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Original Article

Quality of Life in Patients with Cerebral Venous Sinus Thrombosis: A Study on Physical, Psychological, and Social Status of Patients in Long-term

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Abstract

Background: Cerebral venous sinus thrombosis (CVST) causes significant problems for patients in the working age and may therefore negatively affect their quality of life (QOL). In the present study, we sought to evaluate the QOL and its predictors in subjects with CVST.

Methods: This observational, prospective study investigated several outcomes of 56 CVST patients after thrombosis onset. Demographic characteristics, medical history, neurological signs and symptoms during hospitalization, and the employment status of the patients were retrospectively collected. Stroke-related functional scales, including the modified Rankin Scale (mRS) and Barthel Index (BI) were employed. For physical and mental aspects of the QOL, we used the validated Persian version of the Stroke Specific Quality of Life (SS-QOL) scale.

Results: The physical and functional outcomes in the long-term were promising according to mRS and BI tools, as well as the improved rate of return to work. Mental domains of the SS-QOL, such as energy and personality represented the lowest scores. According to the multiple linear regression analysis, lower mRS score, and longer time interval between CVST onset and interview were associated with higher physical function of the patients while their better mental function was correlated with lower mRS score and thrombosis in merely one cerebral venous.

Conclusion: CVST patients experience an acceptable alleviation of the primary physical disabilities, while residual symptoms, mostly in psychologic/mental domains, impair their QOL.

Keywords: Cerebrovascular diseases, Quality of life, Rehabilitation, SS-QOL

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Introduction

Cerebral venous sinus thrombosis (CVST) is a rare cerebrovascular event afflicting young people in the working age.[1,2] Although more than 90% of patients successfully recover from the acute phase, CVST still has extended effects on the lives of patients regarding their young age.[3] CVST was primarily described in the early 19th century on post-mortem examinations. Until the publication of single-center and then larger multicenter studies in the second half of the 20th century, there was no significant progress in understanding the pathophysiology and treatment of the disease.[3-5] Early investigations were focused on the acute phase of the disease and its mortality. However, after the establishment of anticoagulation as the standard acute treatment and considerable reduction in mortality and severe major sequels, studies have usually concentrated on long-term consequences of the disease.[5-8]

Over the past few years, the frequency of significant disabilities has been low in surviving patients (less than 5% needed assistance in activities of daily living); nevertheless, up to 70% of patients still complain of residual symptoms (e.g, neuropsychological difficulties, linguistic difficulties, frequent headaches, and depression) in the long-term.[9] A few prospective and retrospective studies have described long-term outcomes, mostly using the modified Rankin Scale (mRS) scoring system.[5-11] Although favorable long-term outcomes were reported in such investigations, residual symptoms, or functional problems such as failure to return to work, were evident.

Considering the fact that CVST mostly affects individuals in the working age, the residual symptoms could exert a great impact on the patients' quality of life (QOL). To the best of our knowledge, however, this effect has not been studied precisely yet. In addition, the relationship between the hypothesized change in QOL and different demographic, neurological, and functional

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parameters has not been investigated in CVST patients, as far as we are aware. In the current study, we focused on the QOL of CVST patients and the factors that may influence it in the long-term.

Materials and Methods

Trial Design and Setting

In this prospective cohort, a long-term follow-up study, we recruited CVST patients from university hospitals of Tehran University of Medical Sciences (TUMS) from August 2015 to March 2018. Following a complete description of the study and its purpose to the subjects, all patients provided written consent to participate in the study. This research was in accordance with the Declaration of Helsinki and its successive revisions and was approved by the ethical committee of TUMS.

Participants

This prospective cohort study tracked the outcomes of 56 CVST patients admitted to university hospitals of TUMS. Patients were retrospectively selected from the hospital's electronic registry of diagnoses. CVST was diagnosed in all patients based on clinical settings (the presentation of a headache, seizure, focal neurological deficit, or loss of consciousness) and accepted definitions consistent with magnetic resonance imaging (MRI), magnetic resonance venography (MRV), conventional angiography, and computed tomography venography.

Only those patients with a definitive diagnosis of CVST were included in the study. Patients with a history of head and neck trauma or malignancy, and patients younger than 15 years and older than 60 years were excluded. All patients had received anticoagulants for treatment.

