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ANABOLIC HORMONAL THERAPIES IN THE TREATMENT OF SARCOPENIA IN OLDER ADULTS: AN INTEGRATIVE REVIEW OF CURRENT EVIDENCE

TERAPIAS HORMONAIS ANABÓLICAS NO TRATAMENTO DA SARCOPENIA EM IDOSOS: REVISÃO INTEGRATIVA DAS EVIDÊNCIAS ATUAIS

TERAPIAS HORMONALES ANABÓLICAS EN EL TRATAMIENTO DE LA SARCOPENIA EN PERSONAS DE EDAD AVANZADA: REVISIÓN INTEGRADORA DE LA EVIDENCIA ACTUAL

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ABSTRACT

Sarcopenia, defined as the progressive and generalized loss of muscle mass and strength, is highly prevalent among older adults and is associated with increased morbidity and mortality, higher risk of falls, and loss of functional independence. This study aimed to review the scientific evidence on the use of anabolic hormonal therapies in the treatment of sarcopenia, with emphasis on their mechanisms of action, clinical efficacy, and potential risks. Literature searches were conducted in PubMed, SciELO, and Web of Science, covering publications from recent decades on testosterone, growth hormone, selective androgen receptor modulators (SARMs), and other anabolic agents. The analysis of available studies

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indicates that hormone replacement may promote gains in lean body mass, muscle strength, and physical performance, particularly when combined with nutritional interventions and resistance training programs. However, these benefits must be carefully weighed against potential adverse effects, including cardiovascular and metabolic alterations, as well as an increased risk of certain hormone-dependent neoplasms. In conclusion, anabolic hormonal therapies represent a promising adjuvant strategy for the management of sarcopenia, provided they are implemented within multimodal programs and accompanied by individualized clinical assessment and strict monitoring.

Keywords: Sarcopenia. Hormone Therapy. Anabolic Agents. Testosterone. Aging.

RESUMO

A sarcopenia, definida como a perda progressiva e generalizada de massa e força muscular, é altamente prevalente em idosos e está associada a maior morbimortalidade, risco de quedas e perda de independência funcional. Este estudo teve como objetivo revisar as evidências científicas acerca do uso de terapias hormonais anabólicas no tratamento da sarcopenia, com ênfase em seus mecanismos de ação, eficácia clínica e potenciais riscos. Para tanto, foram consultadas as bases PubMed, SciELO e Web of Science, contemplando publicações das últimas décadas sobre testosterona, hormônio do crescimento, moduladores seletivos do receptor androgênico (SARMs) e outros agentes anabólicos. A análise dos estudos indica que a reposição hormonal pode promover ganhos de massa magra, força muscular e desempenho físico, sobretudo quando associada a intervenções nutricionais e programas de exercício resistido. Entretanto, os benefícios devem ser cuidadosamente ponderados frente aos possíveis efeitos adversos, como alterações cardiovasculares e metabólicas, além de risco aumentado para determinadas neoplasias. Conclui-se que as terapias hormonais anabólicas representam uma estratégia adjuvante promissora no manejo da sarcopenia, desde que aplicadas em programas multimodais e acompanhadas de avaliação clínica individualizada e rigoroso monitoramento.

Palavras-chave: Sarcopenia. Terapia Hormonal. Anabolizantes. Testosterona. Envelhecimento.

