Cardiovascular Risks of Trenbolone Abuse: Emerging Evidence

Dear Editor,

The emergence of left ventricular hypertrophy with impaired systolic and diastolic function, potentially progressing to severe cases of heart failure, with no reversibility despite cessation of use and pharmacological treatment, has been documented in several studies and associated with chronic abusive use of anabolic-androgenic steroids (AAS) [1-3].

Among the most prominent AAS, in terms of user demand and the mythification of its potent effects—both beneficial and with severe side effects (considered five times more potent than testosterone in terms of anabolic and androgenic effects)—is trenbolone, a derivative of nandrolone developed in the 1960s and used in the agro-industry to promote muscle growth and feed efficiency in cattle [4,5].

Trenbolone acetate, a synthetic anabolic steroid derived from 19-nortestosterone and it demonstrates strong antigonadotropic properties, inhibiting ovulation and testicular growth, with potential human effects estimated at doses as low as 3–7 mg per day based on preclinical studies. While it is not estrogenic and only weakly progestational, its high androgenicity poses risks of virilization and gonadal disruption [6].

Despite its increasing use, particularly of products from the underground market, trenbolone has not been approved for human use. To the best of our knowledge, no clinical studies have mapped its safety and efficacy, leaving physicians and healthcare professionals in the dark when encountering users presenting side effects, particularly cardiovascular ones, thereby hindering an adequate understanding of the true causality of effects associated with trenbolone abuse [5].

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In this context, three recent case reports, with post-mortem toxicological analyses (detecting the presence of trenbolone in various biological matrices such as blood, nails, and hair), have been published associating trenbolone abuse with cardiopathy observed in autopsy findings [7-9].

The first case [7] involves a 60-year-old man without significant medical history other than strength training and chronic AAS abuse, found dead by his wife, presenting cardiomegaly (cardiac weight of 579 g), advanced coronary artery disease (50–80% vascular obstruction), pulmonary edema, and high concentrations of trenbolone (in blood, bile, and hair) at autopsy.

The second case [8] describes a 59-year-old man, a former weightlifter with a known history of heart disease (under treatment for heart failure with quinidine), also found dead next to several empty vials of oil-based injectable AAS. Trenbolone was detected in his hair at a concentration of 143 pg/mg, indicating repeated and prolonged use.

The third case [9] describes a 29-year-old male bodybuilder found dead at home, with syringes and anabolic products (tablets and oil-based solutions) identified at the scene. He presented cardiomegaly (cardiac weight of 387 g), multivisceral congestion, pulmonary edema, and elevated trenbolone concentrations in keratinized matrices (blood, hair, and nails, indicating repeated consumption) at autopsy.

In none of the cases were the exact dose or duration of trenbolone use reported, nor the precise source of the substance. Except for case 1 (not specified in the study), despite the detection of high concentrations in toxicological analyses, trenbolone was not the only AAS being used (it was combined with other AAS and substances). Furthermore, except for case 1, none of the cases presented a history of illicit drug abuse or tested positive in toxicological analyses. Lastly, except for case 2 (the patient already under treatment for heart failure), no personal history of significant medical conditions (comorbidities) was reported [6-8].

Despite the inherent limitations of case reports as a means of adequately attributing causality, the three reported cases objectively detected high concentrations of trenbolone in toxicological analyses [7-9]. Thus, as observed in observational studies on

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AAS abuse and cardiovascular outcomes [1-3], trenbolone, despite lacking an adequate evidence base from clinical studies in humans, can be considered an AAS with a high probability of cardiotoxicity.

Large-scale epidemiological studies [10] indicate that the prevalence of anabolic-androgenic steroid (AAS) use ranges from 5.5% to 7.7% among men, reaching as high as 31.6% in countries with a strong emphasis on achieving an idealized body aesthetic, such as Brazil [11]. Given the documented evidence of severe cardiovascular harm caused by AAS, including cardiac toxicity, left ventricular hypertrophy, systolic and diastolic dysfunction, and progression to heart failure, the combination of this cardiotoxicity with its high prevalence could represent a significant public health issue. [12].

Based on the information presented, we highlight the potential importance of rigorous cardiological clinical monitoring, with investigations for early detection of potential cardiac damage, in individuals using AAS [1-3]. Finally, the best medical knowledge, combined with the proper support and guidance of users, becomes imperative given the potential magnitude of the problem [13].

DISCLAIMER (ARTIFICIAL INTELLIGENCE):

The authors declare that generative AI was usedsolely during the final stage of manuscriptpreparation (post-writing) and exclusively forlinguistic refinement in the English language(Name: ChatGPT; Version: GPT-4; Model:OpenAI's Large Language Model; Source:OpenAI - https://openai.com). No original textwas generated or substantively edited by the AI.

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