Data Collection

The neurologists had assessed all cases, and the hospital admission diagnosis was reconfirmed at discharge. The baseline data included the patients' age, gender, medical history, neurological complaints, signs and symptoms during admission and hospitalization, National Institutes of Health Stroke Scale (NIHSS) score at discharge, residing city, employment status, and educational level. For the follow-up, all patients were invited to an interview through invitation letters at least six months after the CVST occurrence. In the case of receiving no reply, the patients were contacted by telephone. For the assessment of QOL, we used the validated Persian version of Stroke Specific Quality of Life scale (SS-QOL).[1] SS-QOL questionnaires were sent to subjects before the interview to minimize recall bias. On the day of the interview, the mRS and Barthel Index (BI) were utilized, and the resulting scores were documented. Besides, the completed SS-QOL questionnaires were obtained from the patients, and all responses were verified by interviewing patients face-to-face. Stroke severity that had been measured with NIHSS at discharge was categorized as minor or no neurological deficits (NIHSS = 0-2), and moderate to severe neurological deficits (NIHSS >2). Functional recovery outcome, measured with mRS, was classified as complete recovery or mild residual symptoms (mRS = 0-1), and moderate to major residual symptoms (mRS >1). The time interval between the day of admission and the interview was measured for each patient.

Moreover, we categorized the patients dichotomously according to the number of sinuses involved: one sinus involvement or sole involvement of cerebral veins as n = 0, and in case of involvement of more than 1, we defined n = 1.

Stroke Specific Quality of Life Scale

Patients answered each question of the SS-QOL regarding the previous week. It is a self-report scale encompassing 49 items in 12 subscales: mobility (6 items), upper extremity function (5 items), work/productivity (3 items), energy (3 items), mood (5 items), self-care (5 items), social roles (5 items), family roles (3 items), vision (3 items), language (5 items), thinking (3 items), and personality (3 items).[13] It also has two main subdomains: physical health and mental health. Three response sets are used with each item scored on a five-point Likert scale, ranging from the amount of help needed to do specific tasks: "total help to no help", "unable to do to no trouble at all" in completing tasks, and "strongly agree to strongly disagree" for items addressing statements regarding their functional level. The SS-QOL provides domain and subdomain scores (mental health and physical health scores) and a summary score. Higher scores on the questionnaire exhibit better QOL.

Outcome Measures

The primary outcome measure was defined as assessment of QOL in patients with CVST. Secondary outcome measures were as follows: determining predicting variables for QOL in CVST patients; evaluating functional recovery in long-term, as measured with mRS and BI; returning to work within the study period extending from symptom onset to the day of the interview, defined as not leaving the job due to CVST residual symptoms.

Sample Size

A minimal sample size of 62 was calculated based on the assumption of a satisfactory functional outcome (mRS = 0–1) at the follow-up visit in 80% of the subjects,[5,6] a two-tailed significance of 0.05, a power of 90% and a dropout rate of 10%.

Statistical Analysis

Data analysis was conducted using the IBM SPSS Statistics software, version 24. We used the Shapiro-Wilk test and normal probability Q-Q plot to test the normality of the data. Since the data attributing to all the utilized tools did

not follow a normal distribution, we used non-parametric tests for analysis. The significance level below 0.05 was regarded as significant. Continuous data are presented as median [interquartile (IQR: 25th –75th percentiles) range] while categorical data appear as n/N (%).

In addition, univariate analysis was performed using Spearman correlation to find possible correlations between age, interview mRS score, admission NIHSS score, interview BI score, the time interval between CVST occurrence and interview and QOL variables including mean mental health subscale, mean physical subscale, and mean individual scale. The Mann-Whitney U test was used to compare the aforementioned SS-QOL subscales between groups of gender, residing city, and the number of cerebral veins involved by thrombosis. The Kruskal-Wallis test also was used to compare SS-QOL between different educational levels. Afterward, among variables that had $P < 0.05$ for either analysis mentioned above, we entered the following variables to multiple linear regression analysis (method: automatic stepwise forward selection with a significance level of 0.05): age (years), gender, involvement of single or multiple sites, admission NIHSS score, interview mRS score, and time interval between CVST onset and interview (months). The assumptions of normality, homoscedasticity, and absence of multiple collinearity were checked for the three dependent variables of SS-QOL before regression analysis. The normailty of residuals was considered normal since the Predicted Probability (P-P) plots showed small deviations from the diagonal line. The data was relatively homoscedastic as the points were distributed in the scatterplot in a fairly random pattern. Finally, absence of multicollinearity was met since all the variance infliation factor (VIF) values were found to be below 10.