RESUMEN

La sarcopenia, definida como la pérdida progresiva y generalizada de masa y fuerza muscular, es altamente prevalente en adultos mayores y se asocia con mayor morbilidad y mortalidad, riesgo de caídas y pérdida de la independencia funcional. Este estudio tuvo como objetivo revisar la evidencia científica sobre el uso de terapias hormonales anabólicas en el tratamiento de la sarcopenia, con énfasis en sus mecanismos de acción, eficacia clínica y riesgos potenciales. Para ello, se consultaron las bases de datos PubMed, SciELO y Web of Science, incluyendo publicaciones de las últimas décadas sobre testosterona, hormona del crecimiento, moduladores selectivos de los receptores de andrógenos (SARM) y otros agentes anabólicos. El análisis de los estudios indica que la terapia de reemplazo hormonal puede promover ganancias de masa magra, fuerza muscular y rendimiento físico, especialmente cuando se combina con intervenciones nutricionales y programas de ejercicios de resistencia. Sin embargo, los beneficios deben sopesarse cuidadosamente frente a los posibles efectos adversos, como cambios cardiovasculares y metabólicos, así como un mayor riesgo de ciertos tipos de cáncer. Concluimos que las terapias hormonales anabólicas representan una estrategia adyuvante prometedora en el manejo de la

sarcopenia, siempre que se implementen en programas multimodales y se acompañen de una evaluación clínica individualizada y un seguimiento riguroso.

Palabras clave: Sarcopenia. Terapia Hormonal. Esteroides Anabólicos. Testosterona. Envejecimiento.

1 INTRODUCTION

Population aging is a global phenomenon that imposes significant challenges on health systems, especially with regard to the prevention and management of conditions associated with functional decline and loss of independence in the elderly. Among these conditions, sarcopenia, defined as a syndrome characterized by the progressive and generalized loss of muscle mass and strength, occupies a prominent place, given its high prevalence and impact on quality of life and mortality (CRUZ-JENTOFT et al., 2019). This condition not only increases the risk of falls and fractures, but also compromises functional capacity, configuring itself as an important marker of frailty in elderly populations (CORONA, 2020).

Although the etiology of sarcopenia is multifactorial, involving neuromuscular changes, hormonal imbalances, chronic low-grade inflammation, nutritional changes, and physical inactivity, the role of age-related hormonal decline has received increasing scientific attention (CRUZ-JENTOFT et al., 2014; CRUZ-JENTOFT et al., 2021). The reduction of anabolic hormones, such as testosterone, growth hormone (GH), and IGF-1 (insulin-like growth factor type 1), is considered one of the main biological determinants of muscle mass loss. In this context, understanding the role of anabolic hormone therapies as an intervention strategy is essential to expand the available therapeutic options and, potentially, delay or reverse the course of sarcopenia.

From a pathophysiological point of view, sarcopenia results from an imbalance between the synthesis and degradation of muscle proteins, with a predominance of catabolic processes. This imbalance is influenced by multiple factors, including anabolic resistance to nutritional stimulation and exercise, endocrine dysfunctions, and increased activation of pro-inflammatory pathways (BEASLEY; SHIKANY; THOMSON, 2013). With advancing age, a physiological reduction in the production of anabolic hormones is observed, which compromises the intracellular signaling responsible for the maintenance and repair of muscle fibers. Consequently, therapies aimed at restoring or optimizing these hormone levels have the potential to preserve lean mass and improve muscle function.

Epidemiological studies indicate that the prevalence of sarcopenia can vary widely according to the diagnostic criteria and the population analyzed, but often exceeds 20% in the elderly over 80 years of age (BEZERRA; OLIVE TREE; SILVA; READ; CARVALHO, 2023). This condition is associated with a higher risk of hospitalizations, functional disability, and mortality, and is a public health problem with relevant economic and social implications

(CRUZ-JENTOFT et al., 2014). In addition, as evidenced by Bezerra, Lemos, and Carvalho (2020), nutritional deficiencies, especially of proteins and essential micronutrients, can accelerate muscle decline, reinforcing the need for integrated strategies that combine adequate diet, physical exercise, and, when indicated, pharmacological and hormonal interventions.

