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REVIEW

Evaluation of nutritional state and sarcopenia in patients with vasculitis

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ABSTRACT

Vasculitides are systemic rheumatic diseases characterized by chronic inflammation, predisposing patients to a polymorbid state and profound metabolic disturbances. Among the most clinically relevant complications are malnutrition and sarcopenia, which frequently coexist and contribute to frailty, disability, and mortality. Malnutrition arises from reduced dietary intake, treatment-related gastrointestinal side effects, and inflammation-driven metabolic imbalance, while sarcopenia is defined as the progressive loss of muscle mass, strength, and function, and develops as a secondary complication of chronic inflammation, glucocorticoid exposure, renal impairment, and physical inactivity. Their prevalence is high in patients with vasculitis, and they are strongly associated with adverse outcomes. Early recognition is essential and requires structured screening of nutritional risk with validated tools, complemented by systematic evaluation of muscle strength and body composition. Evidence emphasizes that intervention should begin once risk or probable sarcopenia is identified, rather than awaiting definitive confirmation. Management is multidisciplinary, integrating medical nutrition therapy with adequate protein and energy intake, oral or enteral supplementation when necessary, and individualized exercise programs, particularly resistance training, to stimulate muscle synthesis and restore function. This review highlights the underlying mechanisms, diagnostic approaches, and evidence-based strategies for addressing malnutrition and sarcopenia in vasculitis, underscoring the importance of proactive and coordinated care to improve functional outcomes, quality of life, and prognosis.

Keywords: Vasculitis, sarcopenia, malnutrition, muscle strength, nutritional therapy.

INTRODUCTION

Vasculitides are heterogeneous systemic rheumatic diseases characterized by inflammatory injury and, in some entities, necrosis of blood vessel walls [1]. The common feature of these diseases, chronic systemic inflammation that is prolonged and difficult to control, makes patients highly susceptible to a polymorbid state where multiple health problems coexist. Indeed, it has been shown that the risk of developing polymorbidity in patients with vasculitis, especially ANCA-associated vasculitides (AAV), is approximately 8 times higher than in the general population [2]. In this complex clinical picture, one of the most important and often overlooked problems that arises as a direct result of the systemic inflammatory response is sarcopenia [3]. Sarcopenia, defined as the progressive loss of muscle mass, strength, and function, is no longer considered to be solely related to aging (primary sarcopenia) but is now accepted as a significant complication of chronic inflammatory conditions like vasculitis (secondary sarcopenia) [4]. In patients with systemic inflammatory disorders, sarcopenia is highly prevalent and has been linked to increased morbidity, frailty, infectious complications and mortality [5,6].

PATHOPHYSIOLOGICAL MECHANISMS LEADING TO MALNUTRITION AND SARCOPENIA IN VASCULITIS

The development of sarcopenia and malnutrition in patients with vasculitis is a multifactorial process, fundamentally rooted in inflammation, treatment, and other disease-related complications. The fact that this process is a common feature of systemic rheumatic diseases is supported by findings in other conditions such as systemic sclerosis [7].

Catabolic Effects of Systemic Inflammation

Inflammatory processes lead to the production of pro-inflammatory cytokines such as interleukin-1 (IL-1), interleukin-6 (IL-6), and tumor necrosis factor-alpha (TNF-α) [8]. Systemic inflammation causes the body to redirect energy and nutrients for the immune response. In this process, muscle protein breakdown, insulin resistance, increased lipolysis, and an increase in energy expenditure are observed [9,10]. Particularly in muscle tissue, protein synthesis decreases while protein breakdown increases, depending on the severity of the inflammation. This situation is associated with the increased expression of two key genes that enhance muscle breakdown, atrogin-1 and MuRF-1, via the Ubiquitin-proteasome pathway [11]. Furthermore, the growth hormone/IGF-1 axis is suppressed during inflammation, which accelerates muscle atrophy [12].

Effects of Treatment on Nutritional Status

Glucocorticoids, the cornerstone of vasculitis therapy, are one of the most significant triggers for the development of sarcopenia. In high doses and long-term use, they lead to a condition known as "steroid myopathy" [13]. Glucocorticoids cause insulin resistance, impairing glucose utilization by muscle cells, and inhibit muscle protein synthesis. They also increase muscle protein breakdown. This condition leads to atrophy, especially in type II muscle fibers [14]. Certain genetic polymorphisms (e.g., ABCB1, PAI-1) may increase sensitivity to steroids [15]. It most commonly presents with weakness in the proximal muscles of the lower extremities, difficulty in climbing stairs, and rising from a seated position. Clinical findings are generally related to the cumulative dose and are usually reversible with dose reduction [16]. Other frequently used immunosuppressive drugs such as cyclophosphamide, azathioprine, and methotrexate can hinder adequate nutrient intake by causing gastrointestinal side effects like nausea, vomiting, anorexia, and mucositis [17,18].

