POST-STROKE FATIGUE AND ITS DIMENSIONS WITHIN FIRST 3 MONTHS AFTER STROKE

STOPIEŃ ZMĘCZENIA ORAZ JEGO WYMIARY U PACJENTÓW W CIĄGU PIERWSZYCH TRZECH MIESIĘCY PO WYSTĄPIENIU UDARU

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ABSTRACT

Introduction: Post-stroke fatigue (PSF) is a common stroke complication with long-term negative consequences.

Aim: Assess the qualitative and quantitative PSF characteristics during 3 month post-stroke period.

Materials and methods: There were examined 141 patients with acute ischemic or hemorrhagic strokes at hospital stay, in 1, 2 and 3 months after stroke. PSF was measured by fatigue assessment scale (FAS), multidimensional fatigue inventory-20 (MFI-20) and fatigue severity scale (FSS).

Results: 116 (82.3%) patients had ischemic strokes, 25 (17.7%) had hemorrhagic strokes. According to FAS and MFI-20 "global fatigue" sub-scale, PSF was present, respectively, in 22.0% and 25.5% cases at hospital stay, in 38.3% and 35.5% cases in 3 month after stroke. The growing prevalence of PSF was based on significantly increasing the rates of PSD physical domain (from 28.4% to 41.1%) and the rates of PSF mental domain (from 19.1% to 31.9%). On the other hand, the rates of PSF activity-related component had been significantly reduced from 36.2% to 17.0% within observation period. Moreover, according to MFI-20, it had been revealed significant increasing of PSF intensities in global, physical and mental domains during first 3 post-stroke months. According to FSS value ranks, proportions of patients with "no PSF" had been decreased in 1.5 times due to simultaneously rising rates of "moderate" as well as "severe" PSF impacts on daily life.

Conclusion: The PSF spreading is significantly increased during the first 3 post-stroke months due to increasing of rates and intensities of physical and mental PSF domains.

KEY WORDS: stroke, fatigue, dimensions, measurements.

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INTRODUCTION

Generally, fatigue is a multidimensional, mostly subjective phenomenon that can be described in different terms – difficulties to start and (or) maintain a conscious activity, feeling a lack of energy, so on. In some cases stroke is accompanied by post-stroke fatigue (PSF). PSF is a complex, multifactorial pathological condition with peculiar etiopathogenetic and clinical characteristics, specific diagnostic and therapeutic approaches [1]. It is believed that PSF has multifactorial origin due to complex interaction of biological, psychological, behavioral, social and others factors [2]. PSF is independent predictor of post-stroke disability and long-term mortality, moreover, it has lasting negative impact on patients' life quality [3-5]. So, management and prevention of PSF are ranked by stroke survivors and health professionals among the top 10 research priorities relating to life after stroke [6]. PSF is multidomain entity which consist of different components such as physical, mental, psychological, so on. From prospective point of view, PSF is a dynamic, evolutionary process that may occur in different post-stroke terms with variable subsequent clinical course [7]. However, up to now little is known about the severity and time course of PSF different dimensions during early post-stroke terms.

AIM OF THE STUDY

The objectives of this study were to assess the qualitative and quantitative PSF characteristics during three month post-stroke period.

MATERIALS AND METHODS

Initially we enrolled in the study 186 patients. Patients were included in the study if they had an acute stroke (ischemic or hemorrhagic), agreed to participate in the study and were able to provide informed consent. Exclusion criteria were major medical illness that could cause fatigue (oncological, hematological diseases, cardiac, liver, kidney and respiratory insufficiency, progressive angina pectoris, acute myocardial infarction), alcohol abuse, consciousness impairments, insufficient cognitive ability (Mini-Mental State Examination scores less than 24), depressive and anxious disorders (Hospital Anxiety and Depression Scale scores more than 10 for both pathologies), impaired speech function to participate (severe dysphasia or dysarthria), impaired language or written ability to complete the study questionnaires, severe functional disabilities (modified Rankin scale scores ≥4). During three months observation 45 patients were excluded due to different reasons, so finally 141 patients had been examined.

