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Diffusion tractography as a prognostic biomarker for motor recovery in patients with pontine infarct

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PURPOSE
To investigate the dynamic evolution of diffusion indexes in the corticospinal tract (CST) distal to a pontine infarct by using diffusion-tensor imaging, to determine the relationship of these indexes with clinical prognosis, and to explore the structural changes in the motor pathway during recovery.

MATERIALS AND METHODS
This study was approved by the institutional ethics committee, and written informed consent was obtained from each participant. Twenty-four patients (17 men; average age, 58.6 years; range, 42–83 years) were recruited for this study. All patients were diagnosed with pontine infarct and underwent diffusion-tensor imaging examinations after stroke (mean duration : 50±115 days). Reconstructions of the CST were performed. All Fiber numbers were measured in the medulla, cerebral peduncle, internal capsule, and centrum semiovale. Fiber numbers across the pons of the CST in the ipsilateral side of the infarct were calculated. Their relationships with clinical scores such as Fugl-Myer score, Berg balance test(BBS) and Modified Barthel index were analyzed by using Pearson correlation analysis. A P value of .05 (two tailed) was considered to indicate a significant difference for all statistical procedures.

RESULTS
All patients had some degree of motor deficit. The FM scale scores ranged from 0 to 66 at the first examination. The number of fiber across pons were correlated positively with BBS at discharge ($r = 0.549$, $P = 0.005$) and MBI at discharge($r=0.682$, $P=0.000$). Fractional ratio of fiber across pons (The number of fiber across pons/total number of CST fiber) were correlated positively with BBS at discharge($r=0.423$, $P=0.039$) and MBI at discharge ($r=0.511$, $P=0.013$). Difference between admission and discharge of MBI score was well correlated with the number of fiber across pons ($r=0.436$, $P=0.038$) diffusion-tensor tractographic images showed regeneration and reorganization of the motor pathways.

CONCLUSION
Secondary degeneration of the CST can be detected at diffusion-tensor imaging in the subacute stages after pontine infarction, which could help predict the motor outcomes. Diffusion-tensor tractography can allow detection of regeneration and reorganization of the motor pathways during recovery