

CLINICO-RADIOLOGICAL PROFILE IN CEREBRAL VENOUS THROMBOSIS

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ABSTRACT

Introduction: Cerebral Venous Thrombosis (CVT) occurs generally in combination with nonspecific clinical features. Moreover, the imaging inferences are subjective⁴. Improper diagnosis of CVT may lead to different complications such as haemorrhage, infarction and even death. Hence, proper Radiological imaging is necessary to confirm the diagnosis of CVT. The objective of our study is to evaluate the role of Computed Tomography (CT) and Magnetic Resonance Imaging (MRI) in early diagnosis of CVT.

Methods: We retrospectively reviewed cases in patients with clinical suspicion with CVT referred for CT and MRI study to our department. We evaluated the clinical presentation and aetiology of the CVT and correlated with multimodality imaging findings.

Results: Out of our sample of 20 cases presented with CVT, 10 of them were found to be males, 10 were females with age of presentation between 30-50 years, and among them the most common risk factors were idiopathic, trauma, dehydration and females having a history of Oral Contraceptive Pill (OCP) usage.

Keywords: Cerebral Venous Thrombosis, haemorrhage, infarction

INTRODUCTION

Radiological imaging is essential for diagnosis of Cerebral Venous Thrombosis (CVT). With the advancement of medical technology, and high awareness of the pathology among physicians and obstetricians, the usage of CT and MRI to diagnose CVT has increased many folds during the last two decades. Magnetic Resonance Imaging became the key method for the diagnosis of suspected CVT. For initial evaluation, Computed Tomography has become method of choice. These imaging techniques have high sensitivity to diagnose CVT^{1,2}.

The following causes are mainly associated with CVT. A simple way to understand is that they may involve one or more mechanisms: direct involvement of the dural sinuses e.g., infection, trauma, neoplastic infiltration; damage to the vascular endothelium; venous stasis; hypercoagulable states; and increased blood viscosity³.

Main causes include:

1. Idiopathic
2. Pregnancy & Puerperium
3. Local infections like Mastoiditis.
4. Dehydration
5. Oral Contraceptive Pills
6. Local tumour extension ex : Meningioma.
7. Systemic infection.
8. Systemic tumour syndrome.
9. Trauma

10. Coagulopathies - Factor V Leiden mutation

- Protein C/S deficiency
- PNH
- Antiphospholipid syndrome
- Antithrombin III deficiency

11. Inflammatory bowel disease

12. Behcet's syndrome

13. Nephrotic syndrome

No specific cause could be detected in many cases of CVT and it remains idiopathic in origin^{4,5,6}. In general, pregnancy and puerperium are associated with hormonal changes that may be procoagulant in nature. During delivery, dehydration may occur resulting in hemo-concentration.

Clinical features of cerebral venous thrombosis are, Headache - most common, present in > 80% of cases, Seizures - Present in 35% - 40% of cases. It can be focal or generalised, Focal neurological signs - 30% - 35%, altered sensorium - 30%, Vomiting.

IMAGING FEATURES

Initially any patient with Central Nervous System (CNS) signs and symptoms is subjected to CT for investigation. In case the findings of plain CT are not associated with venous haemorrhage or infarction, the venous sinuses are evaluated for evidence of hyperdensity.

The different features of CVT which can be seen in CT are,

1. Hyperdense triangle sign - Shows the thrombus within the superior sagittal sinus in NECT.
2. Cord sign - Dense cord like thrombosed cortical veins.
3. Empty Delta sign - In CECT the non-enhancing thrombus within the superior sagittal sinus is surrounded by enhancing collaterals. This is seen as an empty delta.
4. Parenchymal haemorrhage - Due to venous congestion and venous infarction parenchymal haemorrhage occurs. The typical location is subcortical region.

For the diagnosis of suspected CVT, a good imaging choice is MRI. It has multiplanar imaging capabilities without bone artifacts and makes it more sensitive than CT when dealing with parenchymal abnormalities, petechial haemorrhage, thrombus formation, and blood flow. Therefore, MRI is an appropriate technique to that of a CT in giving reliable evidence for CVT.

