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Study of Cerebral Venous Sinus Thrombosis at Tertiary Care Center

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Abstract: ***Objective: Present study has been undertaken to describe the etiologies, clinical features, diagnosis and prognosis of cerebral venous sinus thrombosis (CVST). Study Design: Prospective observational study at a tertiary care hospital in patients with a confirmed diagnosis of Cerebral venous sinus thrombosis. Results: We studied 30 patients, with mean age as 37.6 years. Majority of them were in the age group of 18-30 years contributing to 50%. Majority ot the patients (86.7%) belong to nonpuerperal CVST. Hyperhomocystinemia and protein S deficiency were the most common risk factors identified in males whereas anemia and puerperum were the most common risk factors identified in females. Majority of the patients had subacute presentation. Headache was the most common presenting symptom (73.33%) followed by convulsions(46.67%) and focal deficits(46.67%). Hemiparesis (40%) was the most common neurological sign followed by papilloedema (30%). Radiologically most common sinus involved was transverse sinus in 66.67% cases followed by superior sagittal sinus in 43.37% of the cases. Overall outcome is good with 67.86% of the patients having complete recovery at the time of discharge and a mortality rate of 6.67%. Conclusion: Neuroimaging plays a pivotal role in diagnosis. MRI with MRV is the current diagnostic modality of choice. Evaluation for an underlying procoagulant state may be rewarding for further prevention with long term anti coagulation. Management with unfractionated heparin or LMWH and oral anticoagulants is appropriate. Surgical decompression is helpful in the case of continuing deterioration, inspite of maximum medical management.***

Keywords: cerebral venous sinus thrombosis, CVST, Neuroimaging

1. Introduction

Cerebral venous sinus thrombosis (CVST) is an uncommon condition than most other types of stroke & more challenging to diagnose. Although recognized for more than 100 years,[1] it has only in recent years come to be diagnosed frequently ante-mortem. Due to the widespread use of magnetic resonance imaging (MRI) and rising clinical awareness, CVST is recognized with increasing frequency.

Many causes of cerebral venous sinus thrombosis have been recorded in the literature.[1] However, even with extensive investigation no cause is identified in 20, 25% of the cases.[2] Known conditions that increase the risk of CVST include hypercoagulable states, dehydration, adjacent infectious processes, low cerebral blood flow, oral contraceptives, hormone replacement therapy, pregnancy, and puerperium. Each of these conditions is associated with a higher risk of venous thrombus formation, but exactly why the cerebral venous sinus system is involved over other veins is unclear.

CVST presents with a wide spectrum of symptoms and signs. Headache is the presenting symptom in 70–90% of cases.[2, 3, 4] Focal deficits such as hemiparesis and hemisensory disturbance, seizures, impairment of level of consciousness and papilloedema occur in one-third to three-quarters of cases. [2, 4] CVST most commonly involves superior saggital sinus (72%) followed by lateral sinus (70%). In 30 to 40% of cases more than one sinus is involved.[5]

The diagnosis of CVST requires high index of suspicion because of its varied presentations. Neuroimaging is the corner stone in the diagnosis of cerebral venous sinus thrombosis. Imaging modalities of choice in CVST are CT scan and MRI with MR venogram. CT scan may be normal in 15-30% cases but MRI with MRV is almost100% diagnostic.[6]

Current therapeutic options for CVST treatment include anti-thrombotic therapy with un-fractionated heparin, low-molecular-weight heparins (LMWH), oral anticoagulants, intravenous thrombolysis, local thrombolysis by selective sinus catheterization and a combination of thrombolysis and anticoagulation in addition to symptomatic therapy.[7] CVST has an acute case fatality of less than 5% and almost 80% of patients recover without sequelae.[8] It has been found that early diagnosis of cerebral venous thrombosis is essential because early treatment may prevent morbidity and may even be life saving.

Therefore, this study has been undertaken to describe the etiologies, clinical features, diagnosis and prognosis of CVST.

2. Material & Methodology

This prospective observational study was conducted at Image Super Speciality Hospitals and Research Center, **Hyderabad** for a duration of 1 year, in 30 consecutive patients admitted, with a confirmed diagnosis of Cerebral venous sinus thrombosis were taken up for the study and followed until discharge from the hospital or death. Discharged patients were followed up for a period of 6 months.

