Resting state default mode network connectivity during spontaneous migraine attacks

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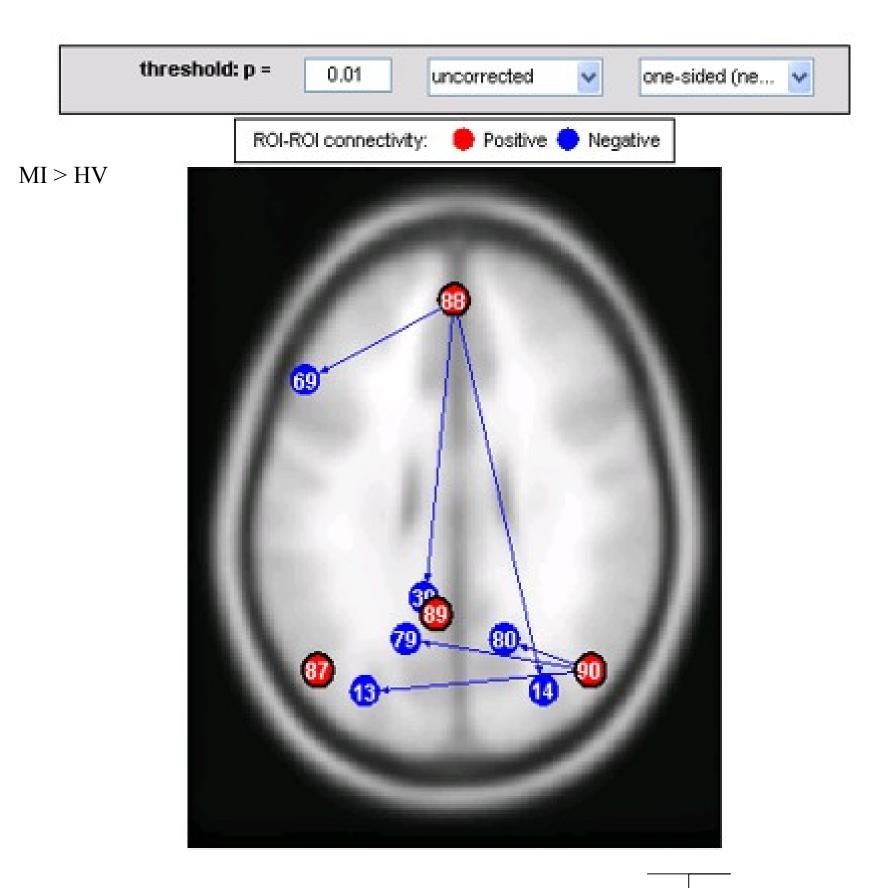
BACKGROUND

▪ The default mode network (DMN) is composed by a set of regions including medial prefrontal cortex (MPFC), posterior cingulate cortex (PCC), and parietal lobule (PL) (Whitfield-Gabrieli and Ford, 2012).

▪ A disruption of DMN connectivity was observed in migraine between attacks.

▪ Here we investigated resting state DMN connectivity during spontaneous migraine attacks.

DESIGN & METHODS

▪ Thirteen patients with untreated migraine without aura (MI) underwent 3T MRI scans during the initial 6 hours of a spontaneous full-blown migraine attack and were compared to a group of 19 healthy volunteers (HV).

▪ We collected resting state data in the default mode network identified by a seed driven approach using functional connectivity toolbox CONN (www.nitrc.org/projects/conn) (Whitfiel-Gabrieli and Nieto-Castanon, 2012).

▪ In a second-level analysis, we collected whole-brain connectivity patterns with the seeds representing DMN (conjunction analysis).

RESULTS

▪ There was greater correlation in MI than in HV between the regions associated with DMN, including MPFC, PCC, and PL.

▪ The conjunction analysis revealed common activation between

  ▪ i) MPFC and left inferior frontal cortex (pars triangularis), left dorsal posterior cingulate cortex, and left associative visual cortex;

  ▪ ii) right PL and bilateral somatosensory association cortices, and left associative visual cortex.

DISCUSSION

▪ In sum, we documented associations between DMN and brain regions involved in multimodal brain processing, including visual, somatosensory, and verbal during spontaneous migraine attacks.

▪ Whether present findings are related to the ictal migraineurs abnormal sensory perception, such as photophobia and allodynia, and to the ictal drop in verbal fluency remains to be determined.

