

Brain structural abnormalities in migraine patients with osmophobia and allodynia

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Introduction

Migraine is a common condition with a great impact on patients' quality of life. Aim of this work is to investigate the structural abnormalities of grey matter (GM) and white matter (WM) and their clinical impact in a cohort of migraine patients (MPs), with special regard to osmophobia and allodynia, two symptoms frequently associated with migraine attacks.

Methods

From 29 MPs and 15 HCs, 3D T1-weighted and DW-images were acquired (1.5 T scanner). All patients were screened for disease duration, monthly number of attacks, osmophobia, and allodynia (Allodynia Symptom Checklist scale). Cortical volumetric changes and the integrity of WM bundles were investigated in those networks which have already been shown to be altered in their functional connectivity in MPs. Comparisons between HCs and MPs and between subgroups (MPs with or without osmophobia and allodynia) were performed.

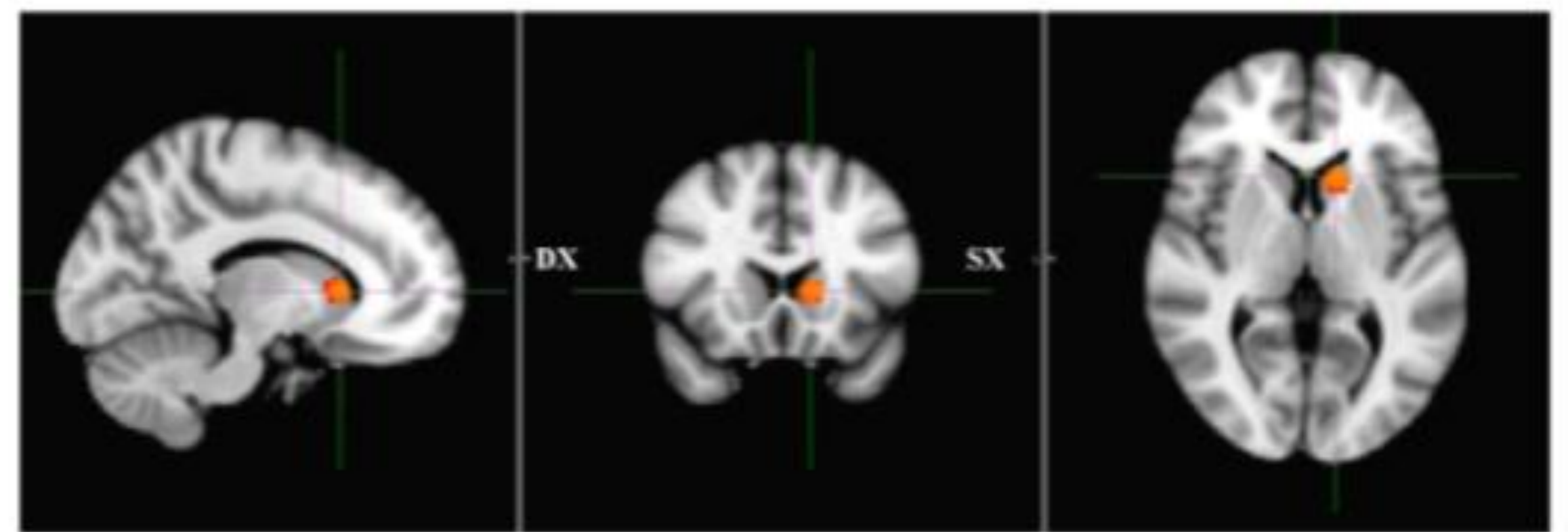
Results

Allodynia was found in 48% of MPs (60% in episodic and 36% in chronic MPs) and osmophobia in 52% (53% in episodic and 50% in chronic MPs).

Compared to HCs, MPs showed an increased structural connectivity of the hippocampal portion of the left cyngulus and a reduction in the integrity of the inferior fronto-occipital fasciculus (IFOF) and of the left thalamic radiation.

