

Article

The Role of Troponin And Il-6 in Immunological Assessment of Sarcopenia in Oncological Patients

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Abstract: Sarcopenia is a progressive syndrome associated with aging, leading to decreased muscle mass and function. This study aims to evaluate troponin and IL-6 as immunological biomarkers in sarcopenia. Methods: 180 patients aged 65–86 were analyzed for serum troponin T and IL-6 levels. Statistical analyses included Mann–Whitney U and logistic regression. Troponin was significantly elevated in sarcopenic patients. IL-6 showed a non-significant upward trend. Troponin was identified as an independent predictor. Troponin and IL-6 may serve as useful clinical biomarkers for sarcopenia. Troponin, in particular, holds promise for early detection.

Keywords: Sarcopenia, Troponin, Interleukin-6, Biomarkers, Aging, Immunology

1. Introduction

Sarcopenia is increasingly recognized as a key component of the aging process, affecting millions of older adults worldwide. It is characterized by progressive and generalized loss of skeletal muscle mass and strength, often accompanied by increased inflammatory activity and immune dysregulation [1], [2]. Numerous studies have investigated the physiological mechanisms and clinical markers associated with sarcopenia, emphasizing its complex, multifactorial origin [3], [4].

Among the molecular biomarkers studied, troponin has traditionally been considered a specific indicator of myocardial injury. However, emerging evidence has demonstrated its relevance in non-cardiac muscle pathology, particularly in sarcopenia. Elevated troponin levels have been observed in elderly individuals with reduced muscle mass, supporting the hypothesis that muscle cell turnover and subclinical damage may be detectable through this cardiac-derived protein [5], [6].

Similarly, interleukin-6 (IL-6), a pro-inflammatory cytokine, plays a dual role in muscle metabolism. While acute increases in IL-6 during physical activity can mediate beneficial effects such as glucose regulation and lipolysis, chronically elevated IL-6 is associated with muscle catabolism, mitochondrial dysfunction, and reduced physical performance [4], [7]. It is now considered one of the most consistent immunological markers linked with age-related muscle decline [8].

Recent meta-analyses have reinforced the association between IL-6, systemic inflammation, and physical frailty, suggesting its potential utility in risk stratification and early detection of sarcopenia [8]. Additionally, the interplay between IL-6 and other

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cytokines, including TNF- α and CRP, further supports its inclusion in multimarker diagnostic panels [9], [10].

Sarcopenia, characterized by the age-related decline in skeletal muscle mass and strength, poses a significant health challenge in the aging population. Its impact extends beyond reduced mobility, increasing the risk of falls, fractures, disability, loss of independence, and diminished quality of life [1], [11]. Despite extensive research, the precise pathophysiology of sarcopenia remains unclear. However, growing evidence suggests that immune system alterations and chronic inflammation are key contributors to its progression [12], [13].

Aging is associated with a shift in immune regulation, notably the transition from Th1- to Th2-mediated immunity, potentially influencing muscle catabolism. In this context, biomarkers such as troponin, traditionally regarded as indicators of cardiac injury, and interleukin-6 (IL-6), a cytokine linked to inflammation and muscle activity, have garnered attention. This study aimed to explore the roles of troponin and IL-6 as immunological indicators in sarcopenia, investigating their potential as diagnostic and prognostic tools.

Defining Sarcopenia and Its Clinical Importance

Sarcopenia is increasingly recognized as a multifactorial syndrome, influenced by age, malnutrition, physical inactivity, chronic disease, hormonal changes, and mitochondrial dysfunction [1], [14]. It is associated with numerous adverse outcomes, including insulin resistance, diabetes, cardiovascular disease, cognitive decline, and increased mortality [15]. Epidemiological studies estimate its prevalence at approximately 20% among individuals over 80 years of age, a figure expected to rise with global aging trends [2].

Muscle mass loss progresses at a rate of 3–8% per decade after the age of 30, accelerating significantly after 70 years [3]. Addressing sarcopenia through early detection and intervention is crucial to maintaining functional independence and reducing healthcare burdens [1], [11].

Troponin and IL-6: Emerging Biomarkers in Sarcopenia

Troponin, long used to detect myocardial injury, has recently been implicated in skeletal muscle pathology. Meanwhile, IL-6 is recognized for its dual role: acutely promoting beneficial muscle responses to exercise but chronically driving inflammation and muscle wasting. Prior studies have linked elevated IL-6 levels to reduced muscle strength and impaired mobility in the elderly.

