



# Diffusion Kurtosis Imaging as a Diagnostic Tool for Parkinson's Disease

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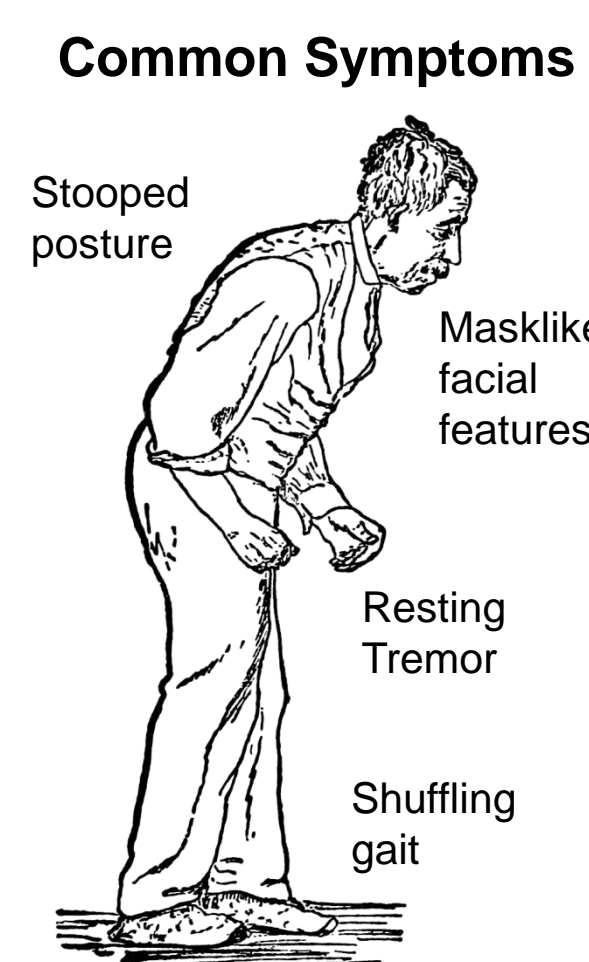
## Diagnostic Challenges

### Parkinson's Disease

- Degenerative neurologic disorder
- Affects 4 million people
- Large differential diagnosis

### No standard diagnostic test

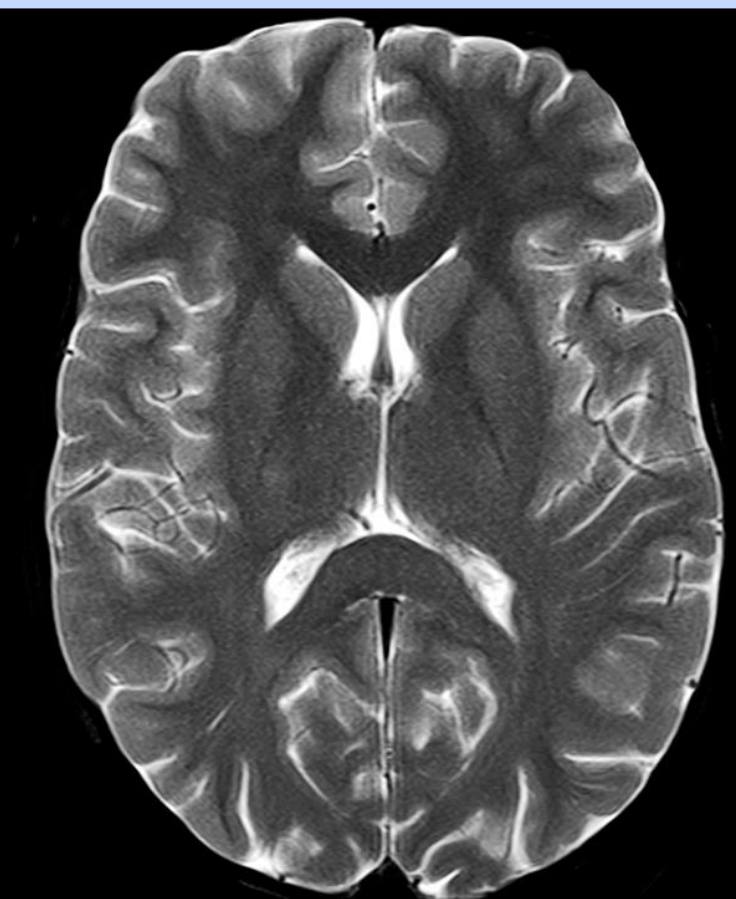
- History and exam
- Response to medications
- Imaging techniques



