

Study of Clinical Profile, Radiological Findings and Risk Factors in Patients with Cerebral Venous Thrombosis in Tertiary Care Hospital

Vivek Lade¹ and Neelima Chafekar^{2*}

¹Former PG Resident, Department of General Medicine, Dr. Vasant Rao Pawar Medical College Hospital and Research Centre, Nashik – 422003, Maharashtra, India

²Professor, Department of General Medicine, Dr. Vasant Rao Pawar Medical College Hospital and Research Centre, Nashik; – 422003, Maharashtra, India neelimachafekar@yahoo.com

Abstract

Background: Cerebral venous thrombosis is a rare cause of stroke in adults especially in the young. It is a diagnostic and therapeutic challenge for the physician, given the wide spectrum of its clinical presentation. The purpose of the present study is to describe the clinical features, risk factors, radiological findings and outcome in a patient of Cerebral venous thrombosis. **Objective:** To study clinical profile, radiological findings and risk factors in patients with cerebral venous thrombosis amongst study participants. **Material and Method:** The prospective observational study was conducted on 60 patients admitted in department of General Medicine at tertiary health care institute at Nashik. Written informed consent was taken from all the study participants, and those who gave consent and satisfy eligibility criteria were enrolled in the present study between August 2017 to December 2019 with a radiologically confirmed diagnosis of cerebral venous thrombosis. Detailed history, clinical examination, laboratory investigations were carried out in all the cases and followed until discharge from the hospital or death. All the data will be analysed by applying appropriate statistical tests Microsoft Excel 2010. **Results:** Majority of incidence was seen in 18-30 age group comprising 50% of the cases, with equal sex distribution. Mean age of patient was found to be 37.3 years. Most patient had subacute onset with headache (76.67%) being the commonest presenting symptoms followed by convulsions and focal deficit in 46.67%. Hemiparesis 43.67% followed by papilloedema 33% were the most common neurological signs. Hyperhomocystinemia 33.67% and Protein S deficiency 20% were the most common risk factors identified in males whereas anemia 60% and puerperium 26.67% were most common in females. Transverse sinus (66.33%) was most common sinus involved radiologically followed by superior sagittal sinus in 43.67%. In 90% of the cases Low Molecular Weight Heparin [LMWH] was given and remaining 10% were given intravenous unfractionated heparin. 14% cases underwent decompressive surgery. Mortality was found to be 6.33% in the present study. **Conclusion:** High index of suspicion required for diagnosis of Cerebral venous thrombosis. The clinical presentation is nonspecific, can vary significantly and often makes the diagnosis of quite puzzling. MRI brain and MR Venogram are necessary for establishing a diagnosis. Patients are treated with anticoagulants, antiepileptics and antiedema measures and surgical decompression in case of continuing deterioration, in spite of maximum medical management. Cerebral venous thrombosis has a good prognosis unlike arterial ischemic stroke if the acute stage of illness has been survived.

Keywords: Cerebral Venous Thrombosis, Low Molecular Weight Heparin [LMWH]

1. Introduction

Cerebral venous thrombosis is a rare condition with varied clinical presentation and often affects young to middle-aged patients. Although known for more than 100 years¹, it has been diagnosed frequently ante-mortem in recent years because of greater awareness among

physicians and neurologists and improved noninvasive imaging techniques.

More than 100 causes of cerebral venous thrombosis have been recorded in the literature¹. However, even with extensive investigation no cause is identified in 20-25% of the cases².

*Author for correspondence

Cerebral venous thrombosis has wide spectrum of symptoms and signs with headache is the most common presenting symptom, in 70-90% of cases²⁻⁴. In one-third to three-quarters of cases focal deficits such as hemiparesis and hemisensory disturbance, seizures, impairment of level of consciousness and papilloedema occur^{2,4}. Superior sagittal sinus (72%) most commonly involved followed by lateral sinus (70%). More than one sinus is involved in 30 to 40% of cases⁵. High index of suspicion required for the diagnosis because of its varied clinical presentations. Neuroimaging is the corner stone in the diagnosis of cerebral venous thrombosis. Imaging modalities of choice are CT scan and MRI with MR Venogram. CT scan may be normal in 15-30% cases but MRI with MR Venogram is almost 100% diagnostic⁶. Present therapeutic options for 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 therapy⁷. Almost 80% of patients recover without sequelae and acute case fatality recorded in less than 5%⁸. Early diagnosis and treatment of cerebral venous thrombosis may prevent morbidity and may even be lifesaving. In the present study we are going to investigate the clinical profile, radiological findings and risk factors of cerebral venous thrombosis.

