Correlation of Three-dimensional colour-coded tractography by diffusion tensor imaging in Acute Ischemic Stroke With 60-Day NIHSS Scores

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Background and purpose -- Infarcts (eg, small capsular strokes, or those located in the corona Radiata) are difficult to assess with regard to the precise location and the extent of pyramidal tract damage with conventional brain imaging (T_1WI, T_2WI, DWI). Color-coded diffusion tensor imaging (CDTI) and three- dimensional white matter tractography provide a means to visualize the course of the corticospinal tract within the white matter. The aim is to evaluate the anatomic and clinical relation-ship between the Infarctions and the corticospinal tract (CST) in patients with acute infarcts and predict clinical outcome.

Materials and methods – We examined 27 patients of pyramidal tract strokes at the acute phase (< 2 days) with a marked motor deficit. In order to assess involvement of the tracts , Lesions were identified on diffusion-weighted MRI and superimposed on CDTI images, infarcts and the tract were shown simultaneously. The anatomic location and pattern of the lesion were visualized on CDTI with regard to the corticospinal tract and subsequently compared with the National Institutes of Health Stroke Scale (NIHSS) scores at acute phase (< 2 days), chronic phase (14 days), and outcome (60 days).

Results – We identified different patterns of corticospinal tract stroke falling into 2 clinical subgroups: (1) those with good recovery (18/27) and (2) those with marked deficits and minor improvement (9/27). NIHSS scores of group 1 were significantly higher than that of group 2 at the acute phase, chronic phase, and outcome respec-tively (P<0.01). Group 1 had long lesions centered in the pyramidal tract , involving the basal ganglia; group 2 lesions were very small and/or showed the corticospinal tract in close proximity to the infarct but not to pass through it.

Discussions -- This study had a major findings , the degree of CST involvement within the infarcts was shown to have significant correlation with stroke severity and the outcome measured by NIHSS. The anatomic location of the CST relative to the infarcts is an important clinical issue. Our study have pointed out these with the close proximity of the CST to the infarcts will have a good recovery, but those with the CST crossing the infarcts will have a bad prognosis.

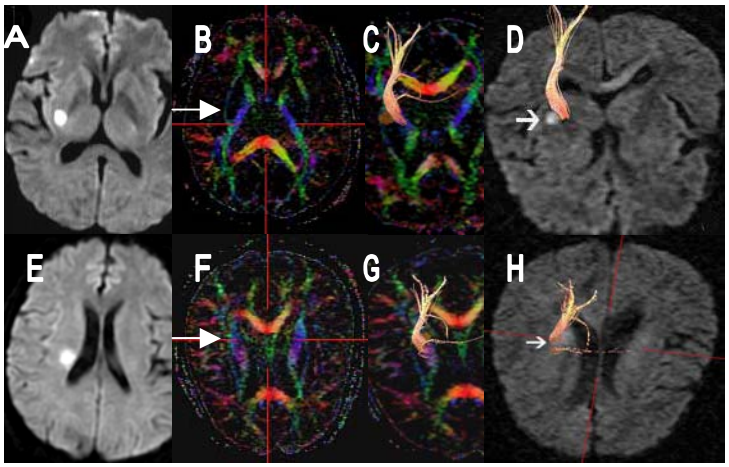

Fig. 1. A -D. Patient 1, a 51-year-old woman with an acute infarct in the posterior limb of the right internal capsule. A. axial diffusion-weighted imaging,, B. axial CDTI shows the blue strip intensity of the pyramid(long arrow)is normal. C-D. 3D tractography show the CST (orange lines) of the affected cerebral hemisphere appears to be medial to but not to run through the infarct (short arrow).

Fig. 2. E-H. Patient 2, a 59-year-old man with an acute infarct in the right corona Radiata . E. axial diffusion-weighted imaging, F. axial CDTI shows the blue strip intensity of the pyramid (long arrow) decreases. G-H. 3D tractography show the corticospinal tract (orange lines) appears to run through the infarct (short arrow).

Reference

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Table 1. Time course of NIHSS scores in the two groups of patients

	group 1	group 2
Number of cases	18	9
NIHSS score at acute phase		
Mean score	12.42 ± 3.23	15. 17 ± 2. 85
NIHSS score at chronic phase		
Mean score	6.42 ± 3.23	11. 65 ± 3. 03
NIHSS score at outcome		
Mean score	1. 92 ± 1. 06	6.13 ± 2.93

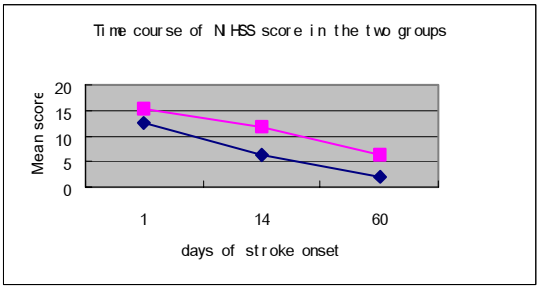

Fig.3. Group 2 (red line)'NIHSS Score at the time of 1 day, 14 days, and 60 days(outcome) are significantly higher than group 1(black line)