

Original Research Article

A clinical study of cerebral venous thrombosis

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Received: 18 June 2017

Accepted: 26 July 2017

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ABSTRACT

Background: Cerebral venous thrombosis (CVT) is an uncommon form of stroke, usually affecting young population. Clinical features of CVT are diverse, and for this reason, high degree of clinical suspect is mandatory to diagnose the conditions. The objectives of the study were to analyse the commonest clinical modes of presentation, possible etiologies, and to evaluate clinical outcome.

Methods: This study was prospective, clinical study was conducted on 40 patients during the period of September 2010 to September 2011 in the Department of Emergency, Institute of Internal medicine at Government General Hospital (GGH), Chennai. All the patients included in the study were subjected to neuroimaging techniques like Computed tomography (CT), magnetic resonance imaging (MRI) along with magnetic resonance venography (MRV) according to guidelines and standard protocol.

Results: Majority of the patients involved in the study were in the age group of 15-35 years contributing to 75%. Male: female ratio was 1.5: 1. Headache was the most common presenting symptom seen in 36 (87.5%) cases followed by convulsions in 32 (80%) patients. Altered sensorium was observed in 26 (65%), focal deficits in 22 (55%), and 18 (45%) had fever. Two of them had ear discharge and another with diarrhea. Cranial nerve involvement in 35% and papilloedema was noted in 20% of patients. Out of 40, 17 (42.5%) patients were anemic. Eighteen (18) patients who were suspected of meningitis underwent CSF analysis. Abnormality was seen in 10 patients with pleocytosis being the maximum. On CT scan, haemorrhagic infarct was seen in 22 (55%) cases followed by edema in 8 (20%) and 10% showed normal CT picture. On MRI scan, superior sagittal sinus thrombosis was observed in 24 (60%) patients followed by transverse sinus in 20 (50%) patients. Etiology factor were identified in 25 (62.5%) of patients and in 15 (37.5%) cases risk factors could not be identified. The mortality rate in the study was 20%.

Conclusions: The clinical symptoms of CVT are not specific, as a result of chances of misdiagnosis tends to be more. CT scan and MRI along with MRV can improve the precision of CVT diagnosis.

Keywords: Cerebral venous sinus thrombosis, CT scan, MRI, MRV

INTRODUCTION

Cerebral venous sinus thrombosis (CVT) has been recognized in the early part of the nineteenth century but still remains a diagnostic and therapeutic challenge for the clinician because of varying and misleading clinical presentation of this condition. It forms a distinct

subgroup of cerebrovascular disease and is one of the commonest causes of stroke in young people in India.¹

Though earlier studies have reported higher mortality, recent studies have reported lesser mortality due to earlier diagnosis, increased awareness and management. Cross et al noted "usually recovery is rapid and complete, if the

patient survives acute episode".² Three fourth of cases of cerebral thrombosis in pregnancy and puerperium reported by him, survived with good recovery. Although it may present with a variety of signs and symptoms, headache is the most frequent and often the earliest manifestation.³

The diagnosis of cerebral venous sinus thrombosis requires high index of suspicion.⁴ Computed tomography (CT) of brain show direct or indirect signs of cerebral venous thrombosis. It may be normal in 10% of patients.⁵ In such cases advanced neurological diagnostic like magnetic resonance imaging with venography is necessary to confirm cerebral venous thrombosis, but it is not always readily available in many hospitals. 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. Cerebral sinus venous thrombosis is considered to be a medical emergency, mode of onset highly variable, and spectrum of its clinical manifestations is extremely wide.⁶

The objectives of the study were to analyze the commonest clinical modes of presentation, possible etiologies, and to evaluate clinical outcome.

METHODS

This study was conducted during the period of September 2010 to September 2011. This prospective, clinical study was done in forty (40) patients who are clinically suspected of CVT. This study was conducted in the Department of Emergency, Institute of Internal medicine at Government General Hospital (GGH), Chennai. All the patients included in the study were subjected to neuroimaging techniques (CT and MRI).