2. Aims and Objectives

1. To study the clinical profile of patients presenting with cerebral venous thrombosis.
2. To study the etiology and risk factors responsible for cerebral venous thrombosis.
3. To study the radiological findings in cerebral venous thrombosis.
4. To study the clinical course and outcome of cerebral venous thrombosis.

3. Materials and Methods

The Prospective observational study was conducted on 60 patients admitted in Department of General Medicine Medical College and tertiary health care institute Nashik was included. Institutional Ethics Committee (IEC) approval was taken. Written informed consent was

taken from all the study participants, and those who gave consent, were enrolled in the present study between August 2017 to December 2019 with a radiologically confirmed diagnosis of CVST.

The minimum estimated sample size for the foresaid study will be of 60 patients.

$$\text{Sample Size for One Proportion} = \frac{Z^2(P \times Q)}{L^2}$$

Where,

Z = Critical Value = 1.96

P = Proportion of patients = 0.5%

Q = (1-P)

L = Allowable error = 3%

Confidence Level: 99.9% = 60

3.1 Eligibility Criteria

3.1.1 Inclusion Criteria

All patients of age group 18 years and above irrespective of genders admitted to the hospital with radiological evidence of cerebral venous thrombosis will be included in the study.

3.1.2 Exclusion Criteria

Patients not willing to participate in the study detailed information of the patient was collected which includes onset and duration of illness, risk factors, history of past illness, symptoms and signs, detailed general physical and systemic examination including detailed neurological examinations.

Haematological, biochemical tests were done in all cases and other relevant investigations as per individual case was performed. All the data will be analysed by applying appropriate statistical tests. (Microsoft Excel 2010)

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 (Boussier *et al.*,¹).

4. Observation and Results

A total of 60 cases of cerebral venous sinus thrombosis were evaluated in this study.

The mean age of the patients in the present study was 37.33 years. Most of them were in the age group of 18-30 years contributing to 50%. Age of youngest patient was 19 and that of eldest was 79 years of age (Table 1).

The mean age of female patients is 36.06 years whereas that of males is 39.14 years in the present study (Table 2).

In this study, out of 60 patients, 52 (86.33%) patients belong to nonpuerperal group and 8 (13.67%) belong to puerperal group. Out of 52 non-puerperal cases, 30 were males and 22 females (Table 3).

In this study, 32 cases (53.33%) had subacute presentation, followed by 20 cases (33.33%) with acute presentation (Table 4).

In this study, most common symptom is headache in 73.67% (44 cases) followed by convulsions and focal deficits in 46.33% (28 cases) each. Hemiparesis was present in 40% and papilloedema in 33% of the patients

Table 1. Age wise distribution of patients

Age in years	Number of patients (n)	Percent(%)
18 – 30	30	50
31 – 40	12	20
41 – 50	6	10
51 – 60	2	3.67
61 -70	6	10
71 – 80	4	6.33

Table 2. Gender wise distribution of patients

Gender	Number of patients 60 (n)	Percent (%)
Male	30	50
Female	30	50
Total	60	100.0

Sex ratio (Male to female) in the present study is 1:1

Table 3. Type of cerebral venous thrombosis

Type of	Number of patients 60 (n)	Percent (%)
Non-puerperal	52	86.33
Puerperal	08	13.67
Total	60	100.0

Table 4. Onset of symptoms, Mode of onset

Onset	Number of patients (n)	Percent (%)
Acute	20	33.33
Sub-acute	32	53.33
Chronic	08	13.33
Total	60	100

Table 5. Symptoms and signs at presentation

Symptom	Number of patients(n)	Percent (%)
Headache	44	73.67
Convulsions	28	46.33
Focal deficit	28	46.33
Vomiting	26	43.67
Altered sensorium	22	36.33
Fever	8	13.67
Generalized weakness	4	6.33
Diplopia	4	6.33
Hemiparesis	24	40
Pallor	22	36.33
Papilloedema	20	33.67
Cranial nerve involvement	18	30
Dysphasia	6	6.33

whereas cranial nerve involvement was seen in 18 cases (30%) (Table 5).

