Unilateral Thalamic Infarct: A Rare Presentation of Deep Cerebral Venous Thrombosis

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Abstract

Deep cerebral venous thrombosis (DCVT) remains a very rare entity among the spectrum of cerebral venous thrombosis (CVT). Due to the bilateral draining territories, DCVT nearly invariably causes bilateral infarction with predictably dismal prognosis. However, rare instances of DCVT with unilateral infarction having favorable prognosis have been described, but pose a wide range of differentials to the clinician and require careful interpretation of clinical and radiological features for accurate diagnosis. Here, we report two unusual cases of DCVT with unilateral thalamic infarction with excellent outcome. We also report a rare case of CVT, with simultaneous deep and cortical vein thrombosis. Through a relevant review of the literature, we also examine the clinical presentations of unilateral infarction due to DCVT and their outcomes.

Keywords: Cerebral venous thrombosis, deep cerebral venous thrombosis, unilateral thalamic infarct

Introduction

Deep cerebral venous thrombosis (DCVT) remains a very rare entity among the spectrum of cerebral venous thrombosis (CVT). Due to the bilateral draining territories, DCVT nearly invariably causes bilateral infarction with predictably dismal prognosis. However, rare instances of DCVT with unilateral infarction having favorable prognosis have been described, but pose a wide range of differentials to the clinician and require careful interpretation of clinical and radiological features for accurate diagnosis. Here, we report two unusual cases of DCVT with unilateral thalamic infarction with excellent outcome. We also report a rare case of CVT, with simultaneous deep and cortical vein thrombosis. Through a relevant review of the literature, we also examine the clinical presentations of unilateral infarction due to DCVT and their outcomes.

Case Reports

Case 1

A 43-year-old female presented to the emergency room with 3 days symptoms of diffuse mild-to-moderate headache which subsided by the next day with paracetamol. Since then, she was noted to have dragging of the right leg and clumsiness of the right hand in the form of fumbling and occasional dropping of objects. She became withdrawn, tending to remain in bed with monosyllabic but appropriate responses and needed coaxing for activities including self-care. She was a mother of three with and her history was also prominent for previous menorrhagia but was not any medications. At admission, she remained apathetic and dull but had no aphasia or dysarthria. She had the right upper motor neuron (UMN) facial palsy with subtle right-sided pyramidal signs and mild weakness of the right upper limb and lower limbs. The clinical localization was over the left frontal cortical or subcortical region with likely etiologies including acute demyelinating encephalomyelitis (ADEM), cerebral cortical venous thrombosis, or intracranial space-occupying lesions.

Her magnetic resonance imaging (MRI) revealed the left thalamic hyperintensity with mild mass effect along with the left caudate and left lentiform nucleus hyperintensities sparing internal capsule. There were separate left superior frontal gyrus and left centrum semiovale hyperintensities. Maximum intensity projection and magnetic resonance venography (MRV) time-of-flight (TOF) images showed evidence for the internal cerebral vein, vein of Galen, and cortical vein thrombosis over the left frontal convexity. Diffusion and apparent diffusion coefficient sequences revealed patchy restriction for both thalamic and frontal cortical infarct, suggesting mixed vasogenic and cytotoxic edema [Figure 1].

Her laboratories meanwhile showed severe iron deficiency anemia with hemoglobin of 5.8 mg/dl (11–14 mg/dl), serum iron 7.4 μg/dl (40–155 μg/dl), and ferritin of 5.6 ng/ml (12–150 ng/ml). Her peripheral smear showed hypochromic microcytic anemia and the rest of her evaluation including antinuclear antibody, IgG and IgM antiphospholipid antibody (APLA), protein C and S, factor V Leiden mutation, and serum homocysteine was normal.

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Ultrasonography of the pelvis revealed multiple subserous fibroids. Meanwhile, lumbar puncture was done considering an encephalitic or demyelinating process which revealed an opening pressure of 150 mm of cerebrospinal fluid (CSF) with protein of 106 mg/dl, with no cells, normal glucose levels, and absent oligoclonal bands. She was initiated on anticoagulation, and her anemia was corrected by parenteral iron and packed red cell transfusion with a plan for elective hysterectomy. At 1-month review, the patient has become completely asymptomatic and has resumed her normal routine.

