

## SARCOPENIA: BEYOND WORDS

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**Abstract:** Modern days focus on life quality and expectancy. Our purpose is to analyze new data regarding sarcopenia from a theoretical as well as practical point of view. This is a narrative review based on PubMed literature. We only included references between 2013 and 2016 and a selection of 41 articles was done. Sarcopenia includes an age-dependent damage of muscle function (dynapenia) and/or mass (myopenia). Frailty is considered a geriatric syndrome involving general weakness, low endurance and vulnerability but overcoming the classical specific context of general medical and surgical conditions. Crosstalk between adipose tissue and muscular-skeletal system is a complex, critical issue. Sarcopenia represents a cutting edge in a multidisciplinary modern field and, despite progresses and modern scientific interest, controversies are still presented related to underlying mechanisms as well as clear definition and recommendations for daily practice.

### INTRODUCTION

Modern days brought an increased concern regarding the quality of life, the well being while complex screening programmes and performing treatments associated an elevation of life expectancy in many countries. Sarcopenia, also initially related to the concept of aging, represents a much larger field and a new domain of research during the last years.(1,2,3)

### PURPOSE

Our purpose is to analyze new data regarding sarcopenia from a theoretical as well as practical point of view ("beyond words").

### MATERIALS AND METHODS

This is a narrative review based on Pub Med literature. We only included references between 2013 and 2016 and a selection of 41 articles was done.

### RESULTS

#### General data

#### Sarcopenia – the concept

Sarcopenia includes a damage of muscle function and/or mass (depending on definition).(1,2,3) Difficulties are related to the measurement of both parameters and their generalised standards as well as the necessity of their implementation in current clinical practice.(1,2,3) The deterioration of muscle strength is progressively registered during aging process in association with inflammatory cytokines production, reduced muscle proteins and their capacity to regenerate, age-dependent endocrine anomalies, exposure to oxidative stress, etc.(1,2,3) Sarcopenia is associated with a poorer outcome of fractures, falls and a higher risk of death in aging patients or in subjects with different morbidities as obesity, osteoporosis, cancer, malnutrition, chronic conditions, long time inactivity etc.(2,3,4) Sarcopenia is a fall

predictor.(1,2,3) The catabolic alteration of muscle is connected to age-related bone loss since muscle and bone act as a unit.(5) Moreover, osteoporotic patients seem to diminish their physical activities after a fracture episode.(5) Sarcopenia prevalence is 5-13% of persons within the sixth and seventh decades of life but the rate is much higher in different categories as critically ill patients; also, the percents depend on criteria and study.(1,2,3,6)

#### Frailty – geriatric syndrome

Sarcopenia is connected to the concept of frailty which is tightly seen in relationship with aging, especially aspects involving general weakness, low endurance, and vulnerability but overcoming the classical specific context of general medical and surgical conditions.(7,8,9) This integrated aspect is a part of modern multidisciplinary approach.(7,8,9) Nowadays, frailty is considered a geriatric syndrome which predicts a poorer surgical outcome after different types of surgery, more severe adverse effects of chemotherapy for oncologic patients, longer hospital stay, higher mortality risk, etc.(7,8,9) Depressive elements are obviously related to the condition but it is difficult to separate depression itself from an age- and chronic disease- related state involving mood anomalies, cognitive deterioration, dementia etc.(10) The underlined diminished reserve of physiological pool involves sedentary behaviour, chronic asthenia, incidental weight loss, reduce muscle function.(8,11) The frailty rate is of 5%-44% in community-dwelling old persons of developing countries.(12) Since a clear cut separation between sarcopenia and frailty is not yet available, it is difficult to define the epidemiologic impact of each component.(12,13) Common pathogenic aspects are reduced physical activities as walking speed; while sarcopenia targets the muscle, frailty is a larger frame of general health deterioration witch dramatically impacts the prognosis of others disorders as well as general survival.(12,13) Another link between the two conditions is the low amount of vitamin D into the body which is essential for skeletal and muscle normal state