Hyperhomocystinemia was the major risk factor identified in 33.67% followed by protein S deficiency (20%) of the male patients. No cause could be identified in 26.33% of male patients. Anemia was the most common risk factor identified in 60% of the female patients followed by puerperum in 26%. No cause could be identified in 13.67% of female patients. (Table 6).

In the present study, 26 cases (43.33%) had hemorrhagic infarction (HI), followed by Non-Hemorrhagic Infarction (NHI) comprising 20 cases (33.33%). Cerebral edema (CE) was present in 18 cases (30%) whereas Cord sign (CS) is found in 8 cases (13%). (Table 7)

In this study, the most common individual sinus involved was superior sagittal sinus in 26 patients accounting for 43.67% followed by left transverse sinus (36.33%) in 22 patients (Table 8).

4.1 Treatment

Anticoagulation was given, starting with subcutaneous LMWH in 54 cases (90%) and intravenous unfractionated heparin in 6 cases (10%), then changed over to oral anticoagulants. Decompressive craniotomy was required in 8 patients (13.67%), out of which one patient died. Additional treatments included antiepileptics in 38 patients (63.67%) and antiedema measures in 40 patients (66.66 %). 13.8 days was mean hospital stay in this study.

Table 6. Risk factors in males and females

Risk factor	Male		Female	
	Number of patients (n) 30	Percent (%)	Number of patients (n) 30	Percent (%)
Hyperhomocysteinemia	10	33.67	6	20
Protein S deficiency	6	20	6	20
Protein C deficiency	2	6.33	0	0
APLA syndrome	2	6.33	0	0
Anemia	4	13.33	18	60
Sec polycythemia	2	6.33	0	0
Malignancy	2	6.33	0	0
No cause found	8	26.33	4	13.67
Puerperium	0	0	8	26.33
OCP/HRT	0	0	4	13.67
SLE	0	0	2	6.33
HIV	0	0	2	6.33

*multiple risk factors per patient identified

Table 7. CT and MRI findings

Finding	Number of patients (n) 60	Percent (%)
HI (Hemorrhagic infarction)	26	43.33
NHI (Non hemorrhagic infarction)	20	33.33
CE (Cerebral edema)	18	30
CS (Cord sign)	8	13.33

Table 8. Sinus involved (MR Venogram findings)

Sinus involved	No.ofpatients (n) 60	Percent (%)
SSS (Superior saggital sinus)	26	43.67
LTS (Left Transverse Sinus)	22	36.33
RTS (Right Transverse Sinus)	18	30
LSiS (Left Sigmoid Sinus)	10	16.33
RSiS (Right Sigmoid Sinus)	8	13.67
StS (Straight Sinus)	8	13.67
DCV (Deep Cerebral Veins)	6	10
SCV (Superficial Cerebral Veins)	4	6.33
ISS (Inferior Saggital Sinus)	2	3.67

4.2 Outcome

13.8 days was mean hospital stay in this study. (Range 4-42). Four patients died during hospitalisation. Out of the 56 survived patients, 38 (67.33%) had complete recovery, while 12 patients had residual hemiparesis, 2 had diplopia, 2 had dysphasia and 2 had persistant headache at the time of discharge. During the follow up period 6 patients had seizure recurrence while no one had recurrent Cerebral venous thrombosis or thrombosis at other sites.

5. Discussion

5.1 Age Group Involved and Mean Age at Onset

The mean age of the patient in this study is 37.3 year. Previous studies done by Daif *et al.*,⁹ shows 27.8 year, Nagaraja *et al.*,¹⁰ is 32.3 year and Strolz *et al.*,¹¹ 42.8 years. By this we can assume that cerebral venous thrombosis mainly occurs in younger population and mostly in their 30's and commonest age group involved is 20-40. The present study also showed similar findings with 66.67% in the same age group (20-40).

