



An ethical review on the search for performance: evidence-based nutrology and the use without indication of anabolic steroids

Limiro Luiz da Silveira Neto^{1*}, Ludmilla Rodrigues de Souza Mol Santos²

¹ Confiance Medical Clinic, Brasília, Distrito Federal, Brazil.

² FAMINAS - Faculty of Minas, medical course, Minas Gerais, Brazil.

Corresponding Author: Dr. Limiro Luiz da Silveira Neto,
Confiance Medical Clinic, Brasília, Distrito Federal, Brazil.

E-mail address: drlimiro@hotmail.com.

DOI: <https://doi.org/10.54448/ijn22101>

Received: 09-19-2021; Revised: 11-23-2021; Accepted: 12-22-2021; Published: 01-03-2022; IJN-id: e22101

Abstract

This study aimed to evaluate what is new in the controversial use of testosterone, as an indication in pathologies such as hypogonadism or its use by athletes and bodybuilders in search of performance. Much is said about the subject and many myths were created without any scientific foundation, one of the objectives of the monograph is to show that when there is a precise clinical indication, testosterone is necessary and extremely beneficial to the patient. It was evaluated in current literature through books and articles, advances in physiology, regulation, treatment of late adult hypogonadism, incidence of use and the most common analogues used by athletes, the harms and benefits expected from the use of the hormone and especially what we have again on cardiovascular safety in testosterone use. After an extensive review, it is still not possible to affirm all the benefits and harms of using the hormone, many old studies are disputed in new studies and even presented results opposite to what was previously believed.

Keywords: Testosterone. Hormone. Hypogonadism.

Introduction

The first studies with androgenic steroids (initially testosterone) were carried out in the year 1800, initially showing the great anabolic power that this hormone caused. been invented the fountain of youth; This belief is present even today by many laypeople and even health professionals [1].

It is not uncommon for patients to seek the use of the hormone as something miraculous that will make them reach the ideal body without much effort, even without first having adequate nutritional therapy,

adequate training, and adequate sleep; some patients are not even aware that there are safe and ethical nutritional measures that can help them achieve their goals without the use of hormones [1-3].

Based on a review of articles and books, this article addressed the risks related to the misuse of anabolic steroids and the importance of Nutrology in the follow-up of patients seeking to improve their sports performance or improve their purely aesthetic body composition.

Methods

Study Design

The present study followed a concise systematic review model, following the rules of systematic review - PRISMA (Transparent reporting of systematic review and meta-analysis-HTTP: [//www.prisma-statement.org/](http://www.prisma-statement.org/)).

Search Strategy and Search Sources

The search strategy was performed in the PubMed, Cochrane Library, Web of Science and Scopus, and Google Scholar databases, using scientific articles from 1980 to 2021, using the MeSH Terms (descriptors): *Testosterone; Hormone; Hypogonadism*, and using Booleans "and" between MeSH terms and "or" between historical discoveries.

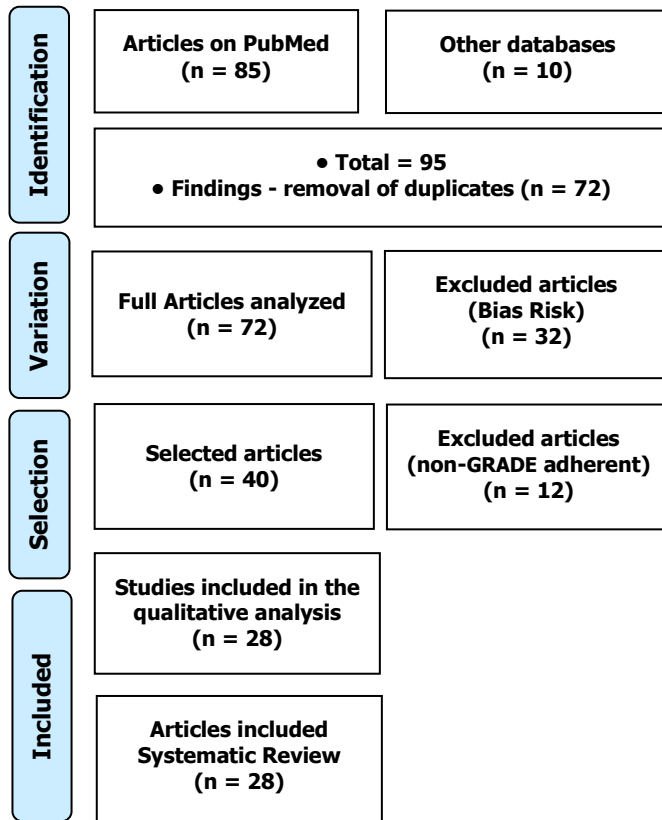
Results

Summary of Findings

As a corollary of the literary search system, 95 studies were analyzed and submitted to eligibility analysis, and then 28 high to medium quality studies were selected (**Figure 1**), considering, in the first

instance, the level of scientific evidence of studies in type of study such as meta-analysis, randomized, prospective and observational. Biases did not compromise the scientific basis of the studies.