Given the observed interplay between inflammation and muscle degradation, investigating troponin and IL-6 together may yield valuable insights into the immunological underpinnings of sarcopenia. This study represents one of the first comprehensive attempts to evaluate their combined significance in elderly patients.

2. Materials and Methods

This cross-sectional, observational study enrolled 180 elderly patients aged between 65 and 86 years, comprising 115 women and 65 men. Participants were recruited based on standardized sarcopenia diagnostic criteria. Exclusion criteria included active malignancies, acute cardiovascular events, advanced organ failure, and any condition potentially affecting muscle mass independently of aging.

Venous blood samples were collected and processed according to strict laboratory protocols. Troponin T levels were measured using chemiluminescent immunoassay methods, while IL-6 concentrations were determined by immunocytochemistry.

Physical performance was assessed using grip strength and gait speed (4-meter walk test). Demographic data, body mass index (BMI), comorbidities, and functional status were recorded.

Data were analyzed using descriptive statistics and inferential tests. The Mann-Whitney U test assessed differences between groups. Correlations between biomarker levels and sarcopenia indicators were explored using Pearson correlation and multiple logistic regression models. A p-value of less than 0.05 was considered statistically significant.

3. Results

Sarcopenia was identified in 30% of the study population. Sarcopenic individuals were significantly older and more likely to be female compared to non-sarcopenic counterparts. Higher rates of comorbidities, including type 2 diabetes and hypertension, were noted among sarcopenic patients.

Troponin levels were significantly higher in sarcopenic patients compared to controls, independent of sex, see Table 1. In contrast, IL-6 levels showed a trend toward elevation in sarcopenic individuals but did not reach statistical significance. Troponin emerged as an independent predictor of sarcopenia in multivariable analysis.

Table 1. Biomarker Levels in Sarcopenic vs. Non-sarcopenic Patients.

Group	Sex	Troponin (ng/L)	IL-6 (pg/mL)	Sample Size
Sarcopenic	Male	338.5	6.2	30
Sarcopenic	Female	342.7	7.0	60
Non-sarcopenic	Male	196.1	5.5	30
Non-sarcopenic	Female	198.3	5.7	60

The presented chart compares troponin levels (ng/L) between two patient groups — sarcopenic and non-sarcopenic, with consideration of sex (male and female), see Figure 1.

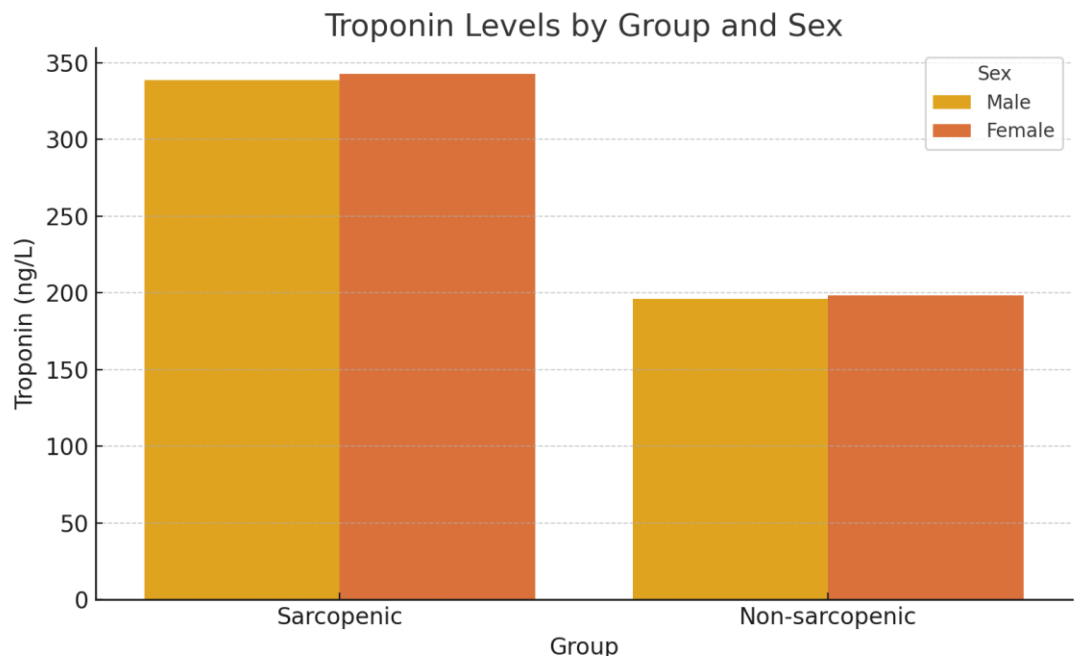


Figure 1. Troponin Levels by Group and Sex.

