BRITISH JOURNAL OF HOSPITAL MEDICINE

CASE REPORT

Meningoencephalitis-like presentation of cerebral venous sinus thrombosis and long-term complications at 5-year follow-up

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Abstract

A 21-year-old gentleman presented with low responsiveness and an unwitnessed tonic-clonic seizure. A 3-day history of fevers, headaches, and poor sleep was reported. He was initially treated for meningoencephalitis. Subsequently, he developed an erythematous rash over the face and chest. He had three generalised tonic-clonic seizures and his Glasgow Coma Score (GCS) deteriorated to 8 out of 15 requiring intubation and ventilation, and antiepileptics. Lumbar puncture (LP) results were unremarkable; however, the computed tomography (CT) head concluded bilateral haemorrhages and commented on the possibility of cerebral venous sinus thrombosis (CVST). Computed tomography venogram (CTV) confirmed CVST in the superior sagittal sinus, cortical vein and left transverse sinus. Repeat CT head revealed no new changes. Clinically, he exhibited residual left-sided weakness following stroke secondary to CVST. The patient was discharged with lifelong warfarin due to unprovoked CVST. He re-presented ten months later with persistent headaches. Clinical review noted bilateral papilloedema and he required LP to relieve raised intracranial pressure (ICP). In a 5-year follow-up, he continues to have raised ICP and associated headaches requiring further LPs. He continues to take warfarin, levetiracetam and topiramate, for headaches. This is an atypical case of CVST presenting initially with meningoencephalitis-like symptoms, demonstrating diverse clinical presentation. Ergo, this encourages an early multidisciplinary approach in presentations of headaches and seizures as clinical suspicion for CVST is high. Ultimately, this will appropriately identify patients for neuroimaging with computed tomography/magnetic resonance venogram. Furthermore, 5-year follow-up is presented in this case highlighting the importance of long-term follow-up in view of variable long-term complications that remain difficult to predict.

Key words: Cerebral venous sinus thrombosis; Complications; CT/MR venogram; Meningoencephalitis; Raised ICP

Submitted: 6 May 2024; **Revised:** 27 June 2024; **Accepted:** 1 July 2024

Introduction

Cerebral venous sinus thrombosis (CVST) is a rare form of stroke, constituting <1% of cases (Coutinho et al, 2012). CVST results from two distinct pathophysiological processes: thrombosis of cerebral veins, leading to venous congestion, cerebral oedema, and venous infarction. The second process involves thrombosis of dural venous sinuses, resulting in elevated intracranial pressures (ICP).

Diagnosing CVST remains challenging due to variable presentation and onset of symptoms. Nonetheless, headaches and seizures are common initial presentations, which can be seen together with focal neurological deficits and loss of consciousness. Indeed, prompt diagnosis and treatment remain crucial to reduce the risk of long-term complications.

Provoking factors are identified in 85% of cases (Behrouzi and Punter, 2018), with pregnancy, oral contraceptive use, and hereditary thrombophilia as the largest reported risk factors. Additionally, obesity and head and neck infections may also contribute to thrombosis risk (Behrouzi and Punter, 2018; Ferro et al, 2019).

This case reports an atypical presentation of CVST in a 21-year-old gentleman with no identified risk factors. He presented following a tonic-clonic seizure, fever, headaches, and poor sleep. Initially, he was treated for meningoencephalitis. However, lumbar puncture (LP)

How to cite this article: Sivanathan S, Sivagnanaratnam A. Meningoencephalitis-like presentation of cerebral venous sinus thrombosis and long-term complications at 5-year follow-up. Br J Hosp Med. 2024. https://doi.org/10.12968/hmed.2024.0236

was unremarkable and a subsequent computed tomography venogram (CTV) demonstrated CVST in the superior sagittal sinus, cortical vein, and left transverse sinus. This unusual presentation highlights the diverse clinical presentation of CVST and the importance of early multidisciplinary collaboration to effectively triage for atypical presentations. Further, this case also highlights the critical importance of long-term follow-up in these patients, given the potential for unpredictable long-term complications.

