The European Research Journal 2022;8(4):468-474 Original Article

DOI: 10.18621/eurj.977242 *Physical Medicine and Rehabilitation*

Evaluation of central neuropathic pain and its relationship with quality of life in patients with stroke: a cross-sectional study

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ABSTRACT

Objectives: Unlike other complications in stroke patients, central post-stroke pain (CPSP) can sometimes be underestimated and overlooked. Considering the morbidities caused by CPSP in patients, it is clear that it is actually a very important problem. The aim of this study is to investigate the frequency of CPSP, the factors that cause CPSP, and the relationship between CPSP and individuals' quality of life and ambulation.

Methods: A cross-sectional study was conducted on a group of patients with stroke. 140 stroke patients were included in the study. The neuropathic pain was assessed with The Leeds Assessment of Neuropathic Symptoms and Signs (LANSS) pain scale, quality of life was assessed with Short Form 36 (SF-36) Questionnaire, and ambulation was evaluated according to the Functional Ambulation Classification (FAC). In addition, a special evaluation form was created for this study. With this form, the demographic characteristics of the patients, the type of stroke, the brain region affected by the stroke and the affected hemisphere were recorded. The patients were divided into two groups. Group 1 included patients with CPSP, and group 2 included patients who could not meet the diagnosis of neuropathic pain according to the LANSS pain scale, regardless of other pain types.

Results: CPSP was detected in 23 (16.5%) of 140 patients. CPSP was statistically significantly higher in female patients ($p = 0.006$). There was no statistically significant difference between the two groups in terms of other demographic characteristics ($p < 0.05$). There was no significant difference between the two groups in terms of affected cerebral region and stroke type ($p < 0.05$), but CPSP was found to be statistically significantly higher in patients with left hemispheric involvement ($p = 0.003$). Emotional role restriction, body pain, social function, general health and mental health subcategory scores of SF-36 were found to be significantly lower in group 1 than in group 2 ($p > 0.05$). In addition, when the two groups were compared in terms of ambulation levels, the rate of patients with FAC 2 and below was 73% in group 1, while this rate was 34.1% in group 2.

Conclusions: It was concluded that CPSP is a common problem and negatively affects the quality of life. Therefore, CPSP should be recognized in the early period after stroke and treatments should be arranged accordingly.

Keywords: Neuropathic pain, stroke, quality of life

According to the International Association for the Study of Pain (IASP), central post-stroke pain (CPSP) is a central neuropathic pain condition in which pain arises as a direct result of a cerebrovascular lesion in the central somatosensory nervous system [1]. The prevalence of CPSP has been reported to be

***Received:* August 1, 2021; *Accepted:* January 25, 2022; *Published Online:* April 14, 2022**

How to cite this article: *Ertem U, İrdesel J. Evaluation of central neuropathic pain and its relationship with quality of life in patients with stroke: a cross-sectional study. Eur Res J 2022;8(4):468-474. DOI: 10.18621/eurj.977242*

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e-ISSN: 2149-3189

11% [2]. Many complications can occur after stroke. One of these complications is the formation of CPSP. Although about 50% of stroke patients suffer from chronic pain, this can be overlooked [3].

There is an inversely proportional relationship between stroke severity and disability and quality of life [4]. The decrease in quality of life after stroke is not just related to stroke. Complications that occur after stroke can also negatively affect the quality of life of individuals. Depression, low socioeconomic status, fatigue, physical disability, female gender, residence in a nursing home, situations requiring social assistance, presence of pain in the affected limbs, situations requiring soft diet or tube feeding, and lack of physical exercise adversely affect the quality of life in post-stroke patients [5-7]. One of the complications that negatively affect the quality of life is the occurrence of CPSP. CPSP can adversely affect the quality of life by disrupting sleep quality and causing depression [8]. Also, neuropathic pain severity may be associated with decreased quality of life [9]. Therefore, CPSP should not be considered as a simple pain syndrome.

