



STUDY OF ETIOLOGY AND CLINICAL PROFILE OF CEREBRAL VENOUS SINUS THROMBOSIS

Neurology

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ABSTRACT

Background: Cerebrovascular thrombosis is an important pathology where the blood in the venous system of the brain gets clotted and produces infarcts. It has varied clinical & radiological presentation & also the outcome. The present study was undertaken to study the clinical & radiological features of all the patients suffering from the cerebrovascular thrombosis and also to study the outcome in those patients. **Material & Methods:** The study was conducted in our institute. All the patient suggestive CVT between September 2023 to June 2024 were included in this study. A prevalidated case record form was used to note down the findings. **Results:** In our study, out of 50 patients, majority of our patients (59.26%) were in the age group 21 years to 40 years, with a mean age of 37.4 ± 12.5 years. Mean age group for male was 38.2 years and for females it was 36.05 years. 53.7% had focal neurological deficits. Hyperhomocysteinemia was found in 36% of cases. 8% of patients are in peripartum period. The commonest risk factor, anemia was found in 68% of patients. The commonest sinus involved was cerebral venous sinus was transverse sinus (83.3%) followed by superior sagittal sinus. **Conclusion:** The present study suggests of male preponderance. Focal neurological deficit and papilledema were the most common presenting signs. The commonest venous sinus involved in CVT, in our study, was transverse sinus followed closely by superior sagittal sinus.

KEYWORDS

Introduction

Cerebral venous thrombosis (CVT) is one of the important cause of infarcts in cerebral parenchyma. It accounts for 1-2 cases per 1,000,000 population. It is more common in females than males with ratio of 3:1. CVT is defined as thrombosis of cerebral veins or dural venous sinus in the brain which contributes to venous drainage of cerebral parenchyma. Venous drainage of cerebral circulation is divided mainly in to deep venous system and superficial venous system. Deep venous system drains from the deeper cerebral structures like basal ganglia, thalamus and brain stem. Superficial venous system drains from cortex through cortical veins which finally enters dural sinuses and then in to internal jugular veins.

Etiology and risk factors of CVT include oestrogen containing oral contraceptives, prothrombotic states (hypercoagulation disorders, genetic and acquired thrombophilias, pregnancy, puerperia, infections, malignancy, head injury, inflammatory diseases). Among males, alcoholism is the major risk factor for CVT. The mechanisms include dehydration, hyperviscosity, and increased platelet reactivity leading to acquired prothrombotic state². Clinical features of CVT include headache, seizures, focal neurological deficits, symptoms and signs of raised intracranial pressure like projectile vomiting, blurring of vision, hypertension, bradycardia and irregular breathing.

Focal neurological deficits depend on the location of CVT i.e; in the cortical venous or dural venous sinuses. Gold standard investigation is Digital subtraction angiography. ESO guidelines suggest MR venography or CT venography³. Anticoagulation is the treatment of choice and treatment of underlying cause for provoked CVT. Additional supportive measures include anti edema measures with mannitol 20%, 3% NaCl, anti epileptics if seizures are present.

Materials and Methods:

This study was conducted from July 2023 to June 2024 in our institute. Detailed history including risk factors, habits, were documented. Through neurological examination was performed in all patients and presence of focal neurological deficits were documented.

Investigations include Complete blood counts, Random Blood Sugars, Renal function tests, serum electrolytes, liver function tests, thyroid profile were done. Brain imaging include CT (computed tomography) brain plain, MRI brain in all patients, MRV (magnetic resonance venography) or CT venography if there was a suspicion of alternate diagnosis.

Inclusion criteria:

Patients aged more than 18 years
Patients who are willing to give consent
Patients with history and imaging features of CVT coming to the hospital.

Exclusion criteria:

Imaging features (CT/MRI) not suggestive of CVT.
Patients not willing to give consent
Patients lost to follow up
Patients with diagnosis other than CVT like arterial stroke, intracranial bleeds, space occupying lesions.