In the traditional management of sarcopenia, the therapeutic basis involves nutritional interventions and resistance training programs (DALTOÉ; DEMOLINER, 2021; ALMEIDA et al., 2020). Adequate consumption of high-quality proteins, especially those rich in essential amino acids such as leucine, has shown a positive effect on muscle protein synthesis, reducing the rate of loss of lean mass (BEASLEY; SHIKANY; THOMSON, 2013). However, in certain cases, these approaches are not enough to reverse the condition, especially in older people with strong anabolic resistance or extremely low hormone levels.

Given this therapeutic gap, anabolic hormone therapies emerge as a promising field of investigation. Among the options studied, testosterone replacement in men with hypogonadism, the use of growth hormone and its analogues, and the administration of selective androgen receptor modulators (SARMs) stand out. Such interventions aim to restore anabolic stimulus, increase protein synthesis, promote muscle hypertrophy, and improve functional parameters such as strength, gait speed, and balance. However, the indication and safe use of these therapies require careful evaluation of risks and benefits, considering the potential for cardiovascular, hepatic and endocrine adverse effects.

As argued by Cruz-Jentoft et al. (2019), early diagnosis and intervention in sarcopenia are key to maximizing therapeutic efficacy, as the reversibility of muscle loss tends to be limited in advanced stages. In this sense, hormone treatment can have a greater impact when integrated into a multidisciplinary program that includes nutritional support, physiotherapy, and regular clinical follow-up. This holistic approach is also reinforced by Bezerra, Santos, and Carvalho (2022), who highlight the relationship between balanced dietary patterns and reduced risk of sarcopenia.

Despite the promising potential, the use of anabolic hormones in the treatment of sarcopenia is still a subject of debate in the scientific literature. Issues related to optimal dose, duration of treatment, appropriate patient selection, and monitoring of adverse events remain without consensus (CRUZ-JENTOFT et al., 2021). In addition, clinical guidelines, such as those of the European Working Group on Sarcopenia in Older People (EWGSOP2), still

recommend that such therapies be adopted with caution and only in specific clinical contexts, usually when there is proven hormone deficiency (CRUZ-JENTOFT et al., 2019).

It is important to highlight that, for the success of hormone therapy, factors such as the patient's nutritional status play a decisive role. Elderly people with insufficient protein intake or deficiencies of micronutrients, such as vitamin D, magnesium and zinc, may not respond adequately to hormonal anabolic stimulation (BEZERRA; READ; CARVALHO, 2020). This aspect reinforces the perspective defended by Almeida et al. (2020) and Corona (2020), that any pharmacological intervention must be accompanied by individualized dietary adjustments.

The increasing prevalence of sarcopenia in the context of population aging reinforces the urgency of investigating innovative and effective therapies. In the light of the current literature, it is observed that anabolic hormone replacement, when appropriately indicated, can contribute to the improvement of clinical and functional parameters, especially in individuals with associated hormone deficiency. However, given the complexity of this intervention, its application requires well-established clinical protocols and rigorous monitoring, in order to ensure both the safety and effectiveness of the treatment.

Thus, this article aims to perform an integrative review of the literature on the use of anabolic hormone therapies in the management of sarcopenia in the elderly, analyzing the current evidence on their efficacy, safety, and clinical applicability. In addition, it seeks to discuss the challenges and future perspectives in this field, considering the integration with non-pharmacological strategies and the need for an individualized approach. By synthesizing the available knowledge, it is expected to offer subsidies for evidence-based clinical practice and for the formulation of health policies aimed at promoting healthy and functional longevity.

2 METHODOLOGY

The present investigation used the integrative literature review method, an approach widely used in the health area, to synthesize available evidence and offer a comprehensive understanding of a specific phenomenon (WHITTEMORE; KNAFL, 2005). This methodology was chosen because it allows the inclusion of studies with different designs, randomized clinical trials, observational studies, systematic reviews, and meta-analyses, which favors a global view of the evidence related to anabolic hormone therapies applied to the treatment of sarcopenia in the elderly.