Table 1. Main Characteristics of the Patients

Variable	
Gender	
Male	21 (37.5%)
Female	35 (62.5%)
Education	
High school and lower	35 (62.5%)
College and BSc	14 (25.0%)
MSc and higher	7 (12.5%)
Residing place	
Capital	27 (48.2%)
Other cities	29 (51.8%)
Employment	
Before the stroke	34 (60.71%)
After the stroke	25 (44.64%)
Manifestation	
Headache	55 (98.2%)
Seizure	12 (21.4%)
Sensory deficit	10 (17.9%)
Motor deficit	11 (19.6%)
Impaired consciousness	6 (10.7%)
Risk factors	
Hypertension	7 (12.5%)
Diabetes mellitus	0 (0.0%)
Smoking	3 (5.4%)
Atrial fibrillation	0 (0.0%)
Oral contraceptive use in females	12 (34.3%) (N = 35)
Rheumatologic disease	9 (16.1%)
Site of thrombosis	
Transverse vein	47 (84%)
Superior sagittal vein	24 (43%)
Inferior sagittal vein	3 (5%)
Sigmoid vein	28 (50%)
Straight vein	3 (5%)
Deep vein	6 (11%)
Jugular vein	23 (42%)

Categorical data appear as n/N (%), representing the number of cases and number of observations for each variable individually.

Results

Baseline Characteristics of the Patients

Out of 62 CVST patients meeting the inclusion criteria, 56 completed the interview. The median age of patients at onset was 38 (IQR 32-43) years, while 35 (62%) of them were females. Thirty-four patients (61%) were employed, which was defined as having a full-time job or a part-time job with over 50% of standard working hours. The median number of sinuses involved was 2.5 (IQR 2-3), and 44 patients (79%) had >1 sinus involved. The main manifestations of the patients included headache: 55 (98%), seizure: 12 (21%), motor deficit: 11 (20%), sensory deficit: 10 (18%), and impaired consciousness: 6 (11%). Twelve women (34% of females) consumed oral contraceptive pills before CVST occurrence. Nine (16%) patients were found to have secondary causes (Table 1). The median NIHSS score at discharge was 1 (IQR 0-3).

Long-term Outcome

The average NIHSS score at admission was 2.3, showing moderate to severe onset. The median interval between the stroke and interview was 17 (IQR 7.25-26) months, and the median mRS and BI scores at the interview were 1 (IQR 0-1) and 100 (IQR 100-100), respectively, indicating favorable recovery of disabilities in physical and daily activities. On the interview day, 50 patients (89.28%) had a favorable functional outcome (mRS = 0-1), and the other 6 patients (11%) were independent in their daily life (mRS = 2). BI findings were also suggestive of favorable outcomes since 53 patients had the maximum score. Finally, 25 patients (45%) could successfully return to work within a median interval of 17 months after symptoms onset.

SS-QOL Analysis

As Figure 1 shows, the lowest scores of SS-QOL pertained to the energy and personality domains. Each subscale score was as follows: mobility: 5 (4.5–5), energy: 3 (2.7–4.6), upper extremity function: 5 (5–5), work/productivity: 5 (5–5), mood: 4.5 (3.8–4.8), self-care: 5 (5–5), social

roles: 4.1 (2.4–5), family roles: 5 (4–5), vision: 5 (4.7–5), language: 4.8 (4.6–5), thinking: 4.7 (4.3–5), personality: 3 (2.3–4.9). Besides, the median total SS-QOL sumscore was 219 (194–235).

The patients' scores of domains are demonstrated in Figure 1, and cumulative frequencies in two main subscales of mental and physical health as well as individual SS-QOL scale are shown in Figure 2.

SS-QOL Predictors

As shown in Table 2, mental health score and mean individual SS-QOL were different between the two groups of males and females (*P* values < 0.1). Age and mRS score were inversely correlated with physical health score, mental health score, and mean individual SS-QOL (*P* values < 0.05); additionally, the time interval between CVST occurrence and data collection, and BI were positively correlated with physical health score, mental health score, and mean individual SS-QOL (*P* values < 0.05); likewise, NIHSS score at admission was shown to have a significant correlation with mental health and mean individual scores of SS-QOL, but not with physical health score (Table 2).