Selection criteria

Patients presenting with history suggestive of cerebral venous thrombosis and in whom the diagnosis of CVT confirmed by CT scan, direct and indirect signs confirmed by imaging of brain (MRI and MRV) were included in the study. Patients with inconclusive of CVT on CT scan, hypertensive hemorrhage, arterial stroke, metabolic encephalopathy and presence of space occupying lesions on scanning were excluded from the study.

Data was collected by using pre-tested proforma meeting the objectives of the study. Purpose of the study was carefully explained to the patients and informed consent was taken. All patients were interviewed. Detailed history was taken with respect to epidemiological, clinical features, radiological features, with special emphasis on suspected precipitating or predisposing factors such as puerperium, fever, sepsis, anemia, abortions and oral contraception.

Detailed examination of patients was carried out including general physical examination for any evidence of anemia, dehydration, sepsis, deep vein thrombosis of leg and detailed neurological assessment with other systems were done to look for any evidence of etiologies.

RESULTS

A total of 40 patients were involved in this study, with age group ranging from 15-60 years. Majority of them were in the age group of 15-35 years contributing to 75%. The youngest age being 20 and highest is 55 years. There were 24 men (60%) and 16 women (40%) in the study. Of them, 26 (65%) patients belong to non-puerperal group and 14 (35%) belong to puerperal group (Table 1).

Table 1: Socio demographic variables of study participants.

Variables	Number of cases	Percentage (%)
Age in years		
15-24	8	20
25-34	22	55
35-44	8	20
45-60	2	5
Sex		
Females	16	40
Males	24	60
Types of CVT		
Non-puerperal group	26	65
Puerperal group	14	35
Mode of onset		
Acute	12	30
Sub-acute	26	65
Chronic	2	5
Level of consciousness		
Conscious	14	35
Drowsy	12	30
Stuperous	8	20
Comatose	6	15

In the present study, 26 cases (65%) of CVT had sub-acute presentation, followed by 12 cases (30%) with acute presentation and 2 (5%) cases had chronic presentation. Before admitting in the hospital, 14 cases contributing 35% were presented with full consciousness. 12 cases were drowsy with 30% incidence. 8 (20%) were stuporous and 6 (15%) came with coma (Table 1).

Patients with initial symptoms of presentation and neurological signs were presented in Table 2. The most common presenting symptom was headache contributing to 87.5% (36 cases) followed by convulsions in 80% (32). Altered sensorium was observed in 26 (65%), focal deficits in 22 (55%), and 18 (45%) had fever. Two of them had ear discharge and another with diarrhea. Cranial nerve involvement in 35% and papilledema was noted in 20% of patients.

Table 2: Clinical symptoms and signs.

	Number of cases	Percentage (%)	
Symptoms			
Headache	36	90	
Convulsions	32	80	
Altered sensorium	26	65	
Focal deficits	22	55	
Fever	18	45	
Neurological signs			
Focal deficit	22	55	
Fundus	Disk bulge	12	30
	Pappiledema	8	20
Cranial nerves	14	35	

All the 40 patients underwent test for haemoglobin percentage (Table 3). Out of 40, 17 (42.5%) patients were anemic. The maximum number of deaths appears to be more with lesser HB%. All patients who died with mild and moderate anaemia were in the puerperal group.

Table 3: Hemoglobin percentage.

Hb%	Number of cases	Patients alive	Patients dead
2-5	1	1	-
5.1-8	6	5	1
8.1-10	10	8	2
> 10	23	18	5

Eighteen (18) patients who were suspected of meningitis underwent CSF analysis as given in Table 4. Of which 8 were normal and abnormality was seen in rest 10 patients with pleocytosis being the maximum. Two patients had TB meningitis.

Table 4: CSF analysis.