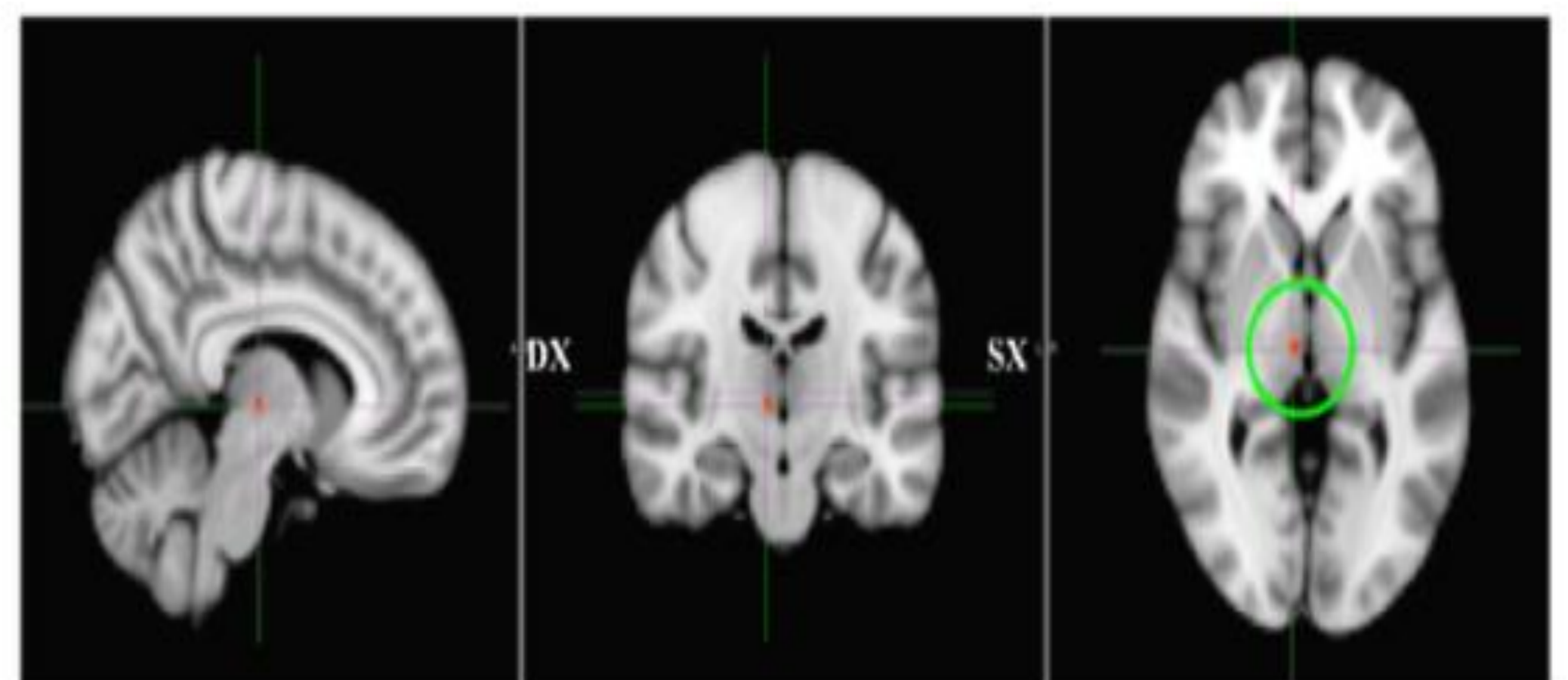
Disease duration was found to be negatively correlated with volumetric measures of the head of the caudate nucleus (especially in patients with allodynia; $\rho=-0.3836$, $p=0.04$) and of the anterior cyngulate cortex ($\rho=-0.499$, $p=0.05$; in patients with osmophobia $\rho=-0.525$, $p=0.44$).

