

Study of Clinical Features, CT Findings in Correlation with MR Venogram Studies In Acute Cerebral Venous Thrombosis

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Abstract:

Objectives: To study the pattern and frequency of clinical presentation of CSVT, and its incidence In CT scan, MRI and MR Venogram studies. To correlate imaging CT studies of brain, plain and contrast, with MR Venogram in cerebral venous sinus thrombosis.

Methodology: Clinically suspected 40 patients of CSVT fulfilling the study criteria, were subjected to neuro-imaging techniques, and data collected was analyzed by correlational studies.

Results: Of the 40 patients, 19 (48%) were females and 21 (52%) were males, and the mean age was 32.1 years, with maximum incidence of 60% in age group 18-30 years. Most common symptoms were headache 72.5%, seizures 65%, focal deficits 45%, altered sensorium 47.5% and mode of presentation was acute in 50% cases. Radiologically most common sinus involved was superior sagittal sinus 70%. 2 patients died during hospitalization. Out of the survived patients 28 patients (70%) had complete recovery. Poor prognostic factors were stupor and coma and evidence of haemorrhagic infarction.

Conclusion: Compared to the previous studies, prevalence of CSVT was higher in men. Clinical manifestations, prognostic factors, common involved sinuses and image findings of this study were similar to those of other studies.

Keywords: Cerebral venous thrombosis, Clinical manifestations, Radiological findings, anticoagulation, acute stroke.

I. Introduction

Cerebral sinus venous thrombosis (CSVT) is a relatively rare cerebrovascular complication but has the propensity to cause substantial damage, including potentially fatal conditions, such as hemorrhagic stroke^[1]. Its clinical presentation is varied and often dramatic. It often affects young to middle-aged patients, and more commonly women. Although CSVT has been recognized for more than 100 years^[2], it has only in recent years come to be diagnosed frequently ante-mortem. This can be attributed to greater awareness among physicians and neurologists, and also to improved non invasive imaging techniques.

The annual incidence is currently estimated to be 3-4 cases per 1 million people. 3 out of 4 people with CSVT are women. It accounts for 10-20 % of the etiology of young strokes in india^[3]. Women are three times more likely to experience a CSVT compared to men, with the risk being particularly raised in pregnancy and with the use of oral contraceptives^[4].

More than 100 causes of cerebral venous sinus thrombosis have been recorded in the literature.² However, even with extensive investigation no cause is identified in 20-25% of the cases^[5].

CSVT presents with a wide spectrum of symptoms and signs. Headache is the presenting symptom in 70—90% of cases^{[5][6][7]}. Focal deficits such as hemi paresis and hemi sensory disturbance, seizures, impairment of level of consciousness and papilloedema occur in one-third to three-quarters of cases^{[5][7]}. CSVT most commonly involves the superior sagittal sinus (72%) followed by lateral sinus (70%). In 30 to 40% of cases more than one sinus is involved^[8]. The diagnosis of CSVT requires high index of suspicion because of its varied presentations. Neuro-imaging is the corner stone in the diagnosis of cerebral venous sinus thrombosis. Imaging modalities of choice in CSVT and CT scan and MRI with MR Venogram. CT scan may be normal in 15-30% cases but MRI with MRV is almost 100% diagnostic^[9].

Current therapeutic options for CSVT 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^[10]. CSVT has an acute case fatality of less than 5% and almost 80% of patients recover without sequelae^[11]. 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.

This prospective observational study is undertaken to describe the clinical profile, diagnosis, radiological features and prognosis of CSVT.

II. Methodology

1. Source of data

All patients aged > 18 years admitted to Basaveshwar teaching and General Hospital, Kalaburagi, between November 2014 to August 2016 with a confirmed diagnosis of cerebral venous thrombosis were taken up for the study and followed until discharge from the hospital or death.

