Differentiating Midbrain Structures in Parkinson’s Disease Using Magnetic Resonance Imaging

**Background:** This study aims to differentiate two midbrain structures: substantia nigra pars compacta (SNc) and ventral tegmental area (VTA) in patients with early-stage Parkinson’s Disease (PD) using magnetic resonance imaging (MRI). The SNc degenerates earlier in PD causing motor symptoms; whereas, VTA degeneration occurs later leading to non-motor symptoms. Conventionally, the SNc and VTA project to the dorsal and ventral striatum respectively. Evidence suggests this model may be overly simplistic since the dorsal striatum has uneven dopamine loss in PD. So, the dorsal striatum was segmented into six functional subregions and only the caudal motor subregion showed early changes in PD. It is necessary to connect the degeneration in the midbrain to the structural changes in the striatum to better understand PD.

**Methods:** Early-stage PD patients and healthy controls will be imaged using various structural and functional MRI techniques to measure the SNc and VTA volumes and their connectivity with the striatum subregions.

**Results:** SNc degeneration is detectable through volumetric and iron content changes. Structural and functional connectivity are reduced between the SNc and caudal motor subregion in early-stage PD, while the VTA is spared.

**Discussion & Conclusion:** This study concludes that the SNc to caudal motor striatum pathway plays a major role in early-stage PD with further inspection required for VTA degeneration in late-stage PD.

**Interdisciplinary Reflection:** Structural and functional imaging are combined to develop a novel multi-modal imaging approach to better explain the changes in early-stage PD.

**References:**
