BRAIN STRUCTURAL CHANGES IN CLUSTER HEADACHE VERSUS MIGRAINE

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Background

Migraine and trigeminal autonomic cephalalgias (TACs) are considered independent conditions although clinical features suggest possible overlapping. Emerging evidence from magnetic resonance imaging (MRI) studies suggest the presence in both conditions of brain structural abnormalities [1,2]. However, no comparison of structural MRI measurements between migraine and TACs patients has been performed and, thus, no evidence of a possible disease "signature" exists.

Objective

To explore in cluster headache (CH) patients vs. migraine without aura (MwoA) patients the possible differences in brain structural abnormalities, which previous studies have shown in both conditions with respect to normal controls.

Materials

In this ongoing prospective study, multimodal brain MRI was acquired on a 3 Tesla MR scanner in 22 patients, of whom CH (n=12, age=42.1±9.5 years, 8 male) and MwoA (n=10, age=35.7±8.8 years, 5 male). CH patients had to be out of cluster for at least 30 days while MwoA patients had not to be on prophylaxis treatment because of migraine low frequency and/or moderate intensity.

Methods

Analysis of MRI data was mostly performed with tools of the Oxford FMRIB Software Library (FSL, www.fmrib.ox.ac.uk/fsl/). Anatomical connectivity along white matter (WM) tracts was assessed, at group level, with voxelwise tract based spatial statistics (TBSS) after using, in single subjects, DTIPrep (www.nitrc.org/projects/dtiprep/) for artefact removal and FMRIB Diffusion Toolbox (FDT) to obtain images of fractional anisotropy (FA), axial and radial diffusivity (AD and RD). FSL-VBM was used to assess local grey matter (GM) volumes. Voxelwise statistics was performed with nonparametric permutation testing ($p<0.005$ uncorrected, cluster size≥25 voxels).

Results

None of the study patients showed brain WM lesions. Compared to MwoA patients, CH patients had lower FA (0.395±0.01 vs 0.465±0.04, $p<0.001$) in the precentral gyrus WM and subcallosal and (Fig. 1), lower AD (0.997±0.04 vs 1.126±0.06 mm^2/s, $p<0.001$) in the precentral gyrus WM and occipital pole and (Fig. 2) and higher RD (0.560±0.02 vs 0.501±0.03 mm^2/s, $p=0.001$) in the superior longitudinal fascicle (temporal part) and precentral gyrus WM (Fig. 3). Moreover, CH patients showed, compared to MwoA, reduced GM volume (100±9.2 vs 120±12.2 mm^3, $p=0.001$) of the subcallosal cortex (Fig. 4).

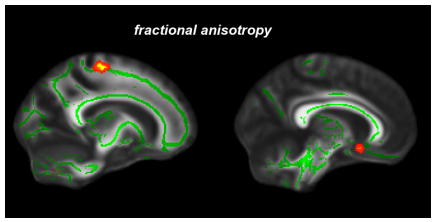

Figure1

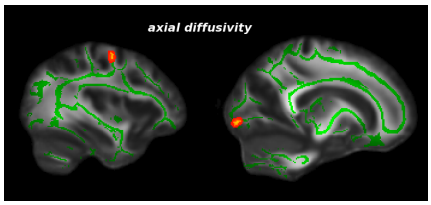

Figure 2

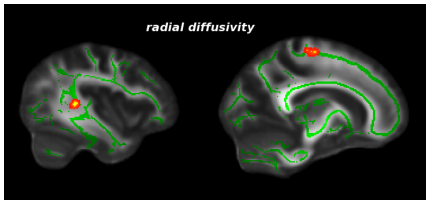

Figure 3

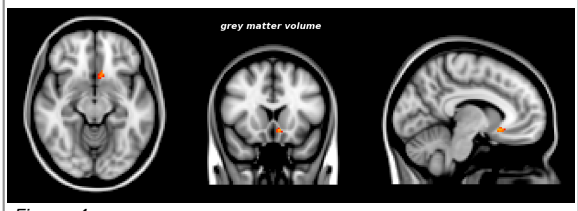

Figure 4

Conclusions

These preliminary findings suggest the occurrence of disrupted anatomical connectivity and local GM atrophy in CH patients with respect to MwoA. In particular, both of these abnormalities map on the subcallosal area, which is an important part of the limbic system, and as such involved in the pain processing.

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