2. Method of collection of data

Meticulous history, clinical examination and laboratory investigations were carried out in all cases of cerebral venous sinus thrombosis. Cerebral venous thrombosis was confirmed by CT scan (or) MRI (or) MR venogram.

3. Laboratory investigations

1. Complete blood count with peripheral smear(Hb, TC, DC, Platelet counts)
2. ESR
3. RBS
4. Serum urea
5. Serum creatinine
6. Serum electrolytes, HIV.
7. Urine routine
8. ECG
9. CSF analysis (wherever deemed necessary)
10. BT, CT, Prothrombin time with INR, activated partial thromboplastin time. (wherever deemed necessary)
11. CT scan
12. MRI and MR venogram.
13. Fundus examination.

4. Inclusion criteria

1. Patients with suspected cerebral venous thrombosis by clinical features,
2. Any age group presenting with Cerebral venous thrombosis,
3. Puerperal and non puerperal group.

5. Diagnostic criteria

Patients presenting with history and examination suggestive of cerebral venous thrombosis and confirmed by imaging of brain (CT scan direct and indirect signs, MRI, MRV).

A) Direct signs

- a. Hyperdense sinus on plain CT
- b. Cord sign on plain CT
- c. Empty delta sign on contrast enhanced CT
- d. Dense triangle sign on plain CT.

B) Indirect signs

- a. Cerebral edema
- b. Cerebral infarction not confirming to an arterial territory
- c. Cerebral haemorrhage
- d. Small ventricles
- e. Bilateral signs
- f. Gyral enhancement
- g. Territorial enhancement,
- h. Erosion of middle ear structures and changes in mastoid region.

6. Exclusion criteria

1. Hypertensive haemorrhage
2. Atherothrombotic stroke
3. Space occupying lesion
4. Primary seizure disorder,
5. HIV positive patients,

The results were analysed by calculating percentages, the mean values, standard deviation, chi-square test. Proportions were compared using chi-square test and significance. A 'P' value of less than 0.05 was considered statistically significant.

III. Results

A total of 40 cases of cerebral sinus venous thrombosis were evaluated in the present study. The mean age of the patients in the present study was 32.1 ± 10.79 years. Majority of them were in the age group of 18-30 contributing to 60.0%. The youngest being 19 and the eldest 60 years of age (Fig. 1).

In the present study, Male : Female is 1.11:1 (Fig. 2). The mean age of female patients is 28.21 and male patients is 35.62 with a standard deviation of 8.01 and 11.93 respectively in the present study. $t=2.2806$, $p<0.05$, suggesting highly significant difference of age among males and females (TABLE 1).

In the present study, out of 40, 22 (55.0%) patients belong to non-puerperal Group and 18 (45.0%) belong to puerperal group. Out of 22 non-puerperal, 1 was female, and 21 were male patients.

In the present study, out of 15 puerperal patients, 46.66% (7 cases) of CVT occurred during 1-10 days after delivery. Followed by 40% (6 cases) of CVT occurred during 11-20 days (Fig. 3).

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 sub acute, and with onset more than 1 month as chronic (Boussier et al, 1985). In the present study, 20 cases (50%) Of CSVT had acute presentation, followed by 16 cases (40%) with sub acute presentation (Fig. 4).

In the present study, 25 patients (62.5%) were conscious, 7 patients (17.5%) were comatose and 7 patients (17.5%) drowsy at the time of presentation (Fig. 5). The most common symptom was headache present in 72.5% (29 cases) followed by convulsions in 65% (26 cases) (Fig. 6).

In the present study, 37.5% patients had hemi paresis, 32.5% had papilloedema, cranial nerve involvement was seen in 32.5% and Dysphasia in 35.0% of patients (Fig. 7). Cranial nerve involvement was seen in 13 cases out of which 46.2% had 7th nerve involvement and 6th nerve was involved in 38.5%. 3rd, 9th, 10th and 12th nerve were involved in 1 patient each (Fig. 8).

