Unique brainstem and hypothalamic activity preceding a migraine headache

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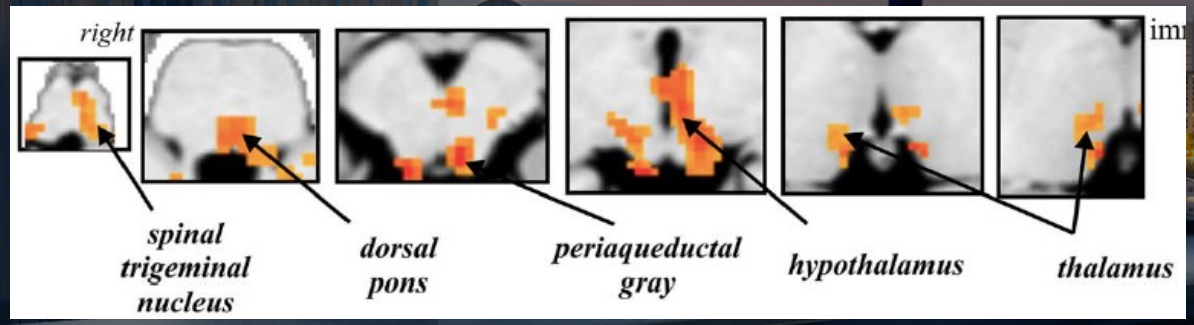
Objective: There is a growing body of evidence suggesting that brain function alters dramatically within the 24 hours preceding a migraine headache. It is possible that altered function in brainstem and hypothalamic sites may either trigger or facilitate a peripheral trigger to activate higher cortical areas evoking pain. The aim of this series of investigations was to determine brainstem and hypothalamic function in the 24 hours preceding a migraine, in both a cross-sectional and longitudinal study.

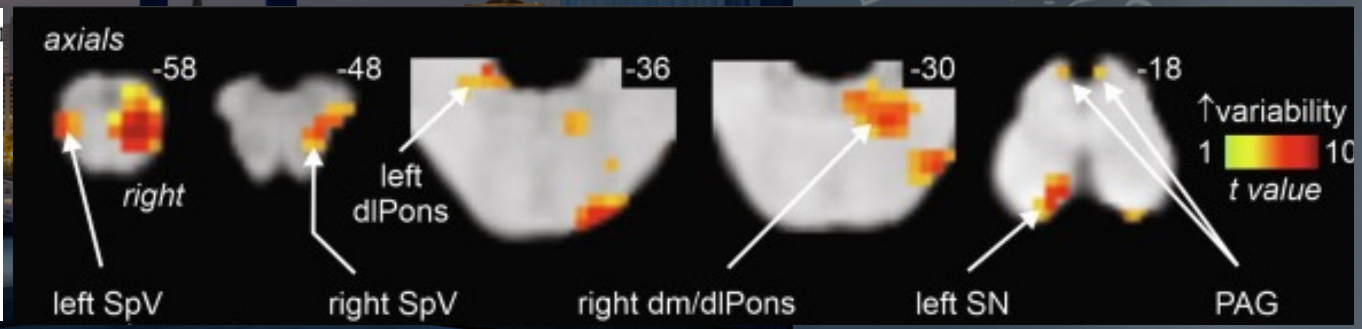
Methods: In 8 migraineurs preceding (within 24 hours) a migraine and 78 pain-free controls, and in 3 migraineurs and 5 pain-free controls, we measured resting blood oxygen level dependent (BOLD) functional magnetic resonance imaging (fMRI) (180 volumes, TR=2 seconds) over the entire brain.

Results: A. There was significant increased infra-slow oscillatory activity in brainstem regions encompassing the spinal trigeminal nucleus (SpV), the midbrain periaqueductal gray (PAG) and dorsal pons, as well as the hypothalamus in the 24-hour period preceding a migraine headache between individuals. B. Interestingly, alterations in these brainstem sites were found in the same period within individual migraine cycles.

A.



B.



Conclusion: These findings provide evidence that in the 24-hour lead up to a migraine, the activity of the hypothalamus and brainstem is disturbed. How these regions are involved in migraine initiation and expression are yet to be fully understood.