The aim of this study is to evaluate the frequency of CPSP, the effects of CPSP on quality of life and ambulation in stroke patients, and to determine the factors that may cause CPSP formation.

METHODS

Study Design

This study was conducted as a cross-sectional study between May 2016 and January 2018. The ethics committee approval for this study was made by Bursa Uludag University Faculty of Medicine Clinical Research Ethics Committee (decision no: 2016-8/20, date: April 26, 2016).

One hundred fourty patients diagnosed with stroke who were evaluated in an outpatient clinic or clinic were included in the study. Patients were divided into two groups. Group 1 included patients with CPSP and Group 2 patients without CPSP (Fig. 1). The patients included in Group 2 were selected from patients who could not meet the neuropathic pain criteria according to The Leeds Assessment of Neuropathic Symptoms and Signs (LANSS) pain scale, regardless of other pain types. Demographic data including age, gender, education level, and marital status were recorded. In addition, stroke type, number of previous strokes, time to post-stroke evaluation, affected brain region and hemisphere were recorded.

Patients older than 18 years of age and with sufficient cognitive level to answer the survey questions were included in the study. Patients who applied to the hospital or received treatment due to neuropathic pain complaints and patients with other conditions that may cause neuropathic pain (polyneuropathy, carpar tunnel syndrome, etc.) were not included in the study.

All patients who met the study criteria were informed of the study and a written consent was obtained.

Measures

Pain Assessment Tools - LANSS Pain Scale

Central neuropathic pain was evaluated with the LANSS pain scale. The total score on this scale is 24. Pain with scores of 12 and above is considered to be neuropathic pain. The LANSS pain scale was first used clinically by Bennett [10] to distinguish neuropathic pain from nociceptive pain . The Turkish validity and reliability of the LANSS pain scale was made by Yücel *et al*. [11] in 2004.

Assessment of Health-Related Quality of Life - Short Form 36 Questionnaire (SF-36)

SF-36 is a scale that evaluates the general health

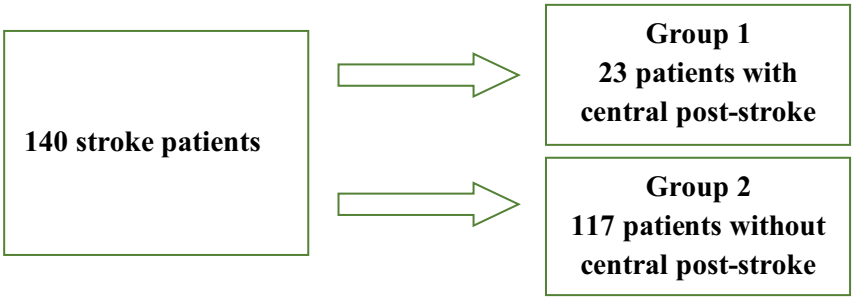

Fig. 1. Study flow diagram.

status with 36 questions in 8 subcategories including physical function, physical role restriction, emotional role restriction, body pain, social function, mental health, vitality and general health [12]. The Turkish validity and reliability of the SF-36 was made by Koçyiğit *et al*. [13] in 1999.

Assessment of Functional Level - Functional Ambulation Classification (FAC)

This scale was used to determine the level of functional ambulation. Patients with FAC 2 and below require varying degrees of manual support for ambulation, depending on their level [14].

Statistical Analysis

All data were analyzed using SPSS 23 for Windows (IBM Corp., Armonk, NY, USA). Whether the data showed normal distribution was examined by Shapiro-Wilk test. In descriptive statistics for continuous data, it was stated as mean ± standard deviation for variables with normal distribution and as median (minimum-maximum) for variables not showing normal distribution. Dependent sample t-tests and Mann–Whitney U tests were used to examine and compare the relationship between the characteristics of the sample. $P < 0.05$ was considered statistically significant.