## Diffusion Kurtosis Imaging

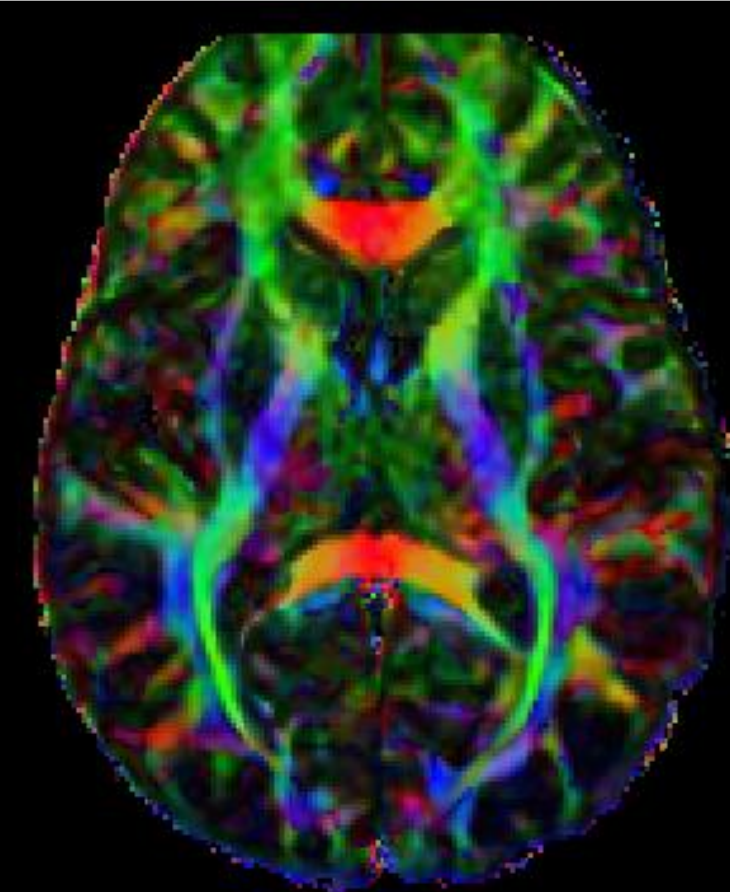
### Magnetic Resonance Imaging

- Non-invasive, **no radiation**
- Uses water concentration and magnetic fields to image brain



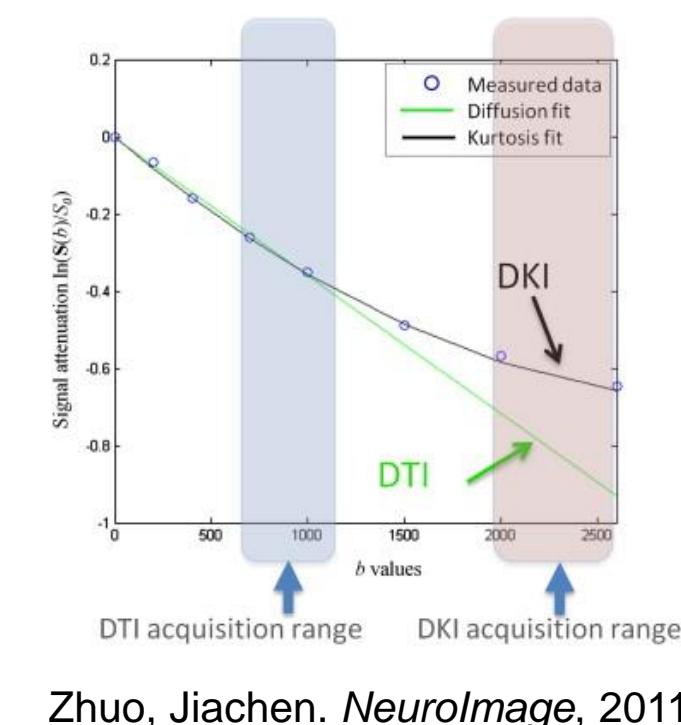
### Diffusion Tensor Imaging (DTI)

