

Sarcopenia

A Research Paper by the All4Smiles Research Team

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Abstract

Sarcopenia is the gradual loss of muscle mass and strength. It usually comes with aging and affects millions of older adults worldwide. While the condition may start with small changes like weaker grip strength or difficulty climbing stairs, it can lead to serious consequences such as falls and loss of independence. Lower physical activity, poor nutrition, hormonal shifts, and chronic health conditions are some factors that can result in sarcopenia. Early recognition and prevention are key because it often progresses slowly. With aging populations on the rise, understanding sarcopenia is not only important for healthcare professionals but also for families and communities as they work to support healthy aging.

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Physical Changes or Symptoms for Sarcopenia

By: Sue Nguyen

Changes that come from sarcopenia often happen gradually but the weaknesses will eventually become noticeable. The most common symptom of sarcopenia is muscle weakness. Reduced muscle strength usually appears earlier than other changes. Every day tasks like lifting objects or climbing stairs will become harder to perform. Over time, losing muscle strength also leads to slower reaction times and a decrease in stamina. Simple exercises may feel more challenging and tiring than before. Along with muscle strength, grip strength will also weaken, which can be an early sign of sarcopenia. Another symptom is decline in mobility. One might walk slower and have poor balance. This instability increases the risks of falls and injuries. Muscles will also decrease in size and appear smaller or less firm. Physical changes of sarcopenia can have a big effect on daily life. As sarcopenia progresses, the symptoms can start to affect overall health. Weaker muscles make it harder to support joints which will cause aches or stiffness. The loss of balance and coordination will make normal activities much more challenging. Every task will require extra effort and caution. The body will become less steady and less reliable as time goes on. Over time, these changes may also limit independence, since people may need more help with daily tasks. Recovery from activities can take longer due to fatigue becoming more common. Even posture may be affected as weaker muscles struggle to hold the body upright. All of the changes will build on one another, creating a cycle that makes sarcopenia even harder to manage.

The Impact of Sarcopenia on Daily Life

By: Aria Fernandes

One of the human body's consistent functions is to grow, but the longevity of a human being's life can only last so long. A majority of individuals will begin to gradually lose muscle mass as they reach a certain age, but some may develop Sarcopenia; a condition referring to an abnormal decrease in muscle mass in older populations. This condition affects around 20% of adults above 60 years old and becomes more dangerous as it develops. The loss of muscle mass considerably impairs the body, subsequently being culpable for mobility disorders and an increased frailty. This section aims to inquire into the effects of sarcopenia on an individual's capabilities and lifestyle.

A large part of the older population without sarcopenia is able to perform most tasks with little external assistance. On the other hand, around 30% of people are at risk of losing functional independence by age 90 (Santos et al., n.d.). A majority of people without sarcopenia also report a greater quality of life in terms of physical functioning compared to those with sarcopenia, including having more physical endurance. In contrast, those with sarcopenia exhibit less strength in certain actions such as walking, sitting, rising, and climbing. Older individuals who experience sarcopenic muscle atrophy are also more prone to fatigue and falling, since reduced muscle strength directly impairs grip strength. Impaired movement and sarcopenia are closely related; the loss of muscle, reduced grip strength and decreased bone density contribute to a weakened balance. For example, reduced grip strength is a factor in the inability to stand upright for longer periods of time—which is seen in ~80% of sarcopenic patients. (Dodds et al., 2022)

The overall struggle associated with movement in sarcopenic patients creates a need for external support found in mobility devices and other people. Family members often help their sarcopenic relatives by assisting them with transportation, retrieving objects, or feeding them. The constant dependency on other people and devices to assist with every task can cause patients to feel like they have also lost their independence. A person's capability to carry out ADLs (activities of daily life) greatly affects their independence, and independence in older adults helps to prevent depression. Many incapacitated people are more likely to suffer from depression, anxiety and stress. Sarcopenia often causes a vicious cycle where older adults need to rely on other people and lose their feelings of independence, around 76% of people afflicted with sarcopenia become prone to depression. (Goodarzi et al., 2024) In turn, depression causes more functional reliance on external help, which leads to less exercise and finally even further muscle loss.