Figure 1. Flowchart showing the article selection process.



Incidence Of Anabolic Steroid Use

In the US, the frequency of use of anabolic steroids varies from 3% to 37% in the pollution of athletes, elementary, secondary, and university students [2]. In a study carried out in Brazil in the city of Porto Alegre [3] with 288 individuals, it demonstrated a prevalence of use of 11.1% for anabolic steroids, 5.2% for other hormones, and 4.2% for other medications, among In the steroid user population, the most used hormones were nandrolone and stanazolol. The study would initially have 307 individuals, but as expected, only 288 accepted to participate in the study.

Another study carried out in the Federal District [4], this time with 3,830 high school students, showed that 5.46% of the participants had already used anabolic steroids, the prevalence of use in private schools was higher than in public schools, 9, 1% and 4.47% respectively, again the most used drug was Deca-Durabolin (nandrolone) with 37.8%.

What Makes Testosterone So Anabolic?

The anabolic effect of using testosterone and its

analogs is mainly due to increased protein synthesis, but indirect effects are also beneficial to anabolism. Anabolic steroids are able to act as antagonists to the catabolic effects of glucocorticoids, when there is a greater amount of circulating testosterone, the balance between protein breakdown and deposit is positive even in fasting, acting positively in relation to anabolism [1].

With the increase in the levels of circulating androgens, there is an increase in the synthesis of muscle creatine, which will be essential in the production of ATP (adenosine triphosphate) being the main source of energy for muscle contraction. Increased creatine due to testosterone or by supplementation plays an important role in the performance of the bodybuilding athlete as it increases performance in high-intensity and explosive exercises such as weight training [5].

There is also a relationship between IGF-1 and Testosterone levels. In hormone replacement in the elderly, there is an increase in IGF-1 receptors mediated by an increase in the levels of exogenous testosterone offered, improving the anabolic condition.

The anabolic effects are so expressive that there is a gain in lean mass even without the stimulus of physical exercise, however, is associated with physical exercise, the increase in lean mass is much more expressive [6].

Could Nutrilogy Help This Patient Profile?

Many safe ergogenic aids and guidelines can be used with the aim of helping the patient to achieve their goals. Assessment of the nutritional status is very important to the patient seeking to gain lean mass [6].

The laboratory evaluation is essential in the follow-up of the athlete patient, it is important to evaluate and treat possible deficiencies in his/her nutrogram (complete blood count, lipid profile, fasting glucose, thyroid function, morning and afternoon cortisol, free and total testosterone, sodium, potassium, phosphorus, magnesium, ionic calcium, copper, zinc, iron, ferritin, selenium, vitamins (A, C, D, E, B9, B12, and 25 hydroxyvit-D) and others depending on the patient) [7-9].

Inadequate intake of Macros in the diet can be a factor not taken into account by the patient and that directly influences the results. Adequate carbohydrate intake will be an important nutritional concern for athletes in intermittent sports, both aerobic and high-intensity sports, helping to maintain optimal blood glucose and muscle glycogen levels [6]. Just as an inadequate protein intake can also negatively interfere

with the patient's goals; the International Society of Sports Nutrition (ISSN) recommended that a protein intake of 1.4 to 2.0 g/kg can improve the body's adaptations to exercise practice [6].

Even simple correct and well-indicated hydration can influence a patient's performance. Significant scientific evidence documents the deleterious effects of hypohydration (reduced total body water) on endurance exercise performance, and a critical review also indicates that hypohydration can limit strength, potency, and endurance exercise performance. high intensity [8-12].

The indication of supplements with proven ergogenic effects, such as caffeine, sodium bicarbonate, creatine, and nitrate, has a fundamental role in helping patients who do not meet their needs only with diet and those whose training intensity or lifestyle requires supplementation to improve performance, resources that are proven to be safe and effective when correctly indicated and do not involve the use of hormones [1, 13,14].

Risks Of Anabolic Steroid Misuse

As testosterone acts on the musculature, it could not fail to act on the cardiac muscle as well [15]. If, on the one hand, a lack of testosterone is harmful to cardiac function, excess testosterone also results in harm, leading to hypertrophy of excessive cardiac muscles, resulting in a contraction ratio that would not be ideal for perfect cardiac functioning [1,16,17].