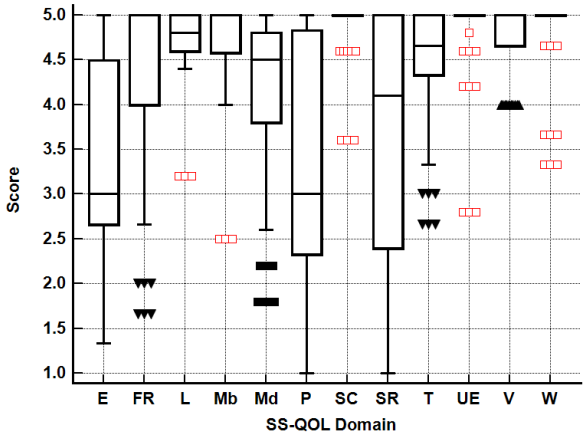

Figure 1. SS-QOL Subdomains in the CVST Patients.

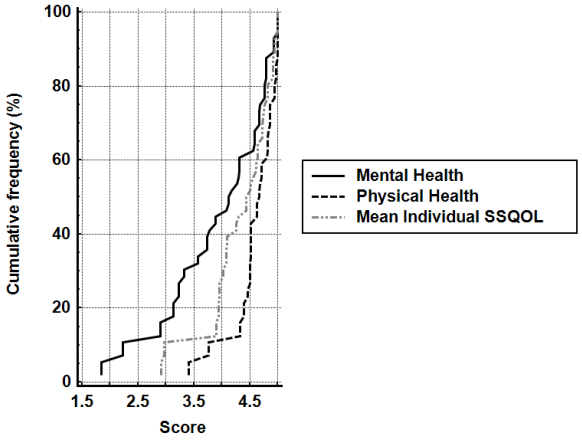

Figure 2. Distribution of Mental Health, Physical Health and Mean Individual SS-QOL in the CVST Patients.

A multiple regression analysis was run to test whether the correlated variables could predict the SS-QOL score.

For physical health subscale, the model significantly predicted physical health status (adjusted R^2 = 0.42, *P* < 0.001). In this model, mRS score (B = -0.35, 95% CI [-0.48, -0.22], *P* < 0.001) and time interval (B = 0.01, 95% CI [0.001, 0.02], *P* = 0.03) significantly predicted the score. In summary, we estimated that: physical health score = -(0.35 × mRS) + (0.01 × time interval (months)) + 4.64.

For the mental health subscale, the model significantly predicted mental health score (adjusted R^2 = 0.39, *P* < 0.001). In this model, mRS score (B = -0.60, 95% CI [-0.89, -0.31], *P* < 0.001), admission NIHSS (B = 0.09, 95% CI [0.03, 0.15], *P* = 0.003), and number of involved sites (B = -0.70, 95% CI [-1.18, -0.22], *P* = 0.005), significantly predicted mental health score. In summary: mental health score = -(0.60 × mRS) + (0.09 × NIHSS)–(0.70 × n) + 5.35. As mentioned above, n indicates the number of sites of sinus involvement.

This model also significantly predicted mean individual SS-QOL score (adjusted R^2 = 0.40, *P* < 0.001). In this model, mRS score (B = -0.46, 95% CI [-0.65, -0.28], *p* < 0.001), NIHSS (B = 0.05, 95% CI [0.01, 0.09], *P* = 0.01), and number of involved sites (B = -0.39, 95% CI [-0.70, -0.08], *P* = 0.02) significantly predicted the score. In summary: mean individual SS-QOL score = -(0.46 × mRS) + (0.05 × NIHSS)–(0.39 × n) + 5.19.

Discussion

Our prospective observational long-term follow-up of 56 CVST patients demonstrated the relationship between CVST occurrence and different domains of life. Moreover, we evaluated several variables to realize whether they affect the QOL in patients with CVST. Assessment of various aspects of patients' life after a median interval of 17 months from the first admission revealed that several domains were impaired, such as energy and personality. However, outcomes related to functional recovery were favorable according to the results obtained from the validated versions of mRS and BI instruments. Besides, the rate of return to work was high since a significant proportion of the population continued their job within the interval spanning from CVST onset to the day of the interview. Finally, we identified that among different variables, thrombosis in more than one site and mRS scale could predict the mental function of the patients in long-term; the latter variable was highly associated with physical function, as well.