Head of caudate: allodynic MPs vs non allodynic MPs

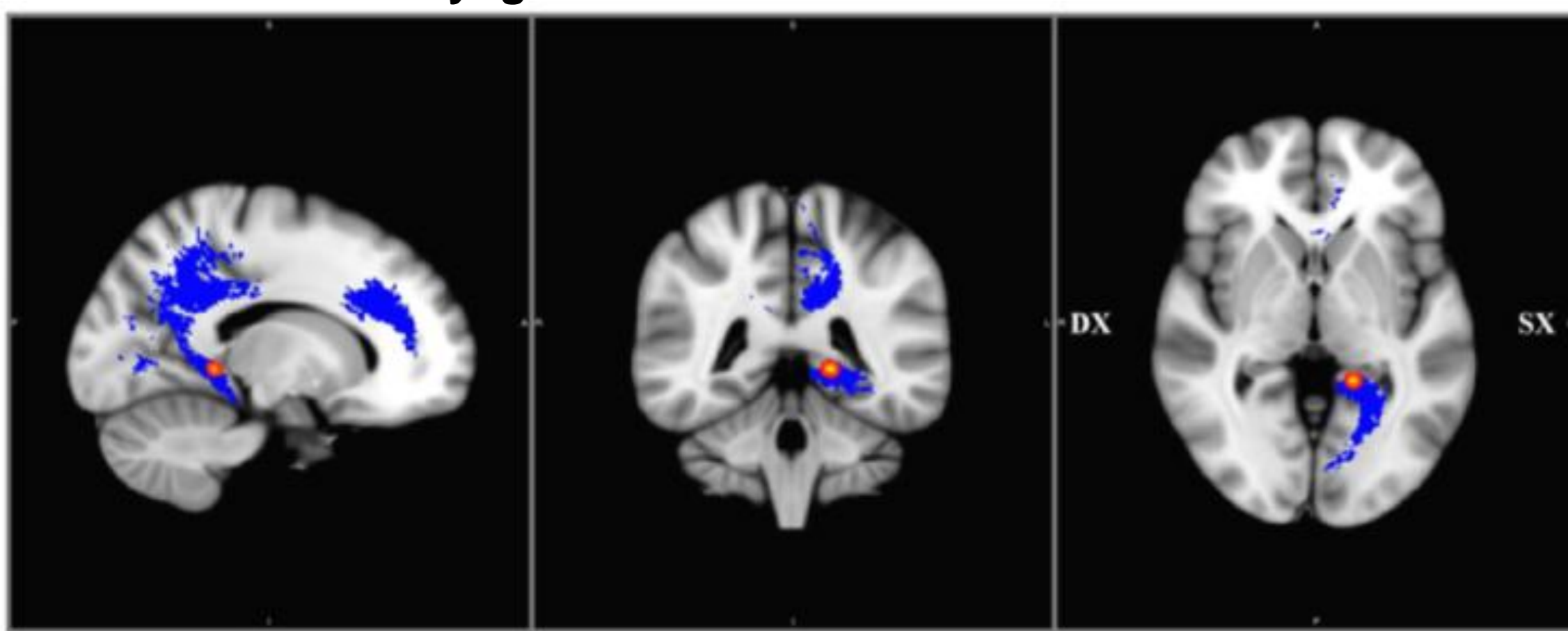


A negative correlation was also found between volumetric measures of the postcentral gyrus and the monthly number of attacks in MPs ($\rho=-0.589$, $p=0.02$). At last allodynia severity was found to be correlated negatively with volumetry of the right thalamus and positively with volumetry of the left thalamus ($\rho=0.581$, $p=0.02$).

Right thalamus: allodynic MPs vs non allodynic MPs



Cyngulate Cortex: MPs vs HCs

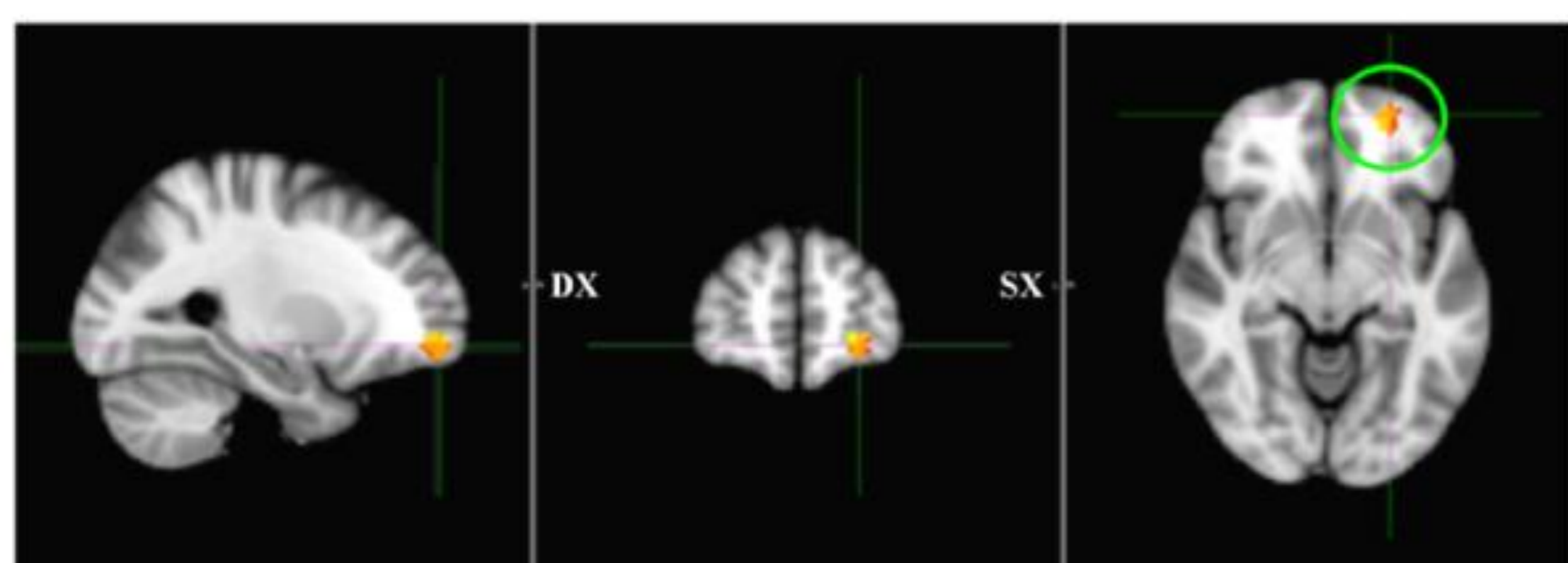


Volumetric analysis showed a reduction of the left medium and inferior frontal gyrus in MPs compared to HCs.

Conclusions

This study shows the existence in MPs of volumetric changes and microstructural abnormalities in areas belonging to several networks involved in different functions, including stress response and emotional control. The observation of morphological and structural volumetric reductions of brain regions involved in the processing of tactile and olfactory sensations among migraineurs, mainly with allodynia and osmophobia, reinforces the idea that migraine chronification may induce an alteration of the adaptation to external stimuli, as a consequence of a reduction of the capacity to filter and modulate those afferences. The assessment of structural abnormalities of regional network properties may contribute to further explain the clinical manifestations in MPs and define their neural mechanisms.

Medium frontal gyrus: MPs vs HCs



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