Pseudonormalisation of a subacute infarct following recent intravenous contrast administration

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DESCRIPTION

A woman in her 70s presented with 4 days history of subacute confusion and dysarthria. Her medical history included valvular atrial fibrillation on warfarin, type 2 diabetes mellitus and hypertension. Her International Normalised Ratio (INR) was 1.1 on admission. Initial multimodal CT imaging (non-contrast CT brain, followed by CT perfusion and CT angiogram from the aortic arch to vertex) showed a subacute hypodense right frontal infarct, no perfusion deficit and no vascular stenosis or occlusion. She was admitted to the stroke unit for conservative management. Four hours later, she had a sudden decrease in her level of consciousness prompting a repeat CT brain. This repeat scan revealed the previously hypodense right frontal infarct was now isodense. No significant changes were found to explain her clinical deterioration and she subsequently returned to her baseline on admission after a few hours. CT brain 40 hours after the second CT showed the expected evolutional changes and the extent of the infarct (figure 1).

The consequence of blood-brain barrier disruption in the area of recent infarct results in contrast staining. The contrast then gives the area an isodense appearance mimicking that of early ischaemic change rather than an established subacute infarct. This effect has previously been described in the context of imaging performed soon after endovascular thrombectomy.[1 2] This pseudonormalisation effect is also similar to the concept of the 'fogging effect', where a previously hypodense infarct becomes radiologically isodense on repeat imaging due to changes in composition of the infarcted tissue. However, classic pseudonormalisation typically occurs 2–3 weeks poststroke, but has also reported to occur as early as 6 days postinfarct.[3]

The appearance of an infarct on a brain CT is often used to estimate its age. It is important to ascertain the timeline of previous scans and whether contrast was used, as potentially an already established subacute infarct could be misinterpreted as early ischaemic change due to pseudonormalisation from contrast extravasation.

For patients being transferred between different sites, the initial imaging at the first hospital must be reviewed. Non-contrast imaging on arrival at the second hospital may not reliably reflect the age of an infarct if contrast was given in the hours prior. For example, when a large vessel occlusion is identified on imaging at a remote site and the patient is transferred to a tertiary centre a few hours away. The Alberta Stroke Programme Early CT score (ASPECTS) was an excellent 9/10 on the second CT (figure 1B).[4] This makes the patient an otherwise ideal candidate for thrombectomy if there was a large vessel occlusion and the clinical deficit was severe enough, even in the delayed time window. However, to proceed based on this information alone would not be appropriate and potentially dangerous. There is a substantial risk of haemorrhagic transformation in reperfusing already infarcted tissue masquerading as 'early ischaemic changes'.

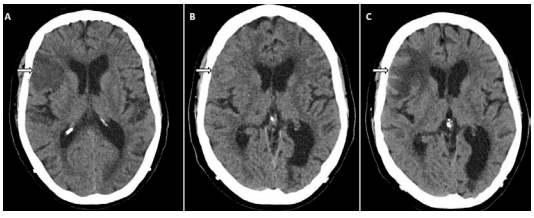

Figure 1 Non-contrast brain CT. (A) Initial CT shows right frontal hypodensity. (B) Subsequent CT shows the previously hypodense right frontal area is now isodense. (C) Repeat CT the next day showed expected evolutional changes of the initial subacute infarct.

Learning points

- Recent contrast use can lead to 'contrast pseudonormalisation', where a subacute infarct can mimic the appearance of 'early ischaemic changes', under-estimating the chronicity of the infarct.
- 'Fogging' on the CT brain due to natural changes in brain parenchymal composition can take days to weeks from stroke ictus. Intravenous contrast extravasation in already infarcted tissue may give the appearance of 'fogging' much faster.

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Case reports provide a valuable learning resource for the scientific community and can indicate areas of interest for future research. They should not be used in isolation to guide treatment choices or public health policy.

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