The mRS, as a simple categorical scale, was introduced to evaluate the functional independence of patients after ischemic stroke.[14,15] It was shown as a valid and reliable scale in clinical trials and outcome measures of acute ischemic strokes.[16,17] The mRS has been used as an outcome measure in acute and even chronic phase of CVST patients.

Table 2. Summary of SS-QOL Subscales

Variables	Physical Health Score	Mental Health Score	Mean Individual SS-QOL
Gender			
Male	4.0 (3.4–4.9)	3.2 (2.2–4.1)	3.7 (2.9–4.6)
Female	4.7 (4.5–4.9)	4.3 (3.3–4.8)	4.7 (4.0–4.8)
P[a]	0.268	0.065	0.065
Educational level			
Diploma and lower	4.7 (4.5–4.8)	4.3 (3.3–4.7)	4.5 (4.0–4.7)
BSc and college	4.5 (4.3–4.9)	3.7 (3.1–4.7)	4.1 (3.9–4.8)
MSc and higher	4.9 (4.7–5.0)	4.1 (3.8–5.0)	4.6 (4.4–5.0)
P	0.094	0.233	0.097
Residing place			
Capital	4.7 (4.5–4.9)	3.8 (3.3–4.6)	4.3 (4.0–4.7)
Other cities	4.7 (4.4–4.8)	4.3 (3.2–4.8)	4.5 (3.9–4.8)
P	0.538	0.664	0.902
Age			
r[b]	-0.35	-0.29	-0.30
P	0.008	0.028	0.027
Number of sites thrombosed			
1	4.7 (4.6–4.9)	4.6 (4.4–4.9)	4.7 (4.5–4.9)
>1	4.6 (4.4–4.9)	3.9 (3.1–4.7)	4.3 (3.9–4.8)
P	0.207	0.020	0.039
mRS score on follow-up day			
r	-0.56	-0.52	-0.53
P	< 0.001	< 0.001	< 0.001
Time interval			
r	0.32	0.34	0.28
P	0.017	0.011	0.038
BI on follow-up day			
r	0.39	0.35	0.39
P	0.003	0.009	0.003
Admission NIHSS			
r	0.15	0.34	0.31
P	0.282	0.010	0.021

BI, Barthel Index; BSc, Bachelor of Science; MSc, Master of Science; mRS, modified Rankin Scale; NIHSS, National Institutes of Health Stroke Scale; SS-QOL, Stroke Specific Quality of Life.

[a] *P* value; [b] Spearman's rho test.

However, several studies have shown that although long-term functional outcome appears competent if measured with mRS, most CVST survivors suffer from residual symptoms, which prevent them from going back to work and normal personal activities; hence, several studies have claimed that maybe the mRS is not precise enough to evaluate CVST survivors in the long-term.[9,18-20] Therefore, we used a more accurate and detailed score (SS-QOL) in addition to the mRS to assess the patients in the long-term and evaluated the association of the two questionnaires. We identified that the mRS score was a robust predictor of QOL; however, it could not report outcomes of all aspects of life in detail, due to its simplicity.

We analyzed the time interval (follow-up period) as a possible predictive factor. Time interval has been evaluated in similar studies only as demographic data and not as a predictive factor.[3,5,9] Our results showed that it is a predictive factor for the physical aspects of QOL, but is not related to the mental/neuropsychological aspects of QOL. This underscores the fact that regardless of gradual physical improvement, time per se does not resolve mental/neuropsychological residual symptoms of CVST survivors, and this aspect should be addressed separately and more rigorously. There could be various reasons for this situation. The physical, rather than mental, conditions of CVST patients are usually more attended to; thus, most of the instant therapies are focused on curing physical disabilities.

In general, physical disabilities synergize mental problems; furthermore, physical recovery over time could positively alter mental aspects.[21] During the acute phase of CVST, treatment is highly effective and results in near-total resolution of physical symptoms and signs. In other words, recovery mostly occurs during the acute phase and physical findings are unlikely to undergo any noticeable change in the long-term. Hence, the effect of physical improvement on mental aspects is assumed to be negligible over the long-term, and the correlation between physical and mental problems appears to be more prominent in the acute phase rather than the chronic setting. Meanwhile, our trial was designed based on the recruitment of successfully acute phase-treated patients, and as most of

the subjects were interviewed at their chronic phase, this might explain why time interval could not considerably predict the scores of SS-QOL.