PSF characteristics had been evaluated in definite time points: at hospital stay, in 1, 2 and 3 months after stroke. Given the wide range of mechanisms probably underlying fatigue, differing manifestations and confounding effects of disease symptoms, PSF was measured by three self-report questionnaires: fatigue assessment scale (FAS), multidimensional fatigue inventory-20 (MFI-20), fatigue severity scale (FSS).

FAS, as uni-dimensional scale, designed to derive a single score that captures heterogeneous symptoms. FAS consist of 10 questions: 5 questions about mental components and 5 of the physical part of fatigue. For each question proposed 5 options. The value of the survey ranged from 10 to 50 points. The score ≥22 indicates fatigue presence [8].

MFI-20 is multidimensional scale, it provides a detailed qualitative and quantitative assessment of fatigue. MFI-20 is a 20-item questionnaire which covers the following fatigue dimensions: global, physical, mental, activity-related and motivational. The sub-scale termed "global fatigue" deals with overall feelings of being tired; physical fatigue relates to physical sensations of fatigue; mental fatigue is associated with questions about concentration and other cognitive symptoms; reduced motivation and reduced activity consider issues such as lack of motivation to start activity and reduction of activity continuation [9]. A cut-off of 12 out of 20 for every sub-scale has been suggested for use with people with stroke. A higher scores for each of the five sub-scales above 12 indicate a greater level of fatigue [10].

The impact of PSF on patients' functioning and daily life was assessed with FSS, which consists of 9 statements scored on a 7-point scale. Total score is the mean of the 9 item scores. The FSS scores was conditionally categorized into one of the three groups: "no PSF" (FSS <4), "PSF moderate influences on life's quality" (FSS 4–4,9), "PSF severe influences on life's quality" (FSS≥5) [11].

The difference between the patients' proportions with PSF at definite time points after stroke onset was assessed using Cochran's Q-test. Parameters of scores for the MFI-20 sub-scales had non-parametric distribution (according to Shapiro-Wilk test) and were described using mediana (Me) and interquartile (25%-75%) range (Q1-Q3). The non-parametric Friedman F-test for repeated measurements was used to compare MFI-20 sub-scales scores assessments and FSS value of the ranks. When the Friedman F-test for MFI-20 sub-scales' scores yielded a significant effect ($p<0,05$), it was followed by Dunnett's test for determination the differences between initial and subsequent measurements. A p-value <0,05 was considered statistically significant.

RESULTS

The mean age of patients was 63.3±0.8 years. There were 65 (46.1%) males and 76 (53.9%) females. 116 (82.3%) patients suffered of ischemic strokes, 25 (17,7%) had hemorrhagic strokes.

According to FAS score (critical value ≥22), proportions of patients with PSF had been significantly increased during observation period (Cochran Q=17,9; $p<0,05$). PSF was present in 31 (22,0%) patients at hospital stay, in 29 (20,6%) patients in one month, in 45 (31,9%) patients in two months and in 54 (38,3%) patients in three month after

Table I. Frequencies of PSF dimensional characteristics according to MFI-20 sub-scales during first 3 post-stroke months

PSF dimension	Time point after stroke onset			
	stay in hospital	1 month	2 month	3 month
global (≥12)	36 (25,5%)	27 (19,1%)	49 (34,8%)	50 (35,5%)
physical (≥12)	40 (28,4%)	38 (27,0%)	46 (32,6%)	58 (41,1%)
mental (≥12)	27 (19,1%)	48 (34,0%)	41 (29,1%)	45 (31,9%)
activity-related (≥12)	51 (36,2%)	32 (22,7%)	23 (16,3%)	24 (17,0%)
motivational (≥12)	21 (14,9%)	24 (17,0%)	22 (15,6%)	27 (19,1%)