Despite sarcopenia's severe symptoms, it is often overlooked by both doctors and patients, thus, recognizing the symptoms of sarcopenia is essential in the long run. The functional status of an older adult may vary depending on their individual lifestyle and habits, finding ways to manage life that coordinates with one's level of function will help to preserve one's sense of independence, help prevent the aforementioned cycle from ensuing, and maintain a decent overall quality of life.

The Systemic Impacts of Sarcopenia on Health

By: Sri Patel

Sarcopenia, progressive loss of skeletal muscle strength and mass, is a pathologic process with a disastrous prognosis in the elderly patient and the chronically ill patient. Although much too frequently thought of as an innocent consequence of getting older, all the signs are for accumulating evidence that sarcopenia also occurs as an independent disease and an independent independent risk factor for other chronic illnesses. Its association with cardiovascular disease, obesity, and frailty is what guarantees that sarcopenia is not only muscle wasting but also vulnerability at the systems level. Sarcopenia has been shown to inevitably coexist with a variety of chronic diseases, particularly metabolic and cardiovascular diseases.

Systematic review of sarcopenia also characterizes it as "a severe condition common to various chronic diseases," pointing out its frequent nexus with diabetes, cancer, and renal disease (Fuggle et al., 2023). The colligations are a vibration of the molecular interaction involved—chronic inflammation, oxidative stress, and hormonal derangement—shared by sarcopenia and these diseases. Sarcopenia therefore develops not just as a result of but also sustains system disease to create a worsening health cycle. Sarcopenia on a clinical level also significantly enhances risks much more severe than muscle weakness. Cleveland Clinic (2022) also adds that sarcopenia exacerbates fall risks, fracture, hospitalization, and loss of independence, all of which add to frailty. Frailty is a syndrome itself that makes the patients prone to infection, surgical complications, and permanent disability. Sarcopenia is thus a sequel and manifestation of frailty, and it demonstrates how muscle loss results in greater losses of

function and health. Sarcopenia also shows a very strong association with cardiovascular disease (CVD).

Recent studies in circulation have established that sarcopenia accelerates CVD, and CVD accelerates muscle loss by slowing mobility and increasing inflammation (von Haehling et al., 2023).

Two-way interaction increases mortality risk and worsening of the quality of life among the old. Sarcopenia and cardiovascular disease increase risks such as disability, impaired physical functioning, and premature death, illustrating how the condition increases inherent susceptibilities. In short, sarcopenia is a multifaceted syndrome that is associated but not specific to the majority of chronic diseases. Sarcopenia drives frailty, obesity, and cardiovascular disease into a loop of deteriorating health outcomes. Treatment with early detection and intervention such as resistance exercise, adequate protein, and holistic medical care can interrupt the cycle, ultimately improving function and quality of life in older adults.

Treatment Options

By: Evelyn Yao

As seniors grow older, a common ailment that may befall them is sarcopenia. This is a type of muscle loss that is caused by aging and muscle loss. It is significantly prevalent among older adults, where seniors feel a loss of muscle mass, strength, and function. A few common causes are aging, reduced physical activity, nutrition deficits, chronic diseases such as heart disease and diabetes, and certain medications like corticosteroids. Adults with sarcopenia report symptoms including difficulty moving and with daily activities, weakness and fatigue, increased risk of falls, and decreased independence. Sarcopenia affects all areas of life, as people with this condition are at a higher risk of falling, fractures, and mortality. As age increases, so does the risk of sarcopenia, which is why it is important to prevent this condition as soon as possible. The main treatments are moderate exercise, nutrition intake, vitamin D, medications, and other therapies.

To begin, engaging in exercise is essential in preventing muscle loss. The key is consistency: regularly scheduling time to exercise maintains healthy levels of fitness. Some activities to practice are weightlifting and bodyweight exercises. Resistance training builds muscle mass and strength and offsets any effects of sarcopenia. Additionally, eating healthy and intaking proper nutrients is also important in maintaining health. Seniors should be on a protein-rich diet to accumulate muscle. They should aim for 1-1.5 grams of protein per kilogram of body weight daily, according to nutritionists. Vitamin D is a significant component of muscle health, so being sure to eat foods with it is critical. Some examples are fatty fish, egg yolk, mushrooms, milk, orange juice, yogurt, cheese, and fortified cereal. Seniors can take vitamin D supplements if they can not get access to vitamin D-rich foods in their daily diet.

