Structural connectivity changes in migraine involving the cerebellum

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Introduction

Although the pathophysiology of migraine remains poorly understood, structural disruptions across large-scale brain networks have been reported [1-3]. However, connectivity studies in migraine have focused mostly on cortical networks and did not include regions, such as the thalamus and the cerebellum (CB), known to play an important role in migraine pathophysiology. Here, we investigate structural connectivity across the whole brain in a group of episodic migraine patients without aura compared to controls using diffusion-weighted MRI (dMRI).

Methods

Subjects:

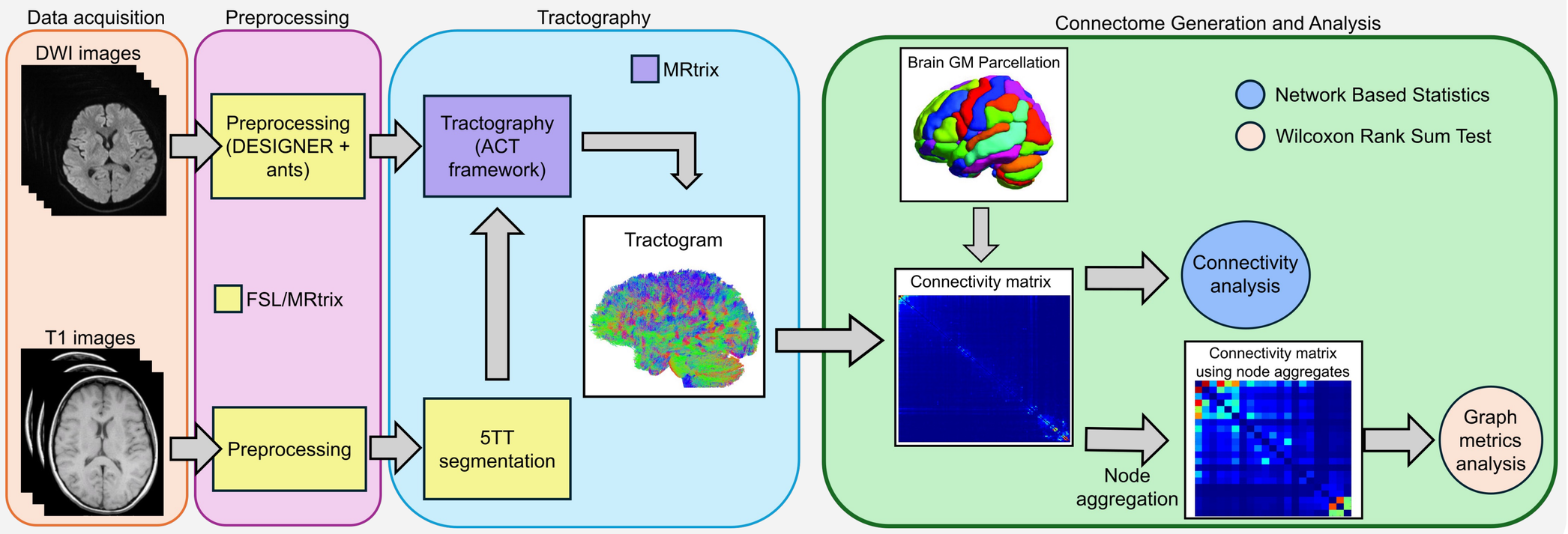
- 15 Healthy Controls
- 14 Migraine Patients

DWI Acquisition:

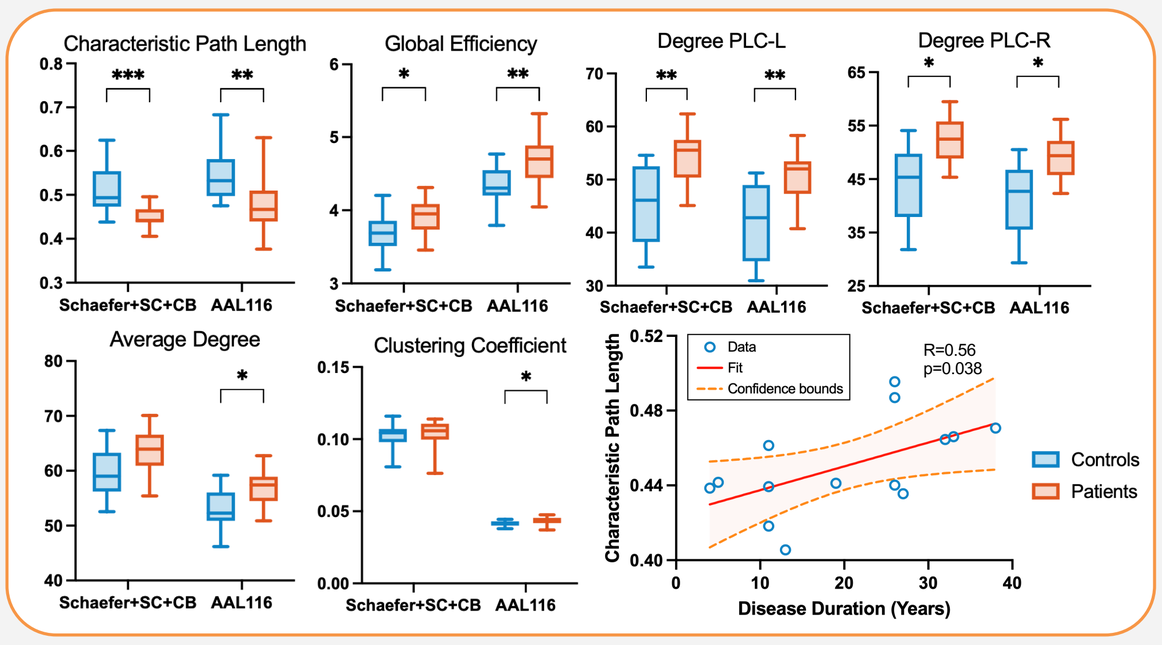
- b=400, 1000, 2000 s/mm^2 along 32, 32, 60 directions
- 8 b=0 volumes
- 2mm isotropic resolution