In the present study, out of 40 patients, 10 were anemic, accounting for 25% cases. The mortality was higher when the degree of anaemia was severe. Hb% v/s patients mortality Chi-square: 6.3158, $p<0.0119$ which is highly significant.

The investigations like total leucocyte count, blood sugar, liver function tests, serum electrolytes, blood urea, serum creatinine were non-contributory to the diagnosis and were non-specific.

In the present study, hemorrhagic infarction was seen in 23 cases (57.5%), followed by non-hemorrhagic infarction comprising 14 cases (35.0%), empty delta sign was seen in 09 (22.5%) and cord sign in 07 (17.5%) cases (Fig. 9). Seven patients were subjected to CSF analysis wherever there was suspicion of meningitis, out of which 05 (71.41%) were normal and pleocytosis seen in 2 (28.57%) patient and protein rise in 1 (14.29%) patients.

In the present study, the superior sagittal sinus was the most common sinus involved in 28 Patients accounting to 70% followed by the transverse sinus (52.5%) in 21 patients, Sigmoid sinus (45%) in 18 patients (TABLE 2).

Treatment and prognosis: All the 40 patients were anticoagulated, initially with subcutaneous LMWH in 30 cases (75%) and intravenous infusion of unfractionated heparin in 10 cases (25%), later on changed over to oral anticoagulants. Additional treatments included anti epileptics in 28 patients (70%) and anti edema measures in 32 patients (80%).

Modified Rankin Scale(mRS) : mRS is the most widely used clinical outcome measure for stroke clinical trials. The scale runs from 0-6, running from perfect health without symptoms to death.

0 - No symptoms.

1 - No significant disability. Patient is able to carry out all usual activities, despite some symptoms.

2 - Slight disability. Patient is able to look after own affairs without assistance, but is unable to carry out all previous activities.

3 - Moderate disability. Patient requires some help, but is able to walk unassisted.

4 - Moderately severe disability. Patient is unable to attend to own bodily needs without assistance, and is unable to walk unassisted.

5 - Severe disability. Patient requires constant nursing care and attention, bedridden, incontinent.

6 - Dead.

Mean hospital stay was 12.7 days in the present study (range 5-36). Modified Rankin scale score (Table 3) at discharge was : 14 have mRS score zero, 11 patients have mRS score 1; 6 patients have mRS score 2; 4 patients have mRS score 3; 2 patients have mRS score 4; 1 patient have mRS score 5; 2 patients have mRS score 6. Out of the survived patients, 26 patients (65.0%) had complete recovery, while 6 patients had residual hemi paresis, 1 had dysphasia, 2 had diplopia at the time of discharge.

Mortality: In the study of 40 patients, 2 patients (5%) died and 48 patients were alive comprising (95%) (Fig. 10).

IV. Discussion

In this study, totally 40 cases were studied. 18-30 years was the commonest age group involved in various series (Mehta SR¹² et al, 77.8% and Ameri et al, 61%). The present study has showed similar finding with 60% in the same age group, with mean age of onset 32.1 years which is comparable with Daif et al (1995) 27.8%.

Male to female ratio in various studies revealed, Mehta SR et al 1:1.5, Daif et al(1995) is 1:1, Bousser et al (1985) is 1.24:1. In the present study, M:F Ratio is 1.11:1 The present study is comparable to Daief et al and Bousser et al.

Kurnar S, et al (2003) had found that 65 out of 85 cases (76%) of CVT presented with symptom duration of 4 days or less. The present study showed 46.66% of patients presented within 10 days. Bousser et al (1985) had arbitrarily defined three main modes of onset based on the time elapsed between the appearance of the first symptom and the date of entry in hospital; acute as <48 hours, subacute as longer than 48 hours but less than one month and chronic as >1 month.

