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Sarcopenia and the Brain

Sarcopenia e Cérebro

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The term sarcopenia ("a poverty of flesh") was first described by Irving Rosenberg in 1989. In its original format it was limited to an aging related loss of muscle that was associated with functional deterioration and earlier mortality[1]. In 2010, the European Working Group on Sarcopenia in Older Persons (EWGSOP) published a consensus definition on sarcopenia where they required both a loss of muscle mass and strength to make the diagnosis[2]. In 2019 a revised version of the EWGSOP included SARC-F as a screening test[3]. Similar consensus recommendations have been published by ICFSR and SCWD[4,5]. SARC-F is a rapid set of 5 questions developed to screen for sarcopenia[6,7,8]. There is an ICD-10 code for sarcopenia[9].

While cognitive frailty is now a well-accepted syndrome[10,11], sarcopenia has not been classically associated with impaired cognition. In the last few years there has been an increasing awareness of a relationship between sarcopenia and impaired cognition[12,13] as highlighted by the article by Cipolli et al.[14]. This association between poor cognition and sarcopenia should not be surprising as 82% of frailty persons have sarcopenia[15]. This raises the question of whether poor cognition leads to sarcopenia or more importantly can loss of muscle mass lead to cognitive impairment? In addition, a number of conditions, e.g., inflammatory cytokines, diabetes mellitus, vascular disease, can cause both brain and muscle dysfunction[16].

In the last decade there has been increasing awareness that myokines can directly affect the brain[17]. This, in part, explains the positive effects of exercise on the brain[18]. One of these myokines is Irisin, which promotes synaptic plasticity ad can improve memory in animal models[19]. Irisin is derived from fibronectin type III domain – containing protein 5 (FNDC5) and is increased with exercise[20]. Irisin is considered to play a role in exercise induced memory enhancement[21,22]. Other myokines that play a role in muscle-brain interaction include cathepsin-B, brain derived nerve growth factor insulin growth factor-1, oncostatin M, and leukemia inhibitory factor[23,24,25]. These myokines promote angiogenesis, neurogenesis, synaptic function, neuronal metabolism and autophagia.

Decline in brain function can result in a decrease in muscle function. Perhaps the most obvious example is loss of muscle and weakness following a cerebrovascular accident. Persons with memory dysfunction have a slower gait speed and a decrease in grip strength[26,27]. Persons with dementia have a deficit in "dual tasking" and tend to be less likely to exercise leading to sarcopenia. Aging itself with the reduction in axonal communication and a reduction in motor unit numbers leads to a decrease in Type 2 muscle fibers[28].

For all of these reasons, it is not surprising that there is a relationship between sarcopenia and cognitive impairment in community dwelling older adults as found by Cipolli et al. and other studies[14,29,30]. As shown in Figure 1 there are multiple causes for the interrelationship between cognitive dysfunction and sarcopenia. It is important that these causes be recognized and treated where possible. Recently, Lundy et al.[31] showed that the combination of cognitive stimulation therapy (CST) and exercise in older persons had a greater improvement in cognition, than CST alone. For this reason, we believe that physicians should recommend exercise therapy not only to improve muscle function but also to improve cognitive deficits.

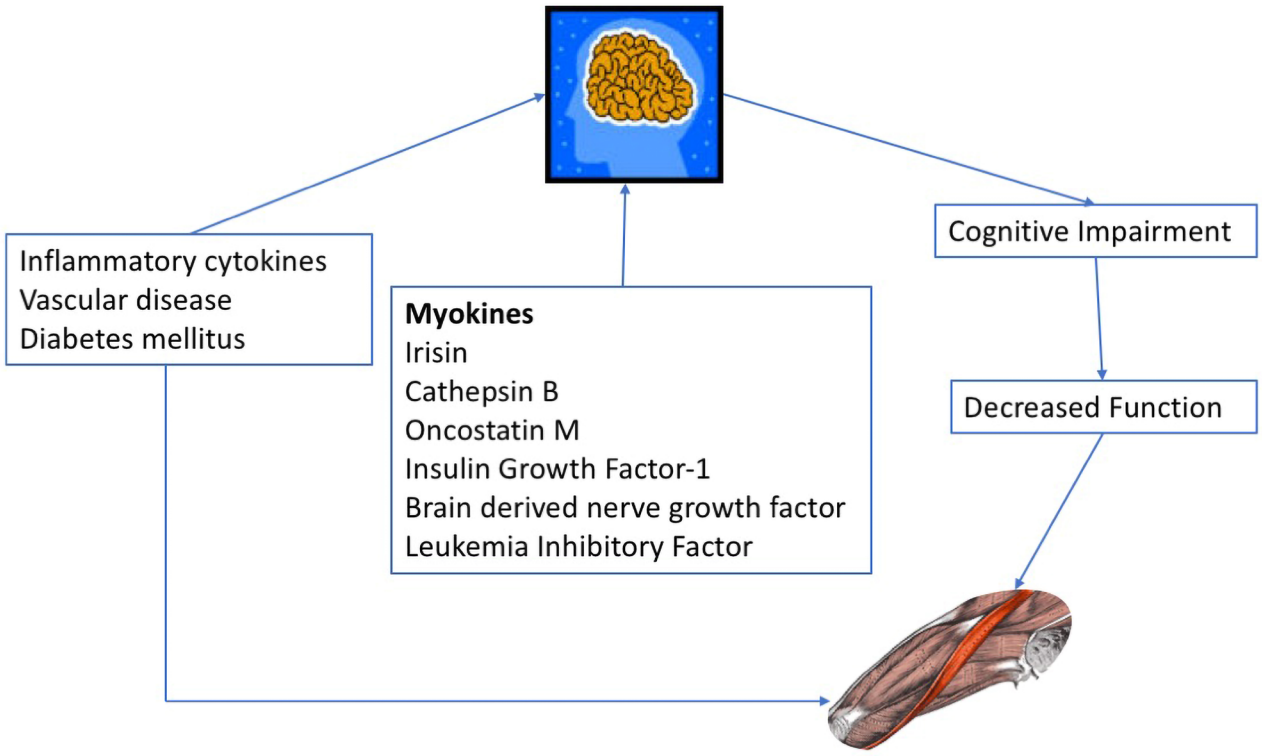

Figure 1. Muscle-brain interactions.

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