5.2 Sex Ratio

The ratio of the male to female population in this study is 1:1 which is similar to study carried out by Srinivasan

et al.,¹² (1:104) whereas Daif *et al.*,⁹ shows ratio of 1:1.3 which shows slight female predominance.

5.3 Mode of Onset

In the present study 32 cases (53.33%) had subacute presentation followed by 20 cases (33.33%) had acute presentation and 08 cases (13.33%) had chronic presentation. Similar findings were noted in the study of, Daif *et al.*,⁹, Strolz *et al.*,¹¹.

5.4 Clinical Profile

In this study the most common presenting symptom was headache which was observed in 73.67% of the study group. This was compared with the study conducted by Strolz *et al.*,¹¹ and Mehta *et al.*,¹³ demonstrated the incidence of headache around 73.4% and 77.8% respectively. This proves that headache is the most common manifestation.

In this study 46.33% of cases had convulsions which is comparable to the study conducted by Strolz *et al.*,¹¹ (39.2%) and Bousser *et al.*,⁴ showed 29%.

The focal neurological deficits were noted in 46.33% of our study population. Which is comparable to Strolz *et al.*,¹¹ and Kumar S *et al.*,¹⁴ showed an incidence of around 56.9% and 66% respectively.

Altered sensorium was found in 36.33% of the patients in our study which is comparable to incidence of altered sensorium in the study of Strolz *et al.*,¹¹ 36% and Bousser *et al.*,¹ of around 27%.

In this study, 33.67% of patients had papilloedema. Which is comparable to the study conducted by Strolz *et al.*,¹¹ 30.3% and Kumar S *et al.*,¹⁴ 32%. Whereas Bousser *et al.*,¹ showed 51%.

5.5 Risk Factors

Predisposing underlying factors can be identified in up to 80% of patients of Cerebral venous thrombosis⁸. In the present study no risk factor could be identified in only 16 patients (26.67%) similar to other studies. Anemia (60%) and puerperum (26.67%) were the most common risk factors identified in females, whereas hyperhomocysteinemia (33.76%) and protein S deficiency (20%) were the most common risk factors in males. Only four of the thirty female patients were on OCP or HRT at the time of presentation. More than one risk factor was sometimes present in the same patient.

5.6 CT Brain and MRI Brain

The most common radiological finding in the present study is Hemorrhagic Infarction (HI) present in 43% of cases followed by Non-Haemorrhagic Infarction (NHI) 33%. Whereas non hemorrhagic infarction was the most common radiological feature in the study by Nagaraja *et al.*,¹⁰ 51.6%.

5.7 Sinus Involvement (MR Venogram Findings)

In our study the commonest sinus involved was transverse sinus (67%) followed by the superior sagittal sinus (44%), then by straight sinus (14%). The studies conducted by Bousser *et al.*,⁵ demonstrated the presence of transverse sinus (74%) and superior sagittal sinus (64%). Whereas study conducted by Daif *et al.*,⁹ and Strolz *et al.*,¹¹ showed superior sagittal sinus 85% & 73% respectively.

5.8 Treatment and Outcome

In present study all the 60 patients were treated initially with anticoagulants like subcutaneous LMWH or unfractionated heparin which later switched over to oral anticoagulant.

High mortality rate reaching upto 30-50% along with bad prognosis was associated with Cerebral venous thrombosis in the past. Significantly better outcome along with much lower mortality rates (8-14%) was reported in the recent ISCVT study, performed in the era of modern neuroimaging, LMWH administration, and endovascular intervention¹⁵. In this study, the mean hospital stay was 13.9 days with 67.86% of the patients having complete recovery at the time of discharge. The mortality in our study is 6.67% which is comparable with Mehta *et al.*,¹⁴ 5.45% while Daif *et al.*,⁹ and Strolz *et al.*,¹¹ showed 10% and 15% mortality rate respectively.

6. Conclusions

Present study included 60 patients of cerebral venous thrombosis. Following conclusion is drawn from the above study.

Most of the patients were in the age group of 18-30 years contributing to 50%.

