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Case Study

A BODY-BUILDER WITH A WEAK HEART

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ABSTRACT
Anabolic steroid use is becoming increasingly more popular in the United States. Many deleterious effects have been described in the literature, yet there is still much to be understood. Our case describes a severe cardiomyopathy as a result of an extensive anabolic-androgenic steroid regimen in a weightlifter. A 38-year old male with no past medical history presented to our emergency department complaining of worsening dyspnea over two weeks' duration. Pertinent findings showed a patient in atrial fibrillation with marked jugular venous distension, extensive pulmonary crackles, and lower extremity edema. Diagnostic evaluation included imaging demonstrating cardiomegaly with marked pulmonary edema. Echocardiography showed a severely reduced left ventricular ejection fraction of 16% with severe biventricular failure and biatrial and biventricular enlargement. Our patient ultimately admitted to the use of a "sophisticated" anabolic steroid regimen, including using trenbolone enanthate, testosterone enanthate, sustanon, stanozolol, oxandrolone, clenbuterol, as well as tamoxifen and anastrozole. Clinic follow-up three weeks after the initiation of heart failure medications with discontinuation of the steroid regimen showed improvement in his cardiac function with a left ventricular ejection fraction of 38%. Our case demonstrates the possibility of a severe cardiomyopathy as a result of anabolic steroid use. It also suggests that prompt discontinuation of such substances can lead to reversibility of the condition. Our case also emphasizes the complexity of a steroid regimen in an abuser.
Keywords: Body-builder, Cardiomyopathy, Weak heart

INTRODUCTION

Androgen abuse in athletes is a known entity, with approximately 3 million anabolic-androgenic steroid users in the United States. A wide variety of medical consequences can occur, including those related to cardiovascular health, vascular thrombosis, hepatotoxicity, reproductive and endocrine abnormalities, and psychiatric problems. In regard to cardiovascular dysfunction, anabolic steroids have been associated with hypertension, left ventricular hypertrophy, and myocardial fibrosis. Further cardiovascular abnormalities are relatively unknown, yet there are few reports of sudden cardiac death and cardiomyopathy [1-3].

Testosterone and anabolic steroids function to increase the metabolic response and promote formation of muscle tissue. Anabolic steroids have an increased affinity for skeletal muscle, propagating hypertrophy and muscle strength. These drugs can also enhance one's endurance, hence the popularity amongst weight-lifters and sportsmen abusing such medications [1-3].

Our case describes an extensive regimen of anabolic steroid use in a patient ultimately diagnosed with an anabolic-androgenic steroid use cardiomyopathy with subsequent heart failure. It emphasizes the appreciation of the mal-effects of such substances as well as gives further evidence to extensive cardiac damage that can occur. It gives evidence to the potential reversibility with prompt discontinuation of the anabolic substances.

Case Presentation

A 38-year old male with no past medical history presented to the emergency department with two weeks' complaint of progressively worsening shortness of breath. He stated that over this same time period he had gained approximately 10 pounds. He otherwise denied chest pain or palpitations, yet admitted to elevated and labile blood pressure readings, ranging between 80 and 180 mm Hg systolic. He complained of severe exertional dyspnea and was initially seen in a walk-in clinic approximately one week prior to admission to our hospital. At that time he was given a prescription for diuretic therapy which did not improve his symptoms. Apart from that, he initially denied the use of medications or illicit drugs, stating that he is a weight-lifter and understands the importance of refraining from such substances.

At the time of examination, a young male in acute respiratory distress was noted. Auscultation of the heart revealed tachycardia with an irregularly irregular rhythm. No murmurs or extra heart sounds were present, yet jugular venous distention to the angle of the jaw was found. He also had lower extremity edema to the level of the knee bilaterally. Pulmonary examination was significant for crackles extending to the middle lobes with decreased breath sounds. Initial laboratory examination found an erythrocytosis with a hemoglobin of 18.8 g/dL, transaminitis with an alanine aminotransferase (ALT) of 921 IU/L and aspartate aminotransferace (AST) of 731 IU/L, and renal dysfunction with a creatinine of 1.9. Chest imaging showed cardiomegaly with pulmonary venous congestion and edema. Electrocardiogram was performed, indicating an underlying rhythm of atrial fibrillation without signs of ischemia and echocardiography showed a severely reduced left ventricular ejection fraction of 16% with severe biventricular failure and biatrial and biventricular enlargement.

After further discussion with the patient regarding his critical condition, he admitted to the use of anabolic steroids over the past 3 months. Specifically, he had been using trenbolone enanthate, testosterone enanthate, sustanon, stanozolol, oxandrolone, clenbuterol, as well as tamoxifen and anastrozole (Table 1) [1-4]. He admitted to the understanding of this regimen, including the two latter drugs to prevent the excess testosterone and anabolic components from being converted to estrogens.

Our patient was subsequently started on appropriate heart failure and atrial fibrillation medications, including beta blocker therapy, diuretics, and digoxin. It was emphasized that he refrains from the use of such illicit medications and was ultimately discharged to an in-patient psychiatric facility. Follow-up in our clinic three weeks after discharge showed improvement in his left ventricular ejection fraction to 38% and mild symptomatic improvement.

Our patient was diagnosed with an anabolic steroid-induced cardiomyopathy. He was actively consuming five testosterone and testosterone-related substances, of which several are marketed for use in veterinary medicine. He also took a substance similar in composition to epinephrine to increase his endurance. Interestingly, his regimen included both an aromatase inhibitor and selective estrogen receptor modulator, both medications used in breast cancer, to prevent the excess androgens from being converted to estrogen or having effects on estrogen receptors. He admitted to the "sophistication" of this regimen.

Table 1: Illicit substances used by our patient as part of his anabolic steroid regimen

Substance	Mechanism of Action	Primary Use	Illicit Use
Trenbolone enanthate	Androgen receptor agonist (5 times as potent as testosterone); no breakdown by aromatase or 5-alpha reductase into estrogen compounds	Veterinary use to increase muscle growth and appetite of livestock	Increase body mass and decrease body fat
Testosterone enanthate	Androgen receptor agonist	Natural sex hormone involved in endocrine and metabolic processes	Enhances muscle development and increases endurance
Sustanon	Androgen receptor agonist	Testosterone replacement	Androgenic properties
Stanozolol	Androgen receptor agonist	Veterinary use to increase muscle growth, bone density, and stimulate appetite of animals	Androgenic properties; also used in horse racing
Oxandrolone	Androgen receptor agonist; no breakdown by aromatase or 5-alpha reductase into estrogen compounds	Used to promote muscle growth and stimulate appetite in patients with severe illness, such as HIV/AIDS	Androgenic properties
Clenbuterol	Beta-2 agonist/stimulant	Bronchodilator in humans; treatment of allergic respiratory conditions in horses	Stimulant, increase endurance
Tamoxifen	Estrogen receptor antagonist	Endocrine therapy in hormone receptor positive breast cancer	Decrease estrogenic effects of other testosterone/testosterone-like substances
Anastrozole	Aromatase inhibitor	Inhibit synthesis of estrogen in breast cancer patients	Decrease estrogenic effects of other testosterone/testosterone-like substances

CONCLUSION

Our case adds to the literature on the possibility of anabolic steroid use precipitating an underlying cardiomyopathy. Our patient had a severe cardiomyopathy with severely decreased cardiac function. To the best of our knowledge, this is the first case report identifying cardiomyopathy as severe in the setting of a "sophisticated" anabolic-androgenic steroid regimen. It is important to investigate whether or not a patient is taking such illicit substances as early as possible, as prompt discontinuation can help to ensure at least some reversibility.

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