

Evaluation of role of magnetic resonance venography in patients with cerebral venous thrombosis attending BIMS hospital, Belgaum - A retrospective study

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Abstract

Background: Cerebral venous sinus thrombosis (CVST) is a common medical problem in India which has serious clinical consequences. MR venographic technique is one of the modality of choice for diagnosis and evaluation of dural sinus and cerebral venous thrombosis wherever MRI facility is available. **Aim:** To evaluate the role of magnetic resonance venography in the diagnosis of cerebral venous sinus thrombosis. **Material and Methods:** The case records of patients of CVST will be retrieved from the department, the data will be collected through the case record of patient with CVST. The records of those cases fulfilling the inclusion and exclusion criteria will be analyzed retrospectively in terms of causes, site of CVST and complication. **Results:** The incidence of CVST was more in female population. The peak incidence of CVST was found in the age group of 21 to 40 years. Headache was the commonest clinical feature seen in 09 patients (30%). The superior sagittal sinus is commonly involved in CVST, which is seen in 19 patients (63.33%), the next commonest sinus involved is transverse sinus in 12 patients (40.00%) followed by sigmoid sinus in 11 patients (36.66%). **Conclusion:** MRI and MRV are valuable imaging modalities for the diagnosis of CVST. MRI and phase contrast MRV should be recommended as they are safer, non-invasive, non-ionizing and highly accurate modalities. **Key Words:** Cerebral venous sinus thrombosis, magnetic resonance venography, magnetic resonance imaging, superior sagittal sinus.

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INTRODUCTION

Cerebral veno-occlusive disease is an elusive, often under diagnosed cause of acute neurological deterioration. Because clinical signs and symptoms are often non-specific, imaging is critical to the diagnosis of this

disorder.¹ cerebral venous sinus thrombosis (CVST) is a common medical problem in India which has serious clinical consequences. It is often clinically unsuspected and has varied clinical presentation. It is thus a challenging condition. The role of Neuroimaging techniques, including CT, MRI, and magnetic resonance venography (MRV) are crucial for the diagnosis of CVST.^{2,3} So, there is reason to evaluate newer methods using advanced radiological modality to diagnose the condition early and aid in its effective treatment. MR venographic (MRV) technique is one of the modality of choice for diagnosis and evaluation of dural sinus and cerebral venous diagnosis of CVST and is now the gold standard in the investigation of this disease.³ MR Venography have made it possible to visualize the dural sinuses and cerebral veins without the use of invasive techniques or ionizing radiation. The present study was

conducted to evaluate the role of magnetic resonance venography in the diagnosis of cerebral venous sinus thrombosis in clinically thromboses wherever MRI facility is available.⁴ The combination of MRI and MRV allows for an accurate suspected patients.

MATERIAL AND METHODS

Sources of data: The data will be collected by going through the case records of patients of CVST, which will be retrieved from the department and these cases will be included and studied.

Duration of study – 3 years approximately 30 cases.

Inclusion Criteria

Patients with diagnosed CVST with or without co morbidity, presented to BIMS HOSPITAL

Exclusion Criteria

No exclusion criteria.

MRV Protocol: The patients were scanned using 1.5 Tesla superconducting magnate, Magnetom Symphony Siemens Software Version 2002 of Germany. A complete clinical history of patients was taken which included name, age, sex, occupation and presenting complaints. This was followed by general physical examination and detailed central nervous system with examination of other significant systems. An attempt was made to do the study without anesthesia or analgesic agents in most of the patients. Few patients required sedation in the form of Inj.Haloperidol 10 mg in consultation with referring physician and anesthetist. The 2 dimensional time of flight (2D TOF) sequence was done in both the axial and coronal planes then the source images were reconstructed in to three dimensional maximum intensity projection (3D MIP) images. All the T1, T2, FLAIR, diffusion weighted images, 2D TOF Source images and 3D MIP images were studied for the following details.

