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Visual Disturbances in Cerebral Venous Sinus Thrombosis Patients *

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ABSTRACT

A prospective cohort study in cerebral venous sinus thrombosis patients hospitalized in Neurology department, Tishreen University Hospital -Syria from January 2021 to January 2023, aims to evaluate the ophthalmic symptoms in cerebral venous sinus thrombosis patient . 72 patients were identified,49 females (68.1%) mean age 39.9±11.2 , 23 males (31.9%) mean age 53.2±17.4 years (p:0.002). The most common complaint led to diagnosis was headache in 34 cases (47.2%) ,hemiparesis and blurred vision in 11 cases (15.3%) for each of them, the ophthalmic complaints were the reason for medical consultation in 19 cases (26.4%). Infection represented the most frequent risk factor (23.6%), followed by hypertension (22.2%), oral contraceptives (16.7%). Ocular symptoms were the initial presentation in 72.2%(52/72), blurred vision represented the most frequent symptom (54.2%). Papilledema was the most frequent manifestation in 57 cases (79.2%). Superior sagittal the most affected sinus (69.4%). Complete recovery was observed in 37 cases (51.4%), ophthalmic complications were present in (34.7%), neurologic complications in (6.9%), mortality rate was (6.9%). Presence of papilledema, orbital pain, increasing the number of affected sinuses, and elevated Intracranial pressure were associated with poor outcome($p<0.05$). Early ophthalmic symptoms were more frequent than neurologic, so that early recognition and initiation of treatment will improve the outcome.

Keywords: Venous sinus thrombosis; ophthalmic; diplopia; headache; ICP.

1. Introduction

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Cerebral venous sinus thrombosis (CVST) refers to the occlusion of Venous vessels in the cranial cavity, including dural venous thrombosis, cortical vein thrombosis and deep cerebral vein thrombosis. it is serious, rare type of cerebrovascular accident which a blood coagulation forms in cerebral venous circulation[1], resulting in increased venous pressure, that may leads to an infarction associated with edema, hemorrhage in cerebral parenchyma[2] and increasing Intracranial pressure [3,4,5].

The incidence is estimated at 0.05 to 0.2 per 100.000 annually[6]. It affects mainly middle aged individuals[7] and there is a female predominance, with a 3:1 female to male ratio [8]. There are many causative conditions for CVST that may be grouped as transient or permanent. Prothrombotic conditions, obesity, oral contraceptive[9], pregnancy, puerperium[10], malignancy[11], and infection[12] were the most frequent risk factors for CVST [13][14].

It can present with symptoms which are widely various depending upon the site and spreading of thrombosis[15]. Headache is usually the first symptom at onset of CVST which may be localized or diffuse[16]. diplopia and visual loss caused by Papilledema as a result of increased ICP[17][18]. Patients with deep venous circulation thrombosis present Mental status changes, especially in patients with bilateral basal ganglia edema or large infarctions[19,20]. There are diverse syndromes associated with isolated sinus thrombosis.[21][22]

many virtual pathophysiology explanations of visual disorders are suggested in CVST: optic nerve malfunction due to increased ICP[23][24], occipital cortex venous infarctions, posterior cerebral artery compression leads to arterial occipital infarctions[25] , and intracranial hypertension resulting from secondary development of arterial venous fistula [26][27]. Ophthalmic manifestations might be the first complaint of CVST which misdiagnosed resulting in delay of diagnosis of CVST[28]. Early identification and treatment of CVST are necessary to enhance the clinical findings, preventing vision loss and blindness [29,30].

Aims of the study

The study aims to evaluate the recrudecence of ophthalmic symptoms and signs in patients with CVST and assessment the potential causes of CVST in addition to investigating the association between visual disorders and affected sinuses and to investigate the association between visual disorders and the demographic variables of the patients.

2. Methods

A prospective cohort study was implemented in CVST patients hospitalized in Neurology

department, Tishreen University Hospital - Latakia-Syria from January 2021 to January 2023. Input criteria were: patients older than 13 years with a diagnosis of CVST. The exclusion criteria were: -patients with optic disorders (blindness, severe reduced visual acuity) resulting from etiologies other than thrombosis, -presence of contraindication regarding Magnetic Resonance Imaging (MRI) scanning.

All patients underwent full physical examination and in detailed medical history. The main investigations were MRI to assess CVST, funduscopic to investigate the presence of abnormal findings, and lumbar puncture to assess cerebrospinal fluid pressure.

Ethical considerations: Provide the patients an explicit and obvious informed consent. The study was done in compliance with the Declaration of Helsinki.

3. Statistical Study

IBM Statistical package for social sciences SPSS (version 20) was used for Statistical study. Also means, standard deviations(SD), Frequency and percentages were included for basic Descriptive. The study of the relation between categorical variables was done by using Chi-square test. One way Anova was used to compare between the three groups. P value <0.05 was considered as statistically significant.