- Extension of MRI using more angles and magnitudes
- Provides **directionality** using water diffusion properties



### Diffusion Kurtosis Imaging (DKI)

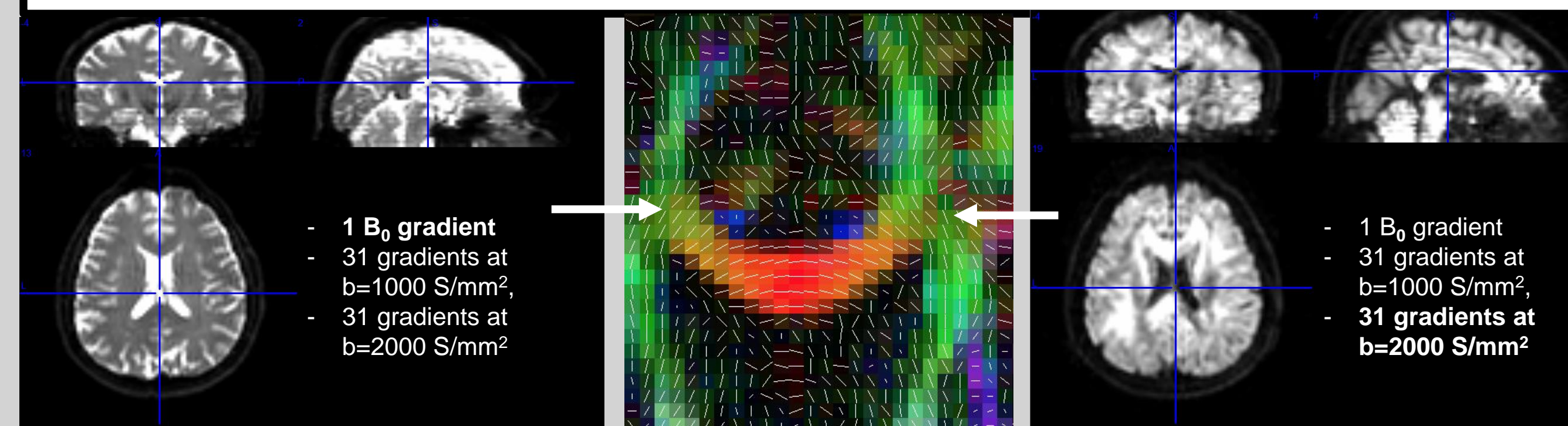
- Additional processing for non-Gaussian diffusion
- Mean kurtosis variable correlates to **tissue microstructure**