- Parenchymal changes in routine T1, T2, FLAIR and Diffusion weighted images for hemorrhagic venous infarct.
- Absence of flow voids in all the sinuses were evaluated which is evidence of sinus thrombosis.
- Presence of edema, whether it is cytotoxic edema or vasogenic edema.
- 2D TOF source and MIP images were evaluated for all the sinuses for flow gaps and collateral venous channels.

Cases were followed up clinically and radiologically as indicated.

Statistical Analysis: Data analysis was done using Rates, Ratios and Percentages of different diagnosis and outcome made by MR Venogram were computed and compiled.

RESULTS

A total of 43 patients who were clinically diagnosed as having cerebral venous thrombosis as per records were sent for MRV. Out of which 13 patients were found to be normal and 30 patients had cerebral venous thrombosis, which were included in the present study. In the present study, out of 30 patients in 8 patients the cause was unknown and the alcohol was the commonest cause for the CVST which was seen in 05 patients (16.66%) and the next common were dehydration and postpartum, each constituted 4 patients (13.33%). Headache was the commonest clinical feature seen in 09 patients (30%) and the next commonest clinical features were seizures in 07 patients (23.33%) and hemiparesis/focal neurological defects in 05 patients (16.66%).

Table 1: Distribution of sinuses involvement in CVST Patients

Sinus	Cases	Percentage (%)
Superior Sagittal Sinus	19	63.33
Inferior Sagittal Sinus	01	03.33
Straight Sinus	02	06.66
Transverse Sinus	12	40.00
Cavernous Sinus	01	03.33
Internal Cerebral Vein	03	10.00
Vein Of Galen (VOG)	02	6.66
Basal Vein Of Rosenthal	01	03.33
Cortical Veins	05	16.66
Sigmoid Sinus	11	36.66
Internal Jugular Vein (IJV)	06	20.00

The superior sagittal sinus is commonly involved in CVST, which is seen in 19 patients (63.33%), the next commonest sinus involved is transverse sinus in 12 patients (40.00%) followed by sigmoid sinus in 11 patients (36.66%).

Table 2: Distribution of patients with CVST depending on the extent of thrombosis (number of sinuses involved in each patient)

No. of Sinuses Involved	Cases	Percentage (%)
One	11	36.66
Two	08	26.66
Three	08	26.66
Four	03	10.00
Total	30	100%

The present study revealed single sinus involvement was common which was seen in 11 patients (36.66%) and two and three sinus involvement were equalled, seen in 08 patients (26.66%) each. The hypoplastic transverse sinus was present in the 21 patients of total 30 patients. Out of 21 patients the left transverse sinus hypoplasia (non dominant) was commonest, seen in 16 patients (76.20%).

Table 3: Incidence of hemorrhagic infarct in patients with CVST

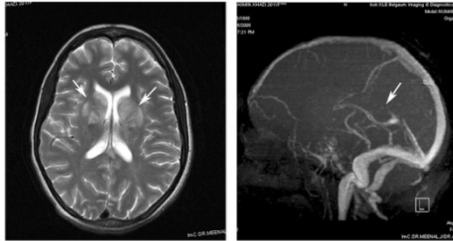
Haemorrhagic Venous Infarct	No. of Cases	Percentage (%)
Present	11	36.66
Absent	19	63.33
Total	30	100 %

In the present study hemorrhagic venous infarct was present in 11 patients (36.66). In this study collateral development was seen in 33.33% of patients.

Table 4: Distribution of patients with CVST depending on the presence of collateral development

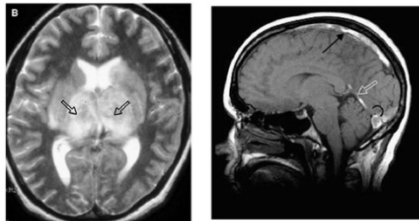
Collaterals	No. of Cases	Percentage (%)
Present	10	33.33
Absent	20	66.66
Total	30	100 %

INFERIOR SAGITTAL SINUS THROMBOSIS



A 58 year old male with chronic alcoholic Fig A. T2 weighted axial image shows bilateral basal ganglia hyperintensities. Fig B, 2D TOF MRV shows non visualization of inferior sagittal sinus suggestive of thrombosis.

