house method to coregister the DTI map onto T1 image and to assess the statistical regional difference of FA values in midsagittal CCs. Furthermore our results may give us an insight for parcellation of CC tracts using these FA distributions.