

FIGURE LEGENDS

FIGURE 1: Q-space imaging processing pathway

The figure illustrates the processing pipeline for the diffusion data. To perform the voxel-wise q-space analysis, the diffusion weighted signal was resampled onto a regularly spaced b-value grid. Then the diffusion decay curve was extrapolated using a bi-exponential fit. Finally, the inverse Fourier transformation of the decay curve was performed to give the probability density function (PDF). From the PDF, the following two summary statistics were derived: the full width of the displacement probability density function (FWHM), and the height of the displacement distribution function, termed zero displacement probability (P0). Furthermore, conventional apparent diffusion coefficient (ADC) maps were also derived from the low b-value part ($<1100 \text{ s/mm}^2$) of the decay curve, where the diffusion is still assumed to be Gaussian.

FIGURE 2: Examples of perpendicular diffusivity maps between patients and controls at baseline, 1 and 3 years follow-up.

Grouped ADC_{xy} and P0_{xy} maps from one patient with PPMS and one healthy control showing an increase of diffusion distribution (ADC_{xy}) and a decrease of probability of zero net displacement (P0_{xy}) over 3 years in the patient and not in the control.

FIGURE 3: Relationship between changes in QSI indices of perpendicular diffusivity and changes in clinical measures over 3 years.

The graphs show the correlations between the increase in perpendicular diffusivity and the worsening in clinical measures. In particular, there was negative correlation between changes in cord FWHM_{xy} and changes in HPT and TWT z-scores, and a positive correlation between changes in cord P0_{xy} and changes in HPT z-score.