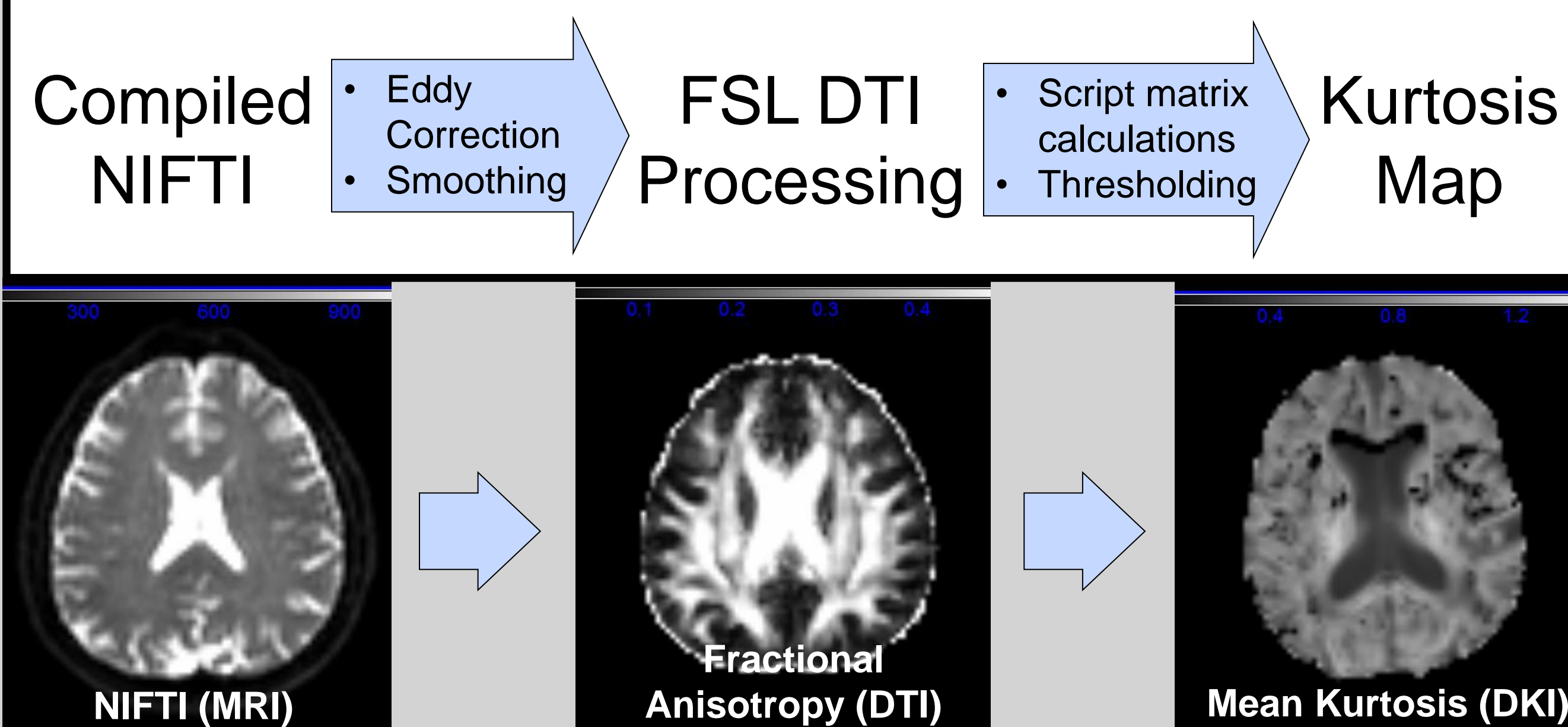
## DKI Analysis in Patients with Parkinson's Disease

### 1. MRI Scans of Three Patient Populations

- Parkinson's Disease (PD) – previous diagnosis
- Essential Tremor (ET) – similar symptoms
- Healthy controls