Headache was the most common symptom in the present study accounting for 72.5% of patients. The present study is comparable with Strolz et al (2005) 73.4%. In the present study, 65% of cases had seizures which is comparable with Kumar S. et al (2003) 67%. Cerebral cortical involvement is indicated by convulsions and paralysis, at times seizures which are heralding symptoms and should arouse the suspicion of diagnosis. In the present study, 45% of patients had focal deficits. The present study is comparable with Strolz et al (2005) 56%. Among those with focal deficits 15 had hemiparesis, 14 had dysphasia. In the present study, 47.5% of patients had altered level of consciousness which is comparable with Nagaraj et al (1999) and Neki S. et al (2003) who had 57.53% and 56% respectively. In the present study, 32.5% of patients had papilloedema. Similar observations were noted with Kumar S et al (2003) who had papilloedema in 32% of the cases.

The most common finding in the present study is haemorrhagic infarction present in 57.5% of cases. Similar observations noted with various studies like Nagaraj et al (1989), Dixit et al (1997) with 40.9% and 48.4% respectively. In the present study, the superior sagittal sinus is most commonly involved accounting for 70% followed by transverse sinus with 52.5% comparable with other studies like Strolz et al (2005) 72.2% and Ameri et al (1992) 72% (TABLE 4).

Current therapeutic options for CSVT include antithrombotic therapy with unfractionated heparin, low molecular weight heparin, oral anticoagulants, IV thrombolysis, local thrombolysis by selective sinus catheterization and a combination of thrombolysis and anticoagulation in addition to symptomatic therapy^[9]. In this study all 40 patients were treated with anticoagulants. The different routes of administration reflect uncertainty of opinions among neurologists^[13] as to what type of Heparin to be used. In the past CSVT had been associated with a dismal prognosis and high mortality rate, reaching 30-50%^[14]. A meta analysis of 19 studies conducted by Dertali et al (2006) showed that the mortality rate during the peri-hospitalization period was about 5.6%, while at the end of the follow-up period, this percentage increased to 94%^[15]. In the present study, the mean hospital stay was 12.7 days with 70% of the patients having complete recovery at the time of discharge.

In the present study, mortality is 05% ,which is comparable with Mehta SR et al (2003) and Daif et al (1995) with 05% and 10% respectively (TABLE 5).

