Neuroimaging Methods

Locus coeruleus imaging in health and disease

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The locus coeruleus in the brainstem provides all of the brain’s noradrenaline, which is essential for attention, arousal, motor control, and cognition. This small nucleus, approximately 20x1x1mm in humans, is one of the earliest parts of the brain to be damaged by Alzheimer’s disease and Parkinson’s disease. Because of the iron content of the neuromelanin made in noradrenergic cells, the locus coeruleus can be identified and quantified by magnetisation transfer sequences in MRI. We have led major studies of imaging the locus coeruleus using ultrahigh field MRI (7T), linked to drug studies of people with movement disorders and dementia. However, the signal to noise and resolution of such sequences has been challenging at 3T. Sensitive scanning of the locus coeruleus at 3T would have many advantages, and a major impact in neuroscience and its clinical applications, because of the greater availability and safety of 3T MRI. This project will therefore optimise MRI for locus coeruleus imaging at 3T, in health and clinical cohorts.

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