The MRI sequences of T1WI, T2WI, FLAIR, T2*WI MRV and DWI are applied for the diagnosis of sinus thrombosis and identification of parenchymal changes. FSE and GRE sequences are used to directly to visualise the thrombus within the venous sinus and are sensitive in detecting the parenchymal changes such as edema, haemorrhage and infarcts.

Magneto Resonance Venography (MRV) has become popular as a imaging modality to establish the diagnosis of CVT. MRV can be conducted either in Time of Flight (ToF) or Phase Contrast Technique (PCT) mode . The ToF technique relies on flow enhancement to give vascular images. PCT is based on velocity-induced phase shifts to differentiate blood flow from the surrounding stationary tissues.

MATERIALS AND METHODS

This is a retrospective study of reviewed cases of CVT in 20 patients with proven or almost certain aetiologies, who were referred for CT and MRI study to Department of Radio-diagnosis in our hospital during the period from July 2020 to December 2020 . All the patients were imaged in our institution. CT scans were done using a Siemens SOMATOM SCOPE 32 slice CT scanner. Whereas, MRI was done using Siemens 1.5 T Magnetom Essenza MRI

scanner. We evaluated the clinical presentation and aetiology of the CVT based on multimodality imaging findings⁵.

RESULTS

Among the 20 patients studied, there was equal predilection of both males and females (M:F – 1:1). The most common cause of CVT in the study was found to be Trauma - 35%, followed by Idiopathic– 30%, history of intake of OCP's – 20% and Dehydration was found to be 15%. In our study, headache was the most common presentation (n=20). In 15 cases headache with nausea and vomiting was the first symptom. In 2 cases presented with seizures, 2 patients presented with altered sensorium and 1 patient with numbness on one side of body.

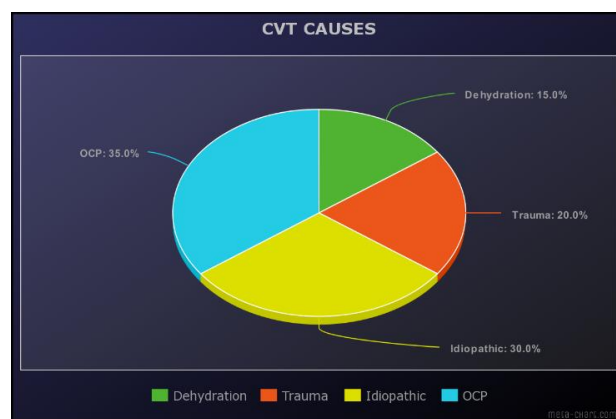


Figure 1: Pie Chart showing distribution of various causes of CVT in our study

DISCUSSION

A few notable cases of our study are explained below in brief

Case 1:

A 43 year old male with head injury presented to the ER with complaints of severe headache. There was no history of nausea, vomiting, and loss of consciousness. On examination GCS was 13/15. Initially plain CT was done Fig. 2, which revealed fractures in left occipital and temporal bone. There were hyperdense areas in the regions of superior sagittal and left transverse sinus Fig. 3A & B. A correlative MRI brain with TOF MR Fig. 3C, Venogram was done which revealed filling defect in superior sagittal sinus and left transverse sinus, thus confirming the diagnosis of CVT.

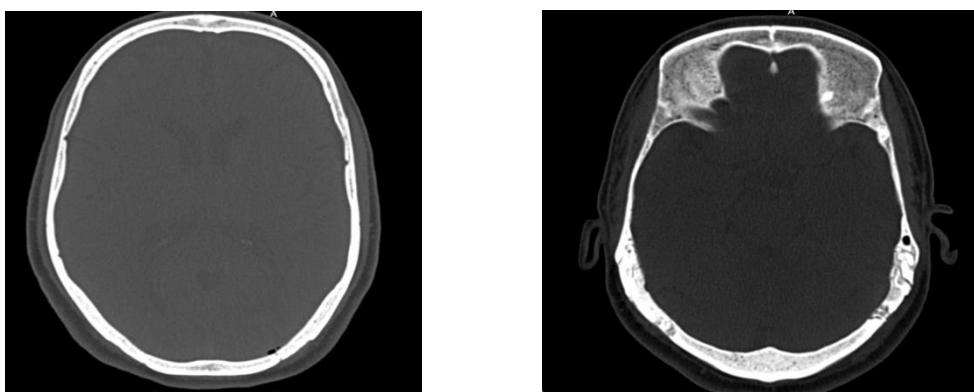


Figure. 2: Axial CT (bone window): showing fractures of left occipital and temporal mastoid bones.

