Original article

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7 tesla T_2*-weighted MRI as a tool to improve detection of focal cortical dysplasia

Tim J. Veersema [1], Pieter van Eijsden [1], Peter H. Gosselaar [1], Jeroen Hendrikse [2], Jaco J.M. Zwanenburg [2], Wim G.M. Spliet [3], Eleonora Aronica [4], Kees P.J. Braun [1], Cyrille H. Ferrier [1]

[1] Department of Neurology and Neurosurgery, Brain Center Rudolg Magnus, University Medical Center Utrecht
[2] Department of Radiology, University Medical Center Utrecht
[3] Department of Pathology, University Medical Center Utrecht
[4] Academic Medical Center, Department of Pathology, Amsterdam, The Netherlands

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Study Summary

- Retrospective review of patients with histologically proven cortical dysplasia
  (FCD and mMCD)
- Reassessment of T2* weighted sequence
  (= susceptibility contrast based, sensitive for deoxyhemoglobin in venous blood, calcifications and blood break-down products etc.)

- In 4 of 6 patients:
  T2* signal changes co-localizing with dysplasia
- Suggestive of increased venous vasculature in the sulci neighboring the malformed cortex.
- Could be possibly used as MRI marker for dysplasia.

gradient echo T_2* : isotropic 0.5mm resolution, echo time 27ms, flip angle 24°, repetition time 57-93ms (shortest possible), with EPI and flow compensation.

Summarized patient characteristics

Pat. no.	Sex/age	*T2** 7T	Surgery	Histopathology
I	♀/45	Hypointensities R frontal parasagittal	R Partial lobectomy frontal parasagittal	ILAE FCD IIb
II	♀/22	Hypointensities R inferior frontocentral	R inferior frontocentral Lesionectomy	ILAE FCD Ib
III	♀/25	Hypointensity superior anterior temporal pole	L ant temp lobectomy + amygdalohippo-campectomy.	mMCD type 2 (no hippocampal sclerosis)
IV	♀/12	Hypointensity in wide sulcus R central	R pre-central lesionectomy.	FCD IIb
V	♂/15	No abnormalities	R basotemporo-occiptal Lesionectomy	FCD IIa
VI	♂/7	No abnormalities	R Front Lesionectomy	FCD IIa

