



Full Length Article

Near-falls in people with Parkinson's disease: Circumstances, contributing factors and association with falling

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ABSTRACT

Objectives: To describe circumstances of near-falls among persons with Parkinson's disease (PD), assess factors associated with near-falling and assess whether near-falls in the first 6 months are associated with falling in the latter 6 months over one year of follow-up.

Materials and methods: In the period August 2011–December 2012, 120 consecutive persons with PD, who denied having fallen in the past 6 months, were recruited at Clinical center of Serbia in Belgrade. Occurrence of falling and near-falls was followed for one year.

Results: A total of 31 persons with PD (25.8%) experienced near-falls, but did not fall. Of 42 fallers, 32 (76.2%) experienced near-falls. Tripping was the most common cause of near-falls among fallers, whereas postural instability was the most common in non-fallers. Regardless of falling experience, the most common manner to avoid fall was holding onto furniture or wall. After adjustment for multiple motor and non-motor PD features, more severe freezing of gait was associated with occurrence of near-falls over one year of follow-up (odds ratio [OR] = 1.08, 95% confidence interval [CI] 1.01–1.16; $p = 0.043$). Adjusted regression analysis did not show associations between near-falling in the first 6 months and falling in the latter 6 months of follow-up.

Conclusion: Near-falls commonly occur in persons with PD. More severe freezing of gait appears to predispose near-falling. Fall prevention programs focusing on balance maintenance when experiencing freezing of gait could potentially be useful in reduction of near-falls.

1. Introduction

Falls among persons with Parkinson's disease (PD) are frequent. Estimated prevalence of falling in PD ranges from 38% to 68% [1]. Extensive epidemiological research has demonstrated that history of previous falls, poor standing balance, motor-issues such as freezing of gait in particular, brain-related changes, depression and fear of falling represent risk factors for falls in PD [2–6]. Falls often result in activity limitations, participation restrictions, social isolation or premature mortality [7]. Subsequently, fall-associated consequences in PD contribute to higher health expenditure [8]. Considering heterogeneity of risk factors for falling, only a small proportion of falls among persons with PD result from an obvious, single cause [9].

Near-falls have been commonly reported among persons with PD [10]. Specifically, over a period of one year, 75% of persons with PD experienced a situation in which they nearly fell [10]. A circumstance of near-falling (or almost falling) is related to stumbling or balance loss

that would result in falling if sufficient recovery mechanisms were not activated [11]. In line with this, it has been observed that near-falls often predispose falls in general older population [12]. Similarly, occurrence of near-falls could influence fall events among persons with PD. However, there is a lack of information regarding circumstances in which near-falls in PD occur, and which factors contribute to episodes of near-falling.

Given that near-falls are remarkably prevalent, the purpose of this study was to: 1) describe circumstances in which episodes of near-falls occur; 2) assess factors associated with occurrence of near-falls and 3) assess whether episodes of near-falls in the first 6 months are associated with falling in the latter 6 months over one year of follow-up.

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2. Material and methods

2.1. Study design

The study was designed as prospective cohort study. Participants were followed for one calendar year. The study began at initial examination at outpatient department (August 2011–December 2012). Follow-up period of the last person in the cohort ended in December 2013.

2.2. Selection of participants

As many as 120 consecutive persons with PD, who denied having fallen in the past 6 months, were recruited at the Department of Movement Disorders, Neurology Clinic, Clinical center of Serbia in Belgrade from August 15, 2011 to December 15, 2012. To ensure that persons with PD were mobile and independent at least around their living space the following inclusion criteria were set: ability to walk independently for at least 10 m and ability to statically stand for at least 90 s. To eliminate potential walking difficulties and participation restrictions, influenced by other impairments or disabilities that could have facilitated falling at the time of fall, exclusion criteria were the following: cognitive impairment, presence of other neurologic (e.g. stroke, traumatic brain injuries, dementia) as well as psychiatric (e.g. psychoses), visual, audio-vestibular and orthopedic impairments (e.g. fracture, moderate to severe osteoarthritis). The study was approved by the Ethical Committee of Faculty of Medicine of the University of Belgrade. Participants signed an informed consent prior to enrollment in the study.

2.3. Measurement instruments

Demographic and clinical characteristics were taken from the medical records of the Neurology Clinic. The PD diagnosis was made according to the United Kingdom Parkinson's Disease Society (UK-PDS) Brain Bank criteria [13]. Cognitive status was assessed by Mini Mental State Examination (MMSE) [14] and only those with a score ≥ 24 were included (i.e. those without cognitive impairment). Disease stage and severity was assessed using the Hoehn and Yahr scale (HY) [15] and the newer version of the Movement Disorder Society - Unified Parkinson's Disease Rating Scale (MDS-UPDRS) [16]. The UPDRS is divided in 4 subscores UPDRS I, II, III and IV and the total score (representing the sum of four subscores). Subsections' scores UPDRS I and II range from 0 to 52; the UPDRS III score ranged from 0 to 132, while the UPDRS IV ranged from 0 to 64. Therefore, the total UPDRS score varies from 0 to 248. Dosages of levodopa were calculated based upon the systematic review of levodopa dose equivalency (LED) reporting in PD [17].