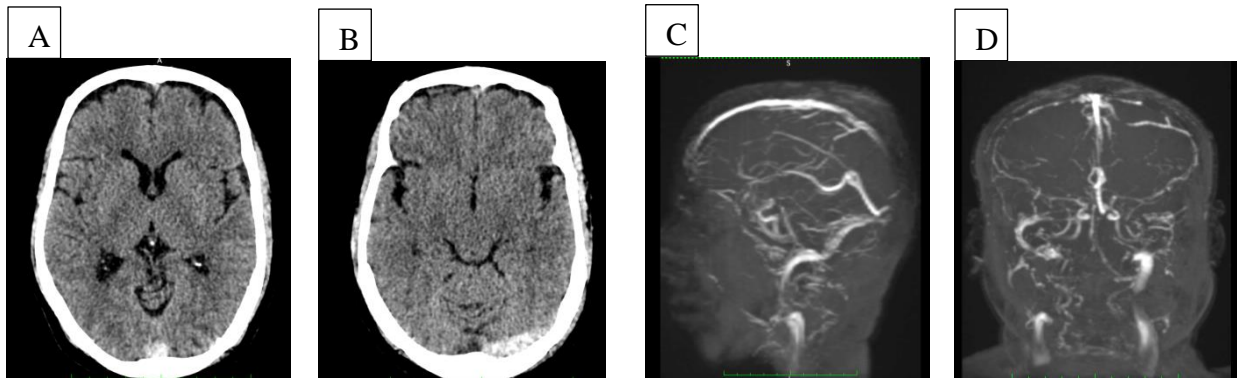


Figure 3: Plain CT axial (A&B) images showing hyper density in the region of superior sagittal sinus and left transverse sinus. (C&D) images TOF MRV confirming the diagnosis of CVT as there is filling defect in superior sagittal sinus and left transverse sinus.

Case 2:

A 46 year old male presented to the hospital OPD with complaints of severe headache. On examination, there was no focal neurological deficit and GCS found to be 15/15. Patient did not have any signs of altered sensorium. Plain CT was done, which showed atypical manifestation of CVT i.e. right transverse sinus thrombosis.

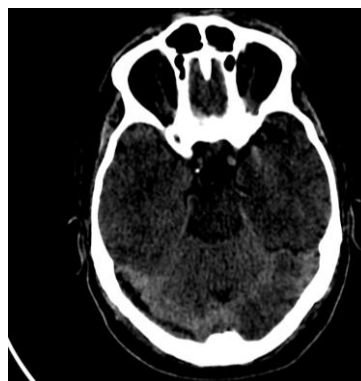


Figure 4: Axial CT showing linear hypo-density in right transvers sinus – Atypical manifestation

Case 3:

A 36 year old female with history of intake of OCP presented to hospital with complaints of severe headache and vomiting. On examination, there was no neurological deficit and GCS found to be 15/15. MRI brain was done, which revealed acute haemorrhagic infarct in left parieto-occipital region. Along with it TOF MRV was done, which confirmed the diagnosis of CVT.

