JAMDA xxx (2018) 1–5

JAMDA

journal homepage: www.jamda.com

Original Study

Sarcopenia in Parkinson Disease: Comparison of Different Criteria and Association With Disease Severity

Davide L. Vetrano MD [a,b,*], Maria S. Pisciotta MD [c], Alice Laudisio MD [d], Maria R. Lo Monaco MD [b], Graziano Onder MD, PhD [b], Vincenzo Brandi MD [b], Domenico Fusco MD [b], Beatrice Di Capua MD [b], Diego Ricciardi PhD [b], Roberto Bernabei MD [b], Giuseppe Zuccalà MD [b]

[a] *Aging Research Center, Department of Neurobiology, Care Sciences and Society, Karolinska Institutet and Stockholm University, Stockholm, Sweden*
[b] *Department of Geriatrics, Catholic University of Rome, Rome, Italy*
[c] *Department of Geriatrics, Foundation Poliambulanza of Brescia, Brescia, Italy*
[d] *Department of Geriatrics, Campus Bio-Medico University, Rome, Italy*

Keywords:
Sarcopenia
Parkinson disease
frailty
DXA

A B S T R A C T

Objectives: In Parkinson disease (PD), sarcopenia may represent the common downstream pathway that from motor and nonmotor symptoms leads to the progressive loss of resilience, frailty, and disability. Here we (1) assessed the prevalence of sarcopenia in older adults with PD using 3 different criteria, testing their agreement, and (2) evaluated the association between PD severity and sarcopenia.
Design: Cross-sectional, observation study.
Setting: Geriatric day hospital.
Participants: Older adults with idiopathic PD.
Measurements: Body composition was evaluated through dual energy x-ray absorptiometry. Handgrip strength and walking speed were measured. Sarcopenia was operationalized according to the Foundation for the National Institutes of Health, the European Working Group on Sarcopenia in Older Persons, and the International Working Group. Cohen k statistics was used to test the agreement among criteria.
Results: Among the 210 participants (mean age 73 years; 38% women), the prevalence of sarcopenia was 28.5%–40.7% in men and 17.5%–32.5% in women. The prevalence of severe sarcopenia was 16.8%–20.0% in men and 11.3%–18.8% in women. The agreement among criteria was poor. The highest agreement was obtained between the European Working Group on Sarcopenia in Older Persons (severe sarcopenia) and International Working Group criteria (k = 0.52 in men; k = 0.65 in women; $P < .01$ for both). Finally, severe sarcopenia was associated with PD severity (odds ratio 2.30; 95% confidence interval 1.15–4.58).
Conclusions: Sarcopenia is common in PD, with severe sarcopenia being diagnosed in 1 in every 5 patients with PD. We found a significant disagreement among the 3 criteria evaluated, in detecting sarcopenia more than in ruling it out. Finally, sarcopenia is associated with PD severity. Considering its massive prevalence, further studies should address the prognosis of sarcopenia in PD.

Parkinson disease (PD) is a frequent neurodegenerative condition in older adults, with a systemic involvement with motor and nonmotor symptoms contributing to worsening function and quality of life.[1,2] Alpha-synuclein deposition, histologic hallmark of PD, is evident not only in the central nervous system but also involves structures belonging to the peripheral nervous system, such as the enteric, pelvic, and cardiac ganglia. These lesions are responsible for a number of nonmotor symptoms that affect, among others, the gastrointestinal system, the cardiovascular system, and the urinary system.[3] Malnutrition and weight changes have been described from preclinical stages of PD. Bradykinesia or, conversely, tremor, swallowing problems, and malabsorption are some of the PD features that may affect not only body composition but also physical performance and vitality. Finally, the PD pharmacologic treatment may affect the above-mentioned aspects.[4]

The authors declare no conflicts of interest.

* Address correspondence to Davide L. Vetrano, MD, Aging Research Center Karolinska Institutet Gävlegatan, Stockholm 16 11330, Sweden.
E-mail address: davidevetrano@gmail.com (D.L. Vetrano).

https://doi.org/10.1016/j.jamda.2017.12.005
1525-8610/

Sarcopenia is defined as an age-related progressive qualitative and quantitative muscle impoverishment. It represents both the determinant and the result of numerous conditions of older age (eg, frailty) and increases the risk of several negative outcomes.[5] Notably, sarcopenia is considered a promising target for interventions directed toward physical frailty.[6] Several criteria for the assessment of sarcopenia have been issued during the past 10 years, some of them based on consensus and others driven by data. Different criteria applied to different populations led to different estimates of sarcopenia prevalence, which according to a meta-analysis is detectable in 10% of the general population.[7–9] So far, only 1 study reported the prevalence of sarcopenia in PD. In this study, sarcopenia, as evaluated by means of impedance analysis, was present in 6% of persons with PD.[10] In the literature there is no information about the prevalence of sarcopenia in PD evaluated through dual energy x-ray absorptiometry (DXA), considered a more reliable tool to assess lean body mass. Consequently, no one so far compared the agreement among the existing criteria for the detection of sarcopenia in populations with PD.

