International Journal Dental and Medical Sciences Research
Volume 6, Issue 2, Mar - Apr 2024 pp 663-670 www.ijdmsrjournal.com ISSN: 2582-6018

Dural Sinus Thrombosis: Role of Mr Venography for Diagnosis and Follow-Up.

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Submitted: 15-04-2024 Accepted: 25-04-2024

ABSTRACT

Aim - To determine the value of MR Venography as the sole procedure for diagnosis and follow-up of dural sinus thrombosis.

Methodology - Prospective study was conducted in GCS medical college, Ahmedabad which included 50 patients with clinical suspicion of dural venous sinus thombosis. MRI was done using 1.5 tesla GE signa explorer machine including standard scan protocol over a period of 12 months from January 2023-December 2023.

Results -Common sinus thrombosis seen in my study was transverse sinus thrombosis, sigmoid sinus thrombosis followed by inferior sagittal thrombosis, superior sagittal thrombosis and IJV thrombosis. Headache was the common clinical symptom in this study. 42 patients presented with subacutethrombus, 7 patients had chronic thrombus and 1 patienthad tumoral thrombosis due to glomusjugulare.

Conclusion - MR Venography is the method of choice in evaluation of patients with suspicion / diagnosis of dural sinus thrombosis.

Keywords: -Dural sinus, MRI, MR Venography, thrombosis.

I. INTRODUCTION :

- Dural sinus thrombosis is a multi-step process that begins with the stepwise thrombotic occlusion of a dural sinus.
- The thrombus formation progresses, obstructing first the sinus and then extending to bridging veins proximal to the obstruction.
- When the cortical veins are occluded, petechial perivascular haemorrhages and cortical venous infarctions may occur.[2,8]
- Common systemic disorders in children that may cause dural sinus thrombosis include dehydration, infection, trauma and haematological diseases, e.g. sickle cell disease.[9]
- In adults, infection, oral contraceptives, pregnancy, malignancy, dehydration, connective tissue disorders, the anti phospholipid antibody syndrome, inflammatory bowel diseases, miscellaneous other hyper coagulation states and haematological disorders can cause cerebral venous or duralsinus thrombosis.[1,2,10,11]
- Due to wide anatomic variety of cerebral venous drainage, there is absence of a specific clinical picture most of the time.[2]
- The leading causes of mortality are: trans-tentorial herniation due to intracranial mass effect, mostly because of delayed diagnosis and the severity of clinical picture at the onset of therapeutic anticoagulation.[3]
- Early diagnosis by imaging methods is essential.
- Earlier, conventional angiography was used for detecting cerebral venous thrombosis, but because of its invasiveness and potential risks, DSA was usually withheld until the later stages of the disease when the risk-benefit ratio justified the use of invasive radiological methods.
- Thus, the incidence of cerebral venous thrombosis was grossly underestimated.
- Currently, MR venography can easily and reliably diagnose dural sinus thrombosis because of its sensitivity to blood flow and its non-invasiveness, owing to which more than 80 % of all cerebral venous thrombosis patients will have a good neurological outcome.[4,5,6,7]

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The imaging characteristics of MRI include:

STAGE OF THROMBUS	DURATION	T1W	T2W	MECHANISM
ACUTE	Upto 7 days	isointense	Marked hypointense	Normal flow void
SUBACUTE	7 – 30 days	hyperintense	hyperintense	deoxyhaemoglobin is converted tomethaemoglobin.
CHRONIC	Beyond 2-4 weeks	Depend on the degree of flowand recanalization that has been established. .[13,15,16,17]		