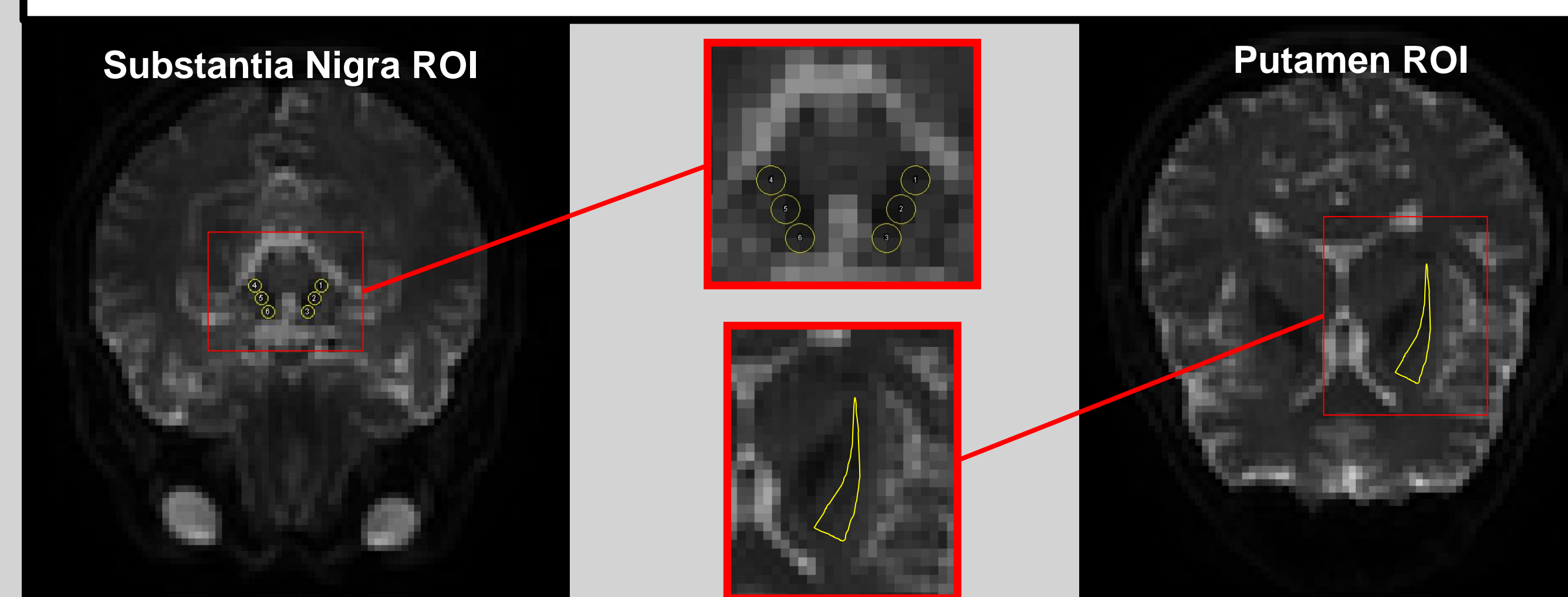


### 2. Software Processing to DKI maps



### 3. Region of Interest (ROI) Analysis

- Substantia nigra
  - Putamen
- Basal ganglia elements involvement in movement

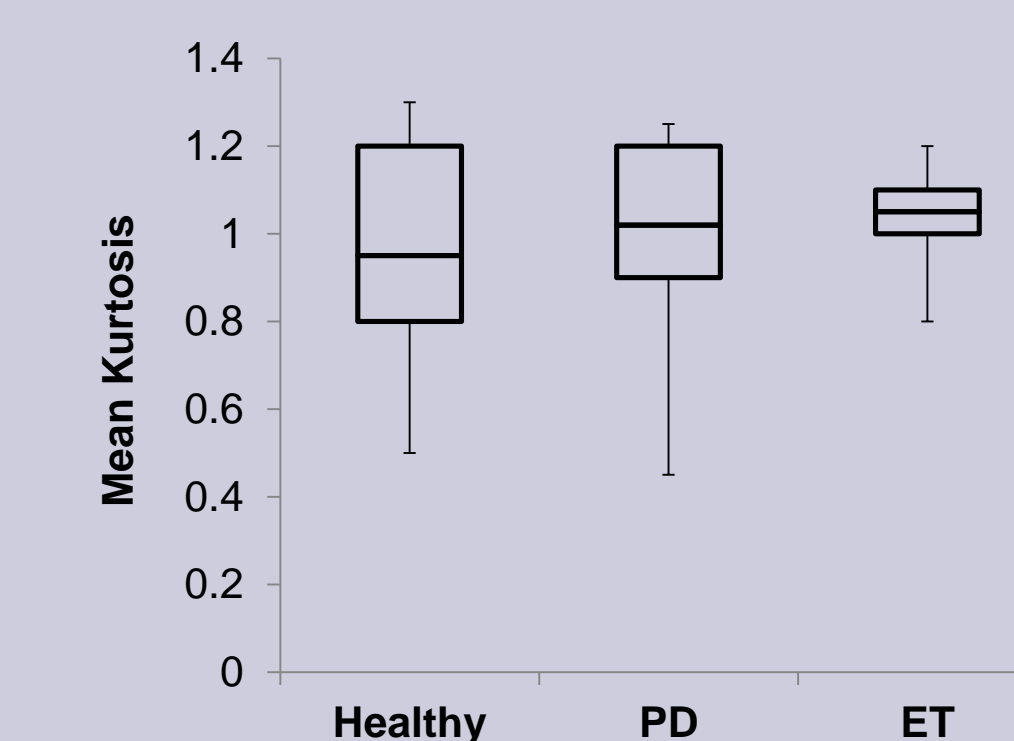


## Results and Conclusions

### ROI Mean Kurtosis

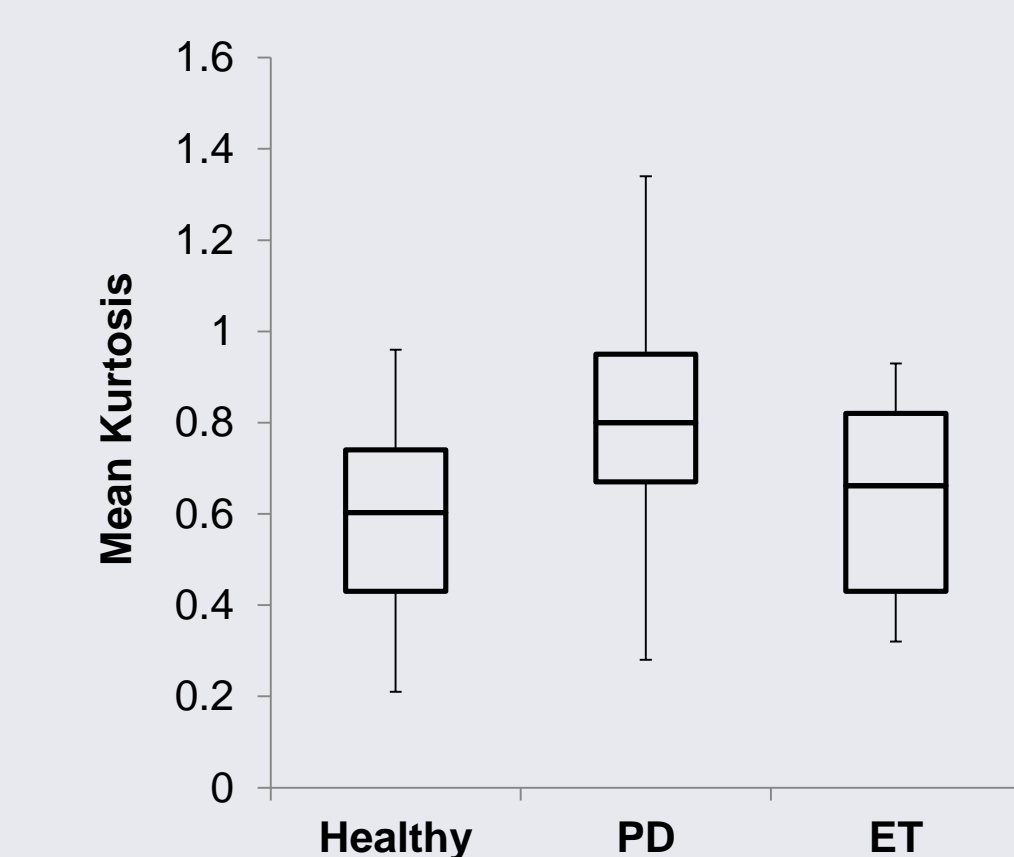
### Analysis

#### Substantia nigra



No statistically significant differentiation in mean kurtosis values in overall region or any of three subdivisions (rostral, medial, caudal).

#### Putamen



Higher mean kurtosis values in Parkinson's patients (0.82 + 0.05 [stdev]) than healthy controls (0.60 + 0.04, p=0.0158).

\*Neither analysis demonstrated significant differentiation from essential tremor patients

### Conclusions

- Mean kurtosis estimates in the basal ganglia may reflect microstructural changes related to Parkinson's disease progression
- Future work will investigate the histological correlates of these kurtosis values

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