Table II. MFI-20 sub-scales scores during first 3 post-stroke months (Me (Q1-Q3))

PSF dimension	Time points after stroke onset			
	stay in hospital	1 month	2 month	3 month
global	14 (13-16)	14 (13-18)	14 (13-17)	15 (14-19)*
physical	14 (14-15)	14 (14-15)	15 (14-16)	15 (14-15)*
mental	14 (13-14)	14 (13-15)	15 (14-15)*	14 (13-16)*
activity-related	14 (13-15)	13 (12-14)	14 (13-14)	13 (12-14)
motivational	13 (12-14)	13 (12-13)	13 (12-14)	13 (12-14

** - significant differences ($p<0,05$), according to Dunnett's test, in comparison with initial sub-scale score.*

Table III. Rates of FSS value ranks during first 3 post-stroke months

Time points after stroke		stay in hospital	1 month	2 months	3 months
Value ranks	<4	102 (72,3%)	89 (63,1%)	90 (63,8%)	71 (50,4%)
	4,0-4,9	22 (15,6%)	43 (30,5%)	30 (21,3%)	40 (28,4%)
	≥5	17 (12,1%)	9 (6,4%)	21 (14,9%)	30 (21,3%)

stroke. Thus, the frequencies of PSF due to FAS evaluation were doubled within first three post-stroke months.

As can be seen from the table I, rate of general PSF had been increased during observation period (Cochran Q=12,7; p<0,05) and in three months after stroke PSF affected more than a third of patients. Most likely, this phenomenon was based on significantly increasing the rates of PSF physical (Cochran Q=8,4; p<0,05) and PSF mental (Cochran Q=9,8; p<0,05) domains. On the other hand, the rates of PSF activity-related component had been drastically reduced during first post-stroke month and frequency of this PSF aspect was only 17,0% at the latest observation (Cochran Q=20,3; p<0,05). Finally, the incidence rates of motivational PSF were statistically stable during whole three months period.

Table II shows that severity of general PSF as well as physical and mental PSF components, according to MIF-20, had been evolved and changed significantly during early post-stroke period. Compared with baseline indicator, global PSF intensity was statistically increased in three months after stroke. Apparently, the basis of the last phenomenon was significant intensification of physical and mental PSF dimensions in the same time point. It is important that mental component of PSF was significantly intensified in even more early time (at two months after stroke). In addition, scores for activity-related and motivational components of PSF have been not significantly changed at any time point after stroke.

Generally, FSS value ranks ("no PSF", "PSF moderate influences on life's quality", "PSF severe influences on life's quality") had been changed in significant manner within three post-stroke months (Friedman F=131,6; p<0,05). As we see from table III, proportions of patients with "no PSF" had been decreased in 1.5 times due to simultaneously rising rates of "moderate PSF impact on daily life" as well as rates of "severe PSF impact on daily life" (roughly, both value ranks were in 2 times higher in comparison with the initial levels). These data substantially correspond to dynamics of PSF qualitative and quantitative characteristics according to FAS as well as to MFI-20 sub-scales for general, physical and mental fatigue. It's logically, that increasing the rates and intensities of PSF should follow with growing the PSF impact on patients' quality of life.

DISCUSSION

In general, the literature data about PSF frequencies have huge variation. According to various studies, at any time point after stroke the PSF incidences have broad range. PSF rates, according to literature review, range from 23% [12] to 59% [13] in the first days after stroke onset and range from 25% [14] to 45% [15] in three months after the stroke. Such huge variations of PSF prevalence can be explained by the numbers of different reasons, such as differences in outcome measures, patients' characteristics, administration of the measurements, so on. In our study incidences of PSF, according to different scales, were within above mentioned literature data. It's important, rates of global PSF, according to MFI-20, and rates of PSF, according to FAS, were more or less similar in certain time points.