Case report

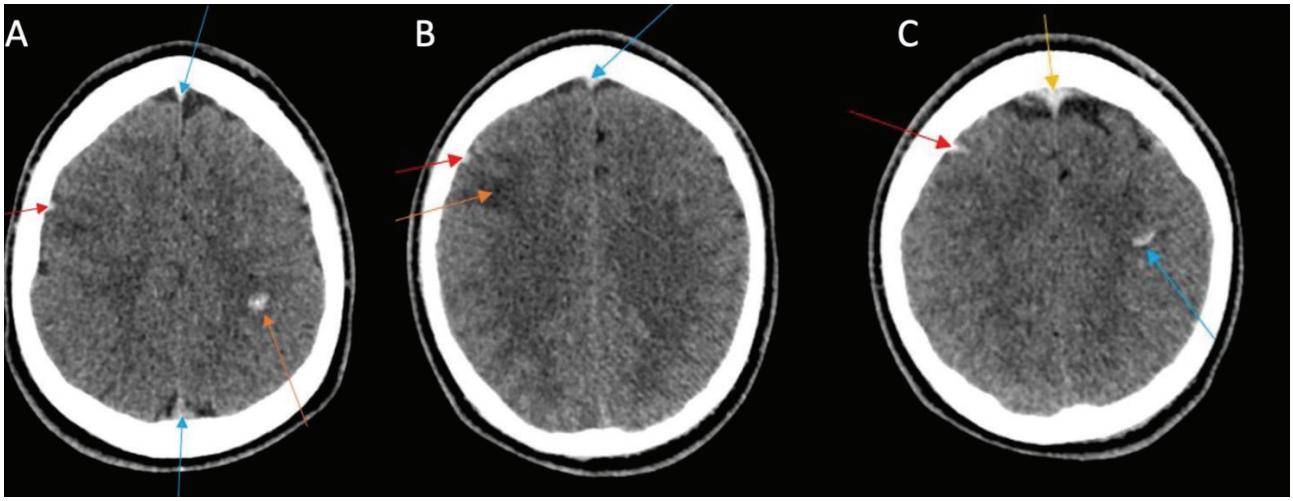
A 21-year-old gentleman with a history of asthma presented with low responsiveness and froth around his mouth. This appeared to be an unwitnessed tonic-clonic seizure. There was a reported 3-day history of fever, 1-day history of headache, and poor sleep. He denied neck pain, photophobia, rashes, blurred vision, and weakness. He denied similar symptoms in the past. There was no recent travel nor relevant family history.

On initial examination, he had a Glasgow Coma Score (GCS) of 14 out of 15 (E3, V5, M6). He developed an erythematous rash over the face and chest. Pupils were equal and reactive to light. There was no evidence of focal neurological deficit or nuchal rigidity. Plantar reflexes were normal.