Medications can be taken as a last measure to combat sarcopenia. Anabolic steroids can increase muscle mass, but do come with side effects. They are not recommended for long-term use due to its potentially irreversible consequences on the heart, liver, kidneys, and mental health. While these steroids do increase muscle, they do not strengthen tendons and ligaments at the same rate, meaning the risk of severe tears and ruptures increases. Additionally, anabolic steroids can cause hormone imbalances and cause side effects in men and women. Growth hormone replacement therapy is another option for treating sarcopenia, but research shows mixed results. It improves the body's protein balance, activates insulin-like growth factor 1, and stimulates muscle protein synthesis, but also leads to an increased risk for disease and cancer. Creatine supplementation can increase muscle mass and strength in seniors when used with resistance training, and is generally considered safe for consumption. It should be taken 3-5 grams per day with meals or as a pre-workout supplement, but some may experience bloating and stomach issues as side effects. Finally, stem cell therapy is a rising treatment option where one can inject stem cells into their muscles to promote muscle growth. Vibration therapy is when vibration is used to stimulate muscle contractions, allowing the senior to move again. These therapies are still being tested on but are bright future options.

Ultimately, while sarcopenia contains life-changing symptoms, there are treatment options that make the ailment manageable. Choices like resistance training exercise, nutrition options, vitamin D supplements, medications, and emerging therapies are all available for seniors to utilize. While sarcopenia may be an inevitable condition for some, with the right mindset, one can overcome it.

Sarcopenia Prevention

By: Hiya Patel

Sarcopenia, the age-related loss of muscle mass and strength, is particularly prevalent in older adults. Sarcopenia increases the risk of falls, potentially causing disability or reduced independence in senior citizens. Though the loss of muscle mass is inevitable, sarcopenia can be lessened or even delayed through prevention strategies. Regular exercise and proper nutrition are the two most popular approaches, as they are not invasive and contribute to better overall health.

Benefits of Exercise as a Preventative Strategy

Exercise, particularly resistance training, is the most effective way to slow sarcopenia. According to the Cleveland Clinic (2023), strength and resistance training performed 2-3 times per week helps to preserve older adults' muscle tissue, as well as improve balance and muscle tone. Exercise stimulates muscle protein synthesis, which helps muscles increase in strength. In addition, exercise regimes combining resistance and balance exercises improved muscle strength, gait speed, and overall function in older participants, which highlights the importance of exercise variety in sarcopenia prevention. Exercise is a lifestyle change with many benefits beyond counteracting the onset of sarcopenia, so its incorporation into older adults' daily life will have measurable positive effects in many other areas, making it a great strategy for sarcopenia prevention.

Nutrition's Importance in Muscle Preservation

Having proper nutrition is equally as important as exercise in maintaining muscle health. The National Institute on Aging (2022) recommends that older adults consume higher protein levels than younger individuals, with a focus on high-quality sources such as lean meats, legumes, dairy, and fish. Protein is crucial for slowing the progression of sarcopenia by providing the necessary building blocks to maintain muscle strength as a person ages. Additionally, both vitamin D and omega-3 fatty acids are

associated with improving muscle function. A 2020 analysis by Liao et al. concluded that supplementing a resistance training regimen with a diet focusing on maximizing protein intake increased muscle mass and strength in older adults with sarcopenia. By ensuring an adequate intake of protein and the amino acids within, older adults can counteract the natural decline in muscle mass that happens with age.

In conclusion, preventing sarcopenia in older adults requires a dual approach of consistent exercise and a proper diet. Resistance and balance training in particular have been proven to maintain muscle strength and tone, while sufficient nutrition and protein intake support muscle growth and repair. These simple but effective strategies, when employed together, can prevent the reduction of older adults' muscle mass and strength, helping preserve independence and a good quality of life.

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