BRAZILIAN JOURNAL OF IMPLANTOLOGY AND HEALTH SCIENCES

ISSN 2674-8169

# *NOVOS PARADIGMAS DO USO DE ESTEROIDES ANABOLIZANTES EM PACIENTES CRÍTICOS NA UNIDADE DE TERAPIA INTENSIVA: UMA REVISÃO DA LITERATURA*

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https://doi.org/10.36557/2674-8169.2024v6n10p1359-1369

*Artigo recebido em 30 de Julho e publicado em 11 de Outubro de 2024*

***REVISÃO DE LITERATURA***

**RESUMO**

A Unidade de Terapia Intensiva (UTI) é um ambiente desafiador onde pacientes graves necessitam de suporte avançado. Nesse contexto, as complicações incluem estado hipercatabólico extremo, perda rápida de massa muscular, comprometimento funcional e disfunção sistêmica. Os esteróides anabolizantes androgênicos (EAAs) surgem como uma terapia complementar para preservar a massa muscular e melhorar a recuperação funcional, mitigando os efeitos da sarcopenia em estados críticos. O estudo explora as evidências sobre os EAAs, seus benefícios e riscos, e novas direções para seu uso em terapia intensiva. Trata-se de uma revisão retrospectiva nas bases de dados PubMed, Scopus e Embase, utilizando descritores relacionados e aplicando o operador booleano “AND”. Os critérios de exclusão incluíram artigos não relevantes a temática e publicações fora do período de 2004 a 2024. Os achados evidenciam a necessidade de equilibrar os benefícios e riscos dos EAAs, a seleção cuidadosa dos pacientes e o monitoramento contínuo como peças fundamentais para garantir resultados efetivos. A eficácia dos esteróides está ligada à preservação da massa muscular e à aceleração da recuperação em estados catabólicos severos. Desse modo, o uso de EAAs em pacientes críticos pode melhorar a recuperação funcional e reduzir a morbimortalidade relacionada à perda muscular nas UTIs, no entanto deve ser avaliado de forma cautelosa e individualizada. As novas abordagens, preconizam os agentes seletivos associado ao tratamento personalizado, visando tornar o uso mais seguro e eficaz, sendo ainda necessário mais estudos para determinar seu papel nos cuidados intensivos.

**Palavras-chave:** Esteróides Anabolizantes, Pacientes Críticos, Unidade de Terapia Intensiva.

# *NEW PARADIGMS OF ANABOLIC STEROID USE IN CRITICAL PATIENTS IN THE INTENSIVE CARE UNIT: A LITERATURE REVIEW*

**ABSTRACT**

The Intensive Care Unit (ICU) is a challenging environment where critically ill patients require advanced support. In this context, complications include extreme hypercatabolic state, rapid loss of muscle mass, functional impairment and systemic dysfunction. Anabolic-androgenic steroids (AAS) emerge as a complementary therapy to preserve muscle mass and improve functional recovery, mitigating the effects of sarcopenia in critical states. The study explores the evidence on AAS, their benefits and risks, and new directions for their use in intensive care. This is a retrospective review in the PubMed, Scopus and Embase databases, using related descriptors and applying the Boolean operator "AND". The exclusion criteria included articles not relevant to the topic and publications outside the period 2004 to 2024. The findings highlight the need to balance the benefits and risks of AAS, careful patient selection and continuous monitoring as fundamental pieces to ensure effective results. The efficacy of steroids is linked to the preservation of muscle mass and the acceleration of recovery in severe catabolic states. Thus, the use of AAS in critically ill patients can improve functional recovery and reduce morbidity and mortality related to muscle loss in ICUs, however, it should be evaluated cautiously and on an individual basis. New approaches advocate selective agents associated with personalized treatment, aiming to make their use safer and more effective, and further research is still needed to determine their role in intensive care.

