Larger BOLD responses to visual stimulation in area V1 in people with migraine with aura
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In migraine, abnormal visual cortical excitability between headaches could predispose to cortical spreading depression and visual aura.

While prior fMRI studies comparing migraineurs with aura (MWA) to controls have shown differences in extra-striate cortex, altered V1 responses to light have not been reported.

Within V1, BOLD responses were significantly larger in MWA as compared both to controls (p<0.005) and MWoA (p<0.01).

A similar difference in the LGN was seen as well.

This is likely a neural effect, as no difference in resting blood flow was seen between the groups in visual cortex.

This effect was specific to patients with aura, as migraine without aura (MWoA) did not differ from controls in any region.

Methods

Task: Subjects underwent BOLD EPI at 3 T scanner (160 TRs, 3mm voxels, TR=3 sec) while viewing a 5 Hz flickering checkerboard in a random sequence as shown in Figure 1. Subjects performed an attention task at the fixation dot.

Subject Demographics

<table>
<thead>
<tr>
<th></th>
<th>MWA</th>
<th>MWoA</th>
<th>Controls</th>
</tr>
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<tbody>
<tr>
<td>Number (n)</td>
<td>18</td>
<td>18</td>
<td>18</td>
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<tr>
<td>Age (yrs ± SD)</td>
<td>34 ± 6</td>
<td>34 ± 6</td>
<td>34 ± 6</td>
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<tr>
<td>Gender</td>
<td>3 m/15 f</td>
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ROI Analyses: The average amplitude of BOLD response was obtained for each subject within the V1-subregion of interest and within an LGN region of interest. Two-tailed t-tests compared the responses between the populations.

Whole Brain Analysis: The amplitude of BOLD response was mapped onto each subject’s inflated surface, aligned to a common average brain and smoothed with a 2-D, 15 mm FWHM kernel. Whole brain random-effects models tested for group differences in BOLD response at each vertex. Additional covariates modeled the effects of age and gender. Permutation analyses and FDRs were used to determine map-wise thresholds.

Relation to perfusion: Could activation differences simply be the result of greater resting blood flow to occipital regions in MWA as opposed to a difference in neural reactivity?

Summary

• Within V1, BOLD responses were significantly larger in MWA as compared both to controls (p<0.005) and MWoA (p<0.01).
• A similar difference in the LGN was seen as well.
• This is likely a neural effect, as no difference in resting blood flow was seen between the groups in visual cortex.
• This effect was specific to patients with aura, as migraine without aura (MWoA) did not differ from controls in any region.

Conclusions

• Consistent with the presumed mechanism of photic sensitivity in migraine, a larger BOLD response to light was seen in patients with aura within area V1.
• Other cortical sites of greater response to light were seen in MWA, including in the cingular gyrus. These may be related to the nociceptive component of photophobia.

Acknowledgements

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References


http://cfn.upenn.edu/aguirre/wiki/lab_presentations