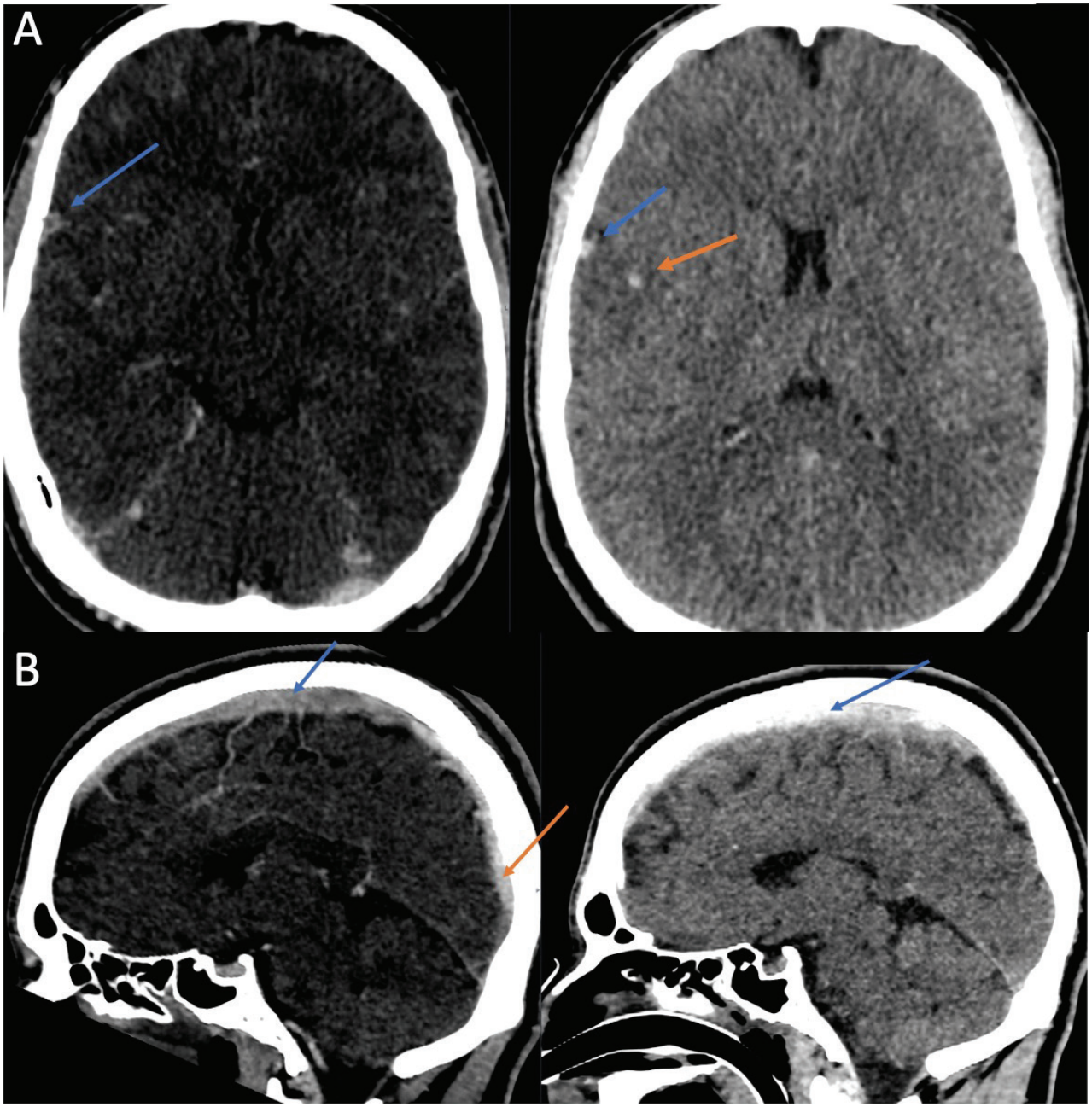
Meningoencephalitis was suspected and treatment with intravenous ceftriaxone and acyclovir was commenced. He had three generalised tonic-clonic seizures and was treated with anti-epileptics. His GCS deteriorated to 8 out of 15 (E2, V1, M5) and was subsequently intubated and ventilated. His highest recorded temperature was 37.6 degrees Celsius.

Blood, urine, Human Immunodeficiency Virus (HIV), and hepatitis screens were unremarkable, with a white cell count of 6×10^9/L (Normal Range=3.0–10.0×10^9/L) and C-reactive protein of 15.2 mg/L (Normal Range = 0–5mg/L). Cerebrospinal fluid (CSF) was unremarkable. CSF was negative for Legionella, HIV, syphilis, *Neisseria meningitidis* and acid-fast bacilli. CSF cultures, viral Polymerase Chain Reaction (PCR) and blood cultures were negative. Coagulation screen was also unremarkable. Autoimmune screens returned isolated positive lupus anticoagulant only.

Computed tomography (CT) head at presentation concluded haemorrhages in the right frontal and left fronto-parietal regions (Figures 1A–C). Further review of the scans the next day raised the possibility of CVST. Computed tomography venogram (CTV) confirmed CVST in the superior sagittal sinus, cortical vein and left transverse sinus (Figures 2A,B).



Figures 1. Computed tomography (CT) head imaging at initial presentation. (A) CT head displaying a small intraparenchymal haemorrhage in the left fronto-parietal region (orange arrow). Hyperdense areas (dense clot sign) in the sagittal sinus (blue arrow). Hyperdense area in right frontal region (dense clot sign) with associated infarct (red arrow). (B) CT head displaying hyperdense area (dense clot sign) in the right frontal lobe (red arrow) and associated infarction (orange arrow). The blue arrow shows another hyperdense area (dense clot sign). (C) CT head displaying small intraparenchymal haemorrhage in the left frontal region (blue arrow). Hyperdense area (dense clot sign) in right frontal region (red arrow). Hyperdense area (dense clot sign) in sagittal sinus (yellow arrow).