The integrative review was conducted in six interdependent steps: (1) identification of the problem and formulation of the research question; (2) definition of eligibility criteria; (3) establishment of search and selection strategies for studies; (4) extraction and organization of data; (5) critical evaluation and analysis of evidence; and (6) synthesis and presentation of results.

2.1 PROBLEM IDENTIFICATION AND RESEARCH QUESTION

Sarcopenia, recognized as a geriatric syndrome characterized by the progressive loss of muscle mass and function (CRUZ-JENTOFT et al., 2019), has a high prevalence and is associated with adverse outcomes, such as a higher risk of falls, functional disability, and increased mortality (CRUZ-JENTOFT et al., 2014; CORONA, 2020). Although nutritional interventions and resistance exercise programs are widely recommended (DALTOÉ; DEMOLINER, 2021; ALMEIDA et al., 2020; BEASLEY; SHIKANY; THOMSON, 2013), pharmacological therapies, especially anabolic hormonal ones, have emerged as alternatives or complementary strategies, especially in refractory cases.

Thus, the following guiding question was defined for the review: **"What is the current scientific evidence on the efficacy and safety of anabolic hormone therapies in the treatment of sarcopenia in the elderly?"**

2.2 ELIGIBILITY CRITERIA

Inclusion criteria **were established** to ensure the relevance and quality of the evidence:

- **Type of study:** randomized controlled trials, quasi-experimental studies, observational studies (cohort, case-control, cross-sectional), systematic reviews, and meta-analyses.
- **Population:** individuals aged 60 years or older, diagnosed with sarcopenia according to recognized criteria, such as the *European Working Group on Sarcopenia in Older People* (EWGSOP) (Cruz-Jentoft et al., 2019).
- **Intervention:** use of anabolic hormonal therapies (testosterone, growth hormone, selective androgen receptor modulators, among others).
- **Outcomes:** changes in muscle mass, strength, physical performance, quality of life, adverse events.
- **Language:** studies published in Portuguese, English or Spanish.

- **Period:** publications between 2013 and 2025, covering the last decade to include more recent data.

The **exclusion criteria** included:

- Studies focusing exclusively on diseases unrelated to sarcopenia.
- Surveys with mixed population without separate analysis of the elderly.
- Case reports, letters to the editor, expert opinions not based on empirical data.

2.3 SEARCH STRATEGY

The bibliographic search was systematically carried out in the **PubMed/MEDLINE, Scopus, Web of Science, SciELO and LILACS databases**. Academic repositories and conference proceedings were also consulted in order to include relevant grey literature, such as papers presented at the *International Congress on Human Ageing* (Almeida et al., 2020).

The search strategies used controlled descriptors and free terms, combined by Boolean operators. Among the main terms used, the following stand out:

- "Sarcopenia" OR "muscle wasting" OR "loss of muscle mass"
- AND "anabolic therapy" OR "hormone therapy" OR "testosterone" OR "growth hormone" OR "selective androgen receptor modulators"
- AND "elderly" OR "older adults" OR "aged"

In addition, we sought to include references that addressed nutritional aspects and diagnoses of sarcopenia (Bezerra; Read; Carvalho, 2020; Bezerra; Oliveira et al., 2023; Bezerra; Saints; Carvalho, 2022; Cruz-Jentoft et al., 2021), since these elements influence the clinical context in which hormonal therapies are applied.

2.4 SELECTION OF STUDIES

The selection was conducted in two stages:

1. **Initial screening by titles and abstracts**, excluding studies that did not directly address anabolic hormone therapies in sarcopenia.
2. **Full reading** of potentially eligible articles, verifying full compliance with the inclusion criteria.

Two independent reviewers performed this step, and disagreements were resolved by consensus. To ensure traceability, the process was documented in **the PRISMA** format (*Preferred Reporting Items for Systematic Reviews and Meta-Analyses*), recording the number of records identified, deleted and included.

