

IHS Fellowship reports



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Participation in REFORM (Registry for Migraine – structural and functional magnetic resonance imaging before and after erenumab treatment)

Fellowship from November 2021 to October 2022

Danish Headache Center, Glostrup, Denmark

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Overview

Chronic and high-frequency episodic migraine is a debilitating disorder and the mechanisms are poorly understood. Migraine is known to be associated with structural and functional changes in the brain, but little is known about the mechanism by which chronic migraine or a high frequency episodic migraine switch into a low frequency episodic migraine. Anti-CGRP treatments provide the opportunity to address this question.

Objective: to identify modification in cerebral connectivity when a chronic migraine/episodic high-frequency migraine is transformed into a low-frequency episodic migraine, among patients treated with erenumab.

Methods: 40 patients with chronic migraine/high frequency episodic migraine responders to an anti-CGRP treatment (erenumab) were planned. To reach 40 patients for the final analysis, we calculated 100 inclusions (20% of drop-out and 50% of anti-CGRP responders). IRM with resting state (BOLD signal) would be performed at baseline and after 6 months of treatment.

BOLD signal would be analysed with Conn software (running under matlab). Functional connectivity was compared: 1) between patients with chronic migraine/episodic high-frequency migraine and healthy controls at baseline, and 2) between MRI at 6 months follow-up and baseline in responders.

Additional methods: The connectivity of the ventro-postero-medial nucleus of the thalamus (VPM), relay of trigeminovascular nociception, was compared between responders and non-responders.

Summary of research

Results: A total of 260 patients with migraine (mean age \pm SD = 41.7 \pm 12.3 years; 88% female) and 148 healthy controls (mean age \pm SD = 41.4 \pm 11.6 years; 85% female) were included. Treatment response at 6 months was available for 149/260 (57%) of the patients, and was divided into four categories: reduction <25% of MMD, n = 48/149 (32%); 25–50%, n = 33/149 (22%); 50–75%, n = 42/149 (28%); >75% n = 26/149 (17%). Compared to responders >75%, responders <25% showed increased connectivity of the left VPM with the left amygdala: cluster (-12, -02, -14), size 82, size p-FDR = 0.0122, T = 4.68, p-FDR < 0.001. In ROI-to-ROI analysis, both VPM showed increased functional connectivity with both amygdala in non-responders.

Conclusion: Increased functional connectivity between the amygdala, a limbic structure, was found in non-responders. This result highlights the influence of emotional and vegetative factors in migraine, which require a multidisciplinary therapeutic approach.

An important part of the activity consisted of the pre-processing of MRI data of around 400 participants. Statistical analysis was carried out at the end of the internship. Other activities included diffusion tensor imaging, activation MRI analysis of patients who had experienced a migraine aura during MRI, and participation in three reviews of literature, two of which are already published.

Conclusion

All our planned objectives were reached and even more work (DTI, activation fMRI) was accomplished. The research team was characterised by a high availability of experienced supervisors and mentors, ensuring the success of projects.

This internship provided the opportunity to meet an internationally recognised team, to publish in this context, and to participate in a debate at an international conference. Working with such an internationally recognised team is an important step in pursuing an academic career in France.