Case 2

A 22-year-old female presented with a rather abrupt onset of holocranial predominantly back of scalp severe headache for the past 2 days with bouts of vomiting. The pain persisted with only temporary relief with analgesics and was worse on lying down. Her examination did not reveal any neurological abnormality. She had presented with nearly similar throbbing holocranial headache along with neck pain and bouts of vomiting exactly 1 year before current and had been diagnosed with extensive thrombosis involving the superior and left transverse sinuses but with no parenchymal changes. She had been on anticoagulation for 6 months after which it was discontinued, and her subsequent procoagulant workup had been negative. Her follow-up MRI with MRV had revealed near complete resolution with the establishment of flow in the superior and left transverse sinus. She had a history suggestive of polycystic ovarian disease for which she was on Metformin for 3 years prior but had not been on any other medications.

Her current MRI showed the left medial thalamic hyperintensity with minimal diffusion restriction with contrast MRV showing complete nonvisualization of the straight sinus, vein of Galen, and deep cerebral veins as well as partial occlusion of the posterior part of superior sagittal sinus [Figure 2]. She was reinitiated on anticoagulation with a plan for indefinite continuation of anticoagulation. Extensive evaluation, including repeat procoagulant workup for and IgM APLA, protein C and S, Factor V Leiden mutation, and serum homocysteine, before initiation of anticoagulation failed to reveal etiology. By discharge, the patient was completely asymptomatic with no focal neurological deficits.

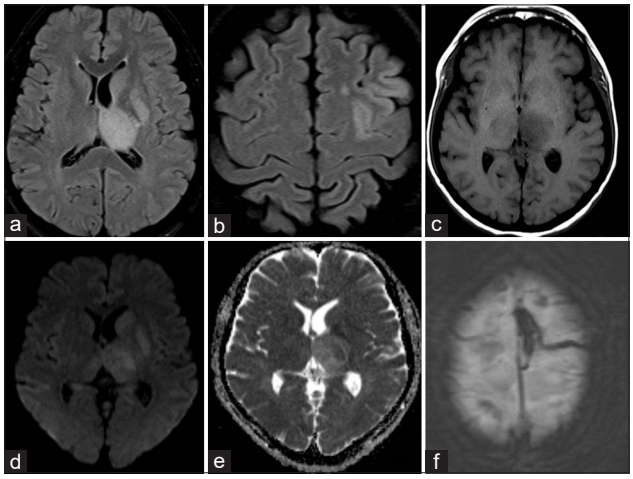

Figure 1: Magnetic resonance imaging sequences of the patient in Case 1. Magnetic resonance imaging T2 fluid-attenuated inversion recovery hyperintensities involving left dorsomedial thalamus, caudate, and lentiform nucleus with mild mass effect; hyperintensity of the left superior frontal gyrus (a and b). T1 images showing corresponding hypointensity (c). Diffusion-weighted images and apparent diffusion coefficient sequences (d and e) showing only patchy diffusion restriction. Maximum intensity projection showing hypodensity over left frontal convexity suggesting a left frontal cortical venous thrombosis (f)

Discussion

The deep venous system comprises: (1) Paired internal cerebral veins which are midline structures, the main tributary being thalamostriate veins, choroidal veins, and anterior septal veins. (2) The basal vein of Rosenthal formed from tributaries on the medial surface and temporal horn of the temporal lobe, and (3) Great vein of Galen formed by confluence of the two internal cerebral veins and the two basal veins just posterior and superior to the pineal gland.[1] Anatomic variations from this classic confluence are, however, common.

In the international multicentric study on CVT, deep venous system thrombosis constituted 10.9% of all cases of CVT.[2] Yousry had noted the rarity of unilateral internal cerebral vein thrombosis, and the asymmetrical thalamic and basal ganglia changes thereof.[3] Due to the symmetrical draining territories, infarctions associated with deep venous system infarction are usually bilateral, often affecting the thalami, corpus striatum, and adjacent white matter structures and upper midbrain. The presence of deep venous system thrombosis predicted a poor outcome in terms of a hazard ratio of 2.9.[2] However, the degree of damage depends on the extent of thrombosis and efficiency

