Detection and Predictive Value of Fractional Anisotropy Abnormalities in the Acute Stroke Patients
Stroke

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Background: A decrease in fractional anisotropy (FA) of the ipsilesional corticospinal tract (CST) distal to stroke lesions in subacute and chronic patients has been associated with poor motor outcomes, but it is unclear whether tract-FA in the acute stroke phase predicts outcome.

Methods: Thirty-eight patients underwent an assessment of their motor impairment acutely and at 3 months using the Upper Extremity Fugl-Meyer (UE-FM). MR images, including diffusion tensor images (DTI) and derived FA values, obtained <3 days after stroke, were overlaid with a probabilistic CST derived from healthy elderly subjects to define two regions of interest (cerebral peduncle (CP) and a slice of the CST consisting of the second subsequent slices caudal to the stroke lesion (nearest slice – NS)).

Results: The FA laterality index (LI) for NS-ROI and CP-ROI were significant, but modest predictors of 3-months outcome (R^2=0.114, p=0.032; R2=0.14, p=0.042). UE-FM (R^2=0.710, p<0.001) was a better predictor than FA values in univariate analysis, though comparable to prediction using the CST lesion load (wCST-LL) (R^2=0.709, p<0.001). In multivariate analyses controlling for initial UE-FM, CST-LL, and Days-of-Therapy, neither the FA LI for the cerebral peduncle ROI (partial correlation r=0.014 p=0.88) nor the nearest slice ROI (partial correlation r=0.025, p=0.72) significantly contributed to the overall model prediction of 88% of the variance in the UE-FM at 3 months.

Conclusion: FA changes of the CST can be detected near the ischemic lesion in the acute phase after stroke, but these changes offer only modest predictive value to motor outcomes at 3 months.