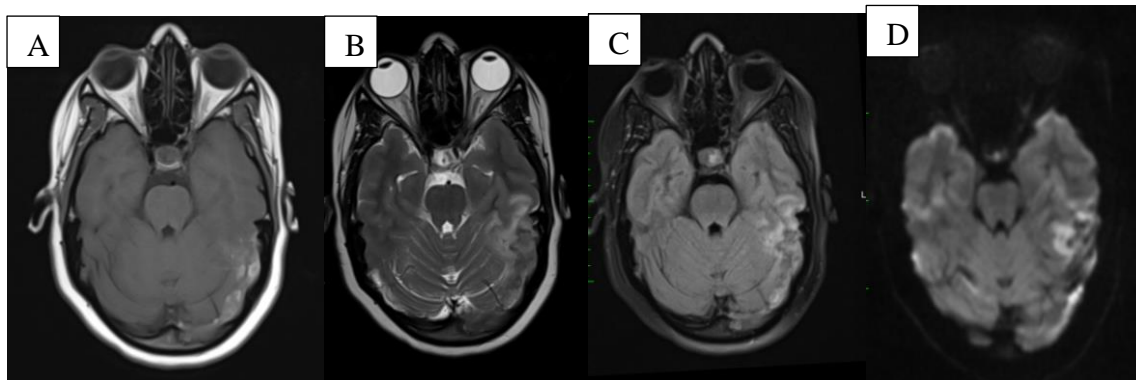


Figure 5: Axial sections of MRI showing an ill-defined lesion appearing heterogeneously hyperintense on T1 (A), heterogeneously hypointense on T2/ FLAIR (B&C) showing restricted diffusion (D) is seen involving left temporo-occipital lobe with associated significant perilesional edema. – Suggestive of Acute Haemorrhagic Venous Infarct.

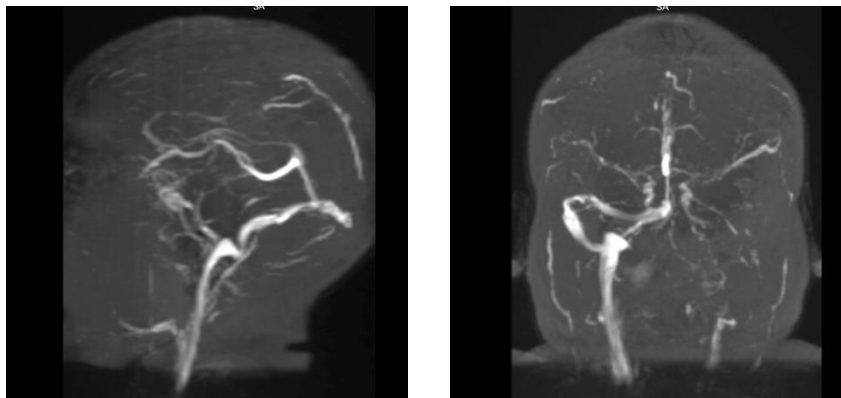


Figure 6: TOF MRV study shows loss of normal signal intensity within superior sagittal sinus, left transverse and left sigmoid sinuses as well as left internal jugular vein which was suggestive of CVT.

Case 4:

A 15 year old girl child who is on OCP presented to the hospital with complaints of severe headache. MRI with MRV was done to rule out CVT.

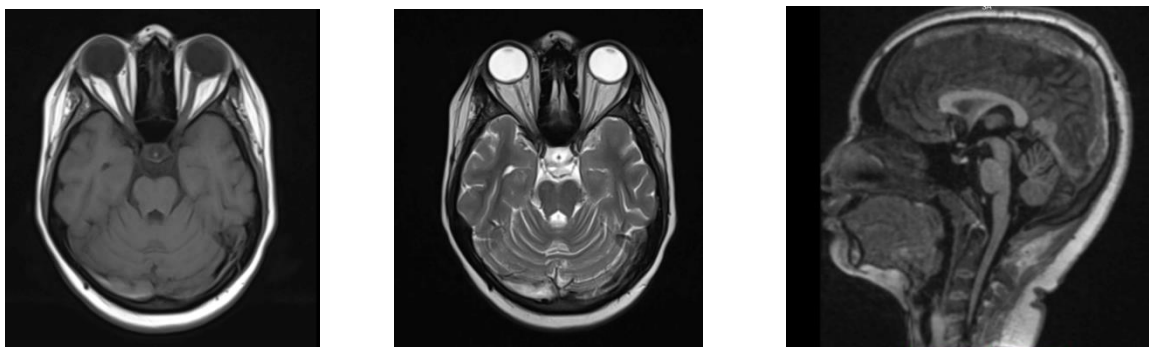


Figure 7 : Axial and Sagittal MRI brain sections shows T1W/ T2W hyperintense signal noted involving the superior sagittal sinus with extension into the right transverse and straight sinuses.