2.5 DATA EXTRACTION AND ORGANIZATION

For each included study, standardized information was collected in a spreadsheet:

- Author(s) and year of publication;
- Country of realization;
- Methodological design;
- Sample size and characteristics;
- Type of hormonal intervention used;
- Duration of treatment;
- Main outcomes evaluated;
- Quantitative and qualitative results;
- Adverse events reported.

This standardization allowed us to compare data from different studies, even in the face of methodological variations.

2.6 CRITICAL EVALUATION AND ANALYSIS OF EVIDENCE

The methodological quality of the studies was evaluated according to the type of design:

- **Randomized controlled trials:** Cochrane Risk of Bias 2 *tool*.
- **Observational studies:** Newcastle-Ottawa Scale *checklist*.
- **Systematic reviews:** AMSTAR 2 *tool*.

The analysis followed a **thematic-descriptive approach**, organizing the findings into categories:

1. Effectiveness of anabolic hormone therapies in improving muscle mass and strength;
2. Functional and quality of life impact;
3. Safety and adverse effects;
4. Comparison between pharmacological and non-pharmacological approaches.

2.7 JUSTIFICATION OF THE METHODOLOGICAL APPROACH

The choice for the integrative review is justified by the complexity of the theme, which involves multiple dimensions, physiological, nutritional, pharmacological and functional. Although hormonal therapies represent an emerging field in the management of sarcopenia, their analysis should consider the context of already consolidated interventions, such as the

high-protein diet (BEASLEY; SHIKANY; THOMSON, 2013; BEZERRA; SAINTS; CARVALHO, 2022) and resistance exercise (DALTOÉ; DEMOLINER, 2021).

Additionally, evidence indicates that factors such as inadequate nutrient intake (BEZERRA; READ; CARVALHO, 2020; BEZERRA; OLIVEIRA et al., 2023) and chronic inflammatory conditions (CRUZ-JENTOFT et al., 2021) can interfere with the response to hormonal therapies, reinforcing the need for a broad and integrative approach.

2.8 EXPECTED METHODOLOGICAL LIMITATIONS

It is recognized that the review may face limitations, such as:

- **Heterogeneity of the included studies** , with variation in doses, duration of therapies and diagnostic criteria;
- **Scarcity of long-term clinical trials**, which limits definitive conclusions about safety;
- **Possible publication bias**, since studies with positive results tend to be published more frequently.

These limitations will be considered in the discussion and interpretation of the results.

3 RESULTS

The integrative review identified that sarcopenia, characterized by the progressive and generalized loss of skeletal muscle mass, strength, and physical function, is a multifactorial problem with a high prevalence among the elderly, with a significant impact on autonomy and quality of life (CRUZ-JENTOFT et al., 2019). The analysis of the evidence showed that, in addition to nutritional factors and the practice of physical activity, anabolic hormonal therapies have stood out as a complementary and promising approach for the treatment of sarcopenia, especially in situations where muscle loss is associated with endocrine dysfunctions or physiological declines related to aging.

The study by Cruz-Jentoft et al. (2014) showed that interventions that combine anabolic stimulation, whether nutritional, pharmacological, or resistance exercise, are more effective in controlling and reversing sarcopenia when compared to isolated strategies. The use of hormonal therapies, such as testosterone replacement, selective androgen receptor modulators (SARMs), and growth hormone, has shown potential to increase muscle protein synthesis, improve strength, and reduce the incidence of falls in frail older adults.

The relationship between hormone levels and sarcopenia is well established in the literature. Clinical studies indicate that the decline of anabolic hormones, such as

testosterone, IGF-1, and growth hormone, constitutes one of the main pathophysiological mechanisms of age-related muscle loss (CRUZ-JENTOFT; ROMERO-YUSTE; CHAMIZO CARMONA; NOLLA, 2021). The replacement of these hormones, under strict medical supervision, can contribute to the maintenance of lean mass and muscle strength. However, evidence also points out that hormone therapy alone is not enough to completely restore muscle function, and it is necessary to associate it with physical rehabilitation strategies and nutritional adequacy.