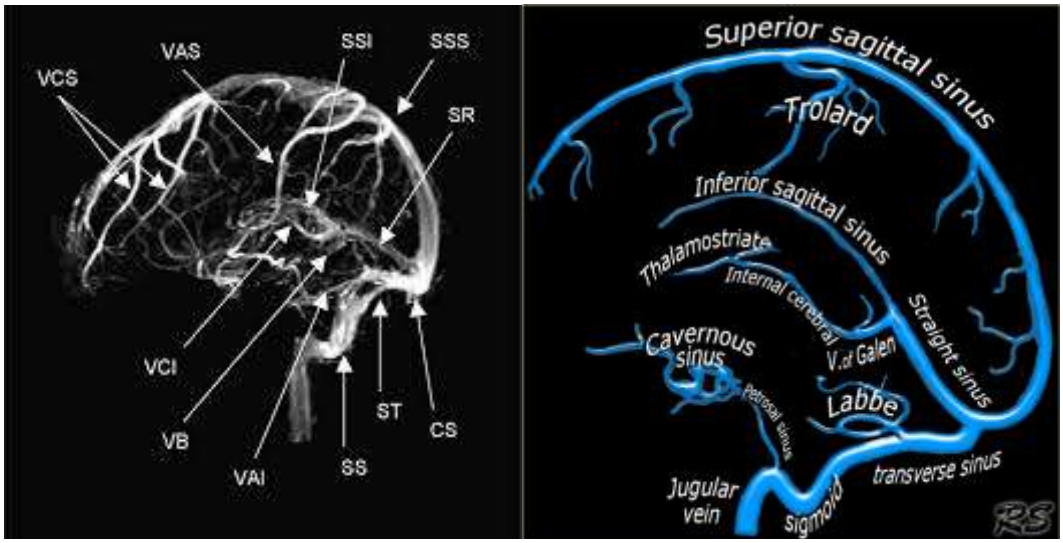
Recanalization of the occluded sinus onlyoccurs within the first four months followingcerebral venous thrombosis and not thereafter,irrespective of oral anticoagulation.[18,20]

A flow void may return but a high percentage of patientscontinue to have an abnormal signalwithin the venous sinus for months to years afterthe event.

Enlarged venous collaterals may be identified easilyas flow voids within the brain parenchymaor on its surface.

The absence of flow in the occludedsinus, the 'frayed' or 'shaggy' appearance of the venous sinus and the abnormal collateralsare almost pathognomonic of thrombosis.

It is important to remember that ahyperintense (subacute) blood clot can masqueradeas flow on MRV so standard sequencesand source images must always be evaluated to exclude artifacts.



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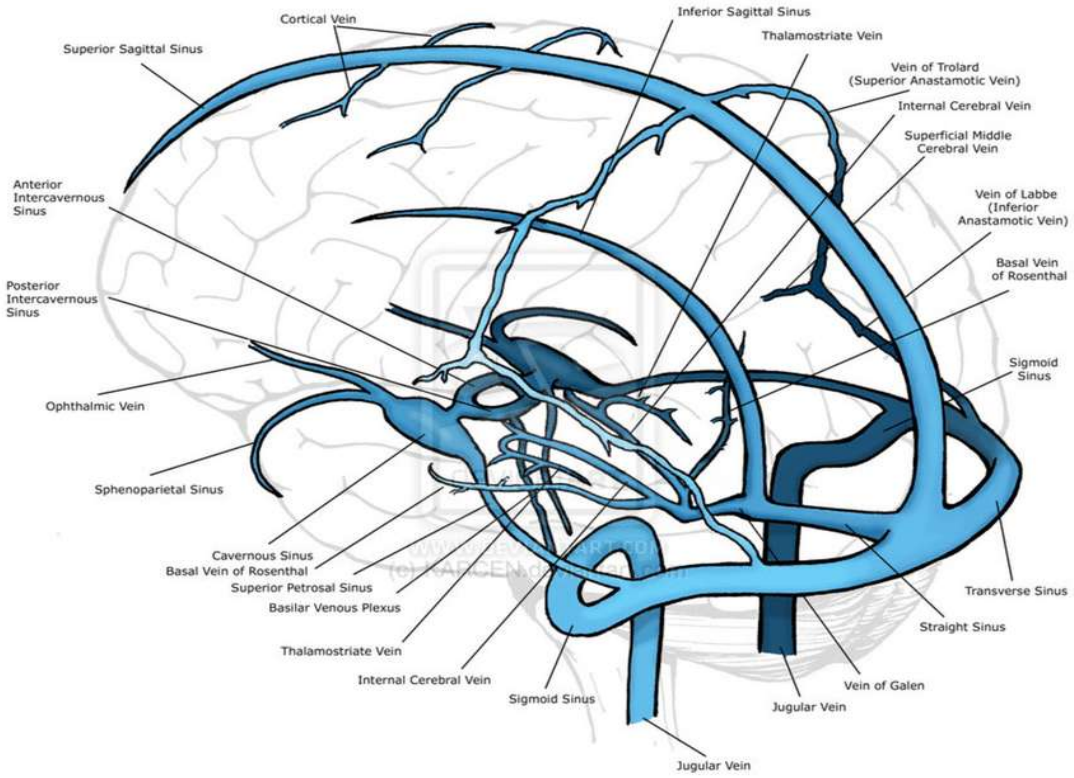

II. MATERIAL AND METHODS:-

Study was conducted in GCS medical college, Ahmedabad and included patients with clinical suspicion of dural venous sinus thombosis. MRI was done using 1.5 tesla GE signa explorer machine including standard scan protocol. The diagnosis was confirmed as well as the location of thrombosis was accurately determined on the basis of sagittal, coronal and axial images. A prospective observational study to determine the value of MR venography for accurate diagnosis and follow-up was conducted over a period of 12 months from January 2023 to December 2023 over 50 patients who underwent MR VENOGRAPHY for the suspicion of cerebral venous thrombosis.