Inclusion Criteria: All Patients suspected to have Cerebral venous sinus thrombosis were evaluated but only those with confirmed diagnosis (based on neuroimaging) of cerebral venous sinus thrombosis were considered for the study.

Exclusion Criteria: Age below 18 years

Arterial infarcts

Meticulous history, clinical examination, laboratory investigations were carried out in all cases of cerebral venous sinus thrombosis in a case proforma. Cerebral venous sinus thrombosis was confirmed by CT scan or conventional MRI or MR Venogram.

Lab investigations as complete blood count, erythrocyte sedimentation rate, basic blood biochemistry including random blood sugar, liver function tests, serum creatinine, blood urea nitrogen, serum electrolytes, prothombin time, activated partial thromboplastin time, workup for hypercoagulable states including serum homocysteine, antithrombin III, protein c, protein s and anticardiolipin antibody, factor V Leiden mutation, lupus anticoagulant and other relevant investigations based on the clinical presentation were done.

During follow up, data regarding disability (according to modified Rankin Scale [mRS]), death, recurrent symptomatic sinus thrombosis (new symptoms with new thrombus on repeated venogram or MRI), other thrombotic events, seizures, headaches requiring bed rest or hospital admission were recorded.

The Statistical software namely SAS 9.2, SPSS 15.0, Stata 10.1, MedCalc 9.0.1 and Systat 12.0 were used for the analysis of the data and Microsoft word and Excel have been used to generate graphs, tables etc.

3. Discussion

A total of 30 cases of cerebral venous sinus thrombosis were evaluated in the study.

1) Age incidence

Table 1: Age wise distribution of patients

Age in years	Number of patients (n)	Percent (%)
18- 30	15	50
31- 40	6	20
41- 50	3	10
51- 60	1	3.33
61 -70	3	10
71- 80	2	6.67

The mean age of the patients in the present study was 37.6 years. Majority of them were in the age group of 18-30 years contributing to 50%. The youngest being 18 and the eldest 80 years of age. The mean age of female patients is 36.06 years with a standard deviation of 17.62, whereas that of males is 39.14+/-20.12 years in the present study.

Table 2: Mean Age at onset in different studies

Author	Number of patients (n)	Percent (%)
Daif et al[9]	40	27.8
Nagaraja et al [10]	150	24.2
Strolz et al [11]	79	42.8
Present study	30	37.6

Comparing the age group involved, 20-40 years was the commonest age group involved in various series (Mehta SR et al[12], 77.8% and Ameri et al[2], 61%). The present study also showed similar findings with 56.67% in the 20-40 age group , with mean age of onset 37.6 years which is comparable with Strolz et al[11].

2) Sex incidence

Sex ratio in the present study is 1:1. Male to female ratio in various studies were as, Mehta SR et al[12] 1:1.4, Daif et al[9] is 1:1, Bousser et al[1] is 1.24:1. The present study is comparable to Daif et al[9].

3) Types of CVST

In the present study, out of 30 patients, 26 (86.67%) patients belong to nonpuerperal group and 4 (13.33%) belong to puerperal group. Out of 26 non-puerperal cases, 15 were males and 11 females.

4) Onset of symptoms:

Table 3: Mode of onset

Onset	Number of patients in present study (n)	Percent in present study (%)	Bousser et al[1]	Daif et al[9]
Acute	10	33.33	36.84%	35%
Subacute	16	53.33	26.32%	40%
Chronic	04	13.33	36.84%	25%
Total	30	100	100	100

In the present study, 16 cases (53.33%) of CVST had subacute presentation, followed by 10 cases (33.33%) with acute presentation. Those who presented within 48 hours were considered to have acute onset, with onset longer than 48 hours but less than 1 month were considered subacute, and with onset more than 1 month as chronic (Bousser et al[1]).

5) Level of consciousness at the time of presentation

In the present study, 18 patients (60%) were conscious and 9 cases (30%) were drowsy at the time of presentation.

