Diffusion-weighted imaging and magnetization transfer imaging of tardive and edentulous orodyskinesia

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INTRODUCTION

Tardive dyskinesias (TD) are commonly seen in patients treated with antipsychotic drugs.[1] TD may more rarely result from antidepressant drug treatment, especially with selective serotonin reuptake inhibitors (SSRI).[2] Several risk factors for TD have been identified in susceptible individuals: age, duration of drug exposure, cumulative dose, substance abuse and brain damage. Another type of dyskinesia, edentulous orodyskinesia (EOD), occurs in individuals with longstanding toothlessness, often in the absence of denture. Several neuroimaging studies have reported anomalies in the basal ganglia and other brain regions in schizophrenic patients with TD. Our recent study demonstrated a significant reduction in the Cho/Cr ratio in the basal ganglia when comparing drug-treated patients with TD or EOD patients with control subjects.[3] In this study, the possibility of using ADC and MTR values as markers of TD was investigated.

METHODS

Eight patients with TD resulting from antidepressant or other drug treatments, 12 patients with EOD, 8 patients on antidepressant medication but without TD and 10 normal control subjects were recruited. All MRI experiments were performed on a GE 1.5 T Signa imager. DWI data were obtained using the GE DIFFUSION protocol using EPI with the following acquisition parameters: TR = 10000 ms; TE = 109.7 ms; 160 x 256 matrix; FOV = 36 x 21.6 cm^2; slice thickness = 3 mm with 1 mm gap; diffusion gradient factors b = 0 and 1000 s/mm^2; AT = 41 s. MTI data were acquired using an axial T1-weighted 2D spin echo sequence with TR = 635 ms; TE = 8-10 ms; $\alpha = 20°$; FOV = 22 x 16.5 cm^2; slice thickness = 3 mm with 1 mm gap, number of slices = 25; with and without saturation pulse; AT = 6.12 min. Post-processing of the MRI data was performed using the GE FUNCTOOL program. ADC and MTR values were measured in the basal ganglia ROI bilaterally at the level of anterior commissure in an area of approximately 8.5 cm^2 and in the caudate nucleus, putamen and globus pallidus. Statistical comparisons between groups for age, ADC and MTR values were performed using ANOVA tests.

RESULTS

Mean ADC and MTR values are summarized in Table 1 for each group. In the basal ganglia ROI, mean ADC values for drug-treated patients with TD were significantly higher than for drug-treated patients without TD (+10%, $P = 0.04$) or control subjects (+16%, $P < 0.001$). Similarly, mean ADC values for EOD patients were higher in comparison to control subjects (+11%, $P = 0.009$). Mean MTR values were increased in both dyskinetic groups relative to control subjects, drug-treated patients with TD showing a trend toward statistical significance (+19%, $P = 0.064$) and EOD patients showing statistical significance (+19%, $P = 0.044$). Although MTR values in drug-treated patients without TD were lower than in dyskinetic patients, the difference was not found to be statistically significant.

Table 1. ADC and MTR values for dyskinetic patients and control subjects

	ADC (x 10^{-3} mm^2/s)				MTR (%)			
	Drug-treated patients		EOD	Controls	Drug-treated patients		EOD	Controls
	With TD	Without TD			With TD	Without TD		
Basal ganglia ROI	0.949 ± 0.086	0.861 ± 0.057	0.911 ± 0.046	0.820 ± 0.067	18.6 ± 2.3	16.4 ± 1.9	18.5 ± 3.2	15.6 ± 1.6
Caudate nucleus	0.922 ± 0.086	0.885 ± 0.103	0.913 ± 0.084	0.843 ± 0.093	21.0 ± 2.9	19.5 ± 3.1	18.9 ± 2.8	20.1 ± 2.3
Putamen	0.860 ± 0.073	0.778 ± 0.058	0.822 ± 0.040	0.789 ± 0.026	17.9 ± 3.2	20.2 ± 2.6	21.4 ± 3.6	19.5 ± 3.2
Globus pallidus	0.793 ± 0.040	0.764 ± 0.053	0.788 ± 0.047	0.782 ± 0.026	23.1 ± 3.0	26.1 ± 2.9	23.9 ± 2.9	25.5 ± 3.2

DISCUSSION

Our results suggest that ADC and MTR data can differentiate drug-induced TD patients and EOD patients from control subjects, but only ADC values can differentiate drug-treated patients with TD from those without TD. Among the three MR parameters which were found to differ for these groups of patients and control subjects, i.e. ADC, MTR and Cho/Cr ratios,[3] ADC values in basal ganglia appear to offer the best discriminating power.

References

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