Inclusion criteria : -

- Patient with clinical suspicion of dural sinus thrombosis.
- Patient diagnosed with dural sinus thrombosis in Radio-diagnosis department of GCSMCH&RC.

Exclusion criteria : -

- Implanted Electric And Electronic Devices are a strict contraindication to the Magnetic Resonance Imaging, and In particular:
- Heart Pacemakers (Especially Older Types)
- Insulin Pumps
- Implanted Hearing Aids
- Neurostimulators
- Intracranial metal clips
- Metallic bodies in the eye

III. RESULTS

36 patients in this study were in the age groups of 20 year and 50 years, while 14 patients were above 50 years of age.

25 patients in the current study were females (50 %) and 25 patients were males (50%).

Headache was the common clinical symptom in this study.

Common sinus thrombosis seen in my study was transverse sinus thrombosis, sigmoid sinus thrombosis followed by inferior sagittal thrombosis,superior sagittal thrombosis and IJV thrombosis.

Hemorrhagic infarction was seen in 11 patients, focal edema in 8 patients and non-hemorrhagic infarction in 4 patients.

42 patients presented with subacutethrombus, 7 patients had chronicthrombus and 1 patient had tumoral thrombosis due to glomusjugulare.

MR venography was done in all patients to corroborate with MRI imaging findings.

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Table 1 – Sex distribution

SEX	NO. OF PATIENTS	PERCENTAGE
MALE	25	50
FEMALE	25	50

Table 2 – Age distribution

AGE	NO. OF PATIENTS	PERCENTAGE
20-30 years	12	24
31-40 years	13	26
41-50 years	11	22
51-60 ears	8	16
>60 years	6	12

Table 3 – Clinical presentation: Headache

HEADACHE	NO. PATIENTS	PERCENTAGE
PRESENT	34	68
ABSENT	16	32

Table 4 – Common sinus thrombosis

SINUS THROMBOSIS	NO. OF CASES	PERCENTAGE
TRANSVERSE	15	30
SIGMOID	11	22
INFERIOR SAGITTAL	8	16
SUPERIOR SAGITTAL	7	14
IJV	4	8
STRAIGHT	2	4
ICV, VEIN OF GALEN	2	4
CORTICAL VEINS (SUPERFICIAL + DEEP)	1	2

Table 5-Distributionofpatients accordingto the causes of cerebralvenousocclusion(CVO).

CAUSE	NO. OF CASES	PERCENTAGE
TUMORAL	1	2
NON-TUMORAL	49	98

Table 6 -DistributionofpatientsaccordingtoMRappearance ofparenchymalchanges.

MR APPEARANCE OF PARENCHYMAL FINDINGS	NO. OF CASES	PERCENTAGE
NON-HEMORRHAGIC INFARCTION	4	8
HEMORRHAGIC INFARCTION	11	22
T2/FLAIR CHANGES (EDEMA)	8	16
LOSS OF FLOW VOID	27	54

Table 6 -Distribution of patients according to the MRI appearance of signal changes in durals in uses and veins.

STAGE OF THROMBUS	T1Wi		T2Wi	
	INTENSITY	PATIENTS	INTENSITY	PATIENTS
SUBACUTE	Hyper	42		
EARLY			Hypo	26
LATE			Hyper	16
CHRONIC	Hypo	7	Hypo	7
Note : One patient was a k/c/o GlomusJugulare with tumoral thrombosis and hence could not be included in the staging of thrombus.				

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IV. DISCUSSION

Most of patients in this study were in the age groups of 20 year and 50 years. This agreed with similar literature reported that the most patients with this disease present in young-to middle- aged patients.[22] Other literature reported that it is most common in the third decade while it may occur in all age groups.

Themostcommon causeofcerebral venous occlusion inthe current study was intraluminal thrombus, it occurred in all patients and this agreed with Bousser etal.,[12] who reported that all patients in his study of 110 cases had cerebral venous occlusion due to thrombosis.[12]Hemorrhagic infarction was the most common parenchymal change found in the present study, seenin (22%) of cases followed by focal edema in 16 % and non-hemorrhagic infarction in 8 %.

