

Case Report: Ipsilateral Thalamic Diaschisis (ITD)

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Patient history

A 47-year-old man was admitted at the emergency room 7 hours after an acute episode of left side weakness and speech difficulties. On neurological examination, the patient showed dysarthria, left facial palsy, left visual field defect, and left-sided hemiparesis and hypoesthesia. The NIHSS on admission was 13. The patient was discharged 7 days after admission with dysarthria and mild left-sided hemiparesis (NIHSS of 5).

Sequence details

- **3D Time-of-Flight (TOF) MR angiography:** TR: 20 ms; TE: 3.59 ms; TA: 4.47 min; matrix 384; FOV 220 x 176; Acq: 1; BW 165 Hz/px; Flip angle: 18°; Slices: 160; thickness: 0.5 mm; Slice gap: -20%
- **FLAIR (transverse and coronal):** TR: 9000 ms; TE: 93 ms; TI: 2500 ms; Echo train: 13; TA: 4.14 min; matrix 256; FOV 230 x 176; Acq: 1; BW 287 Hz/px; Flip angle: 120°; Slices: 25; thickness: 4 mm; Slice gap: 30%
- **syngo DWI (diffusion-weighted imaging):** TR: 3100 ms; TE: 78 ms; TA: 1.38 min; matrix 128; FOV 230 x 230; Acq: 4; BW 1346 Hz/px; Flip angle: 90°; Slices: 19; thickness: 5 mm; Slice gap: 30%
- **syngo ASL (Arterial Spin Labeling):** TR: 2500 ms; TE: 13 ms; TA: 3.52 min; TI: 700/1800 ms; matrix 64; FOV 256 x 256; Acq: 1; BW 2232 Hz/px; Slices: 9; thickness: 8 mm; Slice gap: 25%. ASL images were fused with FLAIR images.

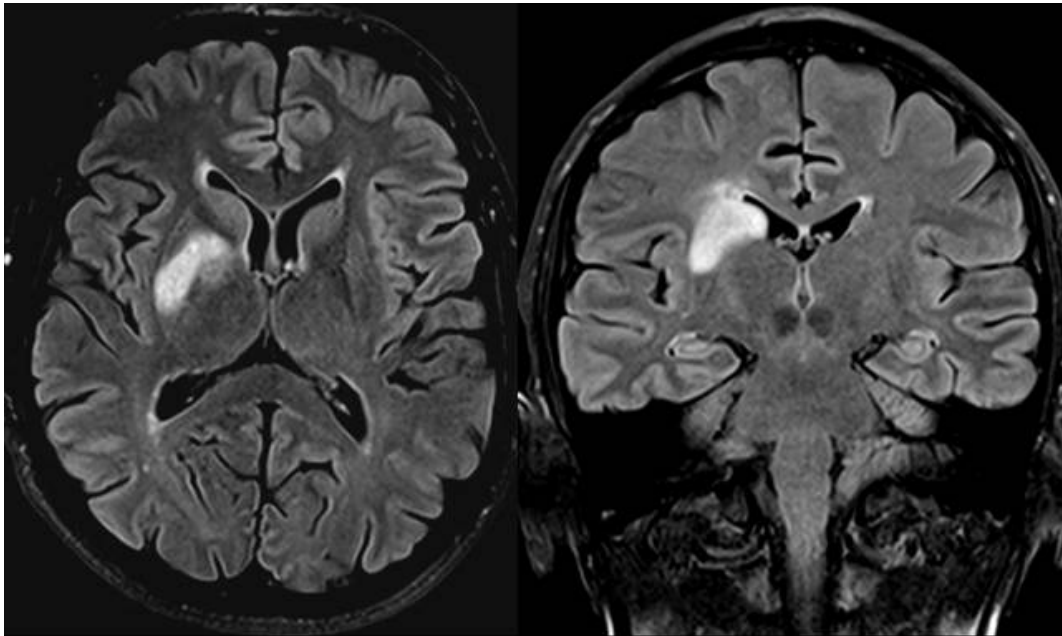


Figure 1: T2-weighted FLAIR showing high signal intensity lesion involving the right basal ganglia without cortical involvement, supporting the initial diagnosis of deep MCA infarction.

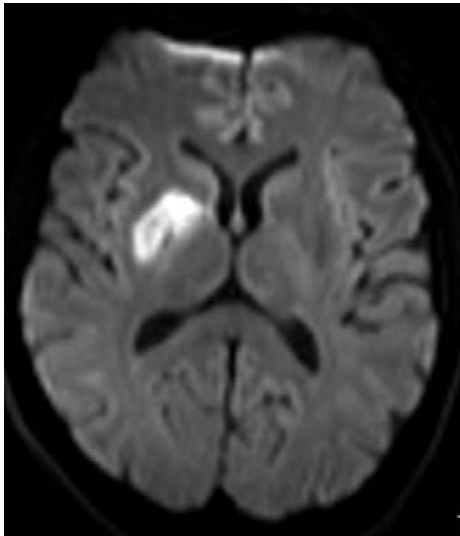


Figure 2: syngo DWI

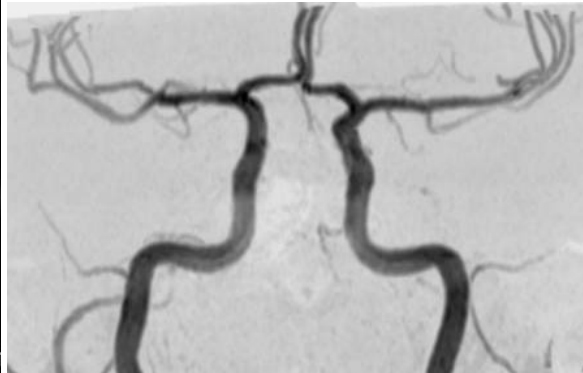


Figure 3: 3D TOF MR angio showing normal permeability of the intracranial arteries.