6) Initial symptoms at presentation

Table 4: Symptoms at presentation

Symptom	Number of patients (Percent)	Bousser et al[1]
Headache	22 (73.33)	28 (74%)
Convulsions	14(46.67)	11 (29%)
Focal deficit	14(46.67)	22 (58%)
Vomiting	13(43.33)	
Altered sensorium	11(36.67)	10 (26%
Fever	4(13.33)	
Generalized weakness	2(6.67)	
Diplopia	2(6.67)	

In the present study, most common symptom is headache in 73.33% (22 cases) followed by convulsions and focal deficits in 46.67% (14 cases) each. Headache was the most common symptom in the present study accounting for 73.3% of patients. The present study is comparable with most other studies like Bousser et al[1] with 74%, Mehta SR et al[12] with 77.8% and Strolz et al[11] with 73.4%.

In the present study, 46.67% of cases had seizures which is comparable with Strolz et al[11]. The manifestations that indicate the cerebral cortical involvement are convulsions and paralysis; at times seizures are heralding symptoms and should arouse the suspicion of diagnosis.

In the present study, 46.67% of patients had focal deficits. Among them 12 had hemiparesis, 2 had diplopia and 2 had dysphasia.

In the present study, 40% of patients had altered level of consciousness which is comparable with Strolz et al[11].

7) Clinical signs at presentation

Table 5: Clinical signs at presentation

Sign	Number of patients (n)	Percent (%)
Hemiparesis	12	40
Pallor	11	36.67
Papilloedema	10	33.33
Cranial nerve involvement	9	30
Dysphasia	3	6.67

In the present study, hemiparesis was present in 40% and papilloedema in 30% of the patients.

In the present study, 33.33% of patients had papilloedema. Similar observations were noted with Strolz et al[11] and Kumar S et al[14] who also had papilloedema in 30.3% and 32% respectively.

8) Investigations

Table 6: Haemoglobin level

Hb level	Number of patients (n)	Percent (%)
<5	0	0
5-8	3	10
8-10	5	16.67
>10	22	73.33
Total	**30**	**100.00**

In the present study, out of 30 patients, 8 patients were anemic, out of which 2 patients from group 5-8 gm hemoglobin had mortality.

9) Risk factors

Table 7: Risk factors* or causes identified in males

Risk factor	Number of patients(n)	Percent (%)
Hyperhomocysteinemia	5	33.33
Protein S deficiency	3	20
Protein C deficiency	1	6.67
APLA syndrome	1	6.67
Anemia	2	13.33
Sec polycythemia	1	6.67
Malignancy	1	6.67
No cause found	4	26.67

*multiple risk factors per patient identified

Table 8: Risk factors* or causes identified in females

Risk factor	Number of patients(n)	Percent (%)
Anemia	9	60
Puerperum	4	26.67
Hyperhomocystenemia	3	20
Protein S deficiency	3	20
OCP/HRT	2	13.33
SLE	1	6.67
HIV	1	6.67
No cause found	2	13.33

*multiple risk factors per patient identified

Predisposing underlying factors can be identified in up to 80% of patients of CVST.[15] In the present study no risk factor could be identified in only 6 patients (20 %) similar to other studies. Anemia and puerperum were the most common risk factors identified in females, whereas hyperhomocysteinemia and protein S deficiency were the most common risk factors in males. Only two of the fifteen female patients were on OCP or HRT at the time of presentation which was far less as compared to western data.[16] Sometimes more than one risk factors were present in the same patient.

10) Neuroimaging

Table 9: CT and MRI findings

Finding	Present Study – No. of patients (n)	Present Study – Percent (%)	Nagaraja et al[10]
hemorrhagic infarction (HI)	13	43.33	40.9%
Non hemorrhagic infarction (NHI)	10	33.33	51.6%
Cerebral edema	9	30	
Cord sign	4	13.33	21.9%

In the present study, 13 cases (43.33%) had hemorrhagic infarction, followed by Non hemorrhagic infarction comprising 10 cases (33.33%). The most common radiological finding in the present study is hemorrhagic infarction present in 44 % of cases, while non hemorrhagic infarction was the most common radiological feature in the study by Nagaraja et al[10].