The results demonstrated that the patients scored worse in the mental subscale and neuropsychiatric domains, including personality, social role, energy, and mood. It shows why in similar long-term studies, patients had considerable chronic complaints and problems getting back to work regardless of their remarkable physical recovery.[8,22,23] Low mRS scores at the interview could confirm influential physical recovery through time. However, to get more valid information about the trends related to the improvement of mental aspects, future studies should concentrate on changes in SS-QOL scores over time.

In a recent investigation by Lindgren et al, return to work of surviving CVST patients was assessed, reporting that 29% of the subjects failed to return to work within a long-term period.[5] Nevertheless, Buccino et al. indicated that all participants could recapitulate their previous jobs after a median interval of 3.5 years.[8] Our SS-QOL scores of the work and productivity domain appear to be more consistent with the report by Buccino et al, since most of the subjects had no related trouble at all. However, 26.47% of employed patients did not return to work after the median interval of 17 months (n = 34) which is almost in line with the former study. To answer the existing discrepancies of the "work/productivity" domain of SS-QOL and the number of patients who failed to return to work, we recommend studies designed with longer follow-up periods and larger populations.

The present study has several limitations that should be noticed. First, our limited sample size affects the statistical power and restricts us from involving more variables in regression analysis due to instability of the model. Further investigations with larger populations are highly suggested to recognize other predictors of QOL in CVST patients. However, the recruitment of a larger sample size appears challenging since CVST is a rare disease. Second, we did not assess the baseline QOL of patients. Thus, we could not confidently report whether impaired neuropsychological aspects were a result of CVST occurrence in long-term or patients' mental conditions irrespective of their disease. Finally, the retrospective collection of baseline data might lead to selection or report biases.

Despite the considerable physical recovery in patients with CVST over time, psychologic/mental symptoms usually persist and compromise the QOL. Taken together, patients had a favorable functional status: they mostly could return to work within the median interval of 17 months; the results of mRS and BI instruments were suggestive of near-total physical and functional resolution. However, when it comes to assessing the recovery of each aspect of life, a more inclusive questionnaire like SS-QOL seems more reliable.

Authors' Contribution

DK, AG, FF: Study Design. DK: Data gathering. FF, KM: Analysis. DK, KM, HS, SB: Interpretation of the results. KM, HS, SB, RR: Drafting of the paper. All authors: Revising the paper.

Conflict of Interest Disclosures

The authors declared no conflict of interest concerning the research, authorship, and publication of this article.

Informed Consent

Informed consent was taken from all participants.

Ethical Statement

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References

1. Bushnell C, Saposnik G. Evaluation and management of cerebral venous thrombosis. Continuum (Minneapolis, Minn). 2014;20(2 Cerebrovascular Disease):335-51. doi: 10.1212/01.CON.0000446105.67173.a8.
2. Hartel M, Kluczewska E, Gancarczyk-Urlik E, Pierzchala K, Bien K, Zastawnik A. Cerebral venous sinus thrombosis. Phlebology. 2015;30(1):3-10. doi:10.1177/0268355514526712.
3. Ferro JM, Canhao P, Stam J, Bousser MG, Barinagarrementeria F. Prognosis of cerebral vein and dural sinus thrombosis: results of the International Study on Cerebral Vein and Dural Sinus Thrombosis (ISCVT). Stroke. 2004;35(3):664-70. doi: 10.1161/01.str.0000117571.76197.26.
4. Coutinho JM. Cerebral venous thrombosis. Journal of Thrombosis and Haemostasis: JTH. 2015;13 Suppl 1:S238-44. doi: 10.1111/jth.12945.
5. Dentali F, Poli D, Scoditti U, Di Minno MND, Stephano VD, Siragusa S, et al. Long-term outcomes of patients with cerebral vein thrombosis: a multicenter study. Journal of Thrombosis and Haemostasis: JTH. 2012;10(7):1297–302. doi: 10.1111/j.1538-7836.2012.04774.x.
6. Lindgren E, Jood K, Tatlisumak T. Vocational outcome in cerebral venous thrombosis: Long-term follow-up study. Acta Neurologica Scandinavica. 2018;137(3):299-307. doi: 10.1111/ane.12875.
7. Preter M, Tzourio C, Ameri A, Bousser MG. Long-term prognosis in cerebral venous thrombosis. Follow-up of 77 patients. Stroke. 1996;27(2):243-6.
8. Buccino G, Scoditti U, Patteri I, Bertolino C, Mancia D. Neurological and cognitive long-term outcome in patients with cerebral venous sinus thrombosis. Acta Neurol Scand. 2003;107(5):330-5.
9. Hiltunen S, Putaala J, Haapaniemi E, Tatlisumak T. Long-term outcome after cerebral venous thrombosis: analysis of functional and vocational outcome, residual symptoms, and adverse events in 161 patients. J Neurol. 2016;263(3):477-84. doi: 10.1007/s00415-015-7996-9.
10. Ferro JM, Lopes MG, Rosas MJ, Ferro MA, Fontes J, Cerebral Venous Thrombosis Portugese Collaborative Study Group Long-term prognosis of cerebral vein and dural sinus thrombosis. Results of the VENOPORT study. Cerebrovasc Dis. 2002;13(4):272-8. doi: 10.1159/000057855.
11. Koopman K, Uyttenboogaart M, Vroomen PC, van der Meer J, De Keyser J, Luijckx GJ. Long-term sequelae after cerebral venous thrombosis in functionally independent patients. J Stroke Cerebrovasc Dis.2009;18(3):198-202. doi: 10.1016/j.jstrokecerebrovasdis.2008.10.004.
12. Mahmoodi M, Safari A, Vossoughi M, Golbon-Haghighi F, Kamali-Sarvestani M, Ghaem H, et al. Stroke specific quality