As compared to study by Simonds etal.[14] which observed hemorrhagic infarction in 40% cases , non-hemorrhagic infarction in 26.7 % followed by focal edema in 25% of cases our study showed lesser number of patients with non-hemorrhagic infarction.

This study showed lesser percentage of progression to infarction which probably may be due to early diagnosis of the thrombosis in patients with clinical suspicion and prompt treatment of the same.

42 patients (84 %)inour study presented with subacutethrombus.7 cases(14%) had chronic thrombus. 1 patient had tumoral thrombosis due to glomusjugulare .

No cases of acute thrombus could be detected, which could be attributed to the more number of referred cases in a tertiary care hospital leading to delayed presentation of the patients.

According to some estimates, in 10–30% of cases of sinus thrombosis, the thrombus at initial presentation or imaging examination is in the acute stage of formation.[14, 19 , 21]

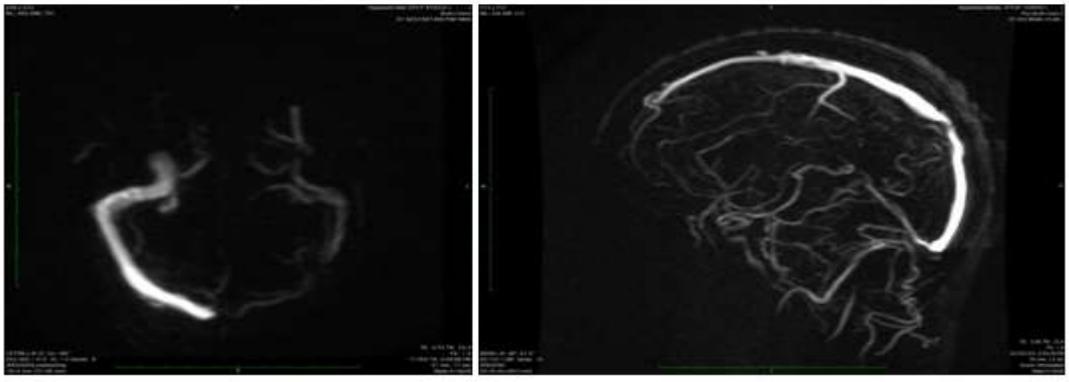
Sub acute-stage thrombus has been found in 55% of patients which was slightly lower as compared toour study.[19 ,21]and chronic thrombosiswas found in 15% of patients which was more or less same as our study.[23,21]

V. CONCLUSION :

MRI in combination with MRV are virtually always the imaging methodsof choice for the diagnosis and follow-up ofpatients with venous or dural sinus thrombosis.

VI. LIMITATIONS OF THIS STUDY:

- In a few patients with clinical suspicion, when the sinuses appeared hypoplastic obvious thrombosis could not be ruled out.To overcome such diagnostic dilemmas, a multicentric trial study with larger study population should be carried out.
- In some patients with non-visualiation on venography, there was absence of significant flow voids on T1W and T2W sequences which was suggestive of artifactual findings.
- In such types of cases, further evaluation with a post-contrast venography was advised.



Thrombosis in Inferior sagittal sinus, Great cerebral vein and Internal cerebral vein

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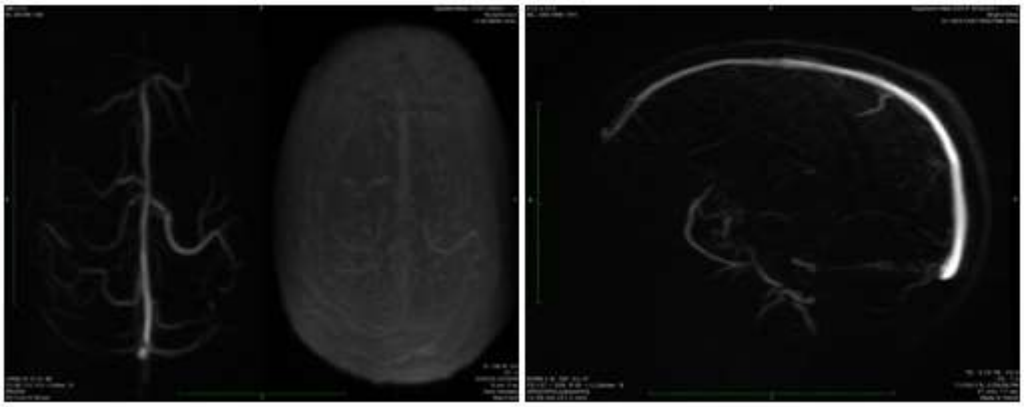

