Journal of Clinical Neuroscience xxx (2017) xxx–xxx

Contents lists available at ScienceDirect

Journal of Clinical Neuroscience

journal homepage: www.elsevier.com/locate/jocn

Case study

Cerebral venous sinus Thrombosis: Clinical Features, Long-Term outcome and recanalization

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ARTICLE INFO

Article history:
Received 20 April 2017
Accepted 21 July 2017
Available online xxxx

Keywords:
Cerebral venous sinus thrombosis
Clinical outcome
Prognosis
Recanalization

ABSTRACT

Recanalization and prognosis of cerebral venous sinus thrombosis (CVST) are generally considered to be good, and various factors have been reported to be associated with recanalization in previous studies.

Fifty patients diagnosed with CVST between September 2007 and July 2016 were analyzed retrospectively. Modified Rankin scale (mRS) scores at six months and results of follow-up imaging of patients with at least six months follow-up were also reviewed for the assessment of long term outcome, recanalization rates and factors associated with recanalization.

The mean age of the patients (39 female, 11 male) was 34.6 ± 11.2 years (17–69). Of the 50 patients enrolled, 31 (62%) had at least six months follow-up with available data and 26 (83.9%) of these had favorable outcomes (mRS 0–1) at six months. Complete recanalization was observed in 15 patients (48.4%), partial recanalization in 14 (45.2%) and no recanalization in 2 (6.5%). Univariate analysis revealed that complete recanalization rates were higher in female patients ($p = 0.013$) and lower in patients with multiple thrombosis in more than one dural sinus ($p = 0.03$).

The prognosis and recanalization rates of CVST were good, and complete or partial recanalization of venous sinuses was not associated with clinical outcome.

1. Introduction

Cerebral venous sinus thrombosis (CVST) is caused by thrombosis of the dural sinus and/or cerebral veins. Although it is an uncommon form of stroke, accounting for 0.5–1% of all strokes, it often affects young people [1]. The most important risk factors associated with CVST are pregnancy and puerperium, oral contraceptive uses, thrombophilias, systemic inflammatory diseases, infections, malignancy, dehydration and head trauma [1,2]. The clinical presentation of CVST may vary from isolated headache to focal neurological symptoms and signs, seizures and coma. Due to the wide spectrum of presenting symptoms, clinical suspicion is very important for accurate diagnosis [3].

Anticoagulation with unfractionated heparin (UFH) or low-molecular-weight heparin (LMWH) is considered the standard therapy and is reported to be safe and effective in the treatment of CVST. Although the clinical course of CVST may range from complete neurological improvement to severe disability or death, early recognition and treatment substantially improves the prognosis [1]. High rates of recanalization and good clinical outcome have been reported in many previous studies [2,4–13]. However, conflicting results have been reported regarding the relationship between recanalization and prognosis [2,6,8,10,12,14].

The purpose of this retrospective study was to assess the clinical characteristics, risk factors, neuroradiological features, clinical outcomes and recanalization rates of patients with CVST. Further, we aimed to investigate the factors associated with recanalization.

2. Methods

We retrospectively evaluated 50 patients with CVST diagnosed on the basis of clinical presentation, magnetic resonance imaging (MRI) and MR venography between September 2007 and July 2016 at the Karadeniz Technical University Medical Faculty, Trabzon, Turkey. Demographic and clinical characteristics, risk factors, radiological features including occluded sinus and/or cerebral vein and the presence of parenchymal lesions, and methods of treatment were assessed. Long term medical management details, modified Rankin scale (mRS) scores at six months, and results of follow-up imaging of patients who have at least six months follow-up were reviewed for the assessment of recanalization rates and prognosis. Initial and follow-up imaging including MRI and MR venography were interpreted by experienced neuroradiologists

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http://dx.doi.org/10.1016/j.jocn.2017.07.028
0967-5868/

retrospectively. The recanalization status of venous blood flow was classified as complete, partial or no recanalization. Normal blood flow with no residual thrombus in previously occluded dural sinuses and/or cerebral veins were assessed as complete recanalization. Residual trombus or disturbance of blood flow in at least one previously occluded dural sinuses and/or cerebral veins were assessed as partial recanalization and disturbation of blood flow or thrombosis of all previously occluded dural sinuses and/or cerebral veins were assessed as no recanalization [9].

All statistical analyses were performed using SPSS for Windows version 23. Main descriptive statistics were presented as patient number, percentage, mean, standard deviation and median values. After evaluation of the assumption of normal distribution, Student's t test and the Mann-Whitney U test were applied for the comparison of continuous variables and the chi-square test was applied for the comparison of categoric variables between patients with complete and partial recanalization. Patients with no recanalization were not included in this comparison due to the low number of patients in this category. Statistical significance was set at a p value of 0.05.

This study was approved by the Ethics Committe of Karadeniz Technical University Medical Faculty.