STRAIGHT SINUS, SUPERIOR SAGITTAL SINUS AND TORCULAR HEROPHILI THROMBOSIS



A 27 year old female, Fig A T2-weighted image show bilateral thalamic ischemia or infarction, Fig B Fig. T1-weighted sagittal MRI reveals high signal intensity in the superior sagittal sinus (solid arrow), straight sinus (open arrow), and torcular herophili (curved arrow).

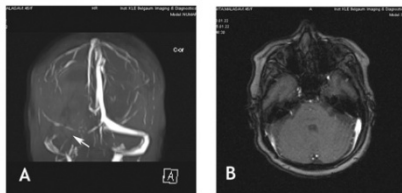
Figure 1:

LEFT TRANSVERSE SINUS THROMBOSIS WITH HEMORRHAGIC VENOUS INFARCT



A 30 year old female with post partum seizures Fig A. T2 weighted image showed hemorrhagic venous infarct and Fig B. Coronal 2D TOF MIP image showed absence of flow signals in left transverse sinus suggestive of thrombosis.

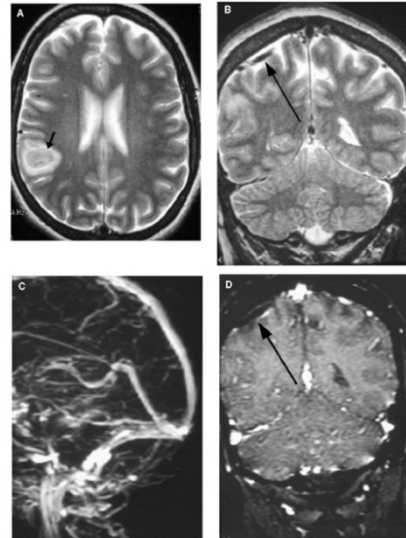
HYPOPLASTIC RIGHT TRANSVERSE SINUS



A 32 year old female with giddiness suspected clinically to be having CVT. Fig. A Coronal MIP image showed flow gaps in the right transverse sinus. Fig. B source image shows minimal narrow flow signal intensities suggestive of hypoplastic right transverse sinus.

Figure 3:

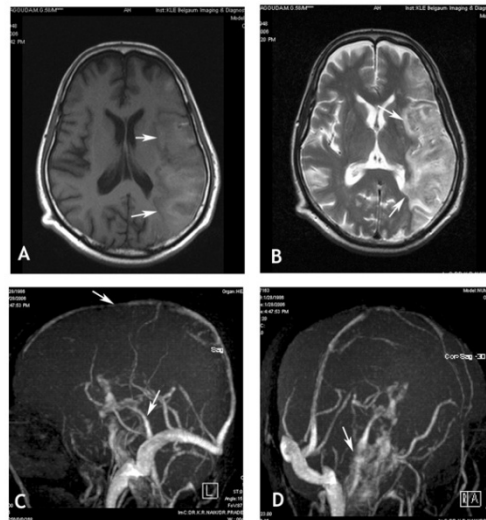
CORTICAL VEIN THROMBOSIS



Cortical vein thrombosis in a 40-year-old patient with a postpartum seizure. Fig.(A) T2-weighted axial MRI shows a mixed signal-intensity lesion in the right parietal lobe (arrow). The superior sagittal sinus is patent. (B) T2-weighted MRI shows a large tubular signal void (arrow) over the surface of the brain. (C) Magnetic resonance (MR) time-of-flight venography demonstrates patency of the major venous sinuses. (D) Source images from gadolinium-enhanced MR venogram demonstrates nonenhancing tubular structure (arrow) on the surface of right hemisphere, indicating an isolated cortical vein thrombosis.

