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Functional status as a predictor of the incidence of falls in 10-year follow-up: results from the RAC-OST-POL study

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Abstract

Introduction: The aim of this prospective study was to establish the influence of baseline functional status on the incidence of falls.

Material and methods: The study was performed in an epidemiological sample of postmenopausal women from the RAC-OST-POL study. At baseline there were 978 postmenopausal women with a mean age of 65.9 ± 7.6 years, and at the end of 10-year follow-up 640 patients with a mean age of 65.04 ± 6.95 years remained in observation. Functional status was established at baseline using a stand up and go test (SAG) and the Lawton Instrumental Activities of Daily Living (IADL) scale. Afterwards, data on fall incidence were updated annually using phone interviews.

Results: In a 10-year period of observation, in 384 (60%) women at least one fall occurred. At baseline, 90% of subjects achieved maximal value in the IADL scale (24 points). Although the difference between mean IADL score in those who fell and did not fall was noticeable (23.50 ± 1.68 vs. 23.65 ± 1.47 , respectively), the category of any IADL score below 24 points was significantly more frequent in women with falls (71.9% vs. 28.1%; chi-square 4.2, $p < 0.05$). The SAG score in the subgroup with falls was (10.75 ± 3.39) and did not differ in comparison to subgroup without falls (10.27 ± 2.72).

Conclusion: The baseline result of the IADL scale but not that of the SAG test are related to the incidence of falls in a 10-year prospective observation. Adequate correction of functional status may benefit patients and reduce the fall rate. (*Endokrynol Pol* 2023; 74 (4): 404–407)

Key words: female; functional status; fall incidence

Introduction

Osteoporosis is a medical condition with serious health consequences, e.g. low-trauma fractures. Bone loss is the main factor increasing fracture risk, and the second essential factor is the affected functional status. The majority of all fractures result from impaired functional status and falls. With increasing age, the importance of functional status is more significant. Therefore, a proper assessment of elderly subjects with osteoporosis should always include not only bone mass measurements but also some measures that help to establish the patient's functional status. Several methods were designed to evaluate functional status [1–4]. Also, other clinical risk factors for osteoporosis should be taken into consideration. In our previous study, the epidemiology of falls observed in an epidemiological RAC-OST-POL study cohort of postmenopausal women aged over 55 years was presented [5]. Another study performed in the same population showed that affected functional status increased fall and fracture rates [6]. The role of

falls as a risk factor of fracture is also enhanced by including falls in some algorithms designed for fracture risk prediction. Fracture risk established by Garvan nomogram [7, 8] and POL-RISK [9, 10], among other risk factors (age, femoral neck bone mineral density, prior fracture, and steroid use), is also modified by the occurrence of falls. One may consider that proper assessment of fracture risk in an individual subject should always concern the description of functional status. The fall rate can easily be interpreted as an indirect expression of impaired functional status.

In the current prospective study we present data on the role of baseline assessment of functional status as a factor related to falls noted in 10-year follow-up.

Material and methods

In this study the results of 10-year observation of an epidemiological female sample from the RAC-OST-POL study are presented. The baseline observation was performed in 2010, and epidemiological data describing the study group were presented earlier [11]. At baseline 978 postmenopausal women with a mean age of 65.9 ± 7.6



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years were enrolled. At 10-year follow-up 640 patients with a mean age of 65.04 ± 6.95 years remained under observation.

Functional status was established at baseline using a stand up and go test (SAG) test [3] and Instrumental Activities of Daily Living (IADL) score [4]. The optimal value for IADL is 24 points, and each score below that value indicates that functional status is impaired. These measures of functional status were used as the predictors of falls in longitudinal observation.

During the period of observation all subjects were asked annually by phone interviews about falls that occurred within the last 12 months. All interviews were performed by the same investigator (WP).