Other Disease-Related Factors

Kidney involvement, which is common especially in ANCA-associated vasculitis, can lead to chronic kidney disease. Uremic toxins, metabolic acidosis, and inflammation play a significant role in the development of cachexia due to renal failure [19]. Additionally, general symptoms of systemic vasculitides such as chronic fatigue, pain, and depression severely restrict patients' physical activity levels, predisposing them to "disuse atrophy" [20].

CLINICAL ASSESSMENT: DIAGNOSING NUTRITIONAL STATUS AND SARCOPENIA

Early diagnosis of nutritional status and sarcopenia in patients with vasculitis is critical for intervention success and requires a multifaceted evaluation.

Assessment of Nutritional Status

In clinical practice, at-risk patients can be quickly identified with validated short screening tools such as NRS-2002 (Nutritional Risk Screening) or MNA-SF (Mini Nutritional Assessment-Short Form) [21].

The MNA-SF is a six-item instrument that evaluates recent changes in food intake, unintentional weight loss over the previous three months, mobility, recent psychological stress or acute illness, neuropsychological problems, and body mass index (BMI). Each item is scored, yielding a total score between 0 and 14. Scores of 12–14 indicate normal nutritional status, 8–11 denote risk of malnutrition and 0–7 indicate established malnutrition.

With the "Global Leadership Initiative on Malnutrition" (GLIM) criteria, established by the Global Clinical Nutrition Community, it is possible to make a definitive diagnosis and determine the severity of malnutrition in patients identified in the risk group by screening tools [22].

Anthropometric measurements provide practical and non-invasive information about body composition [23]. BMI, although used for general screening, cannot distinguish between muscle and fat mass. In conditions where inflammation and corticosteroid therapy coexist, such as in vasculitis, a patient may lose muscle mass while gaining fat mass. In this case, a serious underlying nutritional disorder may be overlooked even if the BMI remains normal or high. Therefore, BMI is not a reliable indicator on its own [24].

Low serum albumin and prealbumin levels may indicate malnutrition that should be interpreted in conjunction with an inflammatory marker such as C-reactive protein (CRP). Measurement of Vitamin D levels should also be standard due to the risk of osteoporosis and its effects on muscle function associated with steroid use [25].

Diagnostic Methods for Sarcopenia

The European Working Group on Sarcopenia in Older People (EWGSOP2) recommends the Find-Assess-Confirm-Severity (F-A-C-S) algorithm. This algorithm can be readily used in the follow-up of vasculitis [26].

Find: Identifying Risk

The first step is to identify patients at risk for sarcopenia. The SARC-F questionnaire is a brief, self-reported screening tool consisting of five domains: strength (difficulty lifting or carrying a moderate weight), assistance in walking, rising from a chair or bed, climbing stairs and history of falls in the previous year [27].

Each item is scored from 0 (no difficulty) to 2 (severe difficulty or inability), resulting in a total score between 0 and 10. A total score of 4 or more suggests a high probability of sarcopenia and indicates the need for objective muscle strength testing.

Assess: Evaluating Muscle Strength

In patients suspected after screening, muscle strength is evaluated. Low muscle strength is sufficient for a diagnosis of "Probable Sarcopenia." Muscle strength is the most reliable measure of muscle function.

Handgrip Strength: A simple, inexpensive, and powerful test for predicting outcomes. A calibrated hand dynamometer is used (Cut-off points: Male < 27 kg, Female < 16 kg) [28].

Chair Stand Test: An indicator of leg (quadriceps) strength. The time it takes for a patient to rise from a chair 5 times without using their arms is measured (Cut-off point: > 15 seconds for 5 rises) [29].

Confirm: Measuring Muscle Mass

If low muscle mass is also demonstrated in a patient with low muscle strength, the diagnosis is confirmed as "Definitive Sarcopenia".

Dual-energy X-ray Absorptiometry (DXA): One of the recommended methods for measuring muscle mass in clinical practice. It measures Appendicular Skeletal Muscle Mass (ASM).

Bioelectrical Impedance Analysis (BIA): A cheaper, portable, and practical alternative. However, it requires population-specific equations to validate the results.

Computed tomography (CT) and magnetic resonance imaging (MRI) are considered reference methods for non-invasive quantification of muscle mass and quality, but their use is usually limited by cost and availability. Nevertheless, in patients with vasculitis who frequently undergo imaging for other reasons (e.g., to assess disease activity or organ involvement), these scans can be used 'opportunistically' to evaluate muscle mass. For example, cross-sectional muscle area at the third lumbar vertebra (L3) strongly correlates with whole-body muscle mass and has prognostic value [30]. Therefore, CT and MRI are valuable tools for confirming a definitive diagnosis of sarcopenia, especially in research settings and specific clinical situations [31].