Results:

In our study, majority of our patients (59.26%) were in the age group 21 years to 40 years, with a mean age of 37.4 ± 12.5 years. Mean age group for male was 38.2 years and for females it was 36.05 years. In the present study, gender distribution with male to female ratio was 1.5:1. (table 1)

In the present study, 38 cases (80%) of CVT had sub-acute presentation, 8 cases (16%) with acute presentation and 2 cases chronic presentation (4%). Headache was the commonest presenting symptom (94.44%) followed by convulsions (63.46%) and altered sensorium (59.6%). (Table 2)

Correlation was found between mode of onset and papilledema, it being common in acute cases. Correlation was seen between motor deficit and altered sensorium.

In the present study, most common presenting signs were focal neurological deficit and papilledema. 53.7% of patients had focal neurological deficits. Among them 27.8% had hemiparesis, monoparesis or quadriparesis, 7.4% had sensory deficit, 3.7% had nystagmus and 14.8% had cranial nerve involvement (table 2). Hyperhomocysteinemia was found in 20 (40%) cases. In our study, out of 20 females 4 (20%) belongs to peripartum period.

The commonest risk factor found in our study was anemia in 62.96% cases and other risk factors such as smoking 25 (46.3%), tobacco chewing 25 (46.3%), alcohol 16 (29.6%), hypertension 13 (24.07%), Diabetes mellitus 7 (12.96%) cases and 2 (3.7%) cases were found to be positive for antinuclear antibodies (ANA). Most of the patients had multifactorial etiology. In the present study, 6 (11.11%) cases were

found to have sickling (2 cases with sickle cell disease and 4 cases with sickle cell trait)(table 3)In the present study, infarct (hemorrhagic + nonhemorrhagic) was present in 38 (76%) cases, SAH in 6 (12%) cases and SDH in 2 (4%) cases.The commonest cerebral venous sinus involved was transverse sinus (83.3%) followed by superior sagittal sinus (70.37%).

TABLE 1: AGE DISTRIBUTION (IN BOTH MALE AND FEMALE PATIENTS)

Age Distribution	Male		Female		Total	
	N	%	N	%	N	%
≤ 20	2	6.66	0	0	2	4
21-30	10	33.33	7	35	17	34
31-40	7	23.33	8	40	15	30
41-50	7	23.33	4	20	11	22
51-60	2	6.66	1	5	3	6
>60	2	6.66	0	0	2	4
Total	30	100	20	100	50	100

TABLE 2: DISTRIBUTION OF STUDY COHORT ACCORDING TO CLINICAL PRESENTATION

Clinical presentation	N	Percentage
Fever	7	14%
Giddiness	13	26%
Convulsion	33	66%
Papilledema	29	58%
Headache	49	98%
Altered sensorium	32	64%
Sensory Deficit	4	8%
Motor deficit	15	30%
Aspiration	4	8%
Cranial Nerve involvement	7	14%
Diplopia/BOV	6	12%
Nystagmus	2	4%
Tingling	12	24%
Numbness	7	14%

TABLE 3: ASSOCIATED RISK FACTORS IN STUDY COHORT

Risk factors	Total number	Percentage
Smoking	23	46%
Tobacco	23	46%
Alcohol	16	32%
OC Pills	7	14%
Puerperium(females)	4	8%
Anemia	34	68%
Hypertension	13	26%
Diabetes Mellitus	7	14%
Homocysteine	18	36%
Sickling	2	4%
Anti nuclear Antibody	2	4%
Idiopathic	0	0%

Discussion:

Cerebral venous thrombosis is a condition characterized by thrombosis of intracranial veins and sinus which results in parenchymal damage and rise in intracranial pressure. Radiological hallmark of this condition is thrombosis of intracranial sinuses and veins with hemorrhagic infarction and edema with or without evidence of herniation.

We compared our experience of CVT, highlighting its diverse clinical presentations, predisposing factors, and neuroimaging with other studies from India and abroad. In this study, total 50 patients with radiological features of CVT were evaluated.

Comparing the age group involved, 20-40 years was the commonest age group involved in various series. The present study also showed similar findings with 54% in the same age group, with mean age of onset 37.4 years.