Figures 2. Computed tomography venography (CTV) head imaging is seen on the left in (A,B). This is placed by comparison with unenhanced CT Head imaging seen on the right. Both images have been selected at the same level. (A,B) demonstrate slices in an axial and sagittal place, respectively. (A) CTV (seen on the left) shows a filling defect in a right superficial cortical vein (blue arrow). This is placed by comparison with an unenhanced CT Head (seen on the right) showing a hyperdense cortical vein with associated parenchymal oedema and haemorrhage in the right frontal lobe (orange and blue arrows). (B) CTV (seen on the left) shows a filling defect in the anterior and mid-superior sagittal sinus (blue arrow), with normal opacification posteriorly (orange arrow). This is placed by comparison with an unenhanced CT Head showing the hyperdensity in the anterior and mid superior sagittal sinus (blue arrow).

In view of negative CSF results and confirmatory diagnosis of CSVT, meningoencephalitis treatment was stopped. The patient was treated for CVST with intravenous heparin and switched to treatment-dose Dalteparin, and eventually warfarin with an International Normalised Ratio (INR) target range between 2 and 3.

A repeat CT head during his 2-week-long admission showed that previous areas of parenchymal haemorrhage were now isodense and no new haemorrhages. He had some residual left-sided weakness following the stroke secondary to CVST. Haematology advised lifelong warfarin therapy because the CVST was deemed unprovoked.

Repeat testing for lupus anticoagulant returned negative. The patient was investigated for Behçet's disease also. Ten months following discharge, he started reporting persistent headaches. Bilateral papilloedema was identified at review. He was followed up by ophthalmology and neurology and underwent LPs to relieve his raised ICP. Bilateral papilloedema has since resolved.

Four years on, there has been complete resolution of the parenchymal changes noted on CT, some improvement of the thromboses and no further seizures since presentation.

Nevertheless, he continues to have raised ICP and associated headaches. His most recent LP showed an opening pressure of 38 mmHg last year (Normal Range = 5–18 mmHg). This increased ICP is undoubtedly due to the chronic CVST, with a recent magnetic resonance imaging (MRI) brain showing longstanding chronic sagittal sinus thrombosis and left transverse sinus thrombosis with associated formation of collateral vessels (**Figures 3A,B**).

He continues follow-up with neurology, stroke and ophthalmology teams and takes warfarin, levetiracetam and topiramate, for headaches as part of a management strategy.

Discussion

CVST is due to full or partial obstruction of a major cerebral venous sinus or a smaller feeding cortical vein (Ulivi et al, 2020). Approximately 1 in 200 strokes are due to CVST (Ferro et al, 2019). With an incidence of 1.32/100,000 per year, it can present with non-stroke syndromes, hence may not always form the forefront of physicians' differentials (Coutinho et al, 2012). Early diagnosis and management are critical to preventing complications (Behrouzi and Punter, 2018).

Provoking factors are found in approximately 85% of patients with CVST (Saposnik et al, 2024). This case is unusual in its meningoencephalitis-like presentation with no provoking factors having yet been determined. This indicates that even without risk factors, a high index of clinical suspicion should be maintained.

Difficulty in diagnosis stems from variable presentation and symptom onset. Symptoms can be due to raised ICP, a focal lesion, or both. 90% of CVST patients have headaches and 40% have seizures, as in this case (Behrouzi and Punter, 2018). Headaches and seizures are present in 30% and 6% of arterial stroke presentations, respectively (Behrouzi and Punter, 2018). Indeed, these symptoms might help distinguish CVST and arterial stroke-like symptoms. Other symptoms of CVST include motor weakness, sensory symptoms, inattention, neglect, visual field loss, drowsiness and coma (Behrouzi and Punter, 2018).

The Royal College of Physicians recommend CT or MRI including venography to be undertaken for suspected CVST (National-Clinical-Guideline-For-Stroke, 2023). Bilateral or parasagittal lesions, juxtacortical lesions, lesions traversing arterial regions and hyperdense