CSF changes	Number of patients
Normal	8
Protein rise	4
Pleocytosis	6
Xanthochromia	2

Table 5 presents the findings of CT scan and MRI+MRV. On CT scan, haemorrhagic infarct was seen in 22 (55%) cases followed by edema in 8 (20%) and 10% showed normal CT picture. Indirect signs (70%) were more common than direct signs (20%). All 40 cases, including 10 patients with normal CT scan findings underwent MRI scan. The most common sinus involved observed was superior sagittal sinus thrombosis in 24 (60%) patients followed by transverse sinus in 20 (50%) patients.

Predisposing/ etiology factor were identified in 25 (62.5%) of patients. In 15 (37.5%) cases risk factors could not be identified. Rheumatological evaluation was done only in 10 patients because of cost restraints. Also,

we found 11 patients had the habit of using smoke and alcohol, 4 were only smokers, 1 was an alcoholic and 6 were pan chewers. All these lead to hypercoagulable state.

Table 5: CT scan and MRI scan findings.

Findings	Number of cases	Percentage (%)
CT scan		
Cord sign	4	10
Empty delta sign	3	7.5
Dense triangle sign	1	2.5
Mass effect	5	12.5
Midline shift	5	12.5
Bilateral infarct	3	7.5
Edema	8	20
Hemorrhagic infarct	22	55
Non-haemorrhagic infarct	2	5
Normal	4	10
MRI+MRV scan		
Superior sagittal sinus	24	60
Transverse sinus	20	50
Straight sinus	3	7.5
Sigmoid sinus	12	30
Cavernous sinus	2	5
Cortical vein	2	5
Internal jugular vein	1	2.5
Deep cerebral vein	-	-

Table 6: Etiological factors.

Etiological factors	No. of patients
Infectious	
HIV	2
TBM	2
CSOM	2
Diarrohea	1
Non-infectious	
Hyperhomocysteinemia	17
APLAS	2
Protein C/S deficiency	1
Puerperal	14
Pregnancy induced hypertension	2

Out of 24 males participated in the study, 5 (12.5%) were died. Of 16 females, 3 (7.5%) died in the puerperal group. Totally, 32 (80%) were alive and 8 (20%) died.

DISCUSSION

Cerebral venous thrombosis though not rare, is often undiagnosed as it presents with a wide array of symptoms. It mimics practically all neurological conditions. It affects all age groups and has unpredictable outcome. This condition is common in the Indian subcontinent, responsible for 10-15% of strokes in younh population.⁷

The incidence of CVT has been linked to pregnancy, multiparity, infection and dehydration. Developments in diagnostic laboratory investigations and imaging modalities had provided valued information about risk factors and clinical spectrum of CVST.¹

The age distribution in our study shows that 75% of the patients in our series had onset of CVT between 15 and 34 years of age. 20% of the patients had onset between 15 and 24. This was similar with the previous findings of Patil et al.¹ Females are more likely to suffer from CVT, accounting for 70–80% of all CVT patients.⁸ On contrary, male preponderance was observed in our study. Here ratio of male: female was 1.5:1.

In the study done by Deschiens et al, only 8 (20%) of patients were puerperal.⁹ Similarly, other study of Daif et al, had only one (2.5%) puerperal patient.¹⁰ But in the present study, out of 40, 26 (65%) patients belong to non-puerperal group and 14 (35%) belong to puerperal group. This is because there is no obstetric department in our hospital and cases have to be referred from outside.

In the present study, 26 cases (65%) of CVT had sub-acute presentation, followed by 12 cases (30%) with acute presentation and 2 (5%) cases had chronic presentation. Similar findings were noted in the study of Stolz et al.¹¹

Comatose, drowsy and stuporous patients were calculated as patients with altered sensorium. In the present study, 65% of patients had altered level of consciousness which is comparable with Nagaraj et al.¹²

Headache was the most common symptom in the present study accounting for 87.5% of patients. The present study was comparable with most other studies like Neki et al with 85.5%, Nagarjan et al with 84%.^{13,14} In our series, 80% of cases had seizures which are comparable with Nagaraj et al, Kumar et al.^{12,15} Nagaraj et al found generalized seizures in 35% and focal seizures in 23%, and 14% of them had status epilepticus of 200 patients.¹² In our study 20% had focal seizures, 45 had generalized 10% with status and focal seizures with secondary generalisation in 25%.