The data compiled by Beasley, Shikany and Thomson (2013) reinforce that the response to hormone therapy strongly depends on adequate protein intake. The intake of high-quality proteins, particularly those rich in leucine and other essential amino acids, enhances the anabolic effects of the therapy, stimulating protein synthesis and reducing muscle breakdown. This synergy between nutrition and hormonal stimulation is highlighted as one of the key factors for the effectiveness of the treatment.

Another aspect evidenced in the reviewed studies refers to the importance of assessing nutritional status before and during hormone therapy. Bezerra, Lemos, and Carvalho (2020) identified a strong association between micronutrient deficiencies, such as vitamin D, calcium, and magnesium, and a higher risk of sarcopenia, suggesting that correcting these deficiencies can optimize the therapeutic response. Similar results were reported by Bezerra et al. (2023), who observed that insufficient intake of essential nutrients compromises both muscle function and the effectiveness of pharmacological interventions.

From an epidemiological point of view, studies such as that of Corona (2020) indicate that the prevalence of sarcopenia increases exponentially with age, affecting more than 40% of the elderly over 80 years of age. This scenario reinforces the urgent need for combined prevention and treatment strategies, in which hormone replacement can be considered in selected cases, especially in the face of marked functional decline and absence of clinical contraindications.

With regard to safety, the reviewed literature presents divergent results. Although testosterone replacement and the use of SARMs demonstrate consistent benefits in terms of increased muscle mass and strength, concerns remain regarding potential adverse effects, including changes in lipid profile, increased cardiovascular risk, and impact on the prostate in men (CRUZ-JENTOFT; ROMERO-YUSTE; CHAMIZO CARMONA; NOLLA, 2021). These risks reinforce the need for continuous clinical and laboratory monitoring during treatment.

Growth hormone (GH) and IGF-1 have also been investigated as potential therapies. Clinical trials have shown that the use of GH can increase lean body mass, although strength gains are modest and, in some cases, accompanied by adverse effects, such as water retention, arthralgia, and insulin resistance (CRUZ-JENTOFT et al., 2014). Thus, the indication for GH remains restricted and should be carefully evaluated.

In addition to pharmacological therapies, the literature emphasizes that adequate nutritional intervention is indispensable for success in the management of sarcopenia. Studies such as those by Almeida et al. (2020) and Daltoé and Demoliner (2021) show that a diet rich in protein, associated with antioxidants and micronutrients, contributes to increasing the anabolic sensitivity of the muscle, enhancing the effects of hormonal therapies. In this sense, the combination of hormones, diet and resistance exercise is presented as the most effective strategy.

The review by Bezerra, Santos, and Carvalho (2022) also highlights the influence of dietary patterns on the development and progression of sarcopenia. Diets low in protein and high in simple carbohydrates are associated with worse muscle outcomes, while dietary patterns such as the Mediterranean diet, characterized by the consumption of unsaturated fats, lean proteins, and bioactive compounds, have a protective effect.

Finally, the joint analysis of the studies shows that anabolic hormone treatment should be individualized, taking into account factors such as age, comorbidities, nutritional status, level of physical activity, and basal hormone profile. There is still no absolute consensus on the most appropriate dose, duration, and type of hormone, and most guidelines recommend that the use of these therapies be restricted to carefully selected patients, with close monitoring and insertion into a multidisciplinary rehabilitation plan.

In summary, current evidence indicates that anabolic hormone therapies represent a potentially effective tool in the management of sarcopenia in the elderly, especially when associated with nutritional interventions and resistance exercise. However, its clinical use should be cautious and based on strict indication criteria, due to the potential risks and the need for personalization of treatment.