Statistics

Statistical analysis was performed using Statistica software (StatSoft, Tulsa, OK, United States). The mean values and standard deviations were used for descriptive statistics of continuous variables. The normality of data distribution was verified by the Shapiro-Wilk test. Absolute values and percentages were given for qualitative variables. Student's t-test for independent samples or the Mann-Whitney U test was applied for comparative analyses of continuous variables, depending on the data distribution. For comparisons of more than 2 subgroups, the ANOVA test with post-hoc least significant difference (LSD) test were applied. Comparisons of qualitative features prevalence were performed by the chi-square test. The odds ratio for predictors of falls was established based on logistic regression analysis. The significance of results in all the statistical analyses was assumed at $p < 0.05$.

Results

During the period of observation only 256 (40%) women reported no falls, whereas in the majority of study participants, namely 384 (60%) subjects, at least one fall occurred. 269 (42%) women reported 2 or more falls (up to maximal number of 45 falls in one subject). Women with falls were significantly older than women without falls, with a mean age of 65.7 ± 7.0 versus

64.1 ± 6.7 years, $p < 0.01$, respectively. The mean age of the women with one fall was 64.5 ± 7.2 years, which did not differ in comparison with women without falls. However, the mean age in women with 2 or more falls was 66.2 ± 6.9 years, which differed significantly in comparison to women without falls ($p < 0.001$) and with one fall ($p < 0.05$).

At baseline, 90% of subjects achieved the maximal value in the IADL scale (24 points). Thus, the difference between mean IADL score in those who fell and those who did not fall was noticeable (23.50 ± 1.68 vs. 23.65 ± 1.47 , respectively), which was statistically significant when compared using the Mann-Whitney U test. For additional comparison, the IADL score was categorised into 2 categories: the optimal score (24 points) and any IADL score below 24 points (64 subjects, 10% of the study group). Among the latter subgroup, 71.9% reported at least one fall, whereas only 28.1% had their follow-up period free from falls, which makes a statistically significant difference in comparison to women with maximal IADL score, who experienced falls in 58.7% and stayed without falls in 41.3% (chi-square 4.2, $p < 0.05$). The falls occurrence in relation to the IADL score is presented in Figure 1.

The SAG score in the subgroup with falls was 10.75 ± 3.39 , and it did not differ significantly in comparison to the subgroup without falls, having mean value of 10.27 ± 2.72 .

To establish how much the functional status changes the probability of falls, logistic regression was applied. The odds ratio (OR) for experiencing at least one fall during the 10-year period of obser-

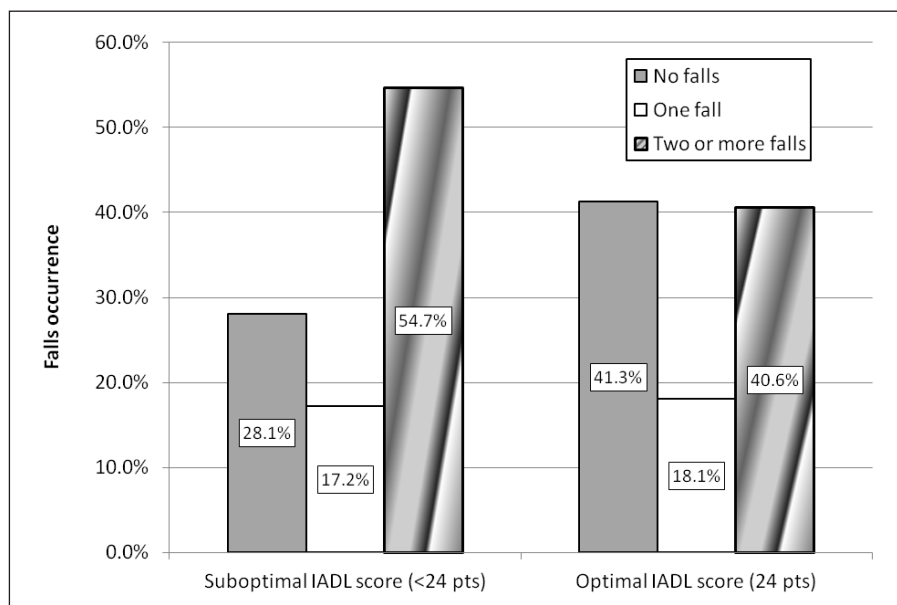


Figure 1. The falls that occurrence in longitudinal observation (percentage values) in study subjects divided according to the Lawton Instrumental Activities of Daily Living Scale (IADL) score achieved at baseline