**Keywords**: Anabolic Steroids, Critical Patients, Intensive Care Unit.

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## INTRODUCTION

The Intensive Care Unit (ICU) represents a challenging clinical scenario in medical practice, since patients with extremely severe and potentially fatal conditions require effective interventions and advanced life support. Among the main complications faced by these patients, the extreme hypercatabolic state, rapid loss of muscle mass, functional impairment and systemic dysfunction stand out, particularly associated with situations such as sepsis, acute respiratory distress syndrome, trauma and extensive burns[1,2]. The impact of severe muscle catabolism is devastating, leading to inability to mobilize, increased time on mechanical ventilation and prolonged hospitalization, in addition to directly contributing to morbidity and mortality in ICUs. It is in this context that the use of anabolic-androgenic steroids (AAS) has aroused increasing interest in the medical literature as a complementary therapeutic approach that emerges as a strategy for preserving muscle mass and functional recovery in order to mitigate the devastating effects of sarcopenia induced by critical illness[2,3].

Furthermore, anabolic steroids are substances widely known for their ability to promote muscle growth and improve physical performance. Although their use is traditionally associated with sports practices and in the treatment of some hormonal conditions such as hypogonadism, in recent years, the application of these compounds in critically ill patients has gained increasing attention since in these individuals, the loss of muscle mass is not only a question of reduced strength or mobility. This process, accelerated by the systemic inflammatory response, prolonged use of mechanical ventilation and immobilization, is associated with a significant increase in mortality. Patients with severe sarcopenia have a worse prognosis, a higher risk of secondary infections and complications related to organ dysfunction[3,4]. In addition, the recovery process, which involves weaning from mechanical ventilation, physical rehabilitation and functional reintegration, is drastically impaired. In this scenario, intervention with AAS becomes relevant, given their ability to promote protein anabolism and reduce muscle catabolism.

Anabolic steroids act by binding to androgen receptors in skeletal muscles, stimulating protein synthesis and inhibiting its degradation. In this way, these agents can improve

nitrogen retention and promote tissue repair, which can be crucial in critically ill patients suffering from traumatic injuries or severe burns[4,5]. Research with AAS in critically ill patients, especially in individuals with major burns, has shown promising results, such as oxandrolone, a synthetic derivative of testosterone that, after studies in this group, demonstrated positive effects in preserving lean mass, reducing hospital stay and accelerating the rehabilitation process. These findings paved the way for the investigation of the use of anabolic steroids in other ICU settings, such as in patients with sepsis and acute respiratory distress syndrome[5,6].

However, despite potential benefits in specific situations, the use of anabolic steroids in critically ill patients is still a subject of debate, as these substances can have a number of side effects, including cardiovascular complications, such as hypertension and increased risk of thrombosis, liver dysfunction, changes in lipid profiles and endocrine suppression. These risks are particularly worrying in critically ill patients, who are already frail and have systemic impairment[6,7]. In addition, there are uncertainties about the ideal dosage, duration of treatment and the profile of patients who would benefit most from this intervention. It is worth noting that the use of AAS in ICUs is dependent on the variability in individual responses to treatment; factors such as age, pre-existing comorbidities, nutritional status and degree of catabolism can influence the efficacy and safety of anabolic steroid use. In some cases, the administration of these agents may not result in significant clinical benefits, so the current challenge in intensive care medicine is to identify which patients are most likely to benefit from this therapy and which are at greatest risk of complications[7,8].

Therefore, the use of anabolic steroids, although still surrounded by challenges and controversies, emerges as an innovative therapeutic possibility for the management of catabolism and muscle loss in critically ill patients. This literature review will seek to explore the available evidence on the subject, addressing both potential benefits and risks, in addition to discussing new paradigms and future directions for the use of these agents in the intensive care setting. Through a critical analysis of the existing literature, we hope to clarify how AAS can contribute to improving clinical outcomes in critically ill patients and their place in modern therapeutic strategies in ICUs[8,9].

## METHODOLOGY

This study was prepared based on a retrospective review of the literature using the PubMed, Scopus and Embase databases. The descriptors used were "Anabolic Androgenic Steroids", "Critical Patients", "Intensive Care Unit" and their English equivalents "Anabolic Steroids", "Critical Patients", "Intensive Care Unit". Furthermore, the Boolean descriptor used was "AND" for the database search. The exclusion criteria were: articles that do not correlate with the theme of the approach to anabolic steroids in critically ill patients in the intensive care unit, as well as articles published that do not cover the period studied from 2004 to 2024. A total of 25 articles were found, adding up all the databases. After reading the titles of the articles, it was observed that some of them did not meet the inclusion criteria for this study. Thus, it was possible to remove 05 duplicate articles and 20 articles were selected for reading the abstract. Of these, 05 works were removed based on the analysis of the abstract and that did not meet the objective of elucidating the use of anabolic steroids in the context of intensive care medicine as well as their preponderant factors in critically ill patients, resulting in 15 full texts included in this literature review. The selection criteria were studies that had to meet the following criteria: studies published in English and Portuguese, systematic reviews, case reports, clinical studies and articles published between 2004 and 2024.