RESULTS

Study Population

A total of 140 patients (66 female and 74 male) were enrolled in this study. The mean age of the patients was 62.4 ± 9.9 years. One hundred thirty of the patients were married and 10 were single. Fourty-two patients were illiterate, 70 patients were primary school graduates, 11 patients were high school graduates, and 17 patients were university graduates (Table 1).

Stroke Characteristics

The mean evaluation period of the patients with the occurrence of stroke was 7.2 ± 2.2 months. 43 of the patients (30.7%) had right hemiplegia, 97 (69.3%) patients had left hemiplegia; while the lesion site was in the extra-thalamic area in 99 (71.4%) patients, the lesion site was in the thalamic area in 41 (28.6%) patients. 30 (21.4%) of the patients had hemorrhagic stroke, and 110 (78.6%) had ischemic stroke (Table 1).

CPSP

While CPSP was observed in 23 (16.5%) patients, it was not observed in 117 (83.5%) patients. In cases

Table 1. Demographic and clinical characteristics of the participants

		n	%
Marital status	Maried	130	92.8
	Single	10	7.2
Education status	İlliterate	42	30.0
	Primary school	70	50.0
	High school	11	7.8
	University	17	12.2
Gender	Female	66	47.1
	Male	74	52.9
Affected hemisphere	Right hemisphere	111	79.3
	Left hemisphere	29	20.7
Affected cerebral localization	Thalamic	41	28.6
	Extra-thalamic	99	71.4
Stroke type	Hemorrhagic	30	21.4
	Ischemic	110	78.6

n = number of patients, % = percentage of patients

Table 2. Central post-stroke pain and related factors

	Group 1 (n = 23)	Group 2 (n = 117)	*p* value
Gender Female/male, n (%)	17/6 (73.9/26.1)	49/68 (41.9/58.1)	**0.006**
Age (years) (mean ± SD)	61.18 ± 9.86	64.15 ± 7.65	0.530
Affected hemisphere Right/left, n (%)	8/15 (34.8/65.2)	89/28 (76.1/23.9)	**0.003**
Affected cerebral region Thalamic/extra-thalamic, n (%)	5/18 (21.7/78.3)	36/81 (30.8/69.2)	0.384
Stroke type Hemorrhagic/ischemic, n (%)	3/20 (12.0/87.0)	27/90 (23.1/76.9)	0.407

n = number of patients, % = percentage of patients, SD = standard deviation, Group 1 = patients with central post-stroke pain, Group 2 = patients without central post-stroke pain.

with CPSP, the median time from the time of stroke to the onset of neuropathic pain was 2 (0-12) months.

CPSP and Demographic Data

Seventeen (73.9%) of 23 patients with CPSP were female. Statistically, the frequency of CPSP in female patients was found to be significantly higher than in male patients ($p = 0.006$). There was no statistically significant relationship between CPSP and age ($p = 0.530$) (Table 2).

CPSP and Stroke Characteristics

There was no significant difference between the two groups in terms of the affected cerebral region and stroke type ($p > 0.05$). But CPSP was significantly more common in patients with left hemispheric involvement ($p = 0.003$) (Table 2).

CPSP and Quality of Life

Emotional role restriction, body pain, social function, general health and mental health subcategories of the SF-36 were found to be significantly lower in group 1 compared to group 2 ($p < 0.05$). There was no statistically significant difference between the two groups between other SF-36 subcategories ($p > 0.05$) (Table 3).

CPSP and Ambulation

Table 3. The relationship between central post-stroke pain and quality of life

SF-36 subcategories	Group 1 (n = 23)	Group 2 (n = 117)	*p* value
Physical function	70.0 (10-90)	67.5 (10-95)	0.442
Physical role restriction	25.0 (0-100)	25.0 (0-100)	0.160
Emotional role restriction	0.0 (0-33)	33.0 (0-100)	**< 0.001**
Body pain	30.0 (0-50)	80.0 (40-100)	**< 0.001**
Social funtion	30.0 (0-60)	50.0 (20-90)	**< 0.001**
Mental health	20.0 (0-60)	40.0 (0-80)	**< 0.001**
Viality	0.0 (0-20)	0.0 (0-60)	0.780
General health	25.0 (0-50)	50.0 (0-100)	**< 0.001**

Variables are presented as median (min-max). Group 1 = patients with central post-stroke pain, Group 2 = patients without central post-stroke pain.

