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The Relatıon Between Qualıtatıve And Qantıtatıve Parameters Of Freezıng And Walkıng In Idıopathıc Parkınson's Dısease

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ABSTRACT

Purpose: Our study is planned for determining the relation of some qualitative and quantitative parameters of freezing phenomenon and walking in patients with Idiopathic Parkinson's Disease (IPD). **Methods:** 87 patients (37 -%42.5 female, 50-%57.5 male) in ErciyesUniversity Faculty of Medicine Neurology Department involved in this study. Patients were evaluated by demographic data, Mini Mental State Examination (MMSE), Hoehn-Yahr Scale, the Unified Parkinson's Disease Rating Scale (UPDRS), freezing, 6 meter walking time, step count, rotation and related to step parameters. **Results:** Hoehn- Yahr Scale for the involved patients between 1-3, 14 out of their was 1(%16.1) and 17 out of their was 3 (%19.5). Freezing phenomenon was determined in 34 (%39.1) of the patients. There were no statistically difference between freezing and non-freezing patients about age, gender, education, profession, marital status and MMSE ($p>0.05$). Statistically difference were obsorved between freezing and non-freezing groups about UPDRS, rotation time 360 degrees from right, rotation time 360 degrees from left, balance defect at 360 degrees right rotation, 6m walking time, step count, hesitating gait, arrhythmic stepping, opening arms outside while walking ($p<0.05$). **Discussion:** Our study showed freezing phenomenon effects some walking parameters for IPD. Effect of freezing phenomenon on postural instability and It's effection balance should be investigated. Also exercise programmes in IPD with freezing phenomenon should focus on walking education.

Key Words:
Idiopathic Parkinson's Disease, freezing, walking

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1. Introduction

Parkinson's disease (PD) is the second most common neurodegenerative diseases. It affects 1% of the population over 65 years old worldwide. PD is a multi-system disease characterized by the progressive degeneration of the dopaminergic nigrostriatal system in the deep part of the brain. Motor symptoms of the disease are; rigidity, bradykinesia, hypokinesia, rest tremor, postural instability, freezing during walking. In addition, PD may show gastrointestinal, sensory, visual and neuropsychiatric effects with motor symptoms. All these symptoms can affect the person's quality of life negatively. Particularly in patients with PD, postural problems, impaired walking and tremor can occur together and can cause falls secondary[1-3].

One study reported that proprioceptive impairments exist in this disease and proprioceptive deficit leads to postural deficit. It is thought that freezing phenomenon is also effective on fall as much as postural deficit. Freezing during walking is the case where the foot is stuck to the floor according to patients, and it occurs suddenly making the person temporarily unable to move for a few seconds (<10 sec) [4-7]. This desease often affects the lower extremities. Freezing occurs before the walk and causes to fall [8-10]. Freezing condition can be seen at the beginning, during walking or turning from side to side [4,5]. We therefore think that the phenomenon of freezing may affect gait parameters. When the literature is examined, a limited number of studies have been found on PD freezing phenomenon effect on gait parameters.

Our study was designed to determine the frequency of freezing phenomena in PD, in relation to sociodemographic factors and to investigate whether there was any effect of freezing on qualitative and quantitative parameters of gait.

2. Materials and Methods

2.1. Patient selection:

Eighty-seven patients who were followed up in neurology outpatient clinic, XXX University Faculty of Medicine, with PD diagnosis were included in the study. Conditions of the study were explained to to the patients and got approval of them. Inclusion criteria of the study was; those who had diagnosis of idiopathic Parkinson's disease according to the criteria of the United Kingdom Parkinson's Disease Society Brain Bank (UK-PDSBB). We conducted a Mini Mental State Examination (MMSE) test to evaluate cognitive levels. We had choosen patients who had scores over on MMSE and asked patients to walk independently at least 6 m. The Patients who has no hearing, speaking, orthopedic, systemic or neurological problems that could can prevent walking were not included in the study. All cases were evaluated during the "on" (drug active) period. The required ethical permission for the study was taken from XXX University Faculty of Medicine Clinical and Laboratory Research Medical Ethics Committee (decision no. 2015/414 dated 17.09.2015).

All Patients were evaluated in terms of demographic characteristics, Modified Hoehn-Yahr Staging (H&Y), Unified Parkinson's Disease Rating Scale (UPDRS), Freezing phenology, 6m walking time and number of steps, rotation and stepping parameters.

2.2.H&Y staging:

The staging of the Parkinson's disease was done with the H&Y scale. H&Y scale examines the disease in 5 stages [11].

2.3. UPDRS:

A combined parkinson's disease assessment scale is widely used for the clinical assessment of disease severity in Parkinson's patients [12]. 1-Mental state, behavior (16 points) 2-Daily living activities (DLA) (52 points), 3- Motor subscores (92 points), and UPDRS total scores were used for statistical analysis.