Only few studies had reported PSF measured in multidimensional way just within early post-stroke period. Vuletic V. et al. showed that higher values of general PSF, according to MFI-20, in three months after stroke were determined by physical and reduced activity domains [15]. Christensen D. et al. also measured PSF by MFI-20 and found that presence of global PSF in ten days after stroke is based on physical and reduced activity dimension but global PSF in three months after stroke is based only on physical component [13]. We can't be directly compare our results with above mentioned studies due to different designs and methodologies. Nevertheless, the cardinal peculiarity of our study is that mental PSF domain is characterized by significant increasing of rates and intensities during first three months after stroke, so mental PSF component very likely plays significant role in development of general PSF. It is obvious that we need to explore mental PSF aspect more thoroughly and to increase our knowledge of factors which are exactly relevant to mental PSF.

To our knowledge, this is among the first study describing PSF characteristics at each single month during first post-stroke three months. Generally, according to all three applied scales (FAS, MFI-20 global fatigue sub-scale, FSS) the spreading and intensity of PSF had been significantly increased from the hospital staying to the final observation. This phenomenon may be explained by that fact that typically patients pay little attention to the PSF within first days or even first weeks after stroke due to other accompanying disorders and functional limitations. Patients' perception of PSF becomes more or less noticeable when they try to restore home, social and professional activity. On the other hand, PSF, as pathological entity, maybe has its inherent regularities of development which need to be investigated in future.

Up to now, there is only single longitudinal study that examined the evolution of PSF during first post-stroke months. It had been showed that the frequency of global PSF aspect is 59% in ten days after stroke and this value decreased up to 44% in three months after stroke [13]. In our study we did obtain a quite opposite result – the spreading of PSF had been raised during observation period. Most likely, this distinction is the consequence of different inclusion criteria between the studies (we applied strict exclusion criteria about co-morbidities, functional disabilities, cognitive impairments, so it had been selected quite specific patients contingent).

Further, our data clearly indicate that PSF is a heterogeneous entity with quite different dynamics of its components within early post-stroke period. In using the MFI-20, we measured different aspects of PSF (global, physical, mental, motivational and activity-related). As it had been revealed in our study, three months after stroke patients have higher rates as well as higher scores of global, physical and mental domains of the MFI-20. Most likely, gradual increasing of physical and mental patients' activity after hospital discharge can't be satisfied by diminished functional, psychological, mental and others capacities. As a result, sooner or later post-stroke patients begin to feel PSF in physical and (or) mental manifestations. So, it is important for more precise clinical decision-making in rehabilitation to define what aspects

of PSF are most commonly present as well as more pronounced in definite time point after stroke.

On the other hand, PSF is multifactorial, multipathogenetic pathological condition. Wu S. et al. proposed conceptual model of PSF as an evolving process. According to this model, in different time points after stroke PSF may be triggered predominantly by some specific factors [2]. It's plausible, definite PSF domain may be more or less attributable to certain pathogenic factors (biological, psychological, social, so on) with different time onset and time trajectories. For example, Hubacher M et al., by applying fatigue scale for motor and cognitive functions, revealed differences between lesion localization and domains of PSF during the first months after stroke: patients with cortical lesions scored higher on the cognitive sub-scale, while patients with subcortical lesions showed higher physical sub-scale scores [16]. Anyway, future studies should therefore explore the temporal relationships and causal directions between each PSF component and the most significant PSF risk factors.

CONCLUSIONS

1. PSF rates, according to FAS and MFI-20, is significantly increased during the first three post-stroke months.
2. The raising of PSF spreading is due to increasing of rates and intensities of physical and mental PSF domains.
3. PSF has significantly growing impact the patients' life during first three post-stroke months.

Future investigations in this field should be directed toward identification of socio-demographic, personal, neurological and other factors associated with general PSF as well as with certain PSF domains during early post-stroke period. Management of modifiable risk factors for PSF probably may be helpful for PSF prevention and management.

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