Figures and Tables

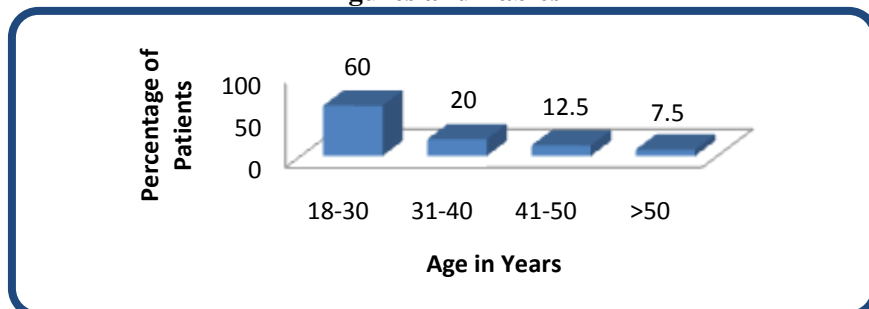


Figure 1: Bar graph showing Age Wise Distribution Of Cases

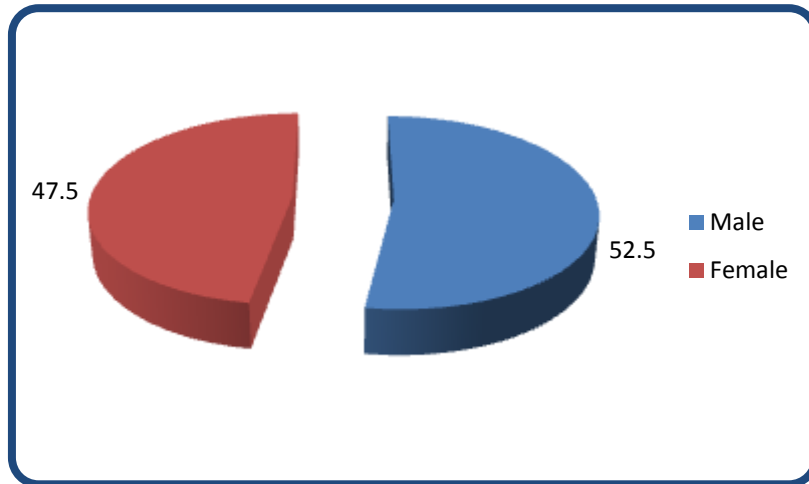


Figure 2: Pie chart showing Sex Wise Distribution of Cases

Table 1: Mean Age of the Patients

Sex	Mean age	Std. Deviation	Range
Female	28.21	8.01	20-36
Male	35.62	11.93	24-47
Total	32.1	10.8	21-43

