

Reminder of important clinical lesson

'Fogging' resulting in normal MRI 3 weeks after ischaemic stroke

Philip Choi, Velandai Srikanth, Thanh Phan

Department of Neurosciences, Monash Medical Centre, Melbourne, Australia

Correspondence to Dr Philip Choi, philip.choi@gmx.com

Summary

CT of the brain is often negative in acute stroke. The absence of changes suggestive of infarction on MRI of the brain in the setting of a recent stroke is unusual. An otherwise fit and well 69-year-old Caucasian man presented to the hospital with a 26-h history of acute mild right hemiparesis. CT brain on arrival showed no abnormality. MRI brain was also normal 3 weeks post stroke with abnormality seen only at 11 weeks. Stroke remains a clinical diagnosis. The time of the stroke must be taken into consideration when interpreting MRI brain images. Infarct may be 'invisible' on MRI in the subacute phase of ischaemic stroke.

BACKGROUND

Physicians often assume MRI is the 'definitive' test to see whether a patient's stroke-like symptoms was due to stroke or not. It is now well recognised that CT may be normal in the acute phase of stroke. It is important to note that MRI, even with all the different sequences, can be negative in the subacute phase of stroke as well. Patient may be misdiagnosed as stroke mimics if the MRI is not interpreted or reported with the time of onset of symptom in mind.

CASE PRESENTATION

A 69-year-old Caucasian man with no significant medical history presented with 26 h of occipital headache, mild right facial, arm and leg weakness.

INVESTIGATIONS

CT of the brain 30 h and again 58 h after symptom were normal.

OUTCOME AND FOLLOW-UP

Patient's symptoms gradually improved over 10 days. MRI, including diffusion weighted imaging (DWI), apparent diffusion coefficient and fluid-attenuated inversion recovery images of the brain 3 weeks after the index stroke was normal (figure 1A–D). Interestingly, a repeat study 8 weeks after the first MRI confirmed a left paramedian pontine infarct on T2-weighted sequence (arrow on figure 1H) but not on the DWI sequence. The patient reported no new neurological symptoms in between the first and second MRI studies.

DISCUSSION

Our case illustrates that the combination of pseudonormalisation^{1–3} and 'fogging' in the subacute phase of ischaemic stroke may cause an infarct to be invisible on MRI. Signal intensity on DWI for acute infarct is maximal within 24 h of onset and may become invisible after 2 weeks post stroke.⁴ During the time of DWI normalisation, the infarct

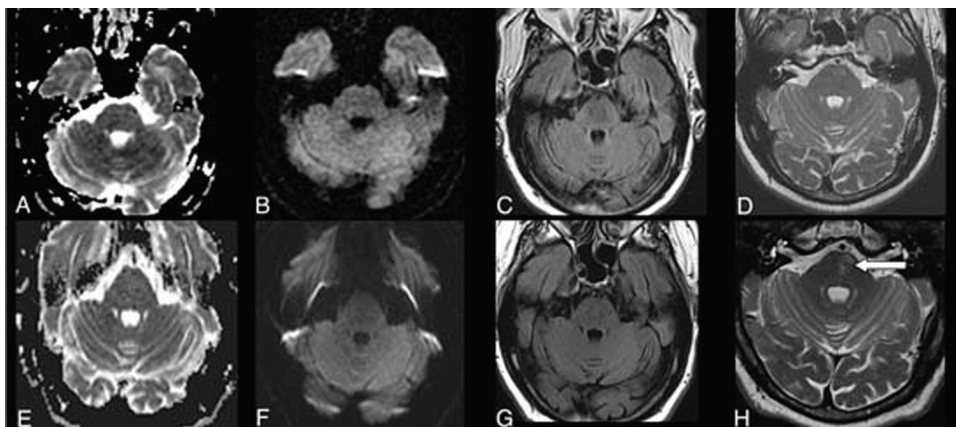


Figure 1 (A–D) The initial apparent diffusion coefficient, diffusion weighted imaging, fluid-attenuated inversion recovery and high resolution T2 images show no abnormality. (H) The follow-up MRI scan shows abnormality best seen on the high resolution T2 image.

is usually visible on T2-weighted image but in this patient, it was normal as well. This may be explained by a less well-recognised phenomenon termed 'fogging'.⁵ Typically fogging is used to describe the reduced infarct extent between initial and subsequent scans. In this instance, fogging rendered the infarct invisible. A decrease in apparent infarct extent on serial DWI scans after stroke in the presence of haemorrhagic transformation has been shown previously.⁶ Thus fogging is thought to be related to mild haemorrhagic transformation or neocapillary growth with some minor leakage of red cells from friable capillaries. The true extent of an infarct may not be apparent until at least 7 weeks post stroke.⁵

Learning points

- ▶ Stroke remains a clinical diagnosis.
- ▶ MRI brain must be interpreted with the stroke onset timing in mind, as MRI may be negative in the subacute phase of stroke.
- ▶ Repeated imaging may be necessary to locate infarct territory in order to guide secondary prevention therapy (symptomatic carotid stenosis vs posterior circulation disease).

Competing interests None.

Patient consent Obtained.

REFERENCES

1. **Sylaja PN**, Coutts SB, Krol A, *et al*. When to expect negative diffusion-weighted images in stroke and transient ischemic attack. *Stroke* 2008;**39**:1898–900.
2. **Pereira AC**, Doyle VL, Clifton A, *et al*. Case reports. The transient disappearance of cerebral infarction on T(2)Weighted MRI. *Clin Radiol* 2000;**55**:725–7.
3. **Axer H**, Grässel D, Brämer D, *et al*. Time course of diffusion imaging in acute brainstem infarcts. *J Magn Reson Imaging* 2007;**26**:905–12.
4. **Burdette JH**, Ricci PE, Petitti N, *et al*. Cerebral infarction: time course of signal intensity changes on diffusion-weighted MR images. *AJR Am J Roentgenol* 1998;**171**:791–5.
5. **O'Brien P**, Sellar RJ, Wardlaw JM. Fogging on T2-weighted MR after acute ischaemic stroke: how often might this occur and what are the implications? *Neuroradiology* 2004;**46**:635–41.
6. **Jäger HR**, Soh C, Beric V, *et al*. Haemorrhagic transformation of acute ischaemic infarcts: a pitfall in the interpretation of diffusion-weighted images and maps of apparent diffusion coefficients. Annual Scientific Meeting of the British Society of Neuroradiologists. Guildhall, Winchester 2002. *Neuroradiology* 2003;**45**:119.

This pdf has been created automatically from the final edited text and images.

Copyright 2011 BMJ Publishing Group. All rights reserved. For permission to reuse any of this content visit <http://group.bmj.com/group/rights-licensing/permissions>.
BMJ Case Report Fellows may re-use this article for personal use and teaching without any further permission.

Please cite this article as follows (you will need to access the article online to obtain the date of publication).

Choi P, Srikanth V, Phan T. 'Fogging' resulting in normal MRI 3 weeks after ischaemic stroke. *BMJ Case Reports* 2011;10.1136/bcr.04.2011.4110, date of publication

Become a Fellow of BMJ Case Reports today and you can:

- ▶ Submit as many cases as you like
- ▶ Enjoy fast sympathetic peer review and rapid publication of accepted articles
- ▶ Access all the published articles
- ▶ Re-use any of the published material for personal use and teaching without further permission

For information on Institutional Fellowships contact consortiasales@bmjgroup.com

Visit casereports.bmj.com for more articles like this and to become a Fellow