Physical Performance Tests: Determining Severity

If low physical performance is also detected in addition to a definitive diagnosis of sarcopenia, the condition is classified as "Severe Sarcopenia".

Usual gait speed measured over a short distance (e.g. 4 m) is a simple and informative test; a walking speed of ≤0.8 m/s indicates poor performance. Other validated tools such as the Short Physical Performance Battery (SPPB) and the Timed Up and Go (TUG) test may also be used to characterize functional limitation [4].

TREATMENT AND MANAGEMENT STRATEGIES

The modern approach to managing both malnutrition and sarcopenia emphasizes that one should not wait for a definitive diagnosis (e.g., completion of GLIM criteria or muscle mass measurement) to start treatment. Risk identified with screening tests (for malnutrition) or "Probable Sarcopenia" determined by low muscle strength are indications to investigate underlying causes and to begin treatment. This proactive approach is critical in preventing the progression of muscle loss and nutritional deficits [4,22]. Nutritional therapy should be initiated in patients who meet at least one of the criteria detailed in Table 1 [32].

When treatment is planned, it is aimed to start nutritional support within the first 48 hours of hospitalization and to reach at least 75% of the patient's needs. This approach has been proven to reduce mortality and the risk of adverse events [33].

The foundation of treatment consists of medical nutrition and exercise. Energy needs are adjusted according to the patient's clinical condition; while 25-30 kcal/kg/day is targeted for sedentary patients, this need can increase to 35 kcal/kg/day and above in cases of severe disease exacerbation or malabsorption [34]. Goals should be reached slowly to avoid refeeding syndrome.

To combat catabolic states, a protein intake of 1.2-1.5 g/kg/day is strongly recommended [35]. However, in patients with an eGFR <60 mL/min/1.73 m^2 who are not on dialysis, this target should be reduced to 0.8 g/kg/day [36].

If the oral route is feasible but spontaneous food intake remains insufficient, oral nutritional supplements (ONS), which have been proven to improve survival and be cost-effective, should be used [37]. In cases where oral intake is inadequate, enteral nutrition (EN) should be preferred to achieve nutritional goals. The timing of parenteral nutrition (PN) when oral/enteral intake is not possible is adjusted according to the patient's risk; it is not recommended before 7 days in low-risk patients, whereas it should be started immediately in those with severe malnutrition [38]. To improve functional status, healing of pressure ulcers and preserve muscle mass, specialized products containing β-Hydroxy β-Methylbutyrate (HMB) may be preferred [39].

Exercise is essential to maximize the effectiveness of nutritional therapy. While nutritional support provides the necessary building blocks for muscle tissue, exercise triggers the anabolic signal that enables the use of these building blocks. The targeted type of exercise in sarcopenia management is resistance exercise, which directly stimulates muscle protein synthesis and increases muscle strength. The exercise prescription must be individually planned and monitored by a physiotherapist, considering the patient's current disease activity and functional capacity. Ultimately, the success of the treatment depends on a multidisciplinary approach that combines nutritional and exercise interventions [40].

CONCLUSION

Sarcopenia and malnutrition are prevalent and clinically significant complications in patients with vasculitis, driven by a complex interplay of systemic inflammation, catabolic effects of treatment, and disease-related factors. Their presence is associated with poor clinical outcomes, including increased frailty and mortality. Therefore, routine screening for nutritional risk and sarcopenia should be an integral part of the clinical management of patients with vasculitis. The EWGSOP2 F-A-C-S algorithm provides a practical and systematic framework for diagnosis. A proactive management strategy

Table 1. Indications for initiating nutritional therapy

Category	Indication Criteria
Anthropometric Criteria	BMI < 18.5 kg/m^2
	Unintentional weight loss > 10% in the last 3-6 months, regardless of BMI
	Unintentional weight loss > 5% in the last 3-6 months if BMI is < 20 kg/m^2
Nutrient Intake Criteria	Starvation for more than three days (oral intake < 500 kcal/day)
	Anticipated inadequate oral intake (<60% of requirement) for more than 5-7 days
	Anticipated period of no oral intake for 5 days or more

is essential, where intervention is initiated upon identifying risk or probable sarcopenia, rather than waiting for a definitive diagnosis. The cornerstone of treatment is a multidisciplinary approach combining individualized medical nutrition therapy, with an emphasis on high protein intake, and a tailored resistance exercise program. Implementing these evidence-based strategies can mitigate the adverse effects of sarcopenia and malnutrition, thereby improving functional status, quality of life, and overall prognosis for patients with vasculitis.

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