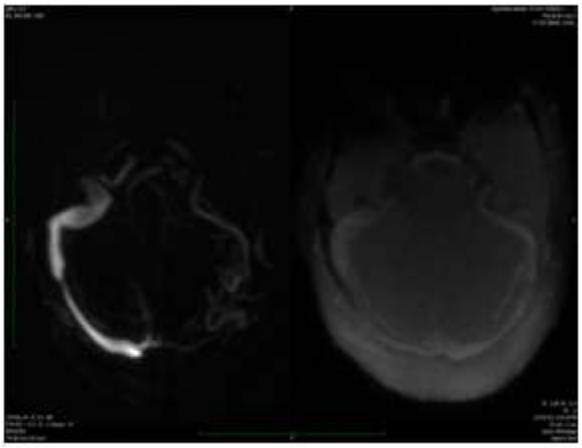

Thrombosis in
Internal Cerebral Vein,
Vein of Galen
and
Left Transverse Sinus.

Hypoplastic Left transverse sinus.

Partial thrombus in segmental branch of inferior sagittal sinus.

Multiple venous collaterals.

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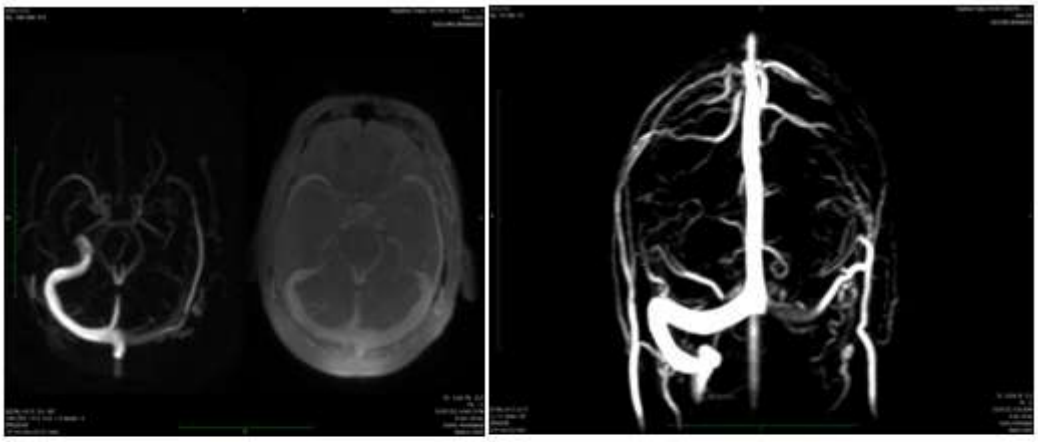
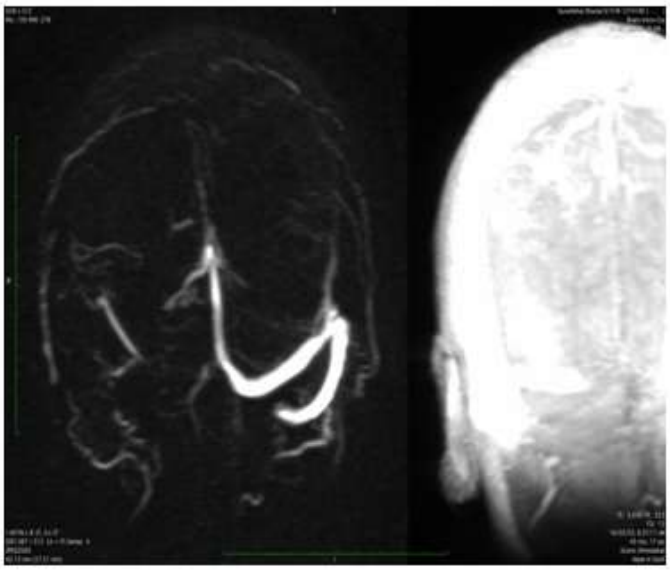


Thrombus in Left transverse sinus, sigmoid sinus and IJV



Thrombus in
Superior sagittal sinus,
Right transverse sinus,
Sigmoid sinus,
Superficial cortical veins on both sides,
Deep cortical veins on right side.

Hypoplastic left sigmoid and transverse sinuses

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