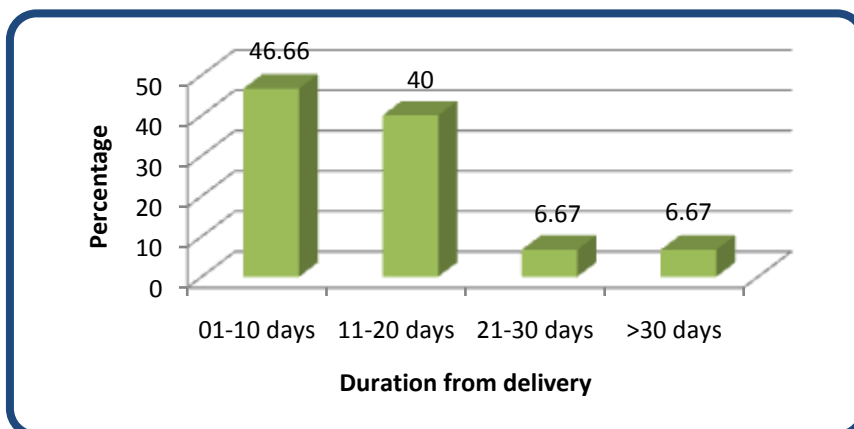


Figure 3: Bar graph showing Duration from delivery on onset of symptoms

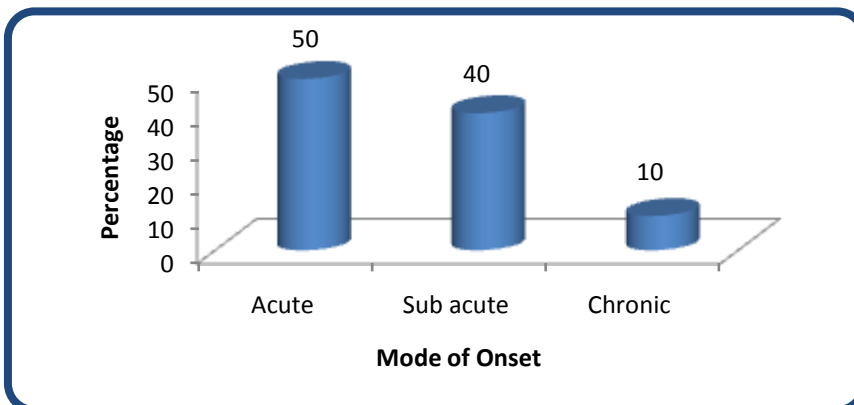


Figure 4: Bar graph showing Mode of onset

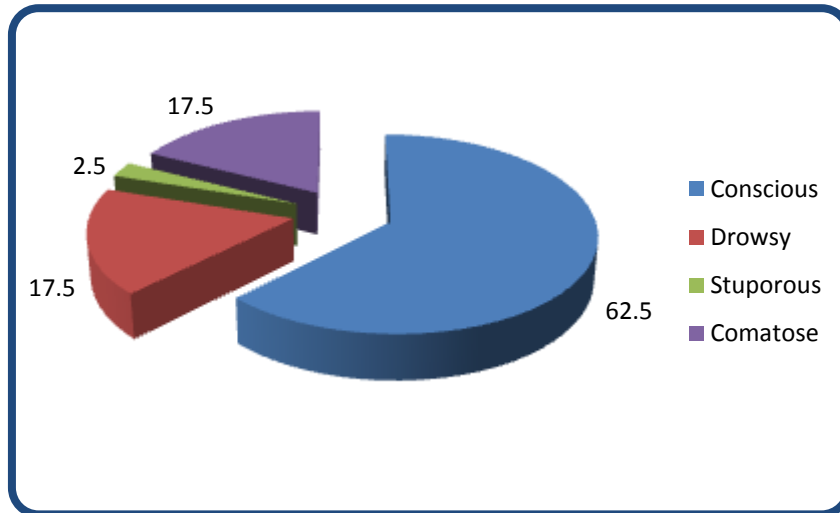


Figure 5: Pie chart showing Level of consciousness

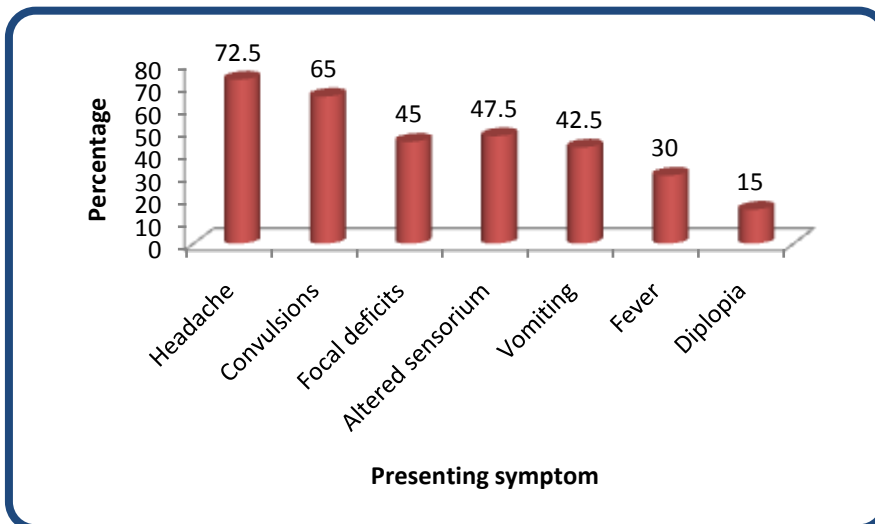


Figure 6: Bar graph showing Initial symptoms at presentation

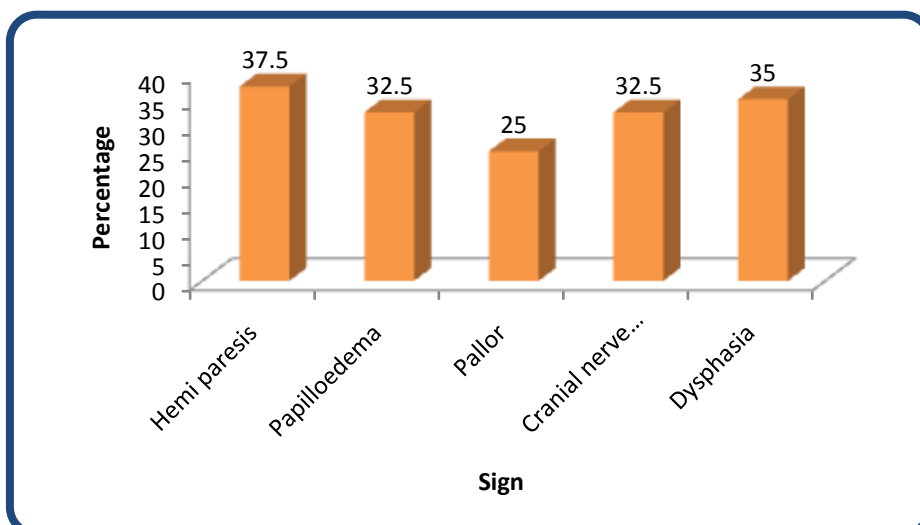