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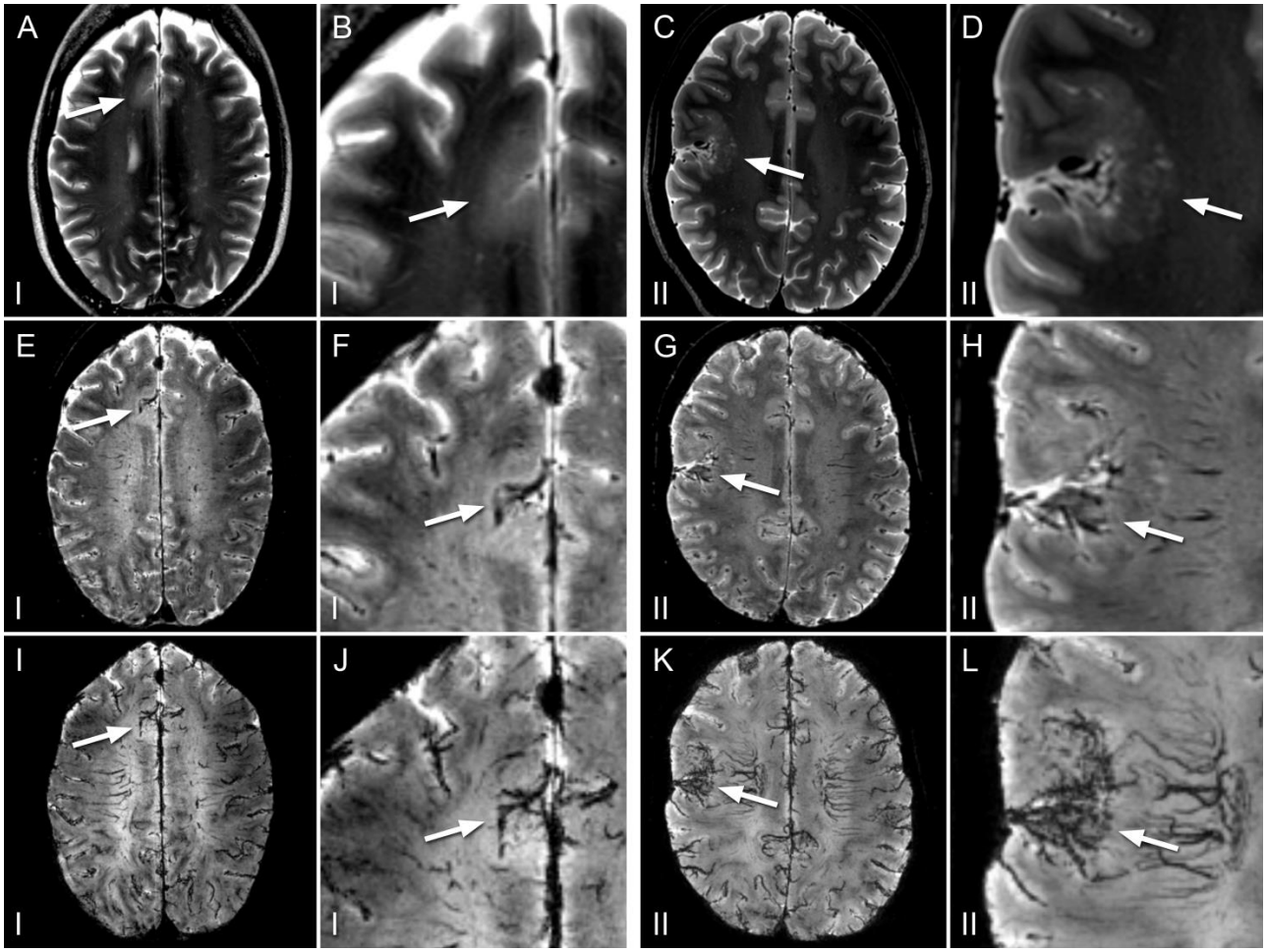
Cases I & II



7T T_2 (A-D), T_2* (E-H) and T_2* minimum intensity projection (I-L), transverse reconstructions. Lesions depicted in detail in B, D, F, H, J and L.

Patient I;
FCD ILAE type IIb (A, B, E, F, I, J).
No lesion identified on 3T MRI, subtle gray-white matter junction blurring is seen on 7T T_2 weighted MRI (A, B). On T_2* (E, F) the neighboring sulcus seems to contain prominent vasculature. T_2* minimum intensity projection (I, J) aids in the visual detection.

Patient II;
FCD ILAE type Ib (C, D, G, H, K, L).
T_2-weighted MRI (C, D) shows grey-white matter junction blurring and cortical thickening indicative of FCD. In the same area T_2* (G, H) shows a wide sulcus with prominent vascular structures. T_2* minimum intensity projection (K, L) strongly emphasizes the increased vasculature.

