Review paper

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Sarcopaenia and rheumatoid arthritis

Tomasz Targowski

Department of Geriatrics, National Institute of Geriatrics, Rheumatology, and Rehabilitation, Warsaw, Poland

Abstract

In October 2016 a new independent disease called sarcopaenia (according to ICD-10 classification) appeared. According to the recommendation of the European Working Group on Sarcopenia in Older People (EWGSOP), sarcopaenia is defined as abnormally low muscle mass plus low skeletal muscle strength or low physical performance. Sarcopaenia, as a primary disease, is mainly observed in older people, but it can also appear in younger adults in the course of many clinical chronic conditions. One of the most frequent chronic diseases associated with chronic inflammation and functional limitation of skeletal system is rheumatoid arthritis. In the present article, current knowledge on the epidemiology of sarcopaenia and its association with rheumatoid arthritis is presented.

Key words: sarcopaenia, lean body mass, rheumatoid arthritis.

Introduction

Many studies show that total skeletal muscle mass decreases by ca. 40% between the 20th and 60th years of life [1]. Lexell et al. [2] revealed similar average muscle mass reduction of 40% for subjects between 20 and 80 years of age, with the average decrease of about 10% at 50 years and fast acceleration of this phenomenon thereafter. There is some evidence that aging men have significantly greater skeletal muscle mass reduction than women, which is interpreted (among others factors) by more significant decrease of growth hormone and testosterone level [3, 4].

Age-related declines in muscle mass are directly correlated with the loss of the muscle strength. Results of many studies allow us to surmise that healthy men and women in the seventh and eighth decade of life exhibit from 20% to 40% loss of muscle strength compared to younger people, with similar strength reduction for proximal and distal skeletal muscles in all extremities. This decrease of the muscle power is even greater than 50% in very old persons [1].

Recognition of sarcopaenia

Nearly thirty years ago the term 'sarcopaenia' (greek: 'sarx' + 'paenia', eng.: flesh + loss) to define age-related decrease of muscle mass was proposed [5, 6]. A widely accepted definition of sarcopaenia suitable for use in research and clinical practice was worked out by the European Working Group on Sarcopaenia in Older People (EWGSOP), which is a gathering of representatives of four participant organisations, i.e. the European Geriatric Medicine Society, the European Society for Clinical Nutrition and Metabolism, the International Association of Gerontology and Geriatrics – European Region, and the International Association of Nutrition and Aging [7]. With respect to the newly established definition, diagnosis of sarcopaenia should be based on documentation of low muscle mass plus low muscle strength and/or low physical performance [7]. EWGSOP has extracted the most useful, for clinical practice and scientific research, diagnostic method of evaluation of the skeletal muscle mass (dual energy X-ray absorptiometry – DEXA, bioimpedance analysis – BIA), muscle strength (handgrip dynamometer), and physical performance (Short Physical Performance Battery test – SPPB, usual gait speed test), and it has proposed diagnostic cut-off points of these methods for men and women [7].

Prevalence of sarcopaenia

The first epidemiological studies on prevalence of sarcopaenia were conducted only with the measure-

Address for correspondence:
Tomasz Targowski, Department of Geriatrics, National Institute of Geriatrics, Rheumatology, and Rehabilitation, Spartanska 1, 02-637 Warsaw, Poland, e-mail: tomasz.targowski@spartanska.pl
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ment of the loss of muscle mass without assessment of muscle power or physical performance ability. For example, measuring appendicular muscle mass by DEXA and defining sarcopenia as 2 standard deviations (SD) below the muscle mass/height $(m)^2$ for young controls. Baumgartner et al. [8] assessed the prevalence of sarcopaenia from 13 to 24% of persons aged 65 to 70 years in a randomly selected group of men and women, whereas Iannuzzi-Sucich et al. [9] found sarcopaenia in 22.6% of women aged 64 to 93 years and in 26.8% of men aged 64 to 92 years. Both authors observed a sharp increase in the percentage of persons with so-called 'sarcopaenia' in people older than 80 years, over 50% of the study participants [8, 9]. Actually, according to new EWGSOP recommendations, only reduction in skeletal muscle mass is considered apre sarcopaenia stage [7].

Based on EWGSOP criteria, new epidemiological data on the prevalence of sarcopaenia varies significantly in different studies in people older than 60 years, from 8.8 to 41.2% in women, and from 8.8 to as much as 68.0% in men (Table I).

It is presently well known that sarcopaenia is related to daily life disability, and is an independent risk factor of falls in older people, and premature death [11, 17]. Brown et al. [11], testing 4425 older adults (mean age 70.1 years) from the Third National Health and Nutrition Survey, evaluated the prevalence of sarcopaenia (recognised with the body bioimpedance plus gait speed test) in 21% participants and estimated that its presence is associated with a higher risk of all-cause mortality (HR 1.29, CI: 1.13–1.47).

Since October 1, 2016 recognition of sarcopaenia has been available for use by medical care as a new independent disease for separate reporting and data collection in ICD-10 classification with the code M62.84 [18].

Some clinical aspects of sarcopaenia

Sarcopaenia is mainly observed in older people, but it can also appear in younger adults in the course of many clinical conditions; thus the two categories: (1) "idiopathic", age-related, primary sarcopaenia and (2) secondary sarcopaenia, are recommended by the EWGSOP for use in clinical practice [7]. Primary sarcopaenia should be recognised when (in spite of age) there is no other clinical evidence for a decrease in muscle mass, while the secondary one could accompany many diseases (Table II).