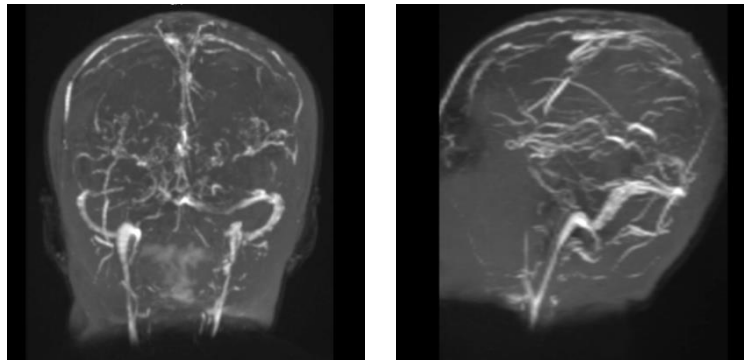


Figure 8: MRV shows filling defect in Filling defect with loss of normal flow noted involving superior sagittal, right transverse and straight sinuses- Suggestive of CVT.

Case 5:

A 42 year old female who is on OCP presented to hospital with complaints of headache and vomiting. On examination, there was no focal neurological deficit and GCS was 15/15. MRI brain with MRV was done which revealed features of CVT.

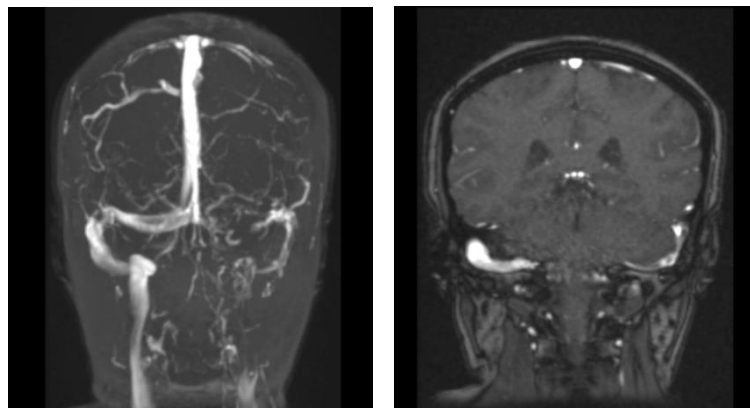


Figure 9: TOF MRV shows loss of normal flow signal involving left sigmoid and transverse sinuses.

Case 6:

A 52 year old male presented to hospital with complaints of seizures (2 episodes). On examination, there was no focal neurological deficit. MRI brain with MRV was done which revealed features of CVT.

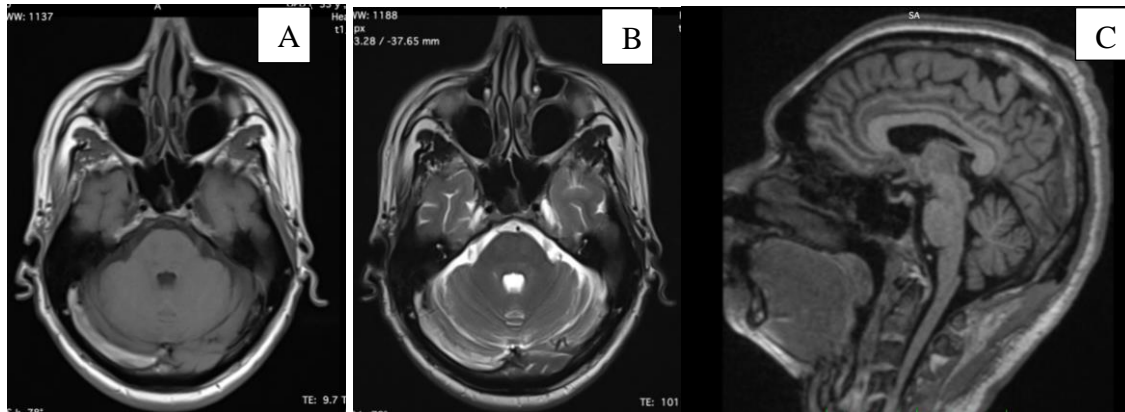


Figure 10: Axial (A&B) and Sagittal images(C) of MRI brain showing T1W(A), T2W(B) hyperintensity noted along the superior sagittal sinus, confluence of sinuses, right transverse and right sigmoid sinuses extending into the right proximal internal jugular vein.