vation when the IADL score was suboptimal (any result below 24) was 1.8 [95% confidence interval (CI): 1.02–3.18]. In the case of the SAG test, logistic regression confirmed the lack of a significant influence of the test result on falls incidence [odds ratio (OR) 1.05; 95% CI: 0.99–1.11].

In addition, the possible impact of selected single factors characterizing the clinical condition of patients on the occurrence of falls was analysed. There was no association between BMI, rheumatoid arthritis, and type 2 diabetes on the incidence of falls (detailed data not shown). However, as might be expected, the frequency of falls was significantly higher in the group of women with type 1 diabetes (88.2% vs. 59.2% in the others; $p < 0.05$) and among those receiving anticonvulsant treatment (100% vs. 59.7% in the others; $p < 0.05$).

Discussion

The most valuable finding provided by the current study is the observation that the affected functional status may increase the fall rate in long-term follow-up. Such a result is important for practitioners in their daily management of patients.

In several previously published papers the role of widely understood functional status was evaluated [12–21]. These authors observed many patients with different abnormalities regarding functional status, and in some studies vision impairment as a reason for functional problems was analysed [17–21]. The SAG test was proven as an effective tool to predict falls in one-year observation in a group of 160 subjects [13]. However, this observation was not confirmed in the current study. One may consider that the cited authors performed only one year of observation, and our follow-up lasted for up to 10 years. In 2 other studies the IADL was used to assess functional status [14, 16]. In a study by Vegara et al. [14] the IADL scale was applied to establish functional status in subjects after hip fracture. In 6-month follow-up the result of the IADL score decreased by 1.6 points. In another study [16] a retrospective analysis of the relationship between IADL and falls in the preceding 3 months was performed. The IADL scores were lower in those who fell, but after adjustment to physical performance measures this difference became insignificant.

It is not easy to compare the current results with the data shown by other authors. The use of several methods, different means of patient selection (the majority of studied groups were not population-based representative samples), and differences in age range and duration of observation do not allow clear conclusions to be drawn. Irrespective of the mentioned differences, the functional status generally was related

to many health events observed in the studied patients, including falls.

In addition to the main analyses of this study, we also conducted a comparison of selected single factors characterizing the clinical status of patients between subgroups with and without falls. We found no significant effect of obesity on the incidence of falls. This aspect requires further research because literature data on the impact of obesity on the incidence of falls, as well as directly on the risk of fractures, remain inconsistent [22]. Also, type 2 diabetes in our material was not shown to be a significant risk factor for falls. The current literature shows that the use of modern pharmacotherapy in type 2 diabetes creates possibilities to reduce the negative impact of this disease on the functional and metabolic status of the musculoskeletal system [23]. Conversely, we found that the frequency of falls was significantly higher in the group of women with type 1 diabetes and among those receiving anticonvulsant treatment. Those medical conditions could be identified as confounding factors in our analysis. However, bearing in mind the main assumption of the study, i.e. the analysis took place in a sample representative for the population, women with these diseases were not excluded from the final analysis.

The current study has some limitations. Contact with some subjects was lost, the study concerns only women, and phone interviews sometimes provide unreliable data. However, we believe that the calls performed by a single experienced investigator allowed us to gather best possible data expressing falls incidence during long-term follow-up.

Concluding, baseline results of the IADL score but not the SAG test are related to the occurrence of falls in a 10-year prospective observation. Adequate correction of functional status may be of benefit to patients and reduce the fall rate.

Conflict of interests

Wojciech Pluskiewicz, Piotr Adamczyk, and Bogna Drozdowska declare that they have no conflict of interest related to this manuscript.

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