

## Brain DT MRI Predicts the Long-Term Clinical Evolution in Amyotrophic Lateral Sclerosis: A 3.4 Year Follow Up Study

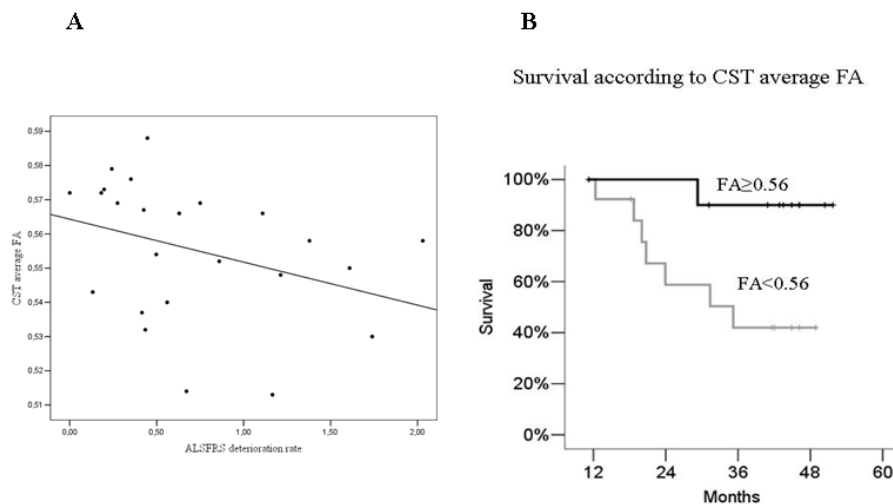
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**Introduction:** Identifying predictors of progression and survival in amyotrophic lateral sclerosis (ALS) is important for management of ALS patients in clinical practice and design of novel clinical trials. The aim of this study was to investigate whether diffusion tensor (DT) MRI features of the corticospinal tract (CST) contribute to the prediction of the long-term clinical evolution in patients with ALS. The predictive values of clinical and conventional MRI measures was also assessed.

**Methods:** Brain conventional and DT MRI were obtained in 24 patients with probable or definite ALS, who were followed up prospectively for a median period of 3.4 years. DT MRI-based tractography was used to obtain mean diffusivity (MD) and fractional anisotropy (FA) of the corticospinal tracts (CST). The ALS Functional Rating scale (ALSFRS) progression rate was estimated. A multivariate analysis was performed to establish which variables were significant predictors of patient's survival.

**Results:** Two patients were lost at follow up. Of the remaining 22 patients, eight died during the observation period. The mean ALSFRS progression rate was 0.7 per month and the median survival after MRI was 41.2 months. Compared with controls, ALS patients showed significantly increased MD and decreased FA of the CST. Shorter disease duration and lower CST FA were significantly associated with greater ALSFRS progression rate. Bulbar-onset and CST FA were independent predictors of time to death in ALS patients. Survival at year three was 42% (standard error [SE]=14%) in patients with CST FA <0.56 compared with 90% (SE=9%) in patients with CST FA  $\geq$ 0.56 ( $p=0.02$ ).



**Figure.** (A) Scatterplot of the correlation between the progression rate of the Amyotrophic Lateral Sclerosis Rating scale score and the average FA of the CST in ALS patients. (B) Kaplan-Meier plots of survival probabilities according to the CST FA at baseline in ALS patients.

**Conclusions:** Bulbar-onset and more severe DT MRI abnormalities in the CST predicted a poorer clinical outcome after a 3.4 year follow up in ALS patients. The prognostic value of DT MRI calls for a more extensive use of this technique as an adjunctive paraclinical tool to monitor ALS evolution.