Parcellations:

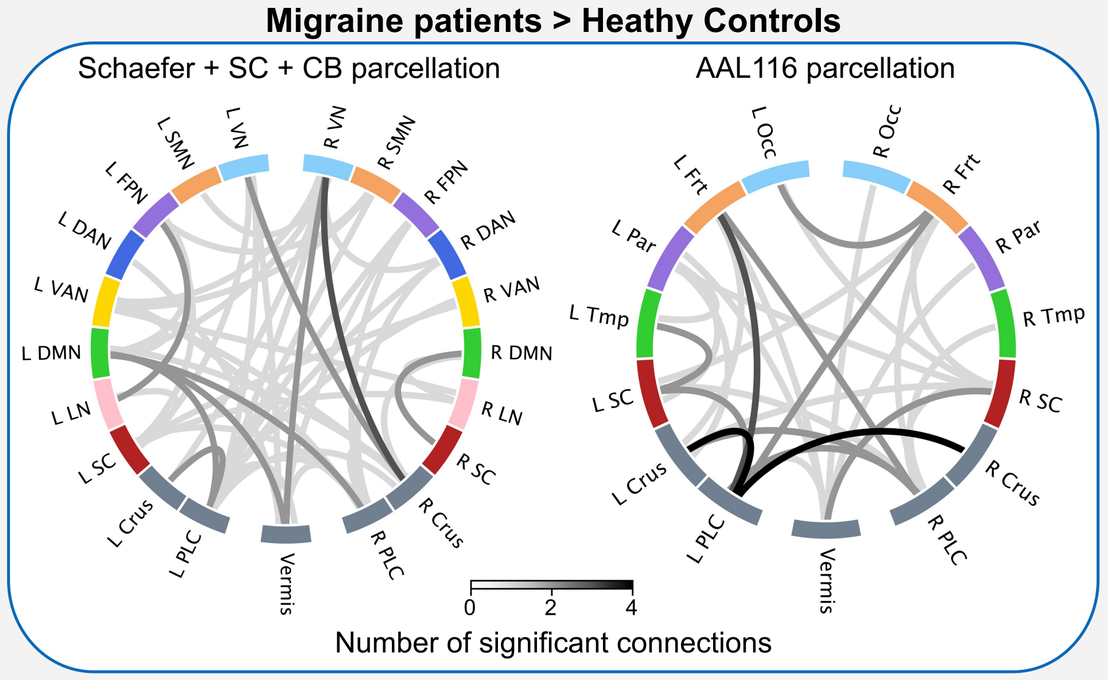
- Schaeffer+Subcortical+ Cerebellum
- AAL116



Results and Discussion



Migraine patients > Heathy Controls



In Migraine Patients:

- Decreased Characteristic Path Length
- Increased Global Efficiency
- Increased Node degree of PLC bilaterally
- Increased Average Degree and Clustering Coefficient

→ Increased pain information dissemination

- Positive correlation between Characteristic Path Length and Disease Duration

→ Plastic Adaptation

Increased connectivity:

- Left Crus - Left PLC
- Occipital/Visual - Vermis
- Cerebellum - Frontal and Parietal regions
- Similar patterns across parcellations

Cerebellum plays inhibitory role in pain processing, through the thalamus [4,5] → Dysfunctional negative feedback loop [6]

Crus and PLC are involved in cognitive functions [7] → Cognitive deficits in migraine

Conclusion

- The structural connectome of migraine patients is shown to be altered, having an increased integration that may be associated with heightened pain information dissemination
- The cerebellum is shown to play an important role in migraine pathophysiology and should therefore be included in connectome studies

References:

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