Table 10: Frequency of Sinus involvement

Sinus involved	Daif et al[9]	Strolz et al[11]	Ferro et al[17]	Bousser et al[13]	Present study
Superior sagittal sinus	85%	72.2%	66.2%	64%	43.33%
Transverse sinus	35%	38%	64.7%	74%	66.67%
Straight sinus	7.5%	7.6%	8.4%	14%	13.33%
Deep venous system			6.3%	7.5%	10%

In the present study, the most common individual sinus involved was superior sagittal sinus in 13 patients accounting for 43.33% followed by left transverse sinus (36.67%) in 11 patients.

The frequency of involvement of different cerebral sinuses in the present study is comparable to that of Ferro et al and Bousser et al[13].

11) Treatment

All the 30 patients were given anticoagulation, initially with subcutaneous LMWH in 27 cases(90%) and intravenous unfractionated heparin infusion in 3 cases(10%), later on changed over to oral anticoagulants. In one patient mechanical thrombectomy with intra sinus tissue plasminogen activator installation was done. 4 patients (13.33%) required decompressive craniotomy, out of which one patient died. Additional treatments included antiepileptics in 19 patients (63.33%) and antiedema measures in 20 patients(70%).

12) Prognosis

Mean hospital stay was 13.9 days in the present study (range 4 - 42). Modified Rankin Scale score at discharge was: 0 (in ten patients), 1 (eight), 2 (six), 3 (two), 4 (one) and 5 (one). Two patients died during hospitalisation (one due to transtentorial herniation and other from myocardial infarction). Out of the 28 survived patients, 19 (67.86%) had complete recovery, while 6 patients had residual hemiparesis, 1 had diplopia, 1 had dysphasia and 1 had persistant headache at the time of discharge. During the follow up period 3 patients had seizure recurrence while no one had recurrent CVST or thrombosis at other sites. 2 patients were lost to follow-up during the first 3 months, 1 during the next 3 months, while 2 patients did not yet complete 6 months of follow-up.

Treatment of CVST ranges from observation to anticoagulation.[18] In our study all the 30 patients were treated with anticoagulants; the different routes of administration reflect uncertainity of opinions among neurologists[19] as to what type of heparin to be used.

In the past, CVST had been associated with a dismal prognosis and high mortality rate, reaching 30–50%. The recent ISCVT study, performed in the era of modern neuroimaging, LMWH administration, and endovascular intervention, reported much lower mortality rates (8–14%) and significantly better outcome. A meta-analysis of 19 studies conducted by Dentali et al. (2006) showed that the mortality rate during the perihospitalization period was about 5.6%, while at the end of the follow-up period, this percentage increased to 9.4%.[20] In the present study, the mean hospital stay was 13.9 days with 67.86% of the patients having complete recovery at the time of discharge.

Table 11: Outcome at discharge, 3 months and 6 months

Modified Rankin Scale	At discharge (n=30)		3 months (n=26)		6 months (n=23)	
	No of cases	(%)	No of cases	(%)	No of cases	(%)
0	10	33.33	19	73.08	20	86.96
1	8	26.67	3	11.54	2	8.69
2	6	20	3	11.54	0	0
3	2	6.67	1	3.84	1	4.35
4	1	3.33	0	0	0	0
5	1	3.33	0	0	0	0
Death	2	6.67				

13) Mortality

The mortality in our study is 6.67% which is comparable with Ameri et al[2] and Mehta et al[12] with 5.45% and 4.44% respectively.

Table 12: Mortality in various studies

Author	Number of patients (n)	Percent (%)
Ameri et al[2]	110	5.45%
Daif et al[9]	40	10%
De brujin et al (2001)	59	10.17%
Mehta SR et al[12]	45	4.44%
Strolz et al[11]	79	15%
Present study(2012)	30	6.67%

4. Conclusions

- The present study emphasizes that CVST is not an uncommon condition. Clinical presentation is extremely varied and symptoms may evolve over hours to few weeks.
- Important clinical features to suggest this disorder are presentation with recent headache, seizures, papilloedema and focal deficits in the appropriate clinical settings.
- Neuroimaging plays a pivotal role in diagnosis. MRI with MRV is the current diagnostic modality of choice. Evaluation for an underlying procoagulant state may be rewarding for further prevention with long term anti coagulation.
- Management with unfractionated heparin or LMWH and oral anticoagulants is appropriate. Surgical decompression is helpful in the case of continuing deterioration, inspite of maximum medical management.
- Contrary to ischemic arterial stroke, CVST could be described as an all or nothing disease with good short and long term outcomes when the acute phase of illness has been survived.

