Brain MRI abnormalities in patients with type 2 diabetes mellitus

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Background and aims: There is a growing body of evidence that brain damage represents another diabetic complication. Changes of cerebral structure and function could be attributed to the influence of the diabetic metabolic milieu. However, the exact brain abnormalities that are associated with type 2 diabetes mellitus (T2DM) need to be further elucidated. Therefore, the aim of this study was to investigate which abnormalities on brain MRI are associated with T2DM.
Materials and methods: We examined 93 patients with T2DM without history of prior cerebrovascular accidents (mean age 62.3±5.5 years, diabetes duration 9.7±6.7 years, BMI 32.5±10.4 kg/м2, HbA1c 8.1±1.3%) and 18 healthy subjects who served as the control group (mean age 59.5±5.7 years, BMI 29.1±4.0 kg/м2). All subjects were scanned on a 1.5T MRI scanner. Intracranial volume (ICV), total brain (TBV), total cerebrospinal fluid (CSF), white matter (WM), grey matter (GM), peripheral CSF, lateral ventricular (LV) and white matter hyperintensity (WMH) volume were determined on the MRI scans automatically by kNN-based probabilistic segmentation. Infarct volumes were manually segmented. Volumes were expressed as % of ICV and numbers represent percentages of ICV. Linear regression analyses adjusted for sex, age and education level were performed.
Results: We found a lower TBV (78.8±2.13 vs. 81.3±1.98; $p<0.05$), a lower WM volume (43.2±1.34 vs. 43.7±1.04%; $p<0.05$) and a lower GM volume (35.4±2.25 vs. 37.5±2.02%; $p<0.05$) in patients with T2DM compared to controls. Total CSF volume (21.2±2.13 vs. 18.7±1.98; $p<0.05$), peripheral CSF volume (19.2±1.78 vs. 17.0±1.93%; $p<0.05$) and LV volume (2.0±0.91 vs. 1.7±0.71%; $p<0.05$) were higher in patients with T2DM compared to controls. However, there were no statistically significant between group differences in WMH volume (0.16+0.18 vs. 0.12+0.13%) and infarct volume (0.2+0.56 vs. 0.03+0.13%). There was a statistically significant negative correlation between longer diabetes duration, on one side, and TBV and WM volume, on the other side. We found a positive correlation between disease duration and LV volume, WMH volume and total CSF volume.
Conclusion: In our study we revealed structural brain abnormalities that are associated with T2DM. These brain abnormalities could underlie the cognitive deficits frequently observed in patients with T2DM.
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