The relationship between HDL and testosterone was for a long time considered an inverse relationship, but as mentioned above, new studies have shown that this relationship may not be true; even so, if excess exogenous testosterone leads to a reduction in HDL levels, this would be another factor in increasing cardiovascular risk [18,19]. The stimulating effect of testosterone in the brain can aggravate pre-existing psychopathology, as well as any other substance that has a direct or indirect stimulating effect on the brain [20].

Testosterone administered orally (17- α -alkylated) ends up being hepatotoxic, due to its liver metabolism, this factor, allied or not to patients with previous liver diseases, ends up increasing the chances of liver tumors such as hepatocarcinoma. In females, the effects can be even more devastating and irreversible [21]. Effects such as increased hair in abnormal regions for females, increased sebum production by the sebaceous glands, acne, clitoris hypertrophy, change in voice timbre, alopecia, aggressiveness, and other undesirable effects

may arise in proportion to the excessive use of testosterone or its derivatives [22,23].

Existing polycythemia can be aggravated by the use of anabolic steroids, the increase in blood viscosity can lead to thromboembolic events [24,25]. As mentioned, there are still no confirming studies that the use of testosterone favors the onset of prostate cancer, but it is known that if the patient already has the disease, the use of testosterone can aggravate the condition [26-28].

Conclusion

The use of anabolic steroids for aesthetic purposes or to improve sports performance, with supraphysiological levels, entail risks for patients of both sexes, while the ethical and well-indicated use provides a significant improvement in the patient's quality of life and health that needs its use. Based on the evidence of all risks related to the use of unintended steroids and the lack of evidence on the safety of aesthetic or performance-oriented use, combined with evidence of the safety and effectiveness of several other ergogenic substances, we can conclude that, at the present time, the use of anabolic steroids without indication should be discouraged in the offices of different specialties. There is a lot to offer in the field of Nutrology for the benefit of athlete patients or even those seeking to improve their body composition for aesthetic purposes, but who opt for safe and evidence-based therapies.

Acknowledgement

Nil.

Funding

Not applicable.

Data sharing statement

No additional data are available.

Conflict of interest

The authors declare no conflict of interest.

About the license

© The author(s) 2021. The text of this article is open access and licensed under a Creative Commons Attribution 4.0 International License.

