

Sarcopenia: Origins and Clinical Relevance¹

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ABSTRACT This presentation reflects on the origins of the term sarcopenia. The Greek roots of the word are *sarx* for flesh and *penia* for loss. The term actually describes important changes in body composition and related functions. Clearly defining sarcopenia will allow investigators to appropriately classify patients and examine underlying pathogenic mechanisms and will allow funding agencies to appropriately target research funds to a taxonomically distinct syndrome. *J. Nutr.* 127: 990S–991S, 1997.

KEY WORDS: • *sarcopenia* • *lean body mass* • *aging*

My task in this article is to reflect upon the origins of the term sarcopenia. Let me start by offering a context for the concept of age-related loss of function. It can be argued that Nathan Shock is the father of modern gerontology and that he shocked the scientific world with a cross-sectional study published in the 1970s, which was the result of studies that had been ongoing for at least two decades. He measured age-related changes in physiologic function and showed a rather sobering and regular decline in function over the decades of life, be it conduction velocity in hearing, basal metabolic rate, cardiac index, measures of renal functions, vital capacity or pulmonary function.

The concept of declining function with age requires a better understanding of whether it is a necessary phenomenon of aging or whether it relates to changes that can be influenced. This basic question has become a significant part of the agenda of biologic gerontology and has certainly had a great influence on the research activities at our Human Nutrition Research Center on Aging. For example, there is probably no decline in structure and function more dramatic than the decline in lean body mass or muscle mass over the decades of life. **Figure 1** shows creatinine excretion as a measure of muscle mass, as well as the associated decline in basal metabolic rate because of the very close association between basal metabolism and lean body mass or muscle mass.

We have also become increasingly aware of the relationship between a decline in muscle mass and lean body mass and changes in function. An association also exists between these kinds of functional changes and an increased tendency for nursing home admissions and loss of independence, as well as increase in weakness, falls and fractures. Many laboratories have noted the striking relationship between lean body mass and strength.

In 1988, we convened a meeting in Albuquerque, New

Mexico, to look at various measurements related to the assessment of health and nutrition in elderly populations, and I was asked to summarize some of the findings. I noted then that no decline with age is as dramatic or potentially more significant than the decline in lean body mass. In fact, there may be no single feature of age-related decline more striking than the decline in lean body mass in affecting ambulation, mobility, energy intake, overall nutrient intake and status, independence and breathing. I speculated as to why we had not given this more attention and suggested that if this phenomenon were to be taken seriously, we had to give it a name. This would provide recognition by the scientific community and by the NIH. I proposed that the name for this phenomenon should be derived from the Greek and that it be called either sarcomalacia or sarcopenia. Sarcopenia seems to have taken hold. I remind you that *sarx* in Greek is flesh and *penia* is loss.

What is sarcopenia? Is it an age-related loss of muscle mass and function, or a disease, or a process of normative aging? The term actually describes an important change in body composition and function. The upper panel of **Figure 2** is a magnetic resonance cross-sectional image of a 20-y-old athletic woman's mid-thighs. The lower panel is a similar image from a sedentary 64-y-old woman. The older woman's thigh has a greatly shrunken amount of muscle, some marbling of muscle, and a great deal more fat. The functional significance of this change is quite dramatic. If we are dealing with changes of function over time, when does this become a disease state? Let's assume that we are dealing with a balance function, strength or mobility. In this model, the rate of decline will influence the age or time at which a person actually reaches the zone of disability. We can use the analogy of decline in bone mass; at some point, the loss of bone density reaches the zone of fracture risk. Does sarcopenia become a disease phenomenon when it induces a disability severe enough to require nursing home placement or assisted-living care?

Perhaps a more important question is whether this phenomenon can be influenced. Research into the area of sarcopenia is very exciting right now, because the work of several investigators in this colloquium has begun to establish the possibility that the decline in mass and function may be amenable to intervention. One intervention that seems particularly promis-