References

[1] Bousser MG. Cerebral venous thrombosis: nothing, heparin or local thrombolysis. Stroke,1999. 30:481–3.

[2] Ameri A, Bousser MG. Cerebral venous thrombosis. Neurol Clin, 1992. 10:87– 111.
[3] Villringer A, Mehraen S, Einhäupl KM. Pathophysiological aspects of cerebral sinus venous thrombosis. J Neuroradiol, 1994. 21:72–80.
[4] Bousser MG, Chiras J, Bories J, Castagne P. Cerebral venous thrombosis - a review of 38 cases. Stroke, 1985. 16:199–213.
[5] Bousser MG, Barnett HJM. Cerebral venous thrombosis. In: stroke: pathophysiology, diagnosis and management, 4th edition. New York. Churchill Livingstone, 2004;300-21.
[6] Wang AM. MRA of venous sinus thrombosis. Clin Neurosci 1997;4:158-64.
[7] Nagaraja D, Sarma GR. Treatment of cerebral sinus/venous thrombosis. Neurol India 2002;50:114
[8] Ferro JM, Canhao P, Stam J, Bousser MG, Barinagarrementeria F, for the ISCVT investigators. Prognosis of cerebral vein and dural sinus thrombosis: results of the International Study on Cerebral Vein and Dural Sinus Thrombosis (ISCVT). Stroke. 2004;35:664-670.
[9] Daif A, Awada A, al-Rajeh S, et al. (1 July 1995). "Cerebral venous thrombosis in adults. A study of 40 cases from Saudi Arabia". Stroke 26 (7): 1193–5.
[10] Nagaraja D, Taly AB. Puerperal venous sinus thrombosis in India. In: Sinha KK, ed, Progress in Clinical Neurosciences. Ranchi: NSI Publications 1989;5:165-177.
[11] Strolz E, Rahimi A, Gerriets T, Kraus J, Kaps M. Cerebral venous thrombosis: an all or nothing disease ? Prognostic factors and long term outcome. Clin Neurol Neurosurg 2005; 107(2):99-107.
[12] Mehta SR, Varadarajulu R, Gupta A, et al., editors. Abstracts of 59th Annual Conference of API 2004 Jan 18-21, Hyderabad. JAPI 2003; 51:1196.
[13] Bousser MG, Ferro JM. Cerebral venous thrombosis: an update. Lancet Neurol. 2007;6:162–170.
[14] Kumar S, Alexander M, Gnanamuthu C. Clinical presentation and outcome of postpartum cerebral venous thrombosis. In: Annals of Indn Acad of Neurol 2004; 7:448-9.
[15] Bousser MG, Russell RR. Cerebral Venous Thrombosis. London: WB Saunders, 1997.
[16] Martinelli I, Battaglioli T, Pedotti P, Cattaneo M, Mannucci PM (2003) Hyperhomocysteinemia in cerebral vein thrombosis. Blood 102:1363–1366.
[17] Ferro J M, Correia M,Pontes C, et al, for the Cerebral Venous Thrombosis Portuguese Colloboration Study Group (VENOPORT) (2001). Cerebral vein and dural sinus thrombosis in Portugal,1980-1998, Cerebrovasc Dis 11:177-182
[18] Stam J, de Bruijn SFTM, DeVeber G (2003) Anticoagulation for cerebral sinus thrombosis [Cochrane Review]. The Cochrane Library, Issue 2. Update Software Oxford, pp. 1–10
[19] Masuhr F, Mehraein S, Einhaupl K (2004) Cerebral venous and sinus thrombosis. J Neurol 251:11–23
[20] Dentali F, Crowther M, Ageno W. Thrombophilic abnormalities, oral contraceptives, and risk of cerebral vein thrombosis: a meta-analysis. Blood. 2006;107:2766 –2773.