References

1. Mustafa EM, Filho IJZ, Ferreira VRR, Sabino SB, Sternieri GB, Verdi LB, Queiroz COV, Sbardellini

- BC, Braile-Sternieri MCVB. AMI and Anabolic-Androgenic Steroids: Case Report with Systematic Review. *Curr Cardiol Rev.* 2021;17(5):e190721189769. doi: 10.2174/1573403X16999201231203405. PMID: 33390145.
2. Lise MLZ, Gama ESTS, Ferigolo M, Barros HMT. O abuso de esteróides anabólico-androgênicos em atletismo *Rev Ass Med Brasil* 1999; 45(4): 364-70.
 3. Silva PRP, Machado J, Leonel C, Figueiredo VC, Cioffi AP, Prestes MC, Czepielewski MA. Prevalência do uso de agentes anabólicos em praticantes de musculação de Porto Alegre *Rev Ass Med Brasil* 1999; 45(4): 364-70.
 4. Araújo JP. O uso de esteroides androgênicos anabolizantes entre estudantes do ensino médio no Distrito Federal dissertação a título de mestre em Educação física pela Universidade Católica de Brasília, 2003.
 5. Peralta J, Amancio OMS. A creatina como suplemento ergogênico para atletas *Rev. Nutr., Campinas*, 2002, 15(1):83-93.
 6. Bhasin, Shalender; Storer, Thomas W.; BERMAN, Nancy Berman; Callegari Carlos; Clevenger Brenda; Phillips Jeffrey; BunnellThomas J.; Tricker, Ray; Shirazi, Aida; Casaburi, Richard The Effects of Supraphysiologic Doses of Testosterone on Muscle Size and Strength in Normal Men *The New England Journal of Medicine*, 1996, 4, 335:1.
 7. Ross AC, Caballero B, Cousins RJ, Tucker KL, Ziegler TR. *Modern Nutrition in Health and Disease (Modern Nutrition in Health & Disease (Shils)*. 11^a ed. Lippincott Williams & Wilkins, 2014.(Traduzido para Português).
 8. Ribas Filho D, Suen VMM – *Tratado de Nutrologia*. Manole, 2013.
 9. Judelson DA, Maresh CM, Anderson JM et al. *Sports Med* 2007;37:907-21.
 10. B Chock TC, Lin CS, Li AS. Plasma testosterone is associated with framingham risk score. *Aging Male* 012 Sep;15(3):134-9. doi: 10.3109/13685538.2011.654369. Epub 2012 Feb 27.
 11. Becher, Edgardo; Torres Luiz Otavio; Glina Sidney *Consenso Latino-Americano sobre DAEM São Paulo : PlanMark*, 2013.
 12. Cussons AJ, Bhagat CI, Fletcher SJ, Walsh JP. Brown-Séquard revisited: a lesson from history on the placebo effect of androgen treatment. *Med J Aust.* 2002 Dec 2-16;177(11-12):678-9. doi: 10.5694/j.1326-5377.2002.tb05014.x. PMID: 12463999.
 13. G Corona, G Tastrelli, M Monami A, Guay J, Buvat A, Sforza G, Forti E Mannucci, M Maggi. Hypogonadism as a risk factor for a cardiovascular mortality in men: A met-analytic study. *Eur J Endocrinol.* 2011 Nov;165(5):687-701. doi: 10.1530/EJE-11-0447. Epub 2011 Aug 18.
 14. Gardner DG. *Endocrinologia Básica e Clínica de Greenspan* 9^o Edição: Mcgraw Hill, 2012.
 15. Gebara OCE, Vieira NW, Meyer JW, Calich ALGT, Eun J, Pierri H, Wajngarten M, Aldrighi JM. Efeitos Cardiovasculares da testosterona, *Arq Bras Cardiol*, volume 79 (n^o 6), 644-9, 2002.
 16. Rosano GMCF, Leonardo PP et al. Acute anti-ischemic effect of testosterone in men with coronary artery disease. *Circulation* 1999; 99: 1666-70.
 17. Hong Y, LI Hongzhi Y, Yate-Ching, Chen S. Molecular characterization of aromatase, *Ann N Y Acad Sci.* 2009 February ; 1155: 112–120. doi:10.1111/j.1749-6632.2009.
 18. J Shapiro J, Christiana WHF. Testosterone and other anabolic steroids as cardiovascular drugs. *Am J Ther* 1999; 6: 167-74. E Yang XC, Jing TY, Resnick LM, Phillips GB. Relation of hemostatic risk factors for coronary heart disease and to sex hormones in men. *Arterioscler Thromb* 1993; 13: 467-71.
 19. JF Knudsen, SR Max. Aromatization of androgens to estrogens mediates increased activity of glucose 6-phosphate dehydrogenase in rat levator ani muscle. *Endocrinol.* 1980, 106(2):440-43.
 20. JS Brand, L Van der Tweel, DE Grobbee, MH Emmelot-VonK YT, Van Der Schouw. Testosterone, sex hormone-binding globulin and the metabolic syndrome: a systematic review and meta-analysis of observational studies. *Int J Epidemiol* 2011;40(189)207-23.
 21. Llewellyn, William. *Anabolics*. 9th edition: Molecular Nutrition, 2009.
 22. M, Zitzmann, S Faber, E Nieschlag. Association of specific symptoms and metabolic risks with serum testosterone in older men. *J Clin Endocrinol Metab*, 2006, 91;4335-4343.
 23. Machado VG, N Faruk. Compostos fosfatados ricos em energia. *Química Nova*, 22(3), 1999.
 24. Means GD, Mahendroo MS, Corbin CJ, Mathis JM, Powell FE, Mendelson CR, Simpson ER. Structural analysis of the gene encoding human aromatase cytochrome P-450, the enzyme responsible for estrogen biosynthesis. *J Biol Chem.* 1989 Nov 15;264(32):19385-91. PMID: 2808431.

25. Noirhomme P, Jacquet L, Underwood M, EL Khoury G, Goenen M, Dion R. The effect of chronic mechanical circulatory support on neuroendocrine activation inpatients with end-stage heart failure. *Eur J Cardio thoracic Surg* 1999; 16: 63-7
26. S Lu, NG Simon Y, Wang SH. Neural androgen receptor regulation: effects of androgen and antiandrogen. *J Neurobiol* 1999 Dec;41:505-12.
27. Srougi M, Ribeiro LA, Piovesan AC, Colombo JR, Nesrallah A. Doenças da próstata. *Rev Med, São Paulo*, 2008 jul.-set.;87(3):166-77.
28. Wang C, Swerdloff RS, Iranmanesh A, Dobs A, Snyder PJ, Cunningham G, Matsumoto AM, Weber T, Berman N. Transdermal Testosterone Gel Improves Sexual Function, Mood, Muscle Strength, and Body Composition Parameters in Hypogonadal Men. *The Journal of Clinical Endocrinology & Metabolism* Printed, Vol. 85, No. 8, U.S.A, 2000.