In the freezing phenomenon story, the patient was questioned as whether there was a sudden or staggered deceleration and eventually a

freezing story while walking in normal unobstructed environment, as opposed to accelerating movements [4,5].

2.4. Rotation:

The patient was asked to start turning for 360-degrees, from left to right and from right to left, while the chronometer was turned on at a certain moment of rotation, and the rotation times were calculated by stopping the stopwatch when 360 degrees were completed. Between each turn there was a break for the comfort of the patient. Equilibrium and posture were being categorized on turns.

2.5. Walking Speed:

Walking time for 6m's test was evaluated and recorded [13]. Also, another officer recorded how many steps he took at the same distance (Walking Hope -Cadance). Mean values of the trials were obtained.

Table 1. Demographic features of Parkinson's disease patients with and without freezing.

		Patients with freezing N: 34 (%)	Patients without freezing N: 43 (%)	p
Sex	Female	12 (35.3)	25 (47.2)	0.274
	Male	2 (64.7)	28 (52.8)	
Education	Not literate	7 (20.6)	12 (22.6)	0.520
	Primary	19 (55.9)	25 (47.2)	
	Secondary	3 (8.8)	6 (11.3)	
	High	5 (14.7)	6 (11.3)	
	University	0	4 (7.5)	
Occupation	Housewife	12 (35.3)	22 (41.5)	0.807
	Retired	15 (44.1)	19 (35.8)	
	Self-employment	2 (5.9)	2 (3.8)	
	Occupied	5 (14.7)	10 (18.9)	
Marital status	Married	32 (94.2)	50 (94.3)	0.388
	Single	1 (2.9)	3 (5.7)	
	Widow	1 (2.9)	0	

Table 2. The Relation of quantitative walking parameters between freezing phenomenon and clinical features among

	Patients with freezing		Patients without freezing		p
	X±SD	Median (min-max)	X±SD	Median (min-max)	
Hoehn& Yahr stage	2.30±0.62	2(1-3)	1.780±0.60	1.5(1-3)	0.000*
UPDRS Mental	1.53±2.28	0(0-8)	0.70±1.20	0(0-4)	0.169
UPDRS DLA	14.06±6.91	12.5(5-32)	5.28±4.88	4(0-23)	0.000*
UPDRS Motor	9.12±7.59	7.5(0-29)	5.98±6.23	3(0-22)	0.003*
UPDRS Total	24.76±14.17	23.5(5-56)	12±11.14	8(1-45)	0.000*
6 m walking (sec)	22.51±16.80	16.75(8-90)	13.94±5.70	12.5(6.5-31)	0.002*
6 m walking (number of steps)	26.52±12.75	22.75(13.5-66)	19.95±7.52	18.5(11-45)	0.002*
360° turn around (right side) (sec)	11.12±7.95	9.5(3-42)	5.81±3.18	5(2-17)	0.000*
360° turn around (leftt side) (sec)	11.79±8.64	9.5(3-45)	5.88±3.11	5(2-18)	0.000*

*p<0.05, UPDRS: Unified Parkinson's Disease Rating Scale, DLA: Daily living activities

2.6. Statistical Analysis

Shapiro Wilks test statistics was used for the distribution of the data in the study. The Mann Whitney U test statistic was used to compare two independent sample groups for the variables that were not suitable for normal distribution. The Exact method of Pearson Chi-square test statistic was used to compare categorical variables. Significance value was accepted as p = 0.05. IBM SPSS 22 program was used for statistical analysis.

3.Results

We collected 87 patients with PD. There were 37 female patients (42.5 %) and 50 male patients (57.5 %). The mean age was found 61.37 (±12.65). On the examination of all PD patients freezing phenomenon was 34 (39.08 %) detected. There was no statistically significant difference between groups with and without frozen phenomen due to age, gender, education, occupation, marital status (p> 0.05) The characteristics of the patients are shown in Table (Table 1).

There was a significant difference between the two groups in the H&Y stating, UPDRS on DLA and motor scores. These are 360-degree rotation time from the right, 360-degree rotation time from left, 6 m walking distance and number of steps (p=0.05), but in terms of

UPDRS mental scores there was no significant difference between the two groups (p> 0.05) (Table 2).

There was a statistically significant difference (p<0.05) in between non-freezing and freezing groups (p<0.05) when examined in terms of parameters such as difficulty in starting walking, unsteady walking, no stepping motion in walking, arm swinging disorder while walking and swinging in the body. There was no statistically significant difference (p> 0.05) (Figure 1) when examined in terms of gait problems.

According to H&Y measurement results, ones who stated that they freeze 4.450 times than non-freezing ones. According to the GYA measurement results in terms of freezing condition, the ones who say they are freezing were 1.063 times more under risk than non-freezing ones. Also, according to UPDRS motor measurement results, ones who were stating they freeze were 1.068 times than non-freezing ones. According to the UPDRS total measurement results ones who said they freeze were 1.081 times riskier than non-freezing ones (Table 3).

Table 3. The results of logistic regression analysis.