of life questionnaire: Test of reliability and validity of the Persian version. Iranian J Neurol. 2015;14(2):94-100.
13. Williams LS, Weinberger M, Harris LE, Clark DO, Biller J. Development of a stroke-specific quality of life scale. Stroke. 1999;30(7):1362-9.
14. Nunn A, Bath PM, Gray LJ. Analysis of the modified Rankin scale in randomised controlled trials of acute ischaemic stroke: a systematic review. Stroke Res Treat. 2016;2016:9482876. doi: 10.1155/2016/9482876.
15. Rankin J. Cerebral vascular accidents in patients over the age of 60. II. Prognosis. Scott Med J. 1957;2(5):200-15. doi: 10.1177/003693305700200504.
16. Quinn TJ, Dawson J, Walters MR, Lees KR. Exploring the reliability of the modified Rankin scale. Stroke. 2009;40(3):762-6. doi: 10.1161/STROKEAHA.108.522516.
17. Quinn TJ, Dawson J, Walters MR, Lees KR. Functional outcome measures in contemporary stroke trials. Int J Stroke. 2009;4(3):200-5. doi: 10.1111/j.1747-4949.2009.00271.x.
18. Korathanakhun P, Sathirapanya P, Geater SL, Petpichetchian W. Predictors of hospital outcome in patients with cerebral venous thrombosis. J Stroke Cerebrovasc Dis. 2014;23(10):2725-9. doi: 10.1016/j.jstrokecerebrovasdis.2014.06.020.
19. Soyer B, Rusca M, Lukaszewicz AC, Crassard I, Guichard JP, Bresson D, et al. Outcome of a cohort of severe cerebral venous thrombosis in intensive care. Ann Intensive Care. 2016;6(1):29. doi: 10.1186/s13613-016-0135-7.
20. Kowoll CM, Kaminski J, Weiß V, Bösel J, Dietrich W, Juettler E, et al. Severe cerebral venous and sinus thrombosis: clinical course, imaging correlates, and prognosis. Neurocrit Care. 2016;25(3):392-9. doi: 10.1007/s12028-016-0256-8.
21. Scott KM, Korff MV, Alonso J, Angermeyer MC, Bromet E, Fayyad J, et al. Mental–physical co-morbidity and its relationship with disability: results from the World Mental Health Surveys. Psychol Med. 2009;39(1):33-43. doi: 10.1017/S0033291708003188.
22. Bugnicourt JM, Guegan-Massardier E, Roussel M, Martinaud O, Canaple S, Triquenot-Bagan A, et al. Cognitive impairment after cerebral venous thrombosis: a two-center study. J Neurol. 2013;260(5):1324-31. doi: 10.1007/s00415-012-6799-5.
23. de Bruijn SF, Budde M, Teunisse S, de Haan RJ, Stam J. Long-term outcome of cognition and functional health after cerebral venous sinus thrombosis. Neurology. 2000;54(8):1687-9.