Sex Ratio

Most of the earlier case series from India reported a high proportion of women suffering from CVT than men, except a series of 110

angiographically proven CVT by Parikh *et al*⁴ which had a male dominance. This gender bias was usually attributed to gender-specific risk factors like the usage of oral contraceptives (OCs) and the influence of other factors such as pregnancy, puerperium, and hormone replacement therapy. In contrast to this, the recent case series from India do not show this trend of female dominance. In their study of 428 patients of CVT recruited from a tertiary care hospital of Hyderabad, Narayan *et al*³ had a larger proportion of males than females. Showing a similar trend, a large prospective study which recruited 612 consecutive patients of CVT from various hospitals of Mumbai had a male to female ratio of 3:2⁶. Saroja AO *et al*⁷ and Shah NM *et al*⁸ also had male predominance with 1.75:1 and 2.4:1 respectively. Our present study also is male predominant with the male to female sex ratio of 1.5:1. The plausible reason for this change in gender trends over the last two decades could be the improvement in obstetric care.

Clinical features

In the present study, 53.7% of patients had focal neurological deficits. Among them 30% had hemiparesis, monoparesis or quadriparesis, 8% had sensory deficit, 4% had nystagmus and 14% had cranial nerve involvement. Ameri *et al*⁹ studied 110 cases out of which 38 (34.54%) had sensory or motor deficit, 13 (11.8%) cases had cranial nerve palsy and 2 (1.81%) cases had nystagmus which is similar to our study.

Etiology and risk factors

A. Anemia

Coutinho JM *et al*¹⁰ included 152 cases and 2916 controls. Anemia was more frequent in cases (27.0%) than in controls (6.5%; $P < 0.001$) suggesting that anemia is a risk factor for CVT. Saroja AO *et al*⁷ had anemia in 46.5% cases. Similarly Anemia has often been noted in 34 (68%) of patients in the present study.

C. Oral contraceptives

In the present study, 7 (14%) cases were found to be taking oral contraceptives comparable to the study Narayan *et al*³ with 49 (11.4%) cases.

D. Other risk factors

The incidence of cerebrovascular complications in SCD is 5 to 10%. There are few studies from Mediterranean countries reported the occurrence of CVST and stroke in SCD patients. Sidani *et al*¹¹ have reported the existence of venous and sinus thrombosis and stroke in a Lebanese young homozygous sickle cell patient. In the present study, 2 (4%) cases were found to have sickling (1 cases with sickle cell disease and 1 cases with sickle cell trait).

Kalita *et al*¹² reported that the CVT more often occurs during pregnancy, multiparity, and infection. In their study of 33 patients with CVT, Predisposing factors could be identified in 16 patients, and included pregnancy and puerperium in 6 cases which is comparable with our study with 4 puerperal cases. The cases in our study were also associated with other various risk factors such as smoking 23 (46%), tobacco chewing 23 (46%), alcohol 16 (32%), hypertension 13 (26%), Diabetes mellitus 7 (14%) cases and 2(4%) cases were found to be positive for anti nuclear antibodies (ANA). Most of the patients had multifactorial etiology. The study of Narayan *et al*³ and Saroja AO *et al*⁷ also had alcohol as a risk factor in 67 (15.6%) and 20% cases respectively. Another study from Sidhom Y *et al*¹³ had diabetes in 7 (17%) cases which is in concordance with our study.

In the present study, infarct (hemorrhagic + nonhemorrhagic) was noted in 34 (68%) of total 50 patients, which is quite higher than reported by published studies before 58.7% cases in a study by Narayan *et al*³ and hemorrhagic infarct in 33 % in a study by Wasay M *et al*¹⁴. In our study, SDH is present in 1 (4%) cases and SAH in 1 (2%) cases which is quite higher than reported by Narayan *et al*³ with 3 (0.7%) of SAH cases.