Also, the Falls Efficacy Scale (FES) was applied to estimate fear of falling and the Self-Assessment Disability Scale (SADS) to quantify the level of difficulty while performing activities of daily living. Both scales were previously validated and culturally adapted [18,19]. The total FES score of > 70 indicated a fear of falling. A higher total SADS score indicated greater disability. Study participants also responded to the New Freezing of Gait (NFOG) questionnaire for frequency, severity and impact of freezing on daily activities (with permission of the author) [20]. To assess the impact of non-motor impairment the Hamilton Depression Rating Scale (HDRS) [21] and the Hamilton Anxiety Rating Scale (HARS) [22] were used.

2.4. Follow-up and registration of falls and near-falls

A fall was defined as an event which results in an individual coming to rest inadvertently on the ground/floor. Definition of near-fall, following criteria used in the literature, implied stumbling or loss of balance that would result in a fall if sufficient recovery mechanisms were not activated [11]. Additional explanation to participants referred to

near-fall as “a fall initiated but arrested by support from a wall, railing, other person, etc.” [23]. Occurrence of falls and near-fall was registered during one calendar year.

Each person with PD was given a ‘fall and near-fall diary’ with the aim at writing characteristics of near-fall as soon as possible after having this experience. The diary represented a booklet with printed tables in each page. Each part of the table referred to a particular circumstance in which a fall and/or near-fall occurred. Circumstances that preceded near-falling were grouped according to extrinsic (such as tripping, slipping) and intrinsic factors that comprised postural instability, dizziness and freezing of gait. Postural instability was defined as involuntary movement of the body either forward (anteropulsion), backward (retropulsion) or to the side (lateropulsion). Additionally, in the near-fall diary, participants were required to explain in own words the manner they avoided falling. Based on their descriptive responses, manners to avoid falls were grouped into three categories: holding onto furniture/walls, holding onto persons nearby and own balance recovery. Also, each month subjects were contacted by investigator through telephone to ensure that all falls and near-falls were reported in case participants failed to fill in the “fall and near-fall diary”. Final near-fall characteristics were obtained through detailed telephone interviews. After one year, 7 persons (5.8%) were lost to follow-up: one person died, one patient moved abroad after 8 months, while 5 were not reachable over telephone.

2.5. Data analysis

Differences in categorical variables were assessed by using Chi square test, while Kruskal-Wallis test for three independent samples was used to assess differences in continuous variables among fallers, near-fallers and non-fallers. Proportions were used to describe frequencies of near-fall episodes, circumstances of near-falls and manners to avoid falling after near-fall. Chi square and Fisher's exact test were used to assess differences in categorical variables.

To assess whether the baseline demographic and clinical characteristics of persons with PD in our entire cohort of 120 individuals were associated with having episodes of near-falls over one year after testing, we created a series of logistic regression models. In all the models the dependent variable was having near-falls over one year of follow-up (yes/no). The independent variables were grouped in three models: Basic model included gender, age and PD duration; Motor symptoms model included variables from the Basic model and also levels of HY, UPDRS III, LED, NFOG and SADS. In the final, Full model, we added non-motor features to the existing independent variables: FES, HDRS and HARS.

To evaluate whether having episodes of near-falling were associated with falling among persons with PD, we have also tested a series of logistic regression models. However, in this part of the analysis, the exposure, i.e. independent variable, was having near-falls in the first six months of follow-up. The outcome, i.e. the dependent variable, was occurrence of falling in the latter six months of follow-up. The independent variable in unadjusted model was occurrence of near-falls in the first 6 months of follow-up. In the Basic model age, gender and PD duration were added as covariates. Next, in Motor symptoms model, we added values of motor symptom assessment: HY, UPDRS III, LED, NFOG and SADS. In the final, Full model, non-motor symptoms were added (FES, HDRS, HARS). Probability level of ≤ 0.05 was considered statistically significant. For statistical analysis the SPSS 17.0 statistical software package (SPSS Inc, Chicago, IL, U.S.A.) was used.

3. Results

After one year of follow up, 42 persons (35.0%) reported at least one fall. Among them, 23 (54.8%) experienced recurrent falls (two or more). A total of 31 persons with PD (25.8%) experienced near-falls, but did not fall over one year of follow-up. The vast majority of these

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