Figure 7: Bar graph showing Clinical Signs at Presentation

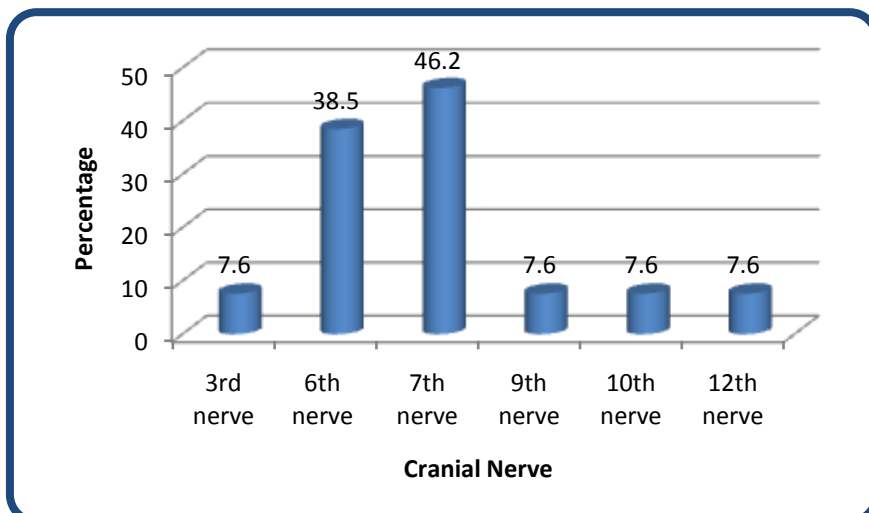


Figure 8: Bar graph showing Cranial nerve involvement

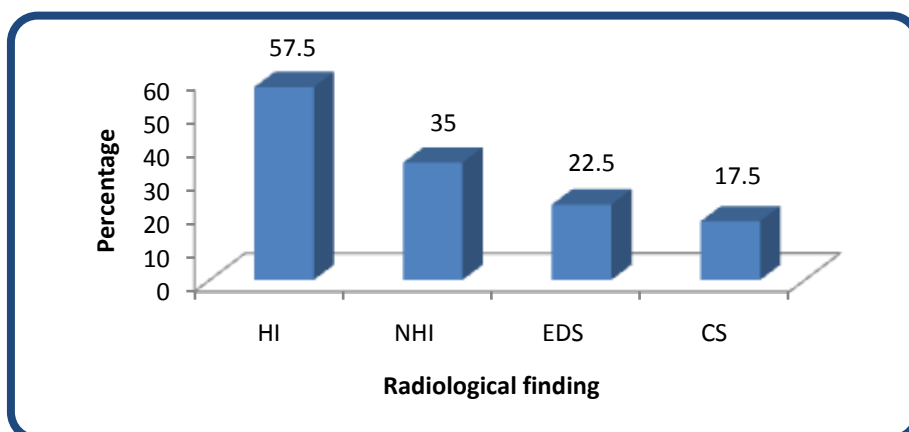


Figure 9: Bar graph showing CT and MRI findings

Table 2: Sinus involvement (MRV)

Sinus involved	Number of patients	Percentage
Superior sagittal sinus	28	70.0
Transverse sinus	21	52.5
Sigmoid sinus	18	45.0
Internal Jugular Vein	08	20.0
Straight sinus	05	12.5
Internal cerebral vein	02	05.0