CONCLUSION

Cerebral venous thrombosis is an important and treatable cause of stroke that can present with a wide spectrum of clinical manifestations. The present study revealed significant number of patients affected by CVT in 3 and 4 decades of life, predominantly affecting male population than in females, as reported by other studies before. Headache was the commonest presenting symptom. Other common presenting symptoms include seizures and altered sensorium. Focal neurological deficit and papilledema were the most common presenting signs. Diagnosis of cerebral venous thrombosis should be

considered in any young patient presenting with the above combination of clinical features. Risk factors like anemia, hyperhomocysteinemia, OCP use, alcoholism, and procoagulant state are being increasingly identified, while conventional risk factors like postpartum state are decreasing. Peripartum period is vulnerable for development of CVT due to the presence of infection and dehydration. The commonest venous sinus involved in CVT, in our study, was transverse sinus followed closely by superior sagittal sinus. CVT was also associated with SDH and SAH. CVT is an underdiagnosed condition for acute or slowly progressive neurological deficit. Newer imaging procedures have led to easier recognition of venous sinus thrombosis, offering the opportunity for early therapeutic measures. MRI combined with MR venography is the best imaging technique for the diagnosis of cerebral vein thrombosis. The meticulous intensive care management is mandatory for better outcome in patients with CVT. Management with heparin or low molecular weight heparin followed by oral anticoagulants is appropriate, regardless of the presence of ICH and the prognosis is generally favourable. CVT is less frequent than arterial thrombosis. Compared with other cerebrovascular events, CVT has low mortality.

REFERENCES

1. Incidence rates and case fatality rates of cerebral venous thrombosis (www.ncbi.nlm.nih.gov/pmc/articles/PMC100820661)
2. Pratibha P. "Alcohol a Provocating Factor in Male Cerebral Venous Thrombosis: A Prospective Analysis in Western Rajasthan." *J Clin NeuroNeurosurg* 5 (2022): 006.
3. Julivi et al, cerebral venous thrombosis a practical guide *Pract Neurol* 2020;20:356-367.
4. Parikh PM, Sukthankar RU, Parikh A, Pipalia DH, Sidhva SJ, Ramakanten R, et al. Cerebral venous thrombosis. *J Assoc Physicians India* 1987;35:349-51.
5. Narayan D, Kaul S, Ravishankar K, Suryaprabha T, Bandaru VC, Mridula KR, et al. Risk factors, clinical profile, and long-term outcome of 428 patients of cerebral sinus venous thrombosis: Insights from Nizam's Institute Venous Stroke Registry, Hyderabad (India). *Neurol India* 2012;60:154-9.
6. Pai N, Ghosh K, Shetty S. Hereditary thrombophilia in cerebral venous thrombosis: A study from India. *Blood Coagul Fibrinolysis* 2013;24:540-3.
7. Naik KR, Saroja AO. Clinico-radiological evaluation of intracranial venous sinus thrombosis in a large cohort from India. *Journal of the Neurological Sciences*. 2017 Oct 15;381:105.
8. Shah NM, Saroja AO, Naik KR. Cerebral venous thrombosis in older individuals: a hospital based retrospective study. *Journal of the Neurological Sciences*. 2017 Oct 15;381:105.
9. Ameri A, Bousser MG. Cerebral venous thrombosis. *Neurol Clin* 1992;10:87-111.
10. Coutinho JM, Zuurbier SM, Gaartman AE, Dikstaal AA, Stam J, Middeldorp S, Cannegieter SC. Association Between Anemia and Cerebral Venous Thrombosis. *Stroke*. 2015 Oct 1;46(10):2735-40.
11. Sidani CA, Ballourah W, El Dassouki M, Muwakkit S, Dabbous I, Dahoui H, Al-Kutoubi A, Abboud MR. Venous sinus thrombosis leading to stroke in a patient with sickle cell disease on hydroxyurea and high hemoglobin levels: Treatment with thrombolysis. *Am J Hematol*. 2008;83:818-820. doi: 10.1002/ajh.21261.
12. Kalita J, Bansal V, Misra UK, Phadke RV. Cerebral venous sinus thrombosis in a tertiary care setting in India.
14. Sidhom Y, Mansour M, Messelmani M, Derbali H, Fekih-Mrissa N, Zaouali J, Mrissa R. Cerebral venous thrombosis: clinical features, risk factors, and long-term outcome in a Tunisian cohort. *Journal of Stroke and Cerebrovascular diseases*. 2014 Jul 31;23(6):1291-5.