Patients with FAC 2 and below require varying degrees of manual support for ambulation, depending on their level. That's why we divided the patients according to whether they need manual support or not. While the rate of patients with FAC 2 and below was 73% in group 1, this rate was 34.1% in group 2 (Fig. 2).

DISCUSSION

In our study, the prevalence of CPSP was found to be 16.5%. Liampas *et al*. reported the prevalence of CPSP as 11% [2]. In one study, the minimum prevalence of absolute or probable CPSP was 7.3%, and the prevalence of CPSP-like dysesthesia or pain was 8.6% [15]. In another study, CPSP was detected in 8% of 166 stroke patients [16]. In a study conducted in Nigeria, the prevalence of CPSP was found to be 5% [17]. This variation in the literature may be due to selection criteria, evaluation time of patients, and the different ethnic populations studied.

There are studies in the literature showing that CPSP may be related to demographic characteristics of patients. Post-stroke pain found to be associated with female gender [18]. No relationship was found between CPSP and gender in another study [19]. In the study of Osama *et al*., the mean age of patients with CPSP was significantly lower than for patients without CPSP [20]. Kılıç *et al*. [19] found no relationship between age and CPSP . In our study, CPSP was significantly more common in women than in men ($p = 0.006$). Considering that pain syndromes are more common in female gender, we can say that our study is similar to the literature. Conversely, we found no relationship between age and CPSP.

In our study, there was no significant difference between the two groups in terms of affected cerebral region and stroke type, but CPSP was significantly more common in patients with left hemisphere involvement. We found that among stroke features, only the affected hemisphere was associated with CPSP. However, many studies show that the affected cerebral region is associated with CPSP. One study found that CPSP formation was associated with the cortical or thalamic location of stroke [21]. In another study, the brain regions most associated with CPSP risk were the anterior/middle cingulate cortex, insula, thalamus, and lower parietal lobe [22]. Harno *et al*. [23] found that the area affected in stroke was not associated with CPSP. There are different results in the literature regarding the relationship between CPSP and stroke characteristics. However, in general, we can say that CPSP is more common in strokes with thalamic involvement. Contrary to the literature, in the current study, no relationship was found between the affected brain region and CPSP. We think that this difference may be due to the different time of questioning the patients in terms of neuropathic pain.