Procedure

3Tesla MRI — Spontaneous BOLD fluctuations (0.01-0.1 Hz) — Resting state analysis

Resting-state functional connectivity reveals spontaneous correlations between groups with the default network areas

MI > HV

Default Mode Network (DMN)

87 = left parietal lobule (PL)
90 = right parietal lobule (PL)
88 = medial prefrontal cortex (MPFC)
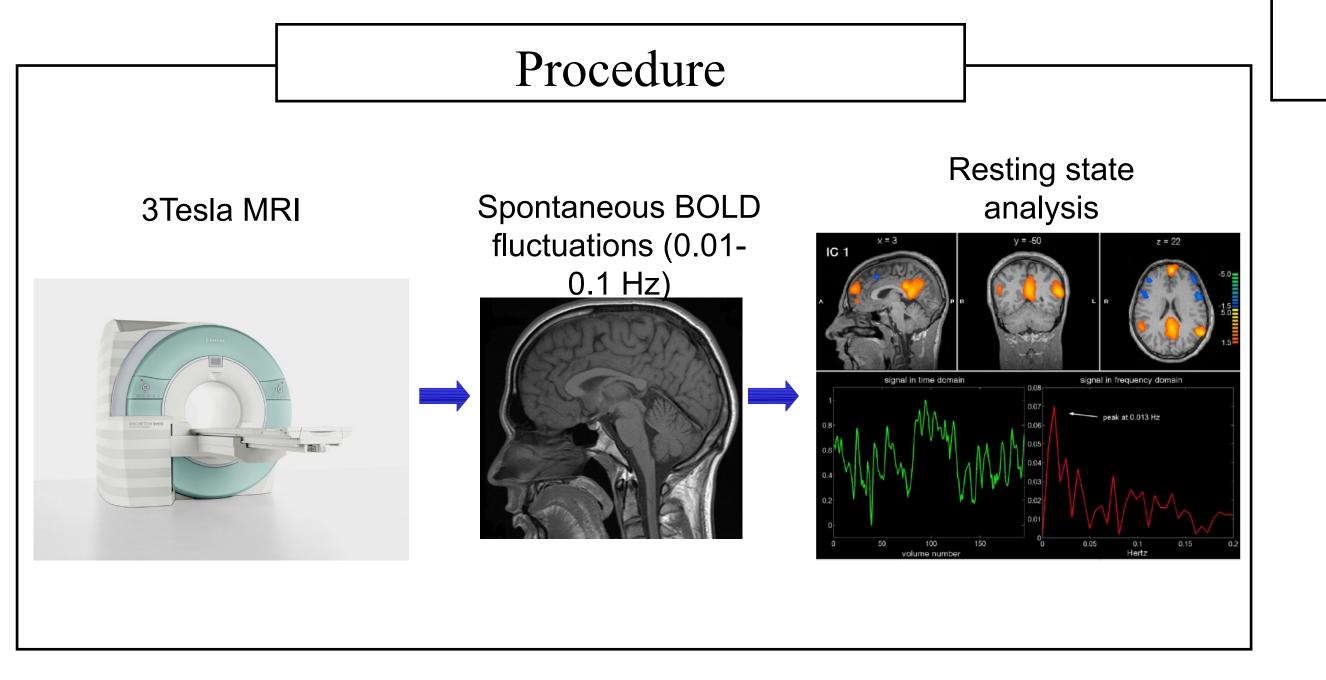89 = posterior cingulate cortex (PCC)

69 = left inferior frontal cortex (pars triangularis)
79 = left somatosensory association cortex
80 = right somatosensory association cortex
13 = left associative visual cortex
14 = right associative visual cortex
39 = dorsal posterior cingulate cortex

Functional connectivity analysis

Source	Target	beta	T	P-uncorrected
(88)	(39)	-0.26	-2.70	0.004740
(90)	(79)	-0.29	-2.59	0.006392
(88)	(69)	-0.27	-2.55	0.006997
(88)	(14)	-0.27	-2.48	0.008430
(90)	(13)	-0.26	-2.44	0.009309
(90)	(80)	-0.27	-2.41	0.009927

Regions showing activation for MI > HV

REFERENCES

▪ Whitfield-Gabrieli S, Ford JM. Default Mode Network Activity and Connectivity in Psychopathology. Annu Rev Clin Psychol 2012; 8:49–76.

▪ Whitfield-Gabrieli S, Nieto-Castanon A. Conn: a functional connectivity toolbox for correlated and anticorrelated brain networks. Brain Connect. 2012;2(3):125-41.