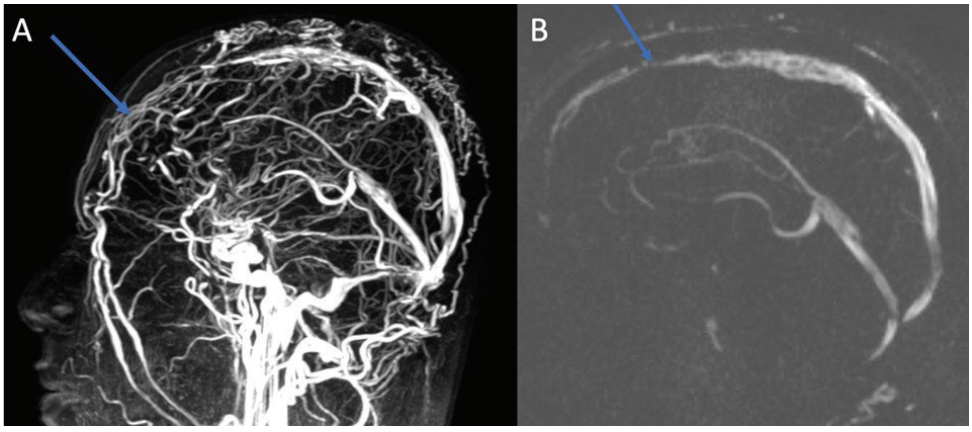


Figure 3. Magnetic resonance venography (MRV) Head imaging taken at follow-up. These images are both depicted in the sagittal view. (A) 3D High Spatial Resolution Cerebral MRV Head imaging shows partial recanalisation of the superior sagittal sinus with the presence of collaterals (blue arrow). (B) MRV Head imaging shows partial recanalisation of the superior sagittal sinus (blue arrow).

lesions on CT may suggest CVST (Haage et al, 2002; Behrouzi and Punter, 2018). CT venography and magnetic resonance venography (MRV) have high sensitivity for CVST detection (Behrouzi and Punter, 2018).

Early complications include seizures, raised ICP and hydrocephalus (Saposnik et al, 2024). Raised ICP can lead to papilloedema and third or sixth cranial nerve palsies. Management includes anticoagulation and sometimes thrombolytic drugs to decrease blockage of venous outflow (Saposnik et al, 2024). LP can reduce ICP, however for persistently raised ICP, multiple LPs are required. A lumboperitoneal shunt may be beneficial in refractory cases (Ferro and Canhão, 2014; Torikoshi and Akiyama, 2016).

Late complications include recurrent venous thromboembolism, headaches, seizures, visual loss and dural arteriovenous fistula (Saposnik et al, 2024). Visual loss often presents insidiously, with progressive reduction in peripheral vision- more prevalent among patients with papilloedema or intracranial hypertension. This can cause permanent visual loss (Saposnik et al, 2024). Headaches are present among half of patients at follow-up. In this case, the patient had persistent headaches, likely due to raised ICP. An explanation for this is chronic blockage of venous sinuses causing increased venous pressures and impaired CSF absorption, as supported by this patient's recent MRI results (**Figure 3**).

Regarding prognosis, 80–90% of patients achieve functional independence (Klein et al, 2022), but chronic symptoms can persist, as in this case with headaches. These undoubtedly affect quality of life. Poor prognostic factors include age, active cancer, decreased level of consciousness and intracerebral haemorrhage (Klein et al, 2022), the latter two of which this patient experienced at presentation. This highlights importance of lifelong follow up for this patient.

Conclusion

This case demonstrates a meningoencephalitis-like presentation in a 21-year-old with no identified risk factors for CVST. This highlights that the clinical presentation of CVST is diverse and suggests that co-presentation of headaches and seizures should encourage an early multidisciplinary approach to identify patients appropriate for CT/MR venogram.

Learning point

- Clinicians should maintain a high index of suspicion for CVST as it can present atypically.
- In order to identify the most suitable investigations and imaging modalities, relevant differential diagnoses should be considered.
- Radiological investigations can be invaluable in helping to identify CVST.
- Collaboration among different members of the multidisciplinary team is critical to delivering effective patient care.
- Long-term complications of CVST should be recognised and investigated and treated accordingly.

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Availability of data and materials

All the data of this study are included in this article.

Author contributions

AS identified the case and was the principal clinician for the patient. AS collected the data for the case. AS and SS annotated the images. AS and SS analysed and interpreted the data. SS wrote the first draft of the case report. Both authors made principal editorial changes to the manuscript. Both authors read and approved the final manuscript. Both authors participated sufficiently in the work and agreed to be accountable for all aspects of the work.

Ethics approval and consent to participate

The participant signed an informed consent form.

Acknowledgement

Not applicable.

Funding

This research received no external funding.

Conflict of interest

The authors have no conflicts of interest to declare.

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