	Freezing (yes-none)
	Odds (%95 CI)
Hoehn&Yahr stage	4.450 (2.057-9.624)
UPDRS DLA	1.063 (0.911-0.970)
UPDRS motor	1.068(1.002-1.140)
UPDRS total	1.081 (1.0.38-1.125)

UPDRS: Unified Parkinson's Disease Rating Scale, DLA: Daily living activities

4.Discussion

In our study; we show that, a significant difference was found between the two groups when compared according to parameters such as H&Y, UPDRS on DLA and motor scores. Rotation time from right, 360-degree rotation time from left, 6m walking time and step number were found different, but no significant difference was found between the two groups in UPDRS mental scores. There was a statistically significant difference between the two groups in favor of freezing group when examined in terms of parameters such as difficulty in starting the walk, hesitant walking, lack of continuity in walking. Arm swinging disorder while walking, and swinging in the body were statistically meaningful, while no statistically significant difference was found between the two groups in terms of cicumduction gait, heel walking and gait.

Freezing phenomenon thought to be associated with walking parameters are among the most common causes of disability that are common in PD and may cause future falls [6,14-16]. In a Chinese study of freezing in Parkinson's disease with 248 early-stage (H & S stage ≤ 2.5) Freezing phenomenon reported in 128 patients [6]. In another study, 34.3% of patients

were reported with freezing phenomenon [7]. Similarly, we found a freezing phenomenon in 34 of 87 patients in our patient group with Hoehn-Yahr Staging 1-3. Hoehn-Yahr Staging in PD, which has a freezing phenomenon, was found to be higher than non-freezing group. This has shown that freezing cannot be a determinant in the very early stages of the disease.

In our study, interms of demographic information such as age, gender, education, occupation, marital status there was no statistically difference between groups of freezing and non-freezing phenomenon among PD patients. Similar to our study, Tollensan et al found no difference interms of age, gender, and education [17]. In addition, this study showed that there is a relationship between moving rhythm and freezing phenomenon. In our study, Arm swinging disorder while walking, which may be associated with gait rhythm, was observed more in the group with freezing habit.

Duncan and colleagues found that the Balance Assessment System, the shortened one, which was completed in more than 30 minutes for evaluating the balance in Parkinson's patients with and without freezing, is more effective than the Berg-Balance Balance Assessment in these patients [18]. In our study, the walking assessment was assessed in terms of 6m walking time and parameters related to step count, turns and stepping. Future studies are considered to be crucial in establishing more efficient treatment programs in patients with frozen phenom- onia, including evaluations of balance and march.

In a study of the relationship between progression of disease and postural oscillation in PD patients. Thirteen PD patients at the onset of the disease were evaluated at 3, 6, and 12 months for anteroposterior and mediolateral release, and there was an increase specially in mediolateral release, compared to healthy controls, and has been found to be reduced by the effect of this treatment [19]. Our results demonstrate that that body oscillation can be an important parameter in PD patients. We have seen that in the group with freezing phenomenon the body oscillation is almost twice.

No differences were found in the parameters of the automatic postural response amplitude and initial balance correcting step length between the group with and without Freezing phenomenon in 25 patients with PD [20]. Although objective test parameters were not used in our study, we found a difference between the two groups in the qualitative and quantitative parameters of the walk.

When the literature is examined, it is reported that there have been very few studies performed with PD. Among these studies, it has been shown that freezing phenomenon was associated with low quality of life scores [21]. In our study, it’s found that many of the walking parameters have been negatively affected by freezing phenomenon. It is thought that it would be beneficial to use the quality of life and functional evaluations of these studies together in this group of patients and to make appropriate treatment combinations by evaluating the patients in a multi-faceted manner.

In patients with PD, difficulty of turning affects walking, and 50 % of these patients are reported to have difficulty turning [22,23]. In our study, the patients with freezing phenomenon completed the rotation tests in a longer time and at a slower rate. We think that results of these patients with freezing phenomenon should be investigated whether this fear is caused by fear of falling or if they are caused by slow motion.

In the literature, a large group study examining the relation of the freezing phenomenon with walking parameters in idiopathic Parkinson's disease is limited. Usually the Parkinson type is not specified. As the walking analysis, measurements made in the laboratory environment were used. Our study is similar to the results of gait analysis studies using complicated and time-consuming systems such

as gait analysis. In the literature, it is noteworthy that walking analysis is mostly done with three-dimensional gait analysis systems [24-26]. It is obvious that subjective measurements, rapid in terms of clinical measurements and gives similiar results like objective results, will save much time especially in patients with motor problems such as PD. We think that these methods can evaluate all the findings faster and patiently so that appropriate treatment programs can be determined.

Conclusion

Our pioneer study showed that the freezing phenomenon negatively affected a lot of walking parameters in PD. In future studies, the effect of freezing on postural instability and balance would be investigated. Exercise programs should also focus on walking training in PD to avoid falls and other potential risks.

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