Troponin levels are significantly higher in sarcopenic patients compared to non-sarcopenic ones, with minimal differences between sexes in both groups. This supports the diagnostic relevance of troponin as a biomarker of muscle degeneration in sarcopenia.

The chart compares interleukin-6 (IL-6) levels (pg/mL) between two groups of patients — sarcopenic and non-sarcopenic, broken down by sex (male and female), see Figure 2.

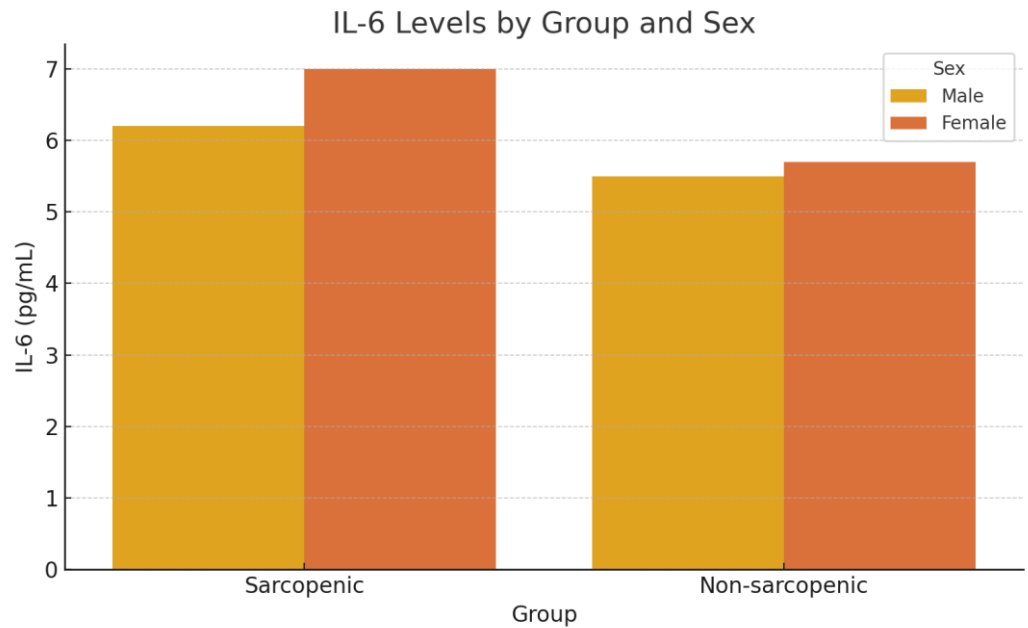


Figure 2. IL-6 Levels by Group and Sex.

IL-6 levels are moderately elevated in sarcopenic patients, especially in females, compared to non-sarcopenic individuals. This finding supports the involvement of IL-6 as an inflammatory marker in the pathogenesis of sarcopenia.

4. Discussion

The findings reinforce the role of chronic inflammation and muscle injury in the pathogenesis of sarcopenia. Elevated troponin levels suggest underlying skeletal muscle damage beyond cardiac involvement. Although IL-6 levels were not independently predictive, their association with muscle function decline remains biologically plausible.

Early detection of sarcopenia using biomarkers such as troponin could facilitate timely interventions aimed at preserving muscle health and reducing morbidity. Larger, longitudinal studies are warranted to validate these findings and to establish standardized biomarker thresholds.

5. Conclusion

Troponin and IL-6 represent promising biomarkers for the immunological assessment of sarcopenia. While troponin demonstrated a stronger association with sarcopenic status, IL-6 remains relevant due to its central role in inflammation-driven muscle degradation. Integrating these markers into clinical practice may improve early diagnosis, guide treatment strategies, and ultimately enhance outcomes for aging populations.

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