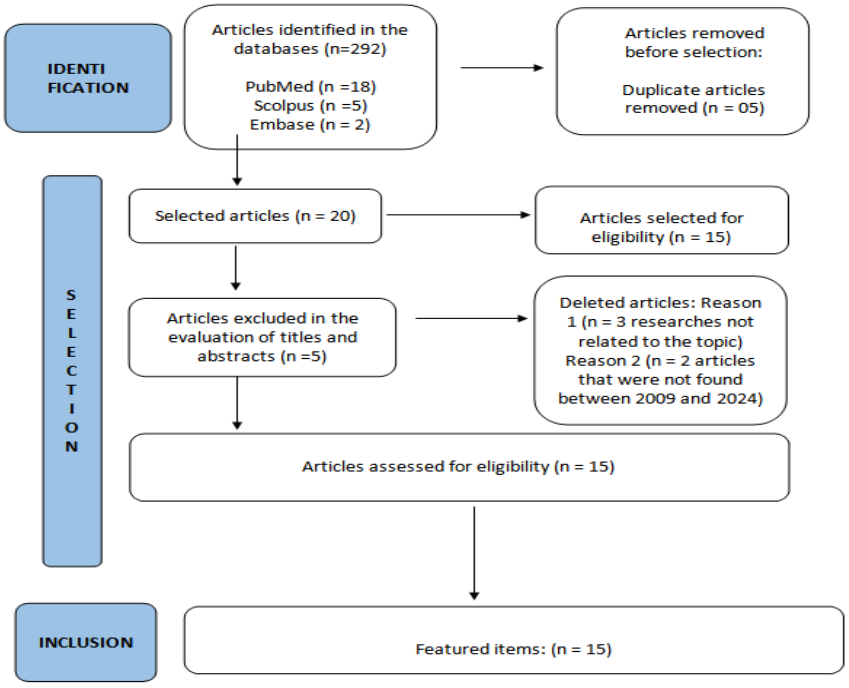


Figure 1: Prism method of research presented

## RESULTS AND DISCUSSION

From this study, it was possible to observe that the use of anabolic androgenic steroids may have important benefits in specific populations of critically ill patients, such as burn patients, patients with multiple organ dysfunction syndrome (MODS) and those with respiratory failure, particularly acute respiratory distress syndrome (ARDS). In this context, patients with major burns are among those who benefit most from the use of AAS. Oxandrolone has been widely studied for its positive effect on the recovery of muscle mass, functional capacity and significant reduction in hospitalization time. In addition, the rate of infectious complications was also reduced, suggesting a beneficial systemic effect [9,10].

The multiple organ dysfunction syndrome is a common condition in critically ill patients, associated with rapid muscle loss and generalized weakness from organic functional impairment that results in severe hypercatabolism present in the intensive care unit. The therapeutic use of testosterone has shown promise in preserving muscle mass and improving strength, which may be crucial in contexts of high mortality. However, data on the impact of AAS on mortality and recovery time remain inconclusive[10,11]

Patients with respiratory failure, especially those with acute respiratory distress syndrome in intensive care units, often develop respiratory muscle weakness due to several mechanisms that compromise both the function of the muscles responsible for breathing and the balance between oxygen supply and demand, which can prolong the need for mechanical ventilation. One of the main factors is the disuse of respiratory muscles, such as the diaphragm and intercostal muscles, during ventilator use, which reduces their activity and leads to muscle atrophy. This weakens these muscles and makes it difficult to resume spontaneous breathing[11,12].

