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Introduction: Whole brain histogram (WBH) of diffusion tensor imaging (DTI) (WBH-DTI) has been applied for quantitative analysis of various disorders such as multiple sclerosis [1], aging [2], CADASIL [3], and cerebral infarction [4]. We studied ischemic moyamoya disease (MMD) using WBH-DTI.

Materials and Methods: Institutional review board approval was obtained and each subject provided written informed consent. Of serial 37 ischemic MMD patients without hemorrhage, we examined 15 MMD patients with evident infarction (EI) (Group 1) and 12 MMD patients without EI (Group 2). As a control, we compared 48 normal volunteers (Group 3). Using a 3-T magnet (Siemens Trio), we obtained whole brain fractional anisotropy (FA) and mean diffusivity (MD) maps (Fig.1 and Fig.2) of each subjects from original FA and MD images with whole brain binary masks using Statistical Parametric Mapping (SPM)2 software (<http://www.fil.ion.ucl.ac.uk/spm/>), then we created the averaged WBHs of FA (WBH-FA) and MD (WBH-MD) of each group (Figs.3 and 4). The parameters of histograms were statistically analyzed using unpaired t-test and the difference with $P < 0.05$ was considered significant.

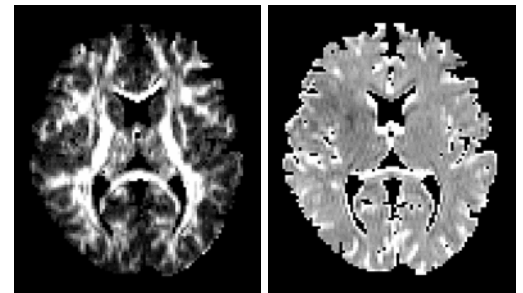


Fig. 1

Fig. 2

Results: Group 1 showed significantly low peak height and mean of FA, and significantly low peak height and high mean of MD, compared with Group 2 and Group 3. Between Group 2 and Group 3, there was no significant difference in peak height, peak location, or mean of FA and MD, but only the percentage of pixel counts of FA showed significantly high in the bins of 0.17-0.29, and low in 0.46-0.73.

Discussion and Conclusion: MMD with EI showed significant difference in WBH-DTI compared with normal control. MMD without EI showed significant difference only in the bin analysis of WBH-FA compared with normal control. The WBH-DTI was shown as a feasible analytic tool in ischemic MMD, and the WBH-FA might promisingly detect subtle ischemic damage in normal appearing brain tissue before the advent of EI in conventional imaging.

References: [1] Cercignani M. et al. Magn Reson Imaging 2001;19:1167, [2] Yoshiura T. et al. Acad Radiol 2005;12:268, [3] Molko N. et al. Stroke 2002; 33:2902, [4] Buffon F. et al, J Cereb Blood Flow Metab 2005; 25:641

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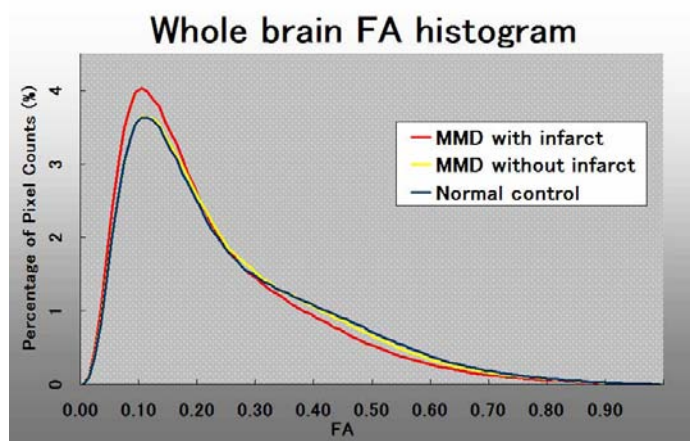


Fig. 3

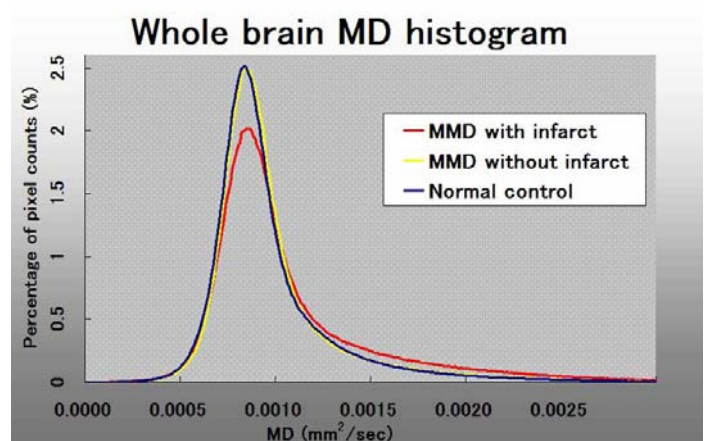


Fig. 4