3. Results

Of the 50 CVST patients, 39 (78%) were female and 11 (22%) were male. The mean age of the patients was 34.6 ± 11.2 years, ranging from 17 to 69 years. The most frequent symptom was headache in 48 patients (%96) and 22 (44%) had isolated headaches. Other presenting symptoms were motor deficits in 23 patients (46%), epileptic seizures in 17 (34%) and mental status changes in 13 (26%). More than one dural sinus was involved in 28 patients (8%) and 4 (8%) had isolated cortical venous thrombosis. The superior sagittal sinus was affected in 33 patients (66%), the transverse sinus in 31 (62%), the sinus rectus in 6 (12%) and the sigmoid sinus in 18 (36%). Thrombosis of both dural sinus and cortical veins was co-present in 7 patients (14%). MRI revealed parenchymal lesions in 25 (50%) patients, comprising hemorrhagic infarction in 15 patients (30%), ischemia in 7 (14%) and isolated hemorrhage in 3 (6%). The lobes most commonly affected were the frontal (34%) and parietal (24%) lobes, and parenchymal lesions involved more than one lobe in 11 patients (22%).

Risk factors or potential causes of CVST were pregnancy or postpartum in 17 patients (34%), oral contraceptive use in 8 (16%), thrombophilia in 19 (38%), malignancy in 3 (6%), central nervous system infection in 2 (4%), vasculitis in 1 (2%) and head trauma in 1 (2%). No risk factors for CVST were identified in 9 patients (18%). Twenty-five female patients (64.1%) had gender-specific risk factors (pregnancy, postpartum or oral contraceptive use). Patients' demographic, clinical and radiological characteristics are shown in Table 1.

The median length of hospital stay was 15 days (4–65 days) and 2 patients died during hospitalization. All patients received anticoagulant therapy, either with unfractionated heparin (UFH) (54%) or low-molecular-weight heparin (LMWH) (46%) initially at time of diagnosis. Eleven patients (22%) with clinical worsening or no improvement despite anticoagulation were treated using endovascular methods. Thirty-six patients (72%) were discharged on warfarin and 12 (24%) with LMWH.

Of the 50 CVST patients, 31 (62%) had at least six months clinical follow-up with available data. The median duration of follow-up of these 31 patients was 13 months (6–54 months). Anticoagulants were discontinued in 16 (51.6%) of these 31 patients during the follow-up period and the median duration of anticoagulation was 9 months (6–40 months). Median mRS scores at six months for these 31 patients was 0 (0−4), and 26 patients (83.9%) had favorable outcomes (mRS 0–1). All 31 patients with six months clinical follow-up had at least one follow-up imaging. Complete recanalization was observed in 15 patients (48.4%), partial recanalization in 14 (45.2%) and no recanalization in 2 (6.5%) at follow-up

Table 1
Demographic, clinical and radiological characteristics of the patients.

	n (%)
Age (years), mean (range)	34.6 ± 11.2 (17–69)
Gender, female	39 (78)
Risk factors	
Pregnancy/postpartum	17 (34)
Oral contraceptive	8 (16)
Thrombophilia	19 (38)
Malignancy	3 (6)
CNS infection	2 (4)
Vasculitis	1 (2)
Head trauma	1 (2)
Symptoms/signs	
Headache	48 (96)
Aphasia	3 (6)
Impaired consciousness	13 (26)
Motor deficit	23 (46)
Seizure	17 (%34)
Occluded sinus/vein	
Sagittal sinus	33 (66)
Transvers sinus	31 (62)
Sigmoid sinus	18 (36)
Cortical vein	11 (22)
More than one sinus	29 (58)
MRI/CT findings	
Parenchymal lesion	25 (50)
Infarction	7 (14)
Hemorrhage	3 (6)
Hemorrhagic infarction	15 (30)
Lesion localisation	
Frontal lobe	17 (34)
Parietal lobe	12 (24)
Temporal lobe	5 (10)

MRI, magnetic resonance imaging, CT, computed tomography

Table 2
Treatment and follow up characteristics of the patients.

	Value
Duration of hospital stay, days (min-max)	15 (4–65)
Acute anticoagulant treatment	
Unfractionated heparin, n (%)	27 (54)
Low-molecular-weight heparin, n (%)	23 (46)
Endovascular treatment, n (%)	11 (22)
Clinical follow-up	
At least 6 months clinical follow-up, n (%)	31 (62)
Clinical follow-up less than 6 months, n (%)	5 (10)
Lost to follow-up, n (%)	12 (24)
Exitus, n (%)	2 (4)
Follow-up data (n = 31)	
Median duration of follow-up, months (min-max)	13 (6–54)
mRS at 6 months, median (range)	0 (0−4)
mRS 0, n (%)	23 (74.2)
mRS 1, n (%)	3 (9.7)
mRS 2, n (%)	3 (9.7)
mRS 3–5, n (%)	2 (6.5)
Discontinuation of anticoagulant treatment, n (%)	16 (51.6)
Duration of anticoagulation, months (min-max)	9 (6 −4 0)
Follow-up MR venography (n = 31)	
Complete recanalization, n (%)	15 (48.4)
Partial recanalization, n (%)	14 (45.2)
No recanalization, n (%)	2 (6.5)
Time to follow-up MR venography, months (min-max)	6 (1–48)

*mRS, modified rankin scale.