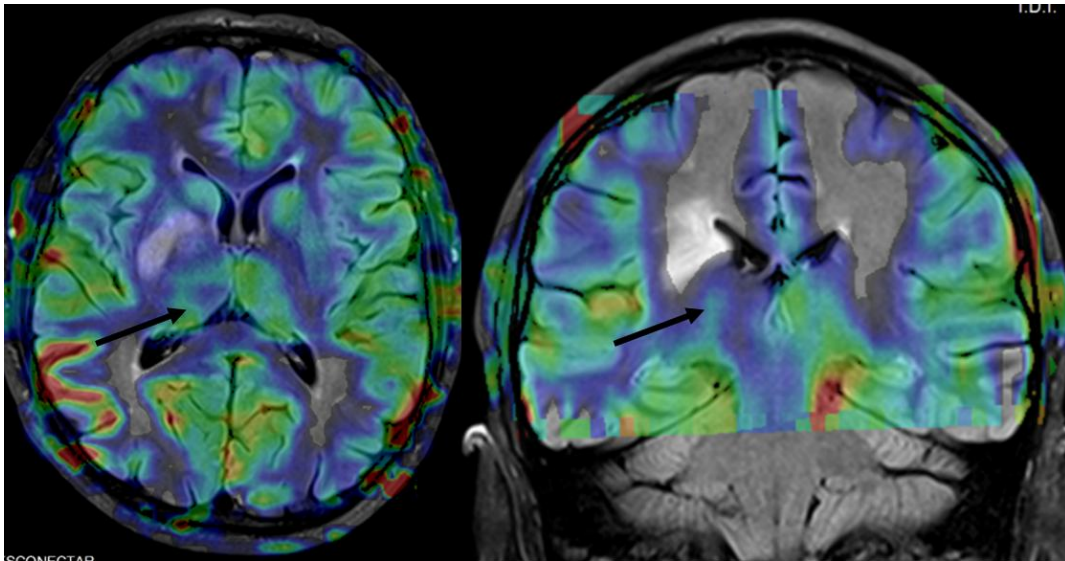


Figure 4: The ASL sequence (CBF map) showed an area of hypoperfusion affecting the right basal ganglia, and in the ipsilateral thalamus (arrows).

Imaging findings

An emergency CT scan showed a slight hypodensity involving the right basal ganglia, suggestive of acute infarction involving the deep territory of the middle cerebral artery (MCA). A transcranial and cervical Doppler ultrasound study did not show arterial occlusions. With the diagnosis of acute MCA infarction a brain MRI was performed on a 3T MAGNETOM Trio system six days after admission, which included fast-Flair, DWI, arterial spin labeling (ASL), and MR angiography (3D TOF) sequences. This study showed a T2 FLAIR (Fig. 1) and DWI (Fig. 2) high signal intensity lesion involving the right basal ganglia without cortical involvement, supporting the initial diagnosis of deep MCA infarction. The 3D TOF MR angio showed normal permeability of the intracranial arteries (Fig. 3).

The ASL sequence (CBF map) showed an area of hypoperfusion affecting the right basal ganglia, and in the ipsilateral thalamus (arrows). The hypoperfused area in the basal ganglia matched the high signal intensity on both T2 and DW images, but no signal changes were present on these sequences in the thalamus (Fig. 4).

Final diagnosis

Right subacute deep middle cerebral artery infarction with ipsilateral thalamic diaschisis.

Comment and discussion

Diaschisis is a physiological phenomenon based on reversible depression of functions anatomically or functionally connected to a damaged area. This phenomenon has mainly been described in cerebrovascular pathology and has been classified according to the connecting fibers involved. When the connecting fibers are intra-hemispheric the diaschisis involve the ipsilateral thalamus or cortico-subcortical areas, when they are inter-hemispheric produce transcallosal diaschisis, and when they are cerebellar affects the contralateral cerebellum.

Ipsilateral thalamic diaschisis (ITD) with depression of blood flow and metabolism, as demonstrated with PET, is more likely to occur in extensive middle cerebral infarcts that involve the convex surface of the cerebral hemisphere. However, ITD has been also described in patients with infarctions that involved the basal ganglia, a fact that can be explained by the complex of neural circuits that interconnect these structures.

The present case report demonstrates a case of acute ITD secondary to basal ganglia infarction demonstrated by means of Arterial Spin Labeling (ASL). ASL is an emerging MR perfusion technique, for quantitatively measuring cerebral blood flow (CBF) by taking advantage of arterial water as a freely diffusible tracer. ASL is completely non-invasive and repeatable and is performed without gadolinium, thus bypassing concerns regarding nephrogenic systemic fibrosis in patients with significant renal insufficiency. It should be expected that the progressive inclusion of this sequence within the routine clinical neuroimaging protocol in patients with stroke, will increase the sensitivity of MRI in demonstrating functional abnormalities not associated with structural changes, such as diaschisis.

References

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