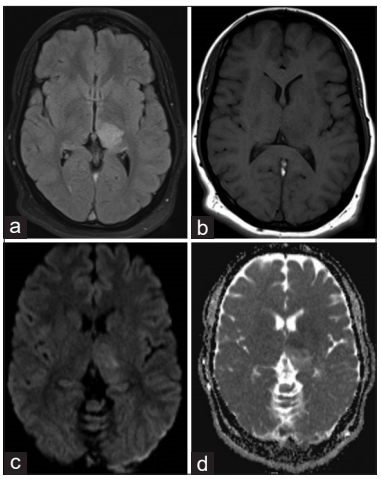

Figure 2: Magnetic resonance imaging sequences of the patient in Case 2. Magnetic resonance imaging T2 Fluid-attenuated inversion recovery hyperintensity over left dorsomedial thalamus (a). Corresponding faint T1 hypointensity (b). Diffusion-weighted images and apparent diffusion coefficient sequences (c and d) showing faint diffusion restriction of the thalamic hyperintensity

of draining collaterals. Accordingly, partial DCVT syndrome, with remarkably good prognosis has been described rarely in literature. Despite deep venous system thrombosis against the norm, asymmetrical involvement of unilateral thalamus and deep structures are seen in these cases. The details of clinical presentations, radiological features, differentials, and outcome of the reported cases of unilateral DCVT infarction are summarized Table 1.

In nearly, all the reported cases in the literature, the infarction has been on the left side, the reason for which remains unclear. It may be that a more common anatomic variant predisposes the left-sided system, especially the left internal cerebral vein with insufficient collateral venous drainage of the thalamus, leading to the left thalamic infarction. However, this conjecture has not been proven in any of the reports and digital substraction angiography (DSA) evidence has been lacking. As has been previously proposed, the left-sided infarction may be clinically more manifest as opposed to the nondominant side, again this remains in the realm of speculations.[8] The current two cases capture the spectrum of DCVT highlighting the clinical features. As has been reported in previous reports, both the cases in our series had a left-sided infarction.

The diagnosis of unilateral deep venous infarct is not easy considering its clinical rarity and wide range radiological possibilities. In most cases, the differential considered was that of a thalamic glioma or an abscess. In our first case, the possibility of viral encephalitis or ADEM was also considered among other differentials, and lumbar puncture was done before anticoagulation which showed elevated protein. In fact, nearly one-third of the patients in the multicentric series of CVT had undergone lumbar puncture. It may also have been employed for documenting the elevated CSF pressures which can be an isolated presentation of CVT. The second case in our series was easier to suspect with a history of previous cortical vein thrombosis, though she had presented with isolated headache alone during both her episodes.

In DCVT, the triad of subacute onset of headache, mild to marked alteration of sensorium with hemiparesis has been the predominant clinical feature. It requires a careful scrutiny for the absence of normal flow voids of deep cerebral veins along with the use of venogram would confirm the diagnosis [Figure 3].

Of the very few reported cases in the literature, the outcome of unilateral deep venous system infarction has been good as opposed to deep CVT in general. It may refer to that end of the spectrum were by the disease has been captured in the initial stages and initiation of anticoagulation has been done before further propagation of thrombosis and more extensive infarction leading to further downhill cascade of events.

In the first case, the current series is even more unique in that in addition to the deep venous system; there was simultaneous ipsilateral superficial cortical vein thrombosis over the left superior frontal gyrus. Combined superficial and deep cortical venous infarct has been reported in a single case series by Kumral *et al*.; however, the imaging characteristics were not highlighted.[9] All the patients with DCVT in addition to superficial venous thrombosis had headache and alteration of consciousness, and the outcome remained poor compared to isolated superficial cortical vein

Table 1: Highlighting the clinical features, duration, and outcomes of the reported cases of unilateral infarct with deep cerebral venous thrombosis in literature

Author	*n*	Age/sex	Presentation	Duration	Site	Vessel involved	DD	Outcome
Herrmann *et al*. (2004)[3]	1	47/female	Headache, hemiparesis, retrograde amnesia	2 weeks	Left thalamus	Left ICV	-	Complete recovery
van den Bergh *et al*.[4]	3	30/female	Headache, hemianopia, drowsiness, seizure	2 weeks	Left thalamus	ICV, vein of Galen, Left TS and SSS	Thalamic tumor	Residual headache, fatigue
		28/female	Right hemiparesis	1 day	Left thalamus	Left ICV, vein of Galen, Straight sinus, left TS and SS	Thalamic abscess	Mild hemiparesis, dysphasia
		53/female	Headache, aphasia, right hemiparesis	3 days	Left thalamus	Partial thrombosis of straight sinus left ICV	Thalamic tumor	-
Wieshmann *et al*. (2009)[5]	1	14/female	Headache, vomiting, drowsiness, aphasia, right-sided weakness	3 days	Left thalamus	ICV, Vein of Galen, straight sinus	Tumour, biopsy done	Mild weakness, memory impairment
Chung *et al*.[6]	1	36/female	Headache, dysarthria, right hemiparesis	1 week	Left thalamus	Left ICV and thalamostriate vein		Mild headache
Deshpande *et al*.[7]	1	31/male	Headache, vomiting, status epilepticus	4 days	Right thalamus	ICV, vein of Galen, SSS	None	Memory impairment
Current series	2	43/female	Headache, apathy, right hemiparesis	3 days	Left thalamus, caudate and lentiform nucleus; left SFG	Left ICV, vein of Galen and cortical vein	ADEM	Complete recovery
		23/female	Headache	2 days	Left thalamus	ICV, Vein of Galen, straight sinus, SSS	-	Complete recovery