Not only do PD and sarcopenia share a number of common pathways, but they can potentially affect each other.[11] The aims of the present study were (1) to assess the prevalence of sarcopenia in a sample of older adults with idiopathic PD using 3 different international criteria, testing their agreement and (2) to evaluate the association between PD severity and sarcopenia.

Methods

Participants

We enrolled 210 older adults with PD consecutively admitted to the geriatric day hospital of the Catholic University of Rome, Italy, between 2012 and 2016. PD diagnosis was ascertained according to the United Kingdom Parkinson Disease Society Brain Bank criteria (Supplemental Appendix). Of 225 participants, 15 were excluded because of missing data. All participants provided written informed consent. The present study was reported in keeping with the strengthening the reporting of observational studies in epidemiology (STROBE) guidelines.

Sarcopenia Assessment

Body composition was evaluated by DXA machine (Hologic, Waltham, MA). Appendicular lean bone-free mass (ALM) was obtained via the software imbedded in the DXA scanner and indexed by height-square (ALM/h^2) and body mass index (BMI, ALM_{BMI}). Handgrip strength was measured using a handheld dynamometer (North Coast Hydraulic Hand Dynamometer; North Coast Medical Inc, Morgan Hill, CA), with the patient seated with the wrist in a neutral position and the elbow flexed 90°. Two trials for each hand were performed; the best result from the strongest hand was used. Walking speed was evaluated measuring usual gait speed (m/s) over a 4-m track. Diagnosis of sarcopenia was made according to the Foundation for the National Institutes of Health (FNIH) criteria,[11] the European Working Group on Sarcopenia in Older Persons (EWGSOP) criteria,[9] and the International Working Group (IWG) criteria.[5] Specific cut-offs for ALM, handgrip strength, and walking speed are reported in Table 1.

Other Measures

Data on age, sex, education, and anthropometric parameters were collected through a dedicated questionnaire. PD severity was assessed through the Unified Parkinson Disease Rating Scale total score (UPDRS). All participants were evaluated during their on-period within 2 hours of the last antiparkinsonian medication administration. Functional and cognitive statuses were evaluated using impairment in the number of 6 activities of daily living and the Mini-Mental State Examination, respectively.

Statistical Analysis

Descriptive statistics were presented. Positive percent agreement and negative percent agreement among the 3 criteria were reported. The overall agreement between couples of criteria and among 3 of them was assessed through the Cohen k statistics with $k < 0.40$ meaning poor agreement, 0.40–0.75 fair-to-good agreement, and >0.75 excellent agreement.[12] The association between sarcopenia (defined as the presence of severe sarcopenia in at least 1 of the EWGSOP and FNIH criteria, the most commonly used criteria in the literature) and PD severity (UPDRS criteria above the median; >42) was tested through a logistic regression model adjusted for age, sex, education, number of comorbidities, and PD duration. In the absence of agreed UPDRS cut-points, the median score was chosen to split the sample in less impaired and more impaired patients. A P value of <.05 was considered significant. All analyses have been performed using the software STATA v 14.0 (StataCorp, College Station, TX).

Table 1
Prevalence of Sarcopenia According to Different Criteria

Criteria	Sarcopenia Definition			Prevalence (%)	
	Physical Performance	Muscle Strength	ALM	Men N = 130	Women N = 80
FNIH					
Sarcopenia	-	Grip strength Men <26 kg Women <16 kg	ALM_{BMI} Men <0.789 Women <0.512	40.7	27.5
Severe sarcopenia	Gait speed ≤0.8 m/s	Grip strength Men <26 kg Women <16 kg	ALM_{BMI} Men <0.789 Women <0.512	20.0	11.3
EWGSOP					
Sarcopenia	Gait speed <0.8 m/s or Grip strength Men <30 kg Women <20 kg	-	ALM/h^2 Men ≤7.23 kg/m^2 Women ≤5.67 kg/m^2	28.8	17.5
Severe sarcopenia	Gait speed <0.8 m/s	Grip strength Men <30 kg Women <20 kg	ALM/h^2 Men ≤7.23 kg/m^2 Women ≤5.67 kg/m^2	16.8	18.8
IWG					
Sarcopenia	Gait speed <1.0 m/s	-	ALM/h^2 Men ≤7.23 kg/m^2 Women ≤5.67 kg/m^2	35.4	32.5