Mean age of patients was found to be 37.3 years. Males and females were equally affected with ratio of 1:1. Majority of the patients (86.3%) belong to nonpuerperal

group. Most of the patients had subacute presentation (53%) followed by acute (33%). The most common presenting symptom was Headache (73.67%) followed by convulsions (46.33%) and focal deficits (46.33%). altered sensorium was present in 36.3% patients. Most common neurological sign was Hemiparesis (40%) followed by papilloedema (36%). 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. No risk factor could be identified in 26.67% of the male patients and 13.33% of the female patients. Most common radiological finding was hemorrhagic infarction seen in 43.33% of cases followed by non hemorrhagic infarct in 33.33% of cases. Cord sign was noted in 13.33% of cases. Most common sinus involved radiologically was transverse sinus in 66.33% cases followed by superior sagittal sinus in 43.67% of the cases. 90% cases were given LMWH and 10% cases was given intravenous unfractionated heparin in 10% whereas 13.33% of the patients required decompressive craniotomy. Overall outcome is good with 67.76% of the patients having complete recovery at the time of discharge and a mortality rate of 6.67%.

7. References

1. Bousser MG. Cerebral venous thrombosis: nothing, heparin or local thrombolysis. *Stroke*. 1999; 30: 481-3. <https://doi.org/10.1161/01.STR.30.3.481> PMID:10066839
2. Ameri A, Bousser MG. Cerebral venous thrombosis. *Neurol Clin*. 1992; 10: 87-111. [https://doi.org/10.1016/S0733-8619\(18\)30235-4](https://doi.org/10.1016/S0733-8619(18)30235-4)
3. Villringer A, Mehraen S, Einhüpl KM. Pathophysiological aspects of cerebral sinus venous thrombosis. *J Neuroradiol*. 1994; 21: 72-80. https://doi.org/10.1007/978-3-642-87602-8_58
4. Bousser MG, Chiras J, Bories J, Castagne P. Cerebral venous thrombosis - a review of 38 cases. *Stroke*. 1985; 16: 199-213. <https://doi.org/10.1161/01.STR.16.2.199> PMID:3975957
5. Bousser MG, Barnett HJM. Cerebral venous thrombosis. In: *stroke: pathophysiology, diagnosis and management*, 4th ed. New York: Churchill Livingstone; 2004. p. 300-21. <https://doi.org/10.1016/B0-44-306600-0/50016-X>
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, 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. <https://doi.org/10.1161/01.STR.0000117571.76197.26> PMID:14976332
9. Daif A, Awada A, al-Rajeh S, et al. Cerebral venous thrombosis in adults. A study of 40 cases from Saudi Arabia. *Stroke*. 1995 1 Jul; 26(7): 1193-5. <https://doi.org/10.1161/01.STR.26.7.1193> PMID:7604412
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. <https://doi.org/10.1016/j.clin-neuro.2004.06.002> PMID:15708223
12. Srinivasan K. Stroke in the young. *Neurology India* 1988; 36: 189-94.
13. Mehta SR, Varadarajulu R, Gupta A, Kumaravelu S. In: Joshi SR, Sainani GS, Joshi VR, Anand P, Mynadkar, Rao M et al., editors. *Abstracts of 59th Annual Conference of API* 2004 Jan 18-21, Hyderabad. JAPI. 2003; 51: 1196.
14. Kumar S, Alexander M, Gnanamuthu C. Clinical presentation and outcome of postpartum cerebral venous thrombosis. *Annals of Indn Acad of Neurol*. 2004; 7: 448-9.
15. Ferro JM, Correia M, Pontes C, et al., Cerebral Venous Thrombosis Portuguese Colloboration Study Group (VENOPOINT). Cerebral vein and dural sinus thrombosis in Portugal, 1980-1998, *Cerebrovasc Dis*. 2001; 11: 177-182. <https://doi.org/10.1159/000047635> PMID:11306764

How to cite this article: Lade V, Chafekar N. Study of Clinical Profile, Radiological Findings and Risk Factors in Patients with Cerebral Venous Thrombosis in Tertiary Care Hospital. *MVP J. Med. Sci.* 2022; 9(1): 62-67.