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but also for immune system, anti-cancer mechanisms etc.(14) The increasing vulnerability of aging people includes the frailty phenotype (the biological aspect) as well as frailty index (the panel of deficiencies) and many models have been proposed for describing the syndrome but this is still a matter of debate.(15) On the other hand, sarcopenia concept and its implementation in daily health care assessment, is still incompletely done up to this moment in many centres.(16) The need for evaluation tools is essential in this area of medicine since scales of life quality revealed a major impact.(17,18) The action against frailty is demanding in order to reduce the associated burden.(19,20) A part from adequate recognition and understanding, interventional national programs and health care providers are necessary.(19,20)

### *Dynapenia*

Sarcopenia (muscle mass waste) is associated with dynapenia (muscle weakness).(21,22,23) Training exercise is the key of muscle re-enforcement and mass adjustment.(21,22,23) The application of training programs in daily activities is useful and impacts the outcome of others specific medical and surgical (including oncologic) conditions.(21,22,23) Practical aspects of dynapenia, underlying age-related muscle strength loss, is expressed in simple tests as stairs climbing or chair rising.(21,22,23) Another direct connection is established with nutritional status which is the foundation of providing proteins and micronutrients for muscle activities.(21,22,23) Correction or anticipation of hormonal impairment also is necessary to prevent dynapenia, for instance, androgen deprivation therapy in men with prostate cancer is expected to affect the muscle function and mass up to atrophy.(24) Paradoxically, obesity is also cited in relationship with sarcopenia and dynapenia field so it represents one major factor to control.(25) The other component of sarcopenia, myopenia (low muscle mass), a part from reduced muscle function, is also caused by either reduced or excessive caloric or nutrients intake.(26) The bone-fat-muscle spectrum is continuum while extreme values of weight are associates with elevated risk of fall targeting a higher rate of fragility fractures.(27) Even no clear recommendations of assessing the body composition to reveal the muscle status are yet made it is useful in daily practice to evaluate it.(27,28)

### *Hunger games (29)*

Crosstalk between adipose tissue and muscular-skeletal system is a complex, critical issue.(29,30) The fat produces adipokines as leptin and adiponectin while hunger/satiety mechanisms activate the production of gastrointestinal hormones like ghreline, GIP (glucose-dependent insulinotropic polypeptide), GP-1 and GP-1 (glucagon-like peptide), peptide YY which interfere with muscle and bone.(29,30) Muscle mass is directly correlated with total weight, normally accounting about 40% and changes of body mass index inevitably modify it.(29,30) How to settle the exact amount of food intake to provide adequate proteins and to maintain or obtain an optimal weight for contra-counting age-related sarcopenia requires an individual adapted management.(31,32) But, the nutrients intake or its lack remains a key factor for dynapenia and myopenia prevention, considering that these conditions are not only age- dependent but also food- dependent (31,32) The skeleton from fat' s closet is inflammation due to white adipose tissue heterogeneous production of cytokines, chemokines which damage the muscle.(34) This is one of the mechanisms described in osteosarcopenic obesity.(35,56,37) The pro-inflammatory environment contributing to sarcopenia contains IL-6 (interleukin-6), TNF-  $\alpha$  (tumour necrosis factor) which are microRNAs regulated.(38) These molecules disturb the intrinsic circadian clock myogenic functions as repair or

growing.(39,40,41) The lifespan of muscle cells also need protection from oxidative stress in the matter of metabolism senescence.(39,40) One of the most recent discoveries in the field is irisin, a myokine (a muscle product) with autocrine and paracrine hormone-like action which is secreted secondary to physical activity and it influences the characteristics of the bone and the fat activity.(41) Probably, in the future, this will become a surrogate marker of sarcopenia.(41)

## DISCUSSIONS

The sarcopenia domain is a new, interesting topic. Many data are still needed but mostly practical points to apply in front of each patient come first.

## CONCLUSIONS

Sarcopenia represents a cutting edge in a multidisciplinary modern field and, despite progresses and modern scientific interest controversies, are still presented related to underlying mechanisms as well as clear definition and recommendations for daily practice.

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