Table 3: Outcome at Discharge

Modified rankin scale	At discharge (n=40)	
	No.of Cases	%
0	14	35.0
1	11	27.5
2	6	15.0
3	04	10.0
4	02	5.0
5	01	2.5
6(Deaths)	02	5.0

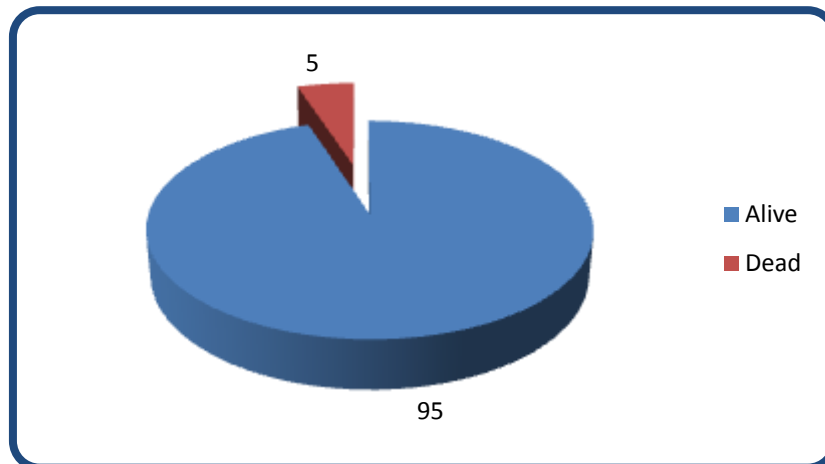


Figure 10: Pie chart showing Mortality

Table 4: Sinus involved

Sinuses involved	Ameri et al (1992)	Daif et al (1994)	Strolz et al (2005)	Present study (2016)
Superior sagittal sinus	72%	85%	72.2%	70%
Transverse sinus	70%	2.5%	38%	52.5%
Sigmoid sinus	-	32%	20.3%	45%
Internal Jugular vein	-	-	76%	20%
Straight sinus	16%	7%	7.6%	12.5%
Internal cerebral vein	8%	10%	6.3%	05%

Table 5: Mortality

Author	No.of patients (n)	Percentage (%)
Ameri et al (1992)	110	5.45
Daif et al (1995)	40	10
Debrujin et al (2001)	59	10.17
Mehta SR et al (2003)	45	4.44
Present study (2016)	40	05

V. Conclusion

Diagnosis of CSVT requires high index of suspicion. Compared to the previous studies, prevalence of CSVT was higher in men. It is an important cause of stroke especially in the peripartum settings and is one of the common causes of stroke in young. While it may occur in all age groups, it is most common in the third decade. The present study has showed similar finding with 60% in the same age group.

The symptoms and signs associated with cerebral venous sinus thrombosis are relatively nonspecific, these include headache, papilloedema, vomiting, seizures, impairment of consciousness and focal neurological deficits in various combinations and degree of severity. Neuroimaging plays a pivotal role in diagnosis. MRI with MRV is the current diagnostic modality of choice.

Management with unfractionated heparin, LMWH and oral anticoagulation is appropriate. Data from the International Study on Cerebral Vein and Dural Sinus Thrombosis suggest low-molecular-weight heparin (LMWH) might be safer and perhaps more efficacious than unfractionated heparin^[11]. Surgical decompression is helpful in the case of continuing deterioration, inspite of maximum medical management. In a small case series including 10 patients (median age 41 years) who underwent decompressive hemicraniectomy following CVT, five patients recovered without disability at 12 months (modified Rankin Scale score of 0 to 1) and two patients died of progressive cerebral edema and expansion of the hemorrhagic infarcts^[16].

The most common cause of death was transtentorial herniation due to unilateral haemorrhagic lesion, diffuse edema and bilateral lesions. In the present era, the mortality has fallen from 20-50% in pre CT period to less than 05%. Contrary to ischemic arterial stroke, CSVT 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.

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