4 DISCUSSION

Sarcopenia, characterized by the progressive and generalized loss of muscle mass, strength, and function associated with aging, represents a significant clinical challenge, given its direct relationship with frailty, falls, functional dependence, and increased mortality in the

elderly (CRUZ-JENTOFT et al., 2019). The multifactorial etiology of this condition involves endocrine alterations, chronic low-grade inflammation, anabolic resistance, physical inactivity, and insufficient protein and micronutrient intake (CORONA, 2020; BEZERRA; READ; CARVALHO, 2020). In this context, anabolic hormonal therapies, such as testosterone replacement, growth hormone (GH), and selective androgen receptor modulators (SARMs), emerge as approaches of interest to slow or reverse the process of muscle loss.

Recent literature indicates that the reduction of endogenous anabolic hormones, including testosterone, IGF-1, and dehydroepiandrosterone (DHEA), plays a central role in the pathogenesis of sarcopenia (CRUZ-JENTOFT; ROMERO-YUSTE; CHAMIZO CARMONA; NOLLA, 2021). Testosterone replacement therapy (TRT), for example, has been shown to be effective in improving lean mass and muscle strength in elderly men with hormone levels below the physiological range (CRUZ-JENTOFT et al., 2014). However, the magnitude of the benefit depends on the patient's baseline state, the dose used, and the association with mechanical stimulation strategies, such as resistance training (DALTOÉ; DEMOLINER, 2021).

In physiological terms, testosterone promotes muscle hypertrophy mainly by stimulating protein synthesis and reducing fiber degradation, acting both through androgen receptors and indirect modulation of IGF-1 (BEASLEY; SHIKANY; THOMSON, 2013). This anabolic effect, when combined with an adequate protein intake, enhances responses to strength training (ALMEIDA et al., 2020). However, the literature also warns of risks associated with TRT, including cardiovascular events and possible stimulation of the growth of hormone-dependent neoplasms, which reinforces the need for rigorous clinical follow-up and individualization of treatment.

The use of growth hormone (GH) and its analogues is another point of debate. Although GH stimulates lipolysis and increases lean mass, its isolated efficacy in improving muscle strength in the elderly is limited, possibly due to the anabolic resistance characteristic of this age group (CRUZ-JENTOFT et al., 2014). In addition, adverse effects such as water retention, arthralgias, and insulin resistance restrict its large-scale clinical application. Some studies suggest that the combination of GH with resistance exercise programs and nutritional support rich in proteins of high biological value could increase the functional benefits (BEZERRA; OLIVE TREE; SILVA; READ; CARVALHO, 2023).

More recently, selective androgen receptor modulators (SARMs) have aroused interest as an alternative to TRT, as they offer anabolic effects on muscle tissue with less impact on androgen-dependent organs, such as the prostate (CRUZ-JENTOFT; ROMERO-YUSTE; CHAMIZO CARMONA; NOLLA, 2021). Initial clinical trials point to increased lean mass and improved functional parameters in sarcopenic elderly, although long-term safety is not yet fully established.

It is important to highlight that, regardless of the hormone therapy chosen, the reviewed literature reinforces the need for integration with nutritional and physical exercise strategies to enhance the results (DALTOÉ; DEMOLINER, 2021; BEZERRA; SAINTS; CARVALHO, 2022). Adequate protein intake, between 1.2 and 1.5 g/kg/day for the elderly, distributed in a balanced way throughout the day, is essential to maximize the anabolic effect of hormonal interventions (BEASLEY; SHIKANY; THOMSON, 2013; ALMEIDA et al., 2020). Micronutrients such as vitamin D, magnesium and zinc also play a relevant role in modulating muscle function and anabolic response (BEZERRA; READ; CARVALHO, 2020).

Regarding prevention, Corona (2020) points out that maintaining adequate hormone levels through an active lifestyle and a balanced diet can reduce the need for more aggressive pharmacological interventions in the future. This concept is in line with the notion of a "window of opportunity" for the treatment of sarcopenia, according to which early interventions tend to be more effective.

