ISSN Print: 2664-8962
ISSN Online: 2664-8970
Impact Factor: RJIF 5.44
IJPR 2023; 5(1): 01-03
www.psychiatryjournal.in
Received: 03-11-2022
Accepted: 05-12-2022

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Anabolic steroid induced mood disorder: A case report

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DOI: https://doi.org/10.33545/26648962.2023.v5.i1a.48

Abstract
Anabolic steroids are being increasingly used by young individuals for athletic purposes and for improving personal appearance. These drugs can cause many adverse reactions including psychiatric disorders. Presented here is the case of a young woman who used anabolic steroids for body building and consequently developed changes in personality and mood along with physical and metabolic changes. She was treated with mood stabilizers, antipsychotics and benzodiazepines with which she started improving gradually. This case report highlights the risks of using anabolic steroids and the need for awareness of it's adverse effects among the youth.

Keywords: Steroid induced, mood disorder, psychiatric disorders

Introduction
Anabolic steroids are a family of drugs composed of testosterone and its synthetic analogs. They have few applications in medicine, such as in the treatment of hypogonadal men, wasting syndrome associated with HIV, hereditary angioedema and Fanconi's anemia [1], chronic kidney disease and osteoporosis in postmenopausal women, as well as inoperable breast cancer, and for diseases characterized by a negative nitrogen balance [8]. However they are used widely for increasing muscle mass and strength especially by young men for athletic purposes or even to improve their appearance. Some of the commonly used agents are methandienone, oxymetholone, oxandrolone, stanozolol and