Figure 2:

THROMBOSIS OF ANOMALOUS DRAINING STRAIGHT SINUS AND GREAT VEIN OF GALEN WITH COLLATERALS



58 year old male comes with head ache. Fig A&B. T1 and T2 images shows hemorrhagic venous infarct in left fronto-parieto-occipital regions(Arrows). Fig. C&D. 2D TOF MIP images left and right anterior views shows anomalous drainage of straight sinus and great cerebral vein of galen with thrombosis of these veins (Arrow) and hypoplasia of superior sagittal sinus (Arrow), left transverse sinus and internal jugular vein.

Figure 4:

DISCUSSION

The clinical manifestations of CVST are often vague and are easily mistaken for those caused by other neurological disease process. CVST may mimic various medical conditions as arterial stroke, tumor, encephalitis, abscess and idiopathic intracranial hypertension.³ So it is a diagnosis of exclusion and imaging investigation. A variety of different imaging techniques are available for noninvasive evaluation of cerebral venous vasculature. The use of cerebral venography is increasing in frequency as a noninvasive means of evaluating the intracranial venous system. CVST is believed to be more common in women than men. In a series of 110 cases, Ameri and Bousser found a female to male ratio was 1.29:1.⁶ Einhäupl *et al* reported 75% of patients were females in their study and had been suggested that the use of oral contraceptives in women is behind the disparity between the sexes.⁷ Female predominance was also seen in the present study where female to male ratio was 1.5:1. CVST is more frequent in the age group of 20 to 35 years. In 1992, Ameri and Bousser reported a uniform age distribution in men with CVST while 61% of women were aged 20 to 35 years.⁶ In the present study also 55.55% of women had CVST in the age group of 21 to 40 years. Other literature reported that it is most common in the third decade while it may occur in all age groups.⁷ In present study the commonest symptoms and signs were headache (30.00%), Seizures (23.33) and paresis (16.66%). In a recent Dutch European study, the most frequent symptoms and signs were headache (38%), focal seizures with or without secondary generalization (34%) and paresis (unilateral or bilateral) in 30%.⁸ EAEL Abd-Elaziz had shown that headache was the most frequent and often the earliest symptom noted in 10 patients (66.7%).⁹ Ameri and Bousser also reported that 75% of the 110 cases complaint of headache.⁶ Superior sagittal sinus is the commonest venous sinus to be involved in cerebral venous sinus thrombosis. The study done by Kalbag and Wolf showed the incidence of superior sagittal sinus thrombosis in 72%, Lateral sinus thrombosis in 63% and sigmoid sinus thrombosis in 50% cases.¹⁰ The present study showed superior sinus thrombosis in 63.33% cases, transverse sinus thrombosis in 40% and sigmoid sinus thrombosis in 36.66% cases. The present study revealed, in most of the patients the extent of involvement is only one sinus, which was 36.66%. Two or three sinuses involved in equal number of patients (26.66%), only 10% of patients had involvement of four sinuses. Hypoplastic transverse

sinus commonly seen on the left side (80%) which is non dominant side, out of which 31% of the transverse sinuses showed flow gaps in 2D TOF MR Venogram.¹¹ In the present study the 76.2% patients had hypoplastic transverse sinus on the left side. With the extensive search of literature, no single study clearly explains the incidence of hemorrhagic venous infarcts in CVST. The present study shows 36.66% of patients had hemorrhagic venous infarct. The collateral venous connections were present in 33.33% of cases in the present study. To conclude, MRI and MRV is the most comprehensive, non-invasive, safe, in-vivo diagnostic modality for delineation of vascular anatomy, diagnosis of cerebral venous thrombosis and its extent of involvement, parenchymal involvement, collateral circulation, predicting the prognosis and for follow up.

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