Sarcopenia and Its Prognostic Role in Hospitalization and In-Hospital Mortality in Coronavirus Disease 2019 Patients with At Least One Cardiovascular Risk Factor

En Az Bir Kardiyovasküler Risk Faktörüne Sahip COVID-19 Hastalarında Sarkopeni ve Bunun Hastaneye Yatış ile Hastane İçi Mortalitedeki Prognostik Rolü

Sarcopenia is defined as decreased muscle quantity, strength, and quality. Several criteria were proposed to diagnose sarcopenia; however, the most commonly used are published by the European Working Group of Sarcopenia in Older People 2 in 2019.[1] Just loss of muscle strength shows probable sarcopenia, but the diagnosis is established when there is decreased muscle mass and quality. In a recent meta-analysis of 151 studies that were conducted between 2000 and 2019, the prevalence of sarcopenia was found between 10% and 27% in subjects over 60 years of age.[2] The range and variation in the prevalence rates came from different criteria that were used in different studies.

Pathogenesis of age-related sarcopenia includes inflammation, insulin resistance, and increased oxidative stress.[3] The infiltration of muscle tissue by adipocytes and the transformation into fibrotic tissue in the later stages of the process contribute to the decrease in muscle mass and strength.[4] Genomics and proteomics studies revealed that there are multiple dysfunctions of cell adhesion, mitochondrial function, and regeneration in patients with sarcopenic traits.[5]

Sarcopenia is an important health problem especially in the elderly population due to its association with increased morbidity and mortality.[6] The reduced muscle strength is associated with physical impairment and dependency in ambulation.[7]

Inflammatory conditions such as sepsis, certain malignancies, and autoimmune diseases may be complicated by sarcopenia, which in turn adversely affects the outcomes in these clinical settings.[8-10]

The presence of sarcopenia is also related to adverse events in cardiovascular diseases. One meta-analysis by Xue et al[11] showed that the patients over 65 years with coronary artery disease (CAD) had almost 2 times higher major adverse cardiovascular events than the patients without CAD. In advanced heart failure, sarcopenia is shown to be a strong prognostic factor and provides incremental value to the risk assessment tools.[12]

The main problem in the field of sarcopenia studies is the lack of consensus on the method to measure muscle mass. Studies with different methodology make it hard to deduce comparable results. Dual-energy x-ray absorptiometry is the imaging technique that is considered to be the gold standard in detecting whole-body muscle mass. Computerized tomography (CT), magnetic resonance imaging (MRI), and ultrasound imaging measure the muscle area in a certain segment of the body and give an idea about the whole-body muscle mass.[13]

In this issue of *Archives of Turkish Society of Cardiology*, Erdöl et al[14] investigated sarcopenia in patients with at least 1 cardiovascular risk factor and hospitalized for coronavirus

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disease-19 (COVID-19). The study aimed to show the effect of the skeletal muscle mass measured by CT on the duration of hospital stay, the intensive care unit (ICU) admission, and the need for invasive mechanical ventilation (IMV). The study was conducted in a single center and included 232 consecutive patients. The median follow-up was 11 days. The median age was 51, and 50% of patients were males. The authors grouped the patients into tertiles according to their muscle mass; tertile 1 represented the patients with the highest muscle mass, whereas tertile 3 represented the patients with the lowest muscle mass.

The most prevalent cardiovascular risk factor was hypertension (HT) in all study populations (43%), and it was significantly higher in the patients with the lowest muscle mass. Additionally, the biochemical parameters such as C-reactive protein, procalcitonin, and D-dimer were all significantly higher and the lymphocyte count was significantly lower in the tertile 3.

The patients in the tertile 3 had a significantly higher need for ICU, IMV and significantly higher in-hospital mortality. The authors formed a Cox proportional regression model for in-hospital mortality which was composed of age, gender, diabetes mellitus (DM), hypertension (HT), high sensitive troponin I, history of coronary artery disease, and cross-sectional area of the total skeletal muscle (total SM_{csa}). The presence of DM and HT significantly increased the risk of in-hospital mortality. On the other hand, total SM_{csa} decreased the risk. Receiver operating characteristic analysis found total SM_{csa} index below 27.1 cm^2/m^2 predicted in-hospital mortality with 75% sensitivity and 80% specificity.

Since the beginning of the COVID-19 pandemic, numerous studies have been conducted to unravel the risk factors that contribute to morbidity and mortality in patients with COVID-19. In a meta-analysis by Dessi and Zwotir, acute kidney injury, chronic obstructive pulmonary disease, DM, HT, cardiovascular diseases, cancer, increased D-dimer, male gender, older age, current smoker, and obesity were all associated with increased mortality in COVID-19.[15]

The effect of sarcopenia on adverse outcomes was also studied in COVID-19 patients. Similar to the current article, a pooled analysis of 6 studies revealed that CT-defined sarcopenia was significantly associated with in-hospital mortality and ICU admission.[16] However, as discussed by the authors, the current study differs from previously published studies by including 3 different muscle groups and muscle attenuation values. The authors described the limitations of the current study as retrospective analysis and the relatively small sample size. Additional limitations are the lack of data about the nutritional status of the patients such as daily calorie and protein intake and physical activity level of the patients before COVID-19. Also, the results of the study could not be generalized to the whole COVID-19 population.

Despite the limitations, however, the current study provides valuable information about the negative effect of sarcopenia in patients with COVID-19 and cardiovascular risk. It also gives hypothesis generating insight into the common pathology underlying sarcopenia, cardiovascular diseases, and inflammatory conditions. More information is still needed to optimally manage the patients with COVID-19 and prevent adverse events.

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