ICV=Internal cerebral vein, SSS=Superior sagittal sinus, SFG=Superior frontal gyrus, ADEM=Acute demyelinating encephalomyelitis, TS=Transverse sinus

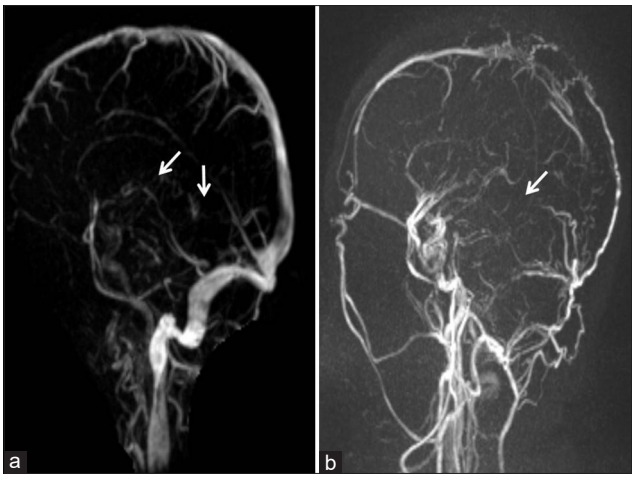

Figure 3: Magnetic resonance venography time-of-flight images (Case 1) and magnetic resonance venography contrast images (Case 2) showing nonvisualization of the internal cerebral vein, basal veins, and great vein of Rosenthal (arrows) of patients in Case 1 (a) and Case 2 (b)

thrombosis. Etiologically, there were no differences between the groups vis a vis isolated superficial venous thrombosis and combined deep and superficial thrombosis. Although deep venous system infarction and combined superficial and deep system infarction has been a pointer for poor prognosis, our patient had an excellent outcome.

The etiological evaluation of CVT in the first case revealed no other cause than severe iron deficiency anemia. Coutinho reported a linear, inverse association between the risk of CVT and hemoglobin concentration. In their case–control study after adjusting for all confounders, anemia was associated with a fourfold increased risk of CVT, and the risk was most for microcytic anemia.[10] The possible pathogenic mechanisms have been postulated to be associated thrombocytosis, which we found in our patient, as well as elevated concentrations of factor VIII. Lumbar puncture in retrospect may appear superfluous and anecdotal reports of CVT precipitated by the same. However, from ISCVT study, the subgroup analysis on the safety of lumbar puncture in CVT, 224 out of 624 patients (35.9%) had undergone LP with no detriment to functional outcome. CSF was normal in only 44% of patients, and CSF protein was above the normal range of 42%. The finding in our patient was consistent with this data.[11]

Both our patients could be started on anticoagulation within 24 h of presentation. With unilateral thalamic lesion, close attention has to be given to the radiological findings. Venous thrombosis leads to ischemia which appears as hyperintensities on T2 images with corresponding T1 hypointensities unless a hemorrhagic transformation of infarct has occurred, which can be readily picked up in susceptibility weighted or gradient images or by computed tomography scan. As opposed to arterial infarcts, these lesions having a combination of cytotoxic and vasogenic edema will have patchy diffusion restriction in diffusion-weighted images while phase contrast or TOF magnetic resonance angiogram can highlight the nonvisualization of vessels T1 and T2 images can reveal the absence of normal venous flow voids and can aid in diagnosis.[3]

The current case series highlights the varied presentation of DCVT. The presence of unilateral infarct does not rule out deep venous system involvement. The clinical presentation of subacute onset headache, alteration of sensorium, and hemiparesis in the presence of unilateral thalamic lesion should raise the possibility of a venous infarct. Delay in the institution of treatment has far-reaching consequences, as further extension of thrombosis can lead to bilateral infarction with significantly higher risk of mortality and long-term morbidity.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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