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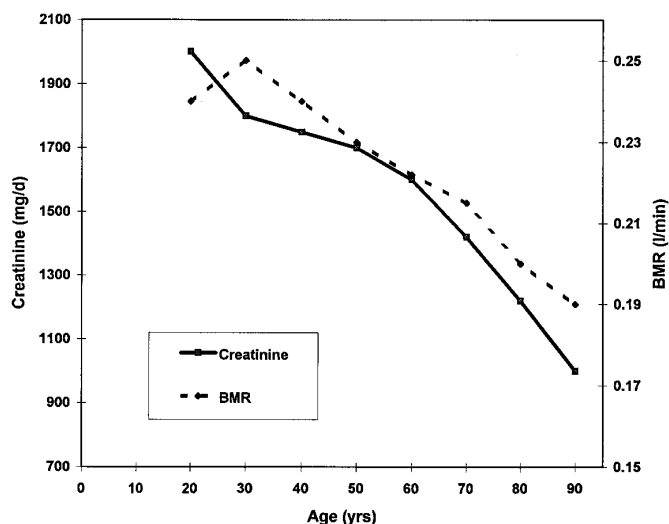


FIGURE 1 Creatinine excretion, a measure of muscle mass, and basal metabolic rate (BMR) as a function of age. Based on original studies of Tzankoff and Norris (1977).

ing is strength training, which might significantly alter this decline and consequently would have important public health implications.

Has there been a benefit in using the name sarcopenia? Although there are investigators in this room who were working on aspects of this phenomenon long before it was called sarcopenia, the name does seem to have generated some additional recognition. The first Sarcopenia Workshop was held by the National Institute on Aging in September 1994 (Holloszy 1995), and this workshop set out some important research questions. This is the first Sarcopenia Symposium to be held at an Experimental Biology meeting. The National Institutes of Health has issued program request announcements on the topic of sarcopenia to help us better understand its significance and its mechanism. In its challenge to the NIH, even the Congress of the United States has recognized sarcopenia by stating that sarcopenia is an area that deserves more attention and, by implication, more funding. So, we at least have a partial answer to the original question of whether giving this phenomenon a specific name would accelerate attention to it and perhaps stimulate the progress of science. The answer seems to be yes, and answers to these scientific questions will no doubt contribute to the elongation and quality of life in our growing population of elders.

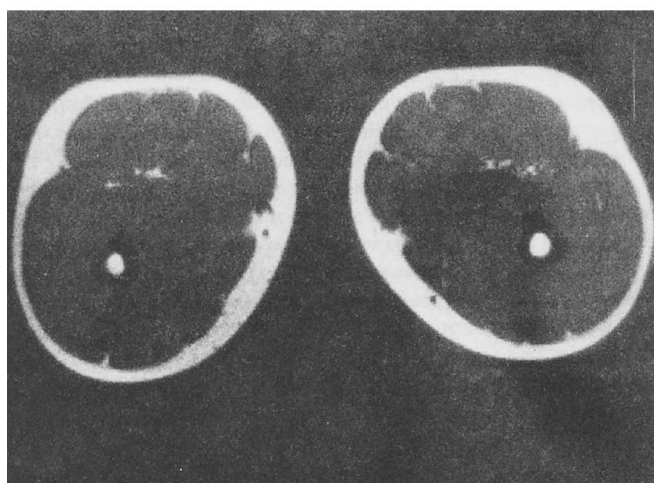
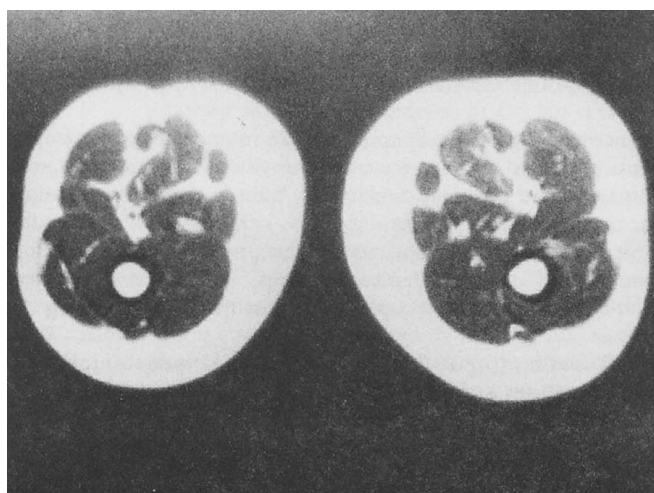


FIGURE 2 Proportion of lean-body mass vs. fat in the thighs of a young vs. old woman. See text for detail. Reproduced with permission from Evans and Rosenberg (1991).

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