A critical point in interpreting the evidence on anabolic hormone therapies is the heterogeneity of the studies. Differences in the populations analyzed (sex, age, nutritional status), doses and routes of administration, as well as in the outcomes evaluated, make direct comparisons difficult (CRUZ-JENTOFT et al., 2019). In addition, some studies are of short duration, which limits safe conclusions about long-term effects, especially with regard to morbidity and mortality.

From a clinical point of view, there is a consensus that the indication of hormonal therapies should be restricted to selected cases, in which the hormonal deficit is well documented and in which conventional measures, such as nutritional optimization and resistance training, have been shown to be insufficient to prevent the progression of muscle loss (CRUZ-JENTOFT et al., 2014; CRUZ-JENTOFT et al., 2019). To maximize results and reduce risks, multidisciplinary follow-up involving a doctor, nutritionist and physiotherapist is recommended.

Another relevant aspect is the interaction between sarcopenia and comorbidities. In patients with rheumatic diseases, for example, systemic inflammation can aggravate muscle loss and reduce the effectiveness of anabolic therapies, requiring individualized adjustments and complementary anti-inflammatory strategies (CRUZ-JENTOFT; ROMERO-YUSTE; CHAMIZO CARMONA; NOLLA, 2021). Similarly, older adults with kidney or liver failure may have contraindications or increased risk of adverse events with certain drugs.

From a public health perspective, the incorporation of anabolic hormone therapies for the treatment of sarcopenia faces logistical and economic barriers. In many countries, the high cost, the need for frequent monitoring, and the absence of consolidated national guidelines limit their large-scale implementation. In this context, the prioritization of cost-effective strategies, such as encouraging the regular practice of resistance exercise and nutritional education programs, remains the first-line approach (BEZERRA; SAINTS; CARVALHO, 2022; ALMEIDA et al., 2020).

Current evidence indicates that anabolic hormone therapies can play a relevant role in the management of sarcopenia, especially in cases with proven hormone deficiency and refractory to conventional interventions. However, its safe clinical application requires careful evaluation, individualization of treatment, and integration with non-pharmacological measures. The absence of a robust consensus on optimal protocols reinforces the need for more longitudinal and randomized studies, capable of establishing not only the efficacy, but also the safety and cost-effectiveness of these approaches in the elderly.

In summary, the treatment of sarcopenia in the elderly requires a multifaceted approach. Anabolic hormone therapies have therapeutic potential, but they are not an isolated solution. The alignment between pharmacological intervention, adequate nutritional support, and regular physical exercise is the fundamental tripod for the prevention and treatment of muscle loss associated with aging, ensuring not only the increase in lean mass, but also functional preservation and improved quality of life.

5 CONCLUSION

Sarcopenia is one of the main challenges of population aging, directly impacting the autonomy, functionality, and quality of life of the elderly. The analysis shows that, although the condition has a multifactorial origin, anabolic hormonal therapies emerge as promising alternatives for its management, especially when used in conjunction with nutritional strategies and resistance exercise programs.

The results indicate that the replacement of anabolic hormones can contribute to the increase of lean mass, muscle strength and functional performance. However, these benefits need to be balanced with the potential risks, which makes rigorous clinical evaluation and individualization of therapeutic conduct indispensable.

It is also observed that the efficacy of these interventions is enhanced when inserted in a multimodal approach, which considers the nutritional status, the practice of regular physical activity and the clinical profile of each patient. Comprehensive and multidisciplinary care, involving professionals in medicine, nutrition and physiotherapy, is essential to maximize results and minimize adverse effects.

In summary, coping with sarcopenia requires a comprehensive and personalized approach. Anabolic hormone therapies have therapeutic potential, but they should be seen as part of a set of strategies that aim not only to preserve muscle mass and strength, but also to ensure greater functional independence, well-being, and quality of life in the aging process.

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