It should be emphasised that in many older people the cause of sarcopaenia is multi-factorial, and a clear classification of individual cases to primary or secondary loss of the muscle mass and strength could be impossible. Skeletal muscles are strictly connected to bones, with which they form the musculoskeletal system supporting the human body and providing the mechanical integrity for motility. It is well known that "healthy" aging is associated with degenerative changes both in muscles and bones, and could be more pronounced if chronic inflammatory diseases follow in the wake of senescence. For example, according to epidemiological data, rheumatoid arthritis is, besides chronic obstructive pulmonary disease, severe chronic heart or kidney failure, and advanced malignant diseases, one of the most frequent causes of cachexia in developed countries, thereby among other factors it is one of the more frequent reasons of the decrease of muscle mass [19]. The main

Table I. Prevalence of sarcopaenia according to EWGSOP criteria

Study	Age of patient (years)	Women, *n*	Sarcopaenia in women, *n* (%)	Men, *n*	Sarcopaenia in men, *n* (%)
Doods et al. [10] 2016 year	> 85	437	90 (20.6)	282	59 (20.9)
Brown et al. [11] 2016 year	≥ 60	2500	756 (30.2)	1925	862 (44.8)
Kim et al. [12] 2014 year	≥ 65	272	24* or 112^ (8.8* or 41.2^)	284	25* or 33^ (8.8* or 11.6^)
Patel et al. [13] 2014 year	68-76	N/A	N/A	88	18 (20.4)
Yamada et al. [14] 2013 year	65-89	1314	22.1%#	568	21.8%#
Legrand et al. [15] 2013 year	≥ 80	185	23 (12.4)	103	13 (12.6)
Landi et al. [16] 2012 year	≥ 70	91	19 (21.0)	31	21 (68.0)

*Values depending on method of adjusted appendicular skeletal muscle mass (ASM) assessment in DEXA: *ASM per height², ^ASM per weight, #absolute number of men and women with sarcopaenia has not been given*

Table II. Most common clinical conditions associated with secondary sarcopaenia [acc. to 7 and own modification]

Related to nutrition status	Inadequate dietary intake, anorexia, bulimia
Related to diseases	malignancies chronic heart failure chronic obstructive pulmonary disease cystic fibrosis pulmonary fibrosis rheumatoid diseases (e.g. osteoarthritis, rheumatoid arthritis) chronic infectious (viral, parasitic, and bacterial) diseases chronic renal failure cirrhosis diabetes endocrine diseases chronic gastrointestinal diseases drug and alcohol abuse chronic neurological disorders
Related to activity	sedentary lifestyle deconditioning dwelling in weightlessness (zero-gravity) conditions

causes of lean body mass decrease in the course of rheumatoid arthritis are chronic inflammation accompanying the disease, decrease in physical activity, chronic pain, and increase of energy expenditure during rest.

Giles et al. [20] revealed that in women with rheumatoid arthritis and normal body weight (BMI below 25) the adjusted odds ratio of loss of lean body mass was more than three times greater (OR 3.41, 95% CI: 1.51–7.69, $p < 0.05$) than in women from a control group. However, in his study the differences in lean body mass in overweight and obese women with and without rheumatoid arthritis were not statistically significant [20]. They have also found that abnormal body composition in the whole group was significantly associated with rheumatoid factor seropositivity (OR 2.15, 95% CI: 1.05–4.38), larger joint deformity (OR 1.08, 95% CI: 1.01–1.16 per joint), functional limitation (OR 2.14, 95% CI: 1.13–4.03 per unit of Health Assessment Questionnaire), and higher CRP level (OR 1.72, 95% CI: 1.27–2.33 per log unit) [20].

In the other study with the use of whole body DEXA scan, in a group of women in the mean age of 47.7 years, the loss of the fat-free mass in 43.3% patients with rheumatoid arthritis and only in 10% of healthy control was found [21]. Moreover, it was shown that in women with rheumatoid arthritis and low fat-free mass almost twice as likely (61.5% vs. 38.5%) an increased serum level of C-reactive protein protruded in comparison to females with rheumatoid arthritis but without loss of lean body mass [21].

A similar effect was revealed in the study by Munro et al. [22], who observed negative correlation between serum C-reactive protein level and muscle mass in women with rheumatoid arthritis. It is believed that in addition to C-reactive protein pro-inflammatory cytokines such as tumour necrosis factor-α (TNF-α) interleukin 1β (IL-1β), which are involved in RA pathogenesis, play also an important role in sarcopaenia development [23, 24]. It should be emphasised that healthy aging itself is presumably associated with a tendency towards a gradual increase in proinflammatory cytokines, first of all interleukin 6 (IL-6) and IL-1 [25].

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Of course development of sarcopaenia in elderly people is not only associated with the elevated concentration of proinflammatory cytokines but also has more complicated aetiology. Multiple, interrelated factors contribute to the development of sarcopaenia, including muscle fibre atrophy, nutritional, hormonal, and metabolic disturbances [1]. However, it is worth remembering that chronic inflammatory disease, such as rheumatoid arthritis, could occur not only with joint and bone destruction, but also with the loss of strength and mass of the skeletal muscles, which deepens the movement disability and contributes to a faster deterioration of the quality of life and is likely to shorten its duration.

The author declares no conflict of interest.

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