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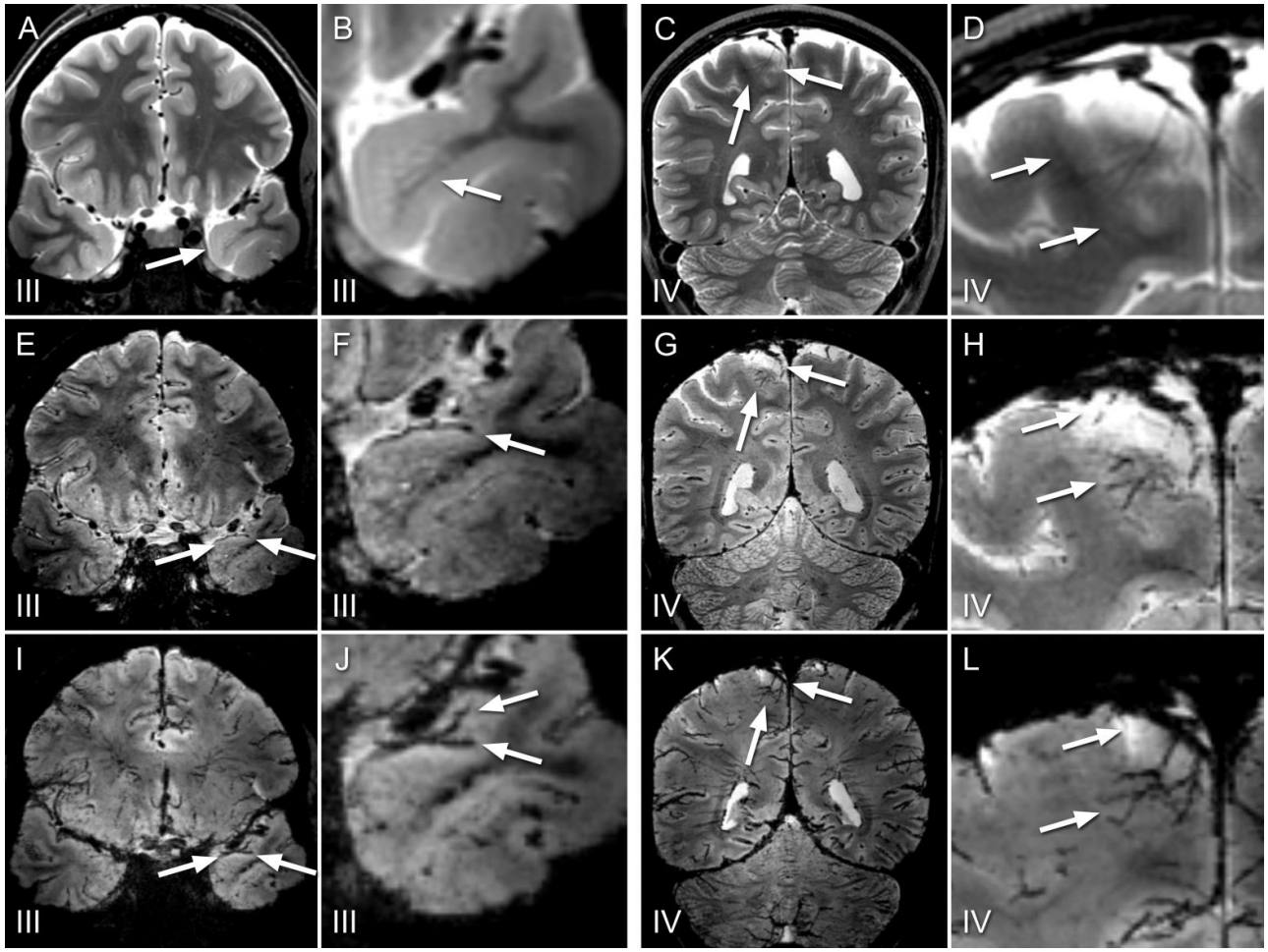
Cases III & IV



7T T_2 (A-D), T_2* (E-H) and T_2* minimum intensity projection (I-L), coronal reconstructions. Lesions depicted in detail in B, D, F, H, J and L.

Patient III; mild malformation of cortical development type 2 (A, B, E, F, I, J). On T_2 (A, B), blurring and subcortical hyperintensity represent developmental malformation. T_2* (E, F) shows a wide Sylvian fissure but no clearly appreciable vascular changes. On T_2* minimum intensity projection (I, J) there appears to be an increase in vascular signal in the superior temporal pole.

Patient IV;
FCD ILAE type IIb. (C, D, G, H, K, L). On T_2 (C, D) notable large extracerebral space central parasagittal containing a large vein, but without evident dysplastic characteristics but. T_2* (G, H) shows the large vein and smaller vasculature that drains from the dysplastic cortex (as proven by histology). Enhanced conspicuity on T_2* minimum intensity projection (K, L).

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