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Sarcopenia

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A B S T R A C T

Sarcopenia is a condition that is characterized by loss of muscle mass, muscle strength and muscle functional impairment with ageing. The definition of sarcopenia has been through various permutations; however, an enormous recent breakthrough is the inclusion of the condition in the ICD-10 classification of diseases. This chapter covers the background issues regarding definition before describing the epidemiology of the disease according to human and environmental factors. It then provides a practical guide for the assessment of sarcopenia in a clinical setting and finishes with advice on present treatment and the exciting frontiers of future therapies.

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Introduction

Sarcopenia is characterised by generalised and progressive loss of muscle mass, reduction in muscle strength and resultant functional impairment. The condition is associated with poor health outcomes and premature death [1,2] and has recently been included under a single code in the International Classification of Disease (ICD-10) [3]. Sarcopenia is associated with a significant burden on the global health economy, calculated at $18.5 billion in the US in 2004, but more recently calculated to cost £2 billion in the UK [4]. The prevalence varies with location and definition; however, it is estimated to be up to 29% of older persons in the setting of community healthcare and 14%–33% for those in long-term care [1]. This emphasises the importance of this condition, and the need to increase awareness of the condition amongst clinicians, researchers, health economists and policy-makers.

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This chapter highlights the scientific narrative that has led to the current definition of sarcopenia and discusses the epidemiology of the condition. We provide information regarding the assessment of sarcopenia in both clinical and research contexts and provide a summary of current therapeutic options.

Definition

The description of muscle mass loss in extreme old age was first made by Critchley in 1931, with a particular observation that this was most marked at the hands and feet. However, the term 'sarcopenia' was first coined in 1984 by Rosenberg, who used it in the context of the age-related loss of muscle mass (ICD1). This definition was used and built on by Baumgartner and colleagues, who defined muscle mass as appendicular lean mass (ALM) divided by height and showed that, using this parameter, future adverse events and poor health could be predicted [5,6].

Work by Edwards and colleagues revealed that although muscle mass was associated with muscle strength, there was only a weak association with disability and function [7]. It was also demonstrated that muscle quantity was not equivalent to muscle quality [8], further questioning the use of muscle mass alone in the definition of sarcopenia. From here, the concept of dynapenia or loss of muscle power was born [9]. This term forms one element of the disability cascade by which 'dynapenia' (loss of muscle power), keratopenia (loss of muscle force) and sarcopenia (loss of muscle) lead to disability (or loss of the ability to perform usual activities) and the physical phenotype of frailty, defined according to the Fried or Rockwood criteria.

In 2010, at the European Working Group on Sarcopenia in Older People (EWGSOP), there was a consensus of opinion in support of the extension of the 'mass' definition of sarcopenia, to also include muscle strength (measured by grip strength) and muscle performance (measured by 6-min walking speed) [10]. This move was echoed and supported within the field [11,12].

There are currently a number of slightly differing definitions of sarcopenia, with most including measures of muscle function and mass.

Muscle mass is measured by the EWGSOP and International Working Group on Sarcopenia (IWGS) as skeletal mass index (SMI) [13,14], with the Foundation of the National Institute of Health (FNIH) sarcopenia project recommending dividing muscle mass by body mass index (BMI), thus providing a measure of muscle mass relative to a measure of adiposity [15]. Threshold levels are defined as SMI of <7.23 kg/m^2 for men and <5.67 kg/m^2 for women [14], with the EWGSOP utilising similar DXA thresholds [13]. The FNIH uses the measure of ALM/BMI and states that values <0.789 for men and <0.512 for women would indicate a low muscle mass [15].

In terms of muscle function, the IWGS uses a gait speed of <1 m/s for the threshold level of poor muscle function [14], which is slightly higher than the more stringent <0.8 m/s used by the EWGSOP [13]. The European group state that grip strength can also be used, which is the chosen measure of muscle function in the FNIH definition, with values of <26 kg for men and <16 kg for women, being consistent with low grip status. A summary of the pertinent differences between definitions is seen in Table 1.

Although there is increasing harmonisation in the definition of sarcopenia, a water-tight consensus would greatly boost the comparability of research studies in this field, and the 'NIA and FNIH Sarcopenia project 2' aims to achieve this [16]. However, there has been a huge breakthrough in the field as, in September 2016, sarcopenia was assigned an ICD-10-CM code (M62.84) [10]. It is hoped that this will provide a similar breakthrough to that seen with osteoporosis in the 1990s, with increased awareness of the condition in diagnosis and considerable therapeutic development.

Practice point

- Sarcopenia is defined by the triad of loss of muscle mass, loss of muscle strength and loss of physical function.

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