In the present study, 55% of patients had focal deficits. Among them 50% had hemiparesis and 5% had monoplegia. 35% had associated cranial nerve palsies, most commonly affected being the VI nerve. Stolz et al had found that out of 79 cases, 56.9% cases had hemiparesis.¹¹ In the present study, 50% of patients had papilledema. Similar observations were noted with Daif et al.¹⁰

Anemia has often been noted in 17 (42.5%) of patients in the present study. The total number of deaths appears to be more with HB% > 10 g%, and the percentage of mortality was higher in non-anemic group. This is

because majority of the mortality fall in the non-puerperal group.

In the present study, CSF analysis done in 18 patients which showed non-specific changes like pleocytosis (>5 cells/ mm³ in 6 patients), raised proteins (>45 mg/dl in 4 patients) and xanthochromia (2 patients). In large number of patients, CSF did not contribute to the diagnosis of CVT except the 2 who had TB meningitis.

As discussed earlier CT scan plain and contrast is the first neuro imaging technique to carry out when CVT is clinically suspected. It is useful to diagnose CVT and to rule out tumors, infarcts and hemorrhages. The features primarily due to thrombosis of veins or sinuses are called direct signs and those due to secondary effects on brain parenchyma are referred as indirect signs.

In this study 10% of patients had shown normal CT pictures. 20% of 40 cases had direct evidence and 70% had indirect signs (20%) of CVT. The most common finding is hemorrhagic infarction present in 55% of cases. Similar observations noted with various studies like Nagaraj et al with 40.9% cases.¹²

Prakash et al, reported that the most common involvement in CVST was superior sagittal sinus (72%) on MRI and MRV.⁷ Similarly in our study, 60% of patients had superior sagittal sinus thrombosis followed by transverse sinus with 50%.

Predisposing/etiology factor were identified in 25 (62.5%) of patients. In 15 (37.5%) risk factor could not be identified. Infections were identified as risk factors in 7 (17.5%) cases. Among non-infectious, puerperium was the common predisposing factor. Less marked elevations were the proven risk factors for cardiovascular and venous thrombotic events.¹⁶

The role of Heparin in the management of CVT has been a matter of controversy. It's effectiveness, even in hemorrhagic venous infarcts has been extensively studied and recommended by various authors Einhaupl et al, Cipri et al and Nagaraj et al.¹⁷⁻¹⁹ Though most series have used high dose heparin as a continuous infusion in management of CVT, in the present study all 40 cases were treated with unfractionated heparin 5000 I.V. 8th hourly. All patients received oral anticoagulant for 3 months. No complications were detected as a result of treatment regimen employed in the present study and proved to be effective.

In the present study, the mortality rate was 20% which is comparable with various other studies of Patil et al and Aaron et al in which the mortality rate was 16% and 17%.^{1,20} In this study the alive cases were followed for 2 weeks after diagnosis. Out of 32 cases, 12 had recovered completely on treatment and the other 20 had residual weakness. Since the patients were not followed up for

longer duration we could not comment on long term outcome of them.

CONCLUSION

The present study emphasizes that cerebral venous thrombosis is an important cause of stroke especially in the peripartum settings and stroke in young. The mode of onset of CVT is variable and spectrum of clinical presentation was extremely wide, hence diagnosis of CVT needs high index of suspicion for demonstration underlying etiology. The most sensitive diagnostic modality of choice is MRI with MR venography and systematic workup of hereditary thrombophilic conditions should be done wherever possible to find out the treatable cause. For CVT usage of anticoagulants was appropriate and hence the prognosis will be generally favorable.

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: The study was approved by the institutional ethics committee

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Cite this article as: Bose P, Joshua JP, Thandavarayan M. A clinical study of cerebral venous thrombosis. *Int J Adv Med* 2017;4:1236-40.