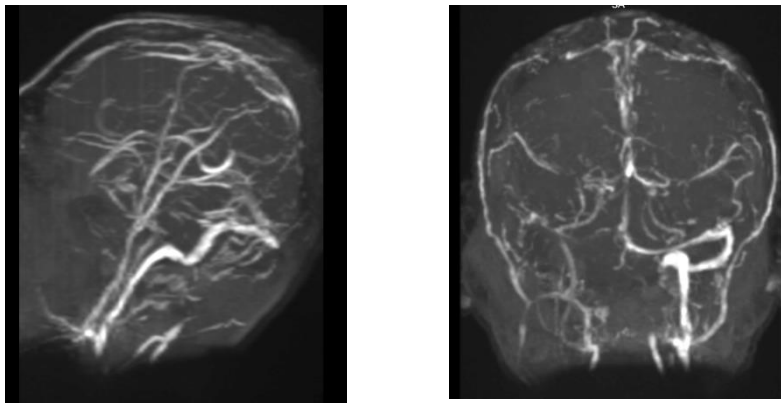


Figure 11: TOF MRV shows Loss of normal signal intensity noted in the superior sagittal sinus, confluence of sinuses, right transverse and right sigmoid sinuses extending into the right proximal internal jugular vein.

Case 7:

A 25 year old female who is on OCP's presented to hospital with Sudden numbness on right side of the body. MRI brain was done which revealed an infarct in pre central gyrus and MRV showed absent flow in anterior aspect of superior sagittal sinus.

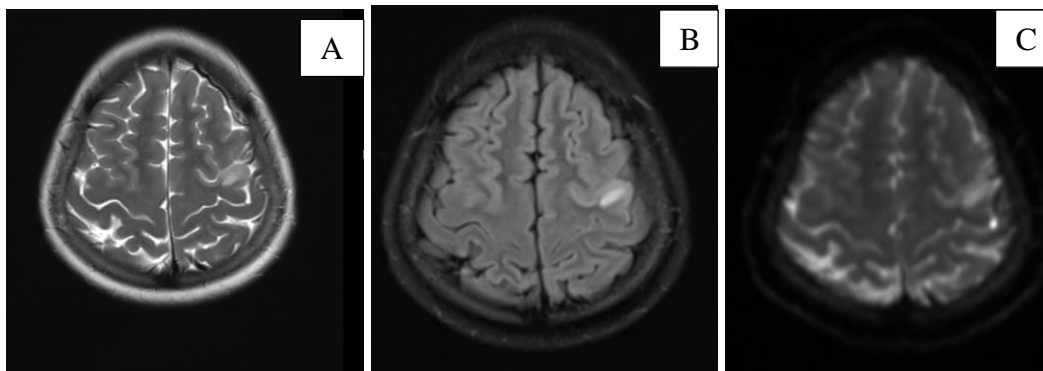


Figure 12: Axial images of MRI brain shows T1W (A), T2W (B) hyperintensity with restricted diffusion (C) noted in precentral gyrus which was suggestive of acute infarct.

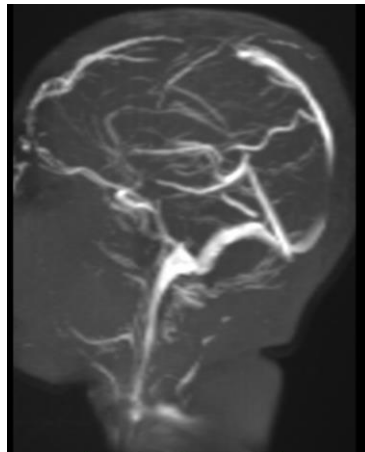


Figure 13: TOF MRV shows loss of normal flow signal in anterior aspect of superior sagittal sinus.

Conclusions

Cerebral venous thrombosis is a rare, potentially life-threatening disease presenting in a variety of ways and to a variety of services. Cerebral Venous Thrombosis is a disease with equal predilection among both genders. Imaging plays an important role in diagnosis and guide clinician in treatment (anticoagulant therapy, endovascular therapy or decompressive craniectomy)³. Although unenhanced CT is the first-line of investigation in the patients with suspected CVT, MRI with MRV has been the diagnostic modality of choice. Superior sagittal sinus and transverse sinus are the most common sinuses involved.

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Conflict Of Interest: The authors declare no conflict of interest.

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