Furthermore, prolonged ventilation can result in a condition known as ventilator-induced diaphragmatic dysfunction (VIDD), in which atrophy and dysfunction of the respiratory muscles make autonomous breathing even more difficult. Other relevant aspects are electrolyte disturbances, the use of sedatives and neuromuscular blockers, hypoxemia and systemic inflammation caused by conditions associated with respiratory failure, such as sepsis and severe lung diseases, which accelerate muscle catabolism, leading to loss of muscle mass and strength, decreased oxygen supply to tissues and

inhibiting the activity of respiratory muscles, prolonging ventilator dependence. The use of AAS, such as nandrolone, has been investigated in preliminary studies, showing a possible preservation of respiratory muscle function, which could facilitate ventilator weaning and prevent VIDD. However, these studies are limited and require further research to validate the benefits[12,13].

The use of anabolic steroids in critically ill patients has been reevaluated with the emergence of new, safer therapeutic approaches and the increasing personalization of treatment. Thus, one of the most significant innovations is the development of selective androgen receptor modulators (SARMs). These compounds stand out for offering the anabolic benefits of traditional steroids, but with a more favorable safety profile, especially in relation to undesirable androgenic effects. Initial evidence suggests that SARMs may be a safer alternative for the treatment of critically ill patients, providing increased muscle mass and strength without the hormonal and metabolic risks associated with traditional anabolic steroids[13,14].

Another trend observed is the use of combination therapies, since the combination of anabolic androgenic steroids (AAS) with complementary interventions, such as protein-rich parenteral nutrition and early motor and respiratory physiotherapy programs, has shown promising results in patient prognosis and recovery time. This multimodal approach can enhance the anabolic effects of EAAs, promoting faster and more effective functional recovery, without a significant increase in the risk of complications.

Furthermore, personalized monitoring of AAS use, focusing on biomarkers such as hormone levels and indicators of catabolism, has gained increasing importance in order to guide medical practice. Personalized treatment allows the identification of subgroups of patients at higher risk of severe muscle loss and worse prognosis, enabling more targeted and safe use of AAS. This reduces indiscriminate use and minimizes potential adverse effects, making treatment more effective and controlled[15].

However, despite these advances, the use of AAS in critically ill patients is not without risks. Among the most common complications are cardiovascular complications, including hypertension, dyslipidemia, and thromboembolic events. These risks are particularly worrying in critically ill patients, who already have an increased predisposition to cardiovascular dysfunction, requiring strict and continuous monitoring during treatment. It is worth noting that endocrine suppression is also a significant

concern, especially because prolonged use of AAS can result in the suppression of endogenous testosterone production, leading to hypogonadism and other endocrine complications in the long term. This effect requires careful monitoring to minimize the hormonal impact after treatment[12,15].

Another important issue is the risk of liver and kidney dysfunction. AAS can be hepatotoxic, especially at high doses or in patients with pre-existing liver impairment. In addition, the impact on kidney function should be considered, particularly in patients with renal failure, a common condition in intensive care units[10,12,13].

Furthermore, these findings reinforce the need for a careful balance between the potential benefits of AAS and the risks associated with their use in critically ill patients. Although the development of new therapeutic approaches offers promising prospects, careful patient selection, continuous monitoring, and personalized treatment are essential to ensure positive clinical outcomes and minimize complications. Thus, anabolic steroids such as oxandrolone have shown significant benefits in specific patient populations, such as those with severe burns, but their use is not effective in all scenarios, such as ventilated patients. The efficacy of these steroids appears to be more linked to preserving muscle mass and accelerating recovery in severe catabolic states[11,13,14].

## CONCLUSION

In summary, the use of anabolic steroids in critically ill patients is a promising field, with the potential to improve functional recovery and reduce morbidity associated with muscle loss and catabolism in ICUs. However, the use of these agents must be carefully evaluated, considering the individual risks and benefits of each patient. New paradigms, such as the development of selective agents and personalized treatment, point to a future where the use of AAS in critically ill patients can be done more safely and effectively. Further studies are needed to consolidate the role of AAS in intensive care and establish clear guidelines for their use.

The implementation of strict monitoring protocols is essential to ensure the safety of patients undergoing treatment with anabolic-androgenic steroids (AAS) in ICUs. These protocols should include continuous evaluation of metabolic, hormonal, and organ

function parameters to prevent complications such as liver dysfunction, cardiovascular alterations, and hormonal imbalances. Interdisciplinary collaboration between physicians, pharmacologists, and intensive care specialists is crucial for the development of personalized and safe therapeutic approaches. With advances in clinical research and the refinement of guidelines, the use of AAS could play a more significant role in the rehabilitation of critically ill patients.

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