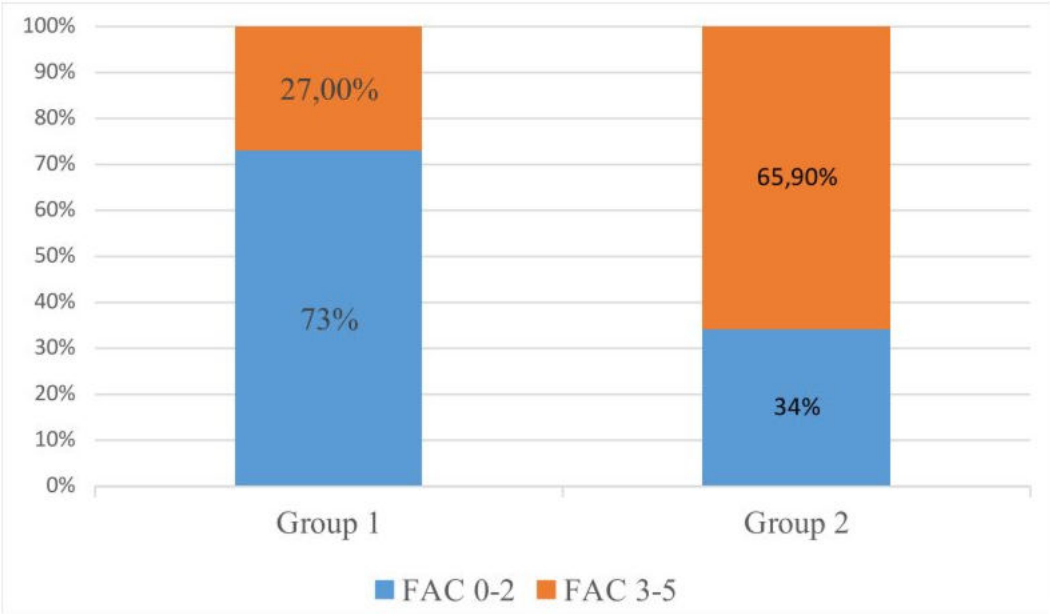

Fig. 2. Central post-stroke pain and ambulation.

In our study, some subcategories of SF-36 were lower in patients with CPSP than in patients without CPSP. In the study of Şahin *et al*. [24], some subcategories of SF-36 (emotional role restriction, social function, mental health, vitality and general health) were found to be significantly lower in patients with CPSP. In another study, CPSP was found to be associated with quality of life [25]. In the study of Gökkaya *et al*. [26], it was determined that quality of life in stroke patients was related to functional status, gender, education, presence of comorbidity and psychological factors. Gorst *et al*. [27] found that foot and ankle disorders such as pain, altered somatosensory input, and weakness contributed significantly to ambulation, balance, and fear of falling problems in stroke patients. In another study, neurological symptoms, cognitive function, and initial neuroimaging findings were found to be useful in predicting independent walking in patients with thalamic hemorrhage [28]. There are many studies showing that pain in stroke, and especially CPSP, affects quality of life. In our study, it was found that the quality of life was negatively affected in the presence of CPSP, which was consistent with the literature. There is not enough data in the literature showing the relationship between ambulation and CPSP. In our study, the presence of CPSP caused poor ambulation results. We think that this may be due to both the negative effects of pain on patients' ambulation and the higher incidence of CPSP in severe and widespread strokes, which cause worse functional outcomes.

Limitations

The missing aspects of our study; The fact that the included patients were not distributed homogeneously in terms of age and involved lesion location made it difficult to evaluate the effect of the involved hemispheric area on the development of CPSP. In addition, since we grouped patients only as thalamic and extrathalamic according to the lesion location, widespread or limited infarcts, affected brain structure and other extra factors were not taken into account. Apart from this, evaluation of patients at different times may have affected the prevalence of CPSP. In addition, the fact that the spasticity of the cases was not evaluated and more sensitive scales were not used to evaluate the ambulation are the weaknesses of our study.

CONCLUSION

In conclusion, due to the increase in diagnosis, treatment opportunities and survival rates, the incidence of stroke patients is increasing day by day and it becomes a more important public health problem. This shows the importance of follow-up and complications of stroke patients for the individual and society. As with other complications after stroke, CPSP causes a decrease in functional capacity and loss of quality of life. Although CPSP is such an important problem, it is neglected compared to other complications. CPSP should be recognized in the early period after stroke and treatments should be arranged accordingly.

Authors' Contribution

Study Conception: UE, Jİ; Study Design: UE, Jİ; Supervision: UE, Jİ; Funding: N/A; Materials: N/A; Data Collection and/or Processing: UE, Jİ; Statistical Analysis and/or Data Interpretation: UE, Jİ; Literature Review: UE, Jİ; Manuscript Preparation: UE, Jİ and Critical Review: UE, Jİ.

Conflict of interest

The authors disclosed no conflict of interest during the preparation or publication of this manuscript.

Financing

The authors disclosed that they did not receive any grant during conduction or writing of this study.

Acknowledgement

It was presented only in Turkish as an oral presentation in a congress in our country.

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