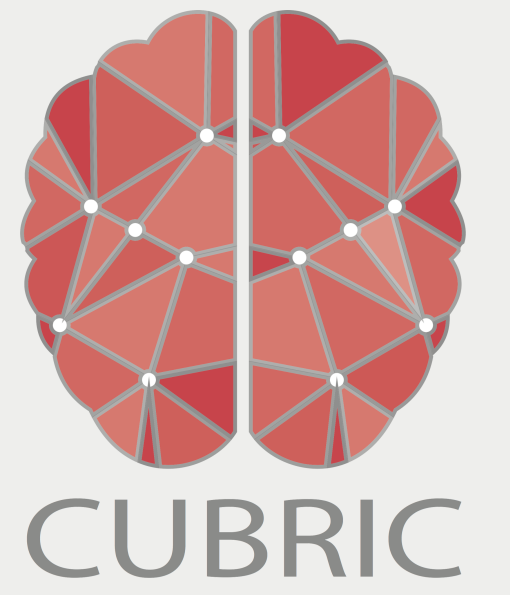




# Patterns of gray matter MRI morphometry longitudinal change in patients with chronic and episodic migraine

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## OBJECTIVES

With a final sample of **33 patients with episodic migraine (EM) and 48 patients with chronic migraine (CM) at baseline**, with **at least three years** between the MRI acquisitions, our objectives were:

1. **Determine the long-term gray matter morphometry changes in patients with CM and EM.**
2. **Characterise diverse patterns of longitudinal changes** according to the clinical course of the disease, especially in patients with CM who improved to EM.

## BACKGROUND

Gray Matter morphometry differences have been identified between patients with chronic migraine (CM) and episodic migraine (EM):

- ▶ Gray matter volume (GMV) and widespread surface area (SA): CM < EM.
- ▶ Cortical thickness (CT): CM or high-frequency EM > low-frequency EM. Used to distinguish CM from EM (classification task).

However, no longitudinal studies have been conducted to determine the long-term gray matter morphometry changes of patients with migraine.

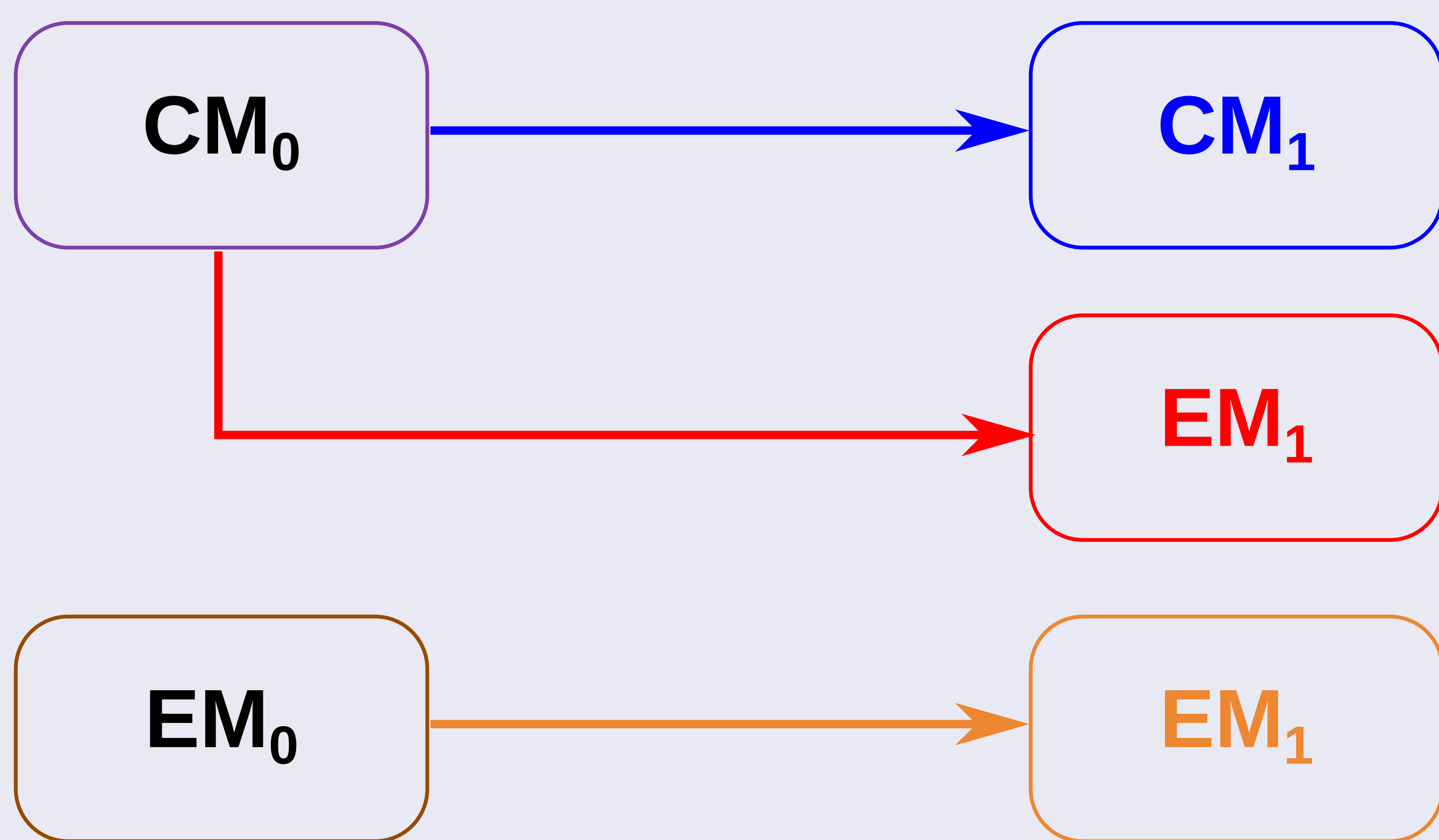
## METHODS

- ▶ High-resolution 3D brain T1-weighted MRI.
- ▶ Longitudinal pipeline of FreeSurfer (6.0.0) to obtain four morphometry parameters: **cortical curvature (CC), CT, SA and GMV.**
- ▶ Desikan-Killiany atlas: 68 cortical regions, and 14 subcortical regions and cerebellum (only GMV).
- ▶ Generalized Linear Mixed Models corrected by age and intracranial volume (GMV).

Assessed longitudinal clinical groups:

1. CM with persistent condition.
2. CM improving to EM.
3. EM at both timepoints.

$t_0$   $\xrightarrow{3+ \text{ years}}$   $t_1$



## REFERENCES

- Planchuelo-Gómez Á, et al. Gray Matter Structural Alterations in Chronic and Episodic Migraine: A Morphometric Magnetic Resonance Imaging Study. *Pain Medicine* 2020; 21(11): 2997-3011.
- Schwedt TJ, et al. Accurate classification of chronic migraine via brain magnetic resonance imaging. *Headache* 2015; 55(6): 762-77.
- Maleki N, et al. Concurrent functional and structural cortical alterations in migraine. *Cephalalgia* 2012; 32(8): 607-20.

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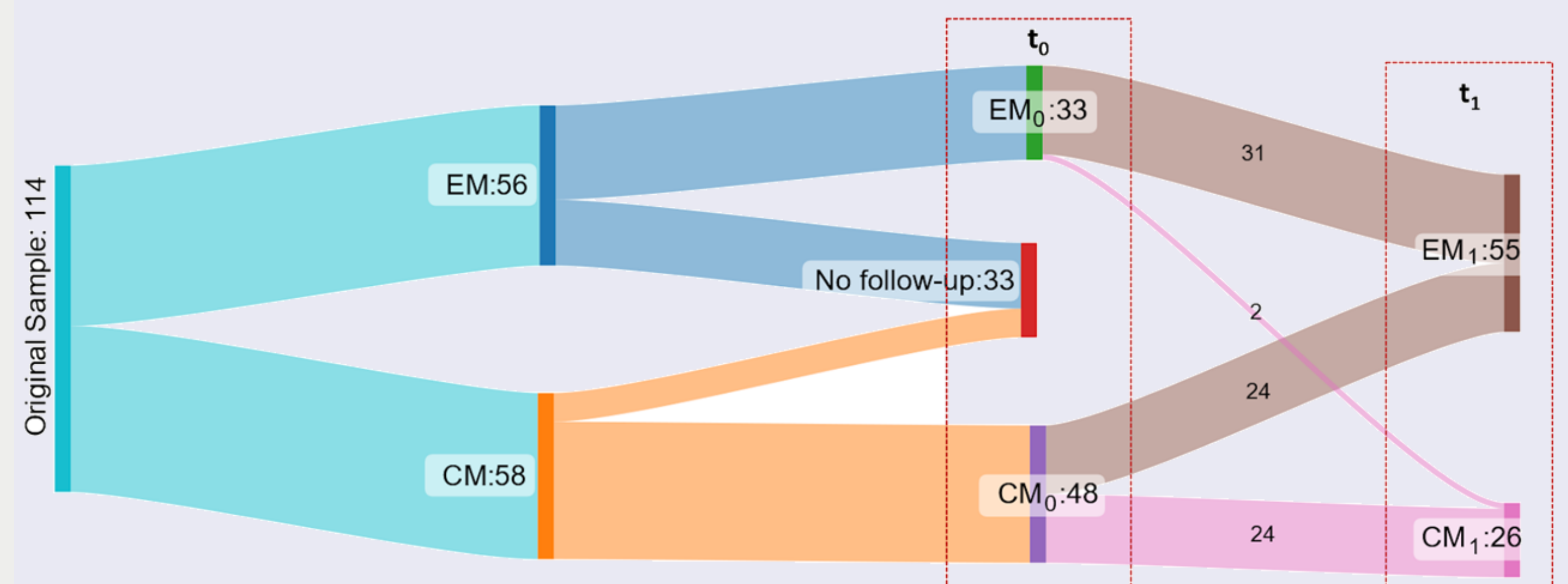
## CONCLUSIONS

Different **clinical evolutions** were associated with **specific longitudinal gray matter changes.**

1. **CM with persistent condition** → **GMV and CT decrease.**
2. **CM improving to EM** → **SA decrease and CT increase.**
3. **EM at both timepoints** → **Longitudinally reduced GMV, increased SA, and distinct CT patterns.**

## RESULTS

Mean time between MRI acquisitions > 60 months.



CM<sub>0</sub> to CM<sub>1</sub>

- ↑ CC (3 ROIs)
- ↓ GMV (13 ROIs)
- ↑ SA (2 ROIs)
- ↓ SA (1 ROI)
- ↓ CT (7 ROIs)

CM<sub>0</sub> to EM<sub>1</sub>

- ↑ CC (3 ROIs)
- ↓ GMV (1 ROI)
- ↓ SA (6 ROIs)
- ↑ CT (14 ROIs)

EM<sub>0</sub> to EM<sub>1</sub>

- ↑ CC (5 ROIs)
- ↓ GMV (5 ROIs)
- ↑ SA (6 ROIs)
- ↑ CT (11 ROIs)
- ↓ CT (5 ROIs)

