

Structural abnormalities in migraine, a VBM study

N. Schmitz¹, M. Kruit¹, G. Schoonman², F. Admiraal-Behloul³, M. Ferrari², M. van Buchem¹

¹Departement of Radiology, LUMC, Leiden, Netherlands, ²Department of Neurology, LUMC, Leiden, Netherlands, ³Departement of Radiology, section of Image Processing (LKEB), LUMC, Leiden, Netherlands

Introduction

Migraine affects almost one in four adult individuals, with a 3:1 prevalence for women¹. Migraine presents itself through extreme permanent or pulsating pain, functional disability and reduced productivity of the patient up to several days after an attack. Functional² and semi quantitative assessed structural³ abnormalities have been reported in individuals with migraine, however no quantitative structural measures have so far been reported. The aim of the current study was to identify whether individuals with migraine show anatomical differences compared to a control population in a quantitative assessment of brain volume, using an unbiased approach of Voxel Based Morphometry (VBM, SPM99).

Methods

24 individuals with migraine (22 female) and 22 control subjects (13 female), aged between 18 and 65 years, were investigated using a standard VBM protocol, based on 3D FFE T1 images (axial orientation; 160 slices; slice-thickness 1 mm; matrix 256 x 256, TE:3.3/TR 7ms, FOV 220mm).

Results (table 1)

- (i) Individuals with migraine showed significantly ($p < 0.001$) increased grey matter volume in the right orbital gyrus and cuneus, bilaterally (figure 1), and
- (ii) Individuals with migraine showed significantly ($p < 0.001$) reduced white matter volume in the right cingulum (figure 2) and the pyramidal tracts (Brodmann Area (BA) 1, 4 and 5), bilaterally, when compared with control subjects.

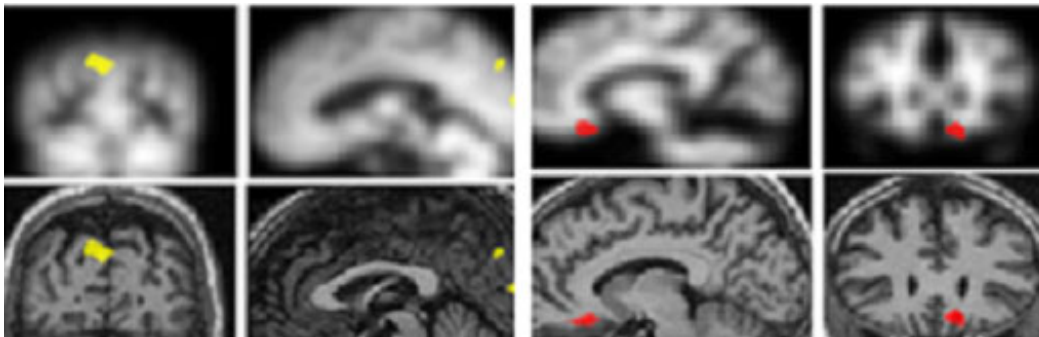


Figure 1: Increased grey matter (cuneus)

Figure 2: Reduced white matter (cingulum)

Table 1: Structural differences

Migraineurs vs Control subjects	Brain areas	Talairach and Tournoux (T&T)	Brodmann Area (BA)	Z Values	P Values
GREY MATTER (increased)	Gyrus orbitalis	9 29 -17	BA 11	4.98	0.000
	Cuneus	-9 -80 39	BA 19	5.38	0.000
	Cuneus	0 -97 15	BA 18	4.81	0.000
WHITE MATTER (decreased)	Cingulum	11 29 -17	CI	4.38	0.000
	Pyramidal tracts	-2 -32 58	BA 1	4.82	0.000
		0 -42 65	BA 5	3.30	0.000
		-30 -27 68	BA 4	3.13	0.000

Conclusion

To our knowledge this is the first study to identify quantitative structural brain abnormalities in grey and white matter compartments in individuals with Migraine compared to a control population. Further research is necessary to investigate the role of these specific anatomical deficits for attack frequency, risk of infarcts and impact on suffering of the individual.

References

1. Laurer et al., 1999, Neurology, 53/3:537-542.
2. Rocca et al., 2002, Stroke, 33: 665-670
3. Kruit et al., 2002, ISMRM Conference