4. Results

The study included a group of 72 patients with CVST who fulfilled the criteria of the study. As shown in table (1), the patients were 68.1% females,31.9 % males, the mean age was 44±14.8 year. The mean age was 53.2±17.4 year for males, and 39.8±11.2 year for females, p=0.002. Main complaints were divided to neurological and ophthalmic. Headache was the most frequent complaint, which was present in 47.2% of patients, followed by hemiparesis (15.3%), seizures (6.9%), confusion (2.8%), and dizziness (1.4%). The observed ophthalmic complaints included: reduced visual acuity (9.7%) which represented the most frequent symptom, followed by transient blurred vision (5.6%), diplopia (4.2%), ptosis (2.8%), metamorphopsia (2.8%), and eyeball movement restriction (1.4%).

The most common provocative factor for CVST was infection in 17 cases (23.6%), followed by hypertension in 16 cases (22.2%), diabetes mellitus in 12 cases (16.7%), using of oral contraceptives (16.7%), and malignancy in 7 cases (9.7%). Other less frequent etiologies that associated with CVST were: pregnancy (2.8%), hematologic diseases (2.8%), puerperium (2.8%), and Bechet's disease (1.4%).

Table 1. Patients demographic characteristics.

Variable	Result
Age (years)	44±14.8
Sex	
Female	49(68.1%)
Male	23(31.9%)
Main complaints	
Neurologic	
Headache	34(47.2%)
Hemiparesis	11(15.3%)
Seizures	5(6.9%)
Confusion	2(2.8%)
Dizziness	1(1.4%)
Ophthalmic	
Reduced visual acuity	7(9.7%)
Transient blurred vision	4(5.6%)
Diplopia	3(4.2%)
Ptosis	2(2.8%)
Metamorphopsia	2(2.8%)
Eyeball movement restriction	1(1.4%)
Risk factors	
Infection	17(23.6%)
Hypertension	16(22.2%)
Diabetes mellitus	12(16.7%)
Oral contraceptives	12(16.7%)
Malignancy	7(9.7%)
Pregnancy	2(2.8%)
Hematologic conditions	2(2.8%)
Puerperium	2(2.8%)
Bechet's disease	1(1.4%)

As shown in table (2), 52 patients (72.2%) presented with ocular onset presentation as the chief complaint. Blurred vision (54.2%), orbital pain (22.2%), and defects of visual field (16.7%) were the most frequent complaints, followed by metamorphopsia (9.7%), restricted of eye movements (9.7%) and chemosis (8.3%). The patients also exhibit palsy of sixth nerve which was unilateral in 5 cases (6.9%) and bilateral in 4 cases (5.6%).

Of the 72 patients with CVST, 58 patients (80.6%) had abnormal findings on fundoscopy.

Papilledema was the most frequent manifestation with various grades: 38 patients (52.8%) had grade I, 7(9.7%) had grade II, and 12(16.7%) had grade III. Other manifestations included retinal hemorrhages (4.2%), optic disk hemorrhages (1.4%), and vasodilation (1.4%).

Table 2. Distribution of the population according to the ophthalmic findings.

Variable	Result
Ophthalmic manifestations	
Blurred vision	39(54.2%)
Orbital pain	16(22.2%)
Defects of visual field	12(16.7%)
Metamorphopsia	7(9.7%)
Restricted of eye movements	7(9.7%)
Chemosis	6(8.3%)
Palsy of sixth nerve	
• Unilateral	5(6.9%)
• Bilateral	4(5.6%)
Ptosis	2(2.8%)
Exophthalmos	2(2.8%)
Dyschromatopsia	2(2.8%)
Migraine- like symptom	2(2.8%)
Nystagmus	1(1.4%)
Funduscopic findings	
• Normal	14(19.4%)
• Abnormal	58(80.6%)
Papilledema	
I	38(52.8%)
II	7(9.7%)
III	12(16.7%)
Retinal hemorrhages	3(4.2%)
Optic disk hemorrhages	1(1.4%)
Vasodilation	1(1.4%)

Sinuses involved in CVST were according to their frequency as follow: superior sagittal(n=50), right transverse(n=44), left transverse(n=40), cavernous(n=8), and straight(n=7). The number of the affected sinuses were: 1 in 14 cases (19.4%), 2 in 45 patients (62.5%) which represented the most frequent group, 3 in 9 cases (12.5%), 4 and 5 in 2 cases (2.8%) for each one of them.

Five patients died. For the 67 survivors, 37 patients (51.4%) had a complete recovery without any sequelae, 25(34.7%) had signs and symptoms of ophthalmic complications, and 5 (6.9%) had neurological complications.

Table3. Location and number of thrombotic sinuses and its relationship to prognosis.

Variable	Result
Affected sinus	
Superior sagittal sinus	50(69.4%)
Right transverse sinus	44(61.1%)
Left transverse sinus	40(55.6%)
Cavernous sinus	8(11.1%)
Straight sinus	7(9.7%)
Number of affected sinuses	
1	14(19.4%)
2	45(62.5%)
3	9(12.5%)
4	2(2.8%)
5	2(2.8%)
Outcome	
Recovery	37(51.4%)
Recovery with ophthalmic sequelae	25(34.7%)
Recovery with neurological sequelae	5(6.9%)
Mortality	5(6.9%)

As shown in table 4, advanced age, presence of papilledema, orbital pain, increasing the number of affected sinuses, bilateral blindness and elevated levels of cerebrospinal fluid pressure were significantly associated with high rate of mortality and complications($p<0.05$). There was no significant association between gender($p=0.2$), presence of visual field defects ($p=0.05$), diplopia ($p=0.1$), and blurred vision($p=0.5$) with outcome.

Table4. The relationship of prognosis to demographic variables and visual disorders

Variable	Outcome				P value
	Recovery	Recovery with ophthalmic sequelae	Recovery with neurological sequelae	Mortality	
Male	10(27%)	7(28%)	3(60%)	3(60%)	0.2
Age	37.5±10.9	49.5±14.9	53.4±14.1	56.2±19.5	0.001
Papilledema	25(67.6%)	24(96%)	4(80%)	5(100%)	0.02
Number of affected sinuses	1.8±0.6	2.2±0.8	2.6±0.9	3.2±1.3	0.001
Cerebrospinal fluid pressure (cmH_2O)	27±2.1	27.7±2.8	29.6±3.4	33.4±3.5	0.0001

Blindness					
Unilateral	1(2.7%)	3(12%)	1(20%)	1(20%)	0.0001
Bilateral	1(2.7%)	10(40%)	1(20%)	4(80%)	
Orbital pain	2(5.4%)	10(40%)	3(60%)	1(20%)	0.002
Defect of visual field	2(5.4%)	7(28%)	2(40%)	1(20%)	0.05
Diplopia					
Unilateral	1(2.7%)	2(8%)	1(20%)	1(20%)	0.1
Bilateral	0(0%)	3(12%)	1(20%)	0(0%)	
Blurred vision	18(48%)	14(56%)	4(80%)	3(60%)	0.5

There was a significant association only between visual field defects($p=0.01$) and orbital pain($p=0.01$) with sagittal sinus thrombosis. In addition to that, cavernous sinus thrombosis was associated significantly with diplopia ($p<0.02$). No significant correlation was noticed between straight sinus and transverse thrombosis with outcome($p>0.05$).

5. Discussion

The current study showed that prevalence of CVST occurred at a high frequency in females with lower mean age compared to males [30]. Gender difference is believed to be due to factors such as oral contraceptive use, prothrombotic changes in coagulation system in pregnancy, and using of hormone replacement therapy. Patients had preexisting risk factor indicating multiple mechanisms involved in its pathogenesis, and the most frequent risk factors were infection, hypertension, diabetes mellitus, and using of oral contraceptives. Headache represented the most frequent main complaint, with presence of ophthalmic complaints in approximately quarter of the patients. These symptoms may be explained by intracranial hypertension syndrome. Ophthalmic symptoms were present in approximately three-quarter of the patients as a primary complaint before hospitalization, and papilledema might be due to chronic course or delayed clinical presentation. Defects of visual field and orbital pain were associated with thrombosis in sagittal sinus, whereas diplopia was associated with cavernous sinus. Complete recovery was observed in half of cases, and ophthalmic complications were more frequent than neurologic sequelae. The results of our study were correlated with the previous studies[25][31].

Wang et al. (2011) conducted a study in 118 patients with CVST. The men: women ratio was 1:1.2, with mean age was 34 years. 21.2% of the patients presented with ocular symptom as initial

presentation. Blurring and degeneration of acute vision represented the most frequent complaints (85.9%), and papilledema was the most common objective signs in eyes (48.3%). Acute vision deterioration occurred in 22.4% of the patients due to optic atrophy [31].

Eliseeva et al. (2015) demonstrated in a study conducted in 49 patients with CVST that majority of patients were females with mean age was 33 years. Papilledema was present in 84.6% of the patients with acute and subacute onset of the disease and in all patients with chronic onset. Visual disturbances and optic atrophy were found in 65.2% of patients with chronic onset, without any association between site of thrombosis and clinical manifestations [32].

Yadegari et al. (2017) found in a study conducted in 53 CVST patients with mean age was 33.7 years that ocular manifestations were the most frequent clinical presentations (77.4%). Papilledema and diplopia were the main findings in chronic CVST, and proptosis was associated significantly with thrombosis in cavernous sinus. Favorable outcome was associated with absence of proptosis and vision loss($p<0.05$) [33].

In summary, we emphasis the importance of early detection of ophthalmic manifestations as the presenting symptom of CVST to prevent complications and improve outcome.

6.Conclusions:

Cerebral venous sinus thrombosis is a disease with very complex and multiple symptoms. Therefore, we must not ignore the importance of any symptom, whether neurological or ocular, in early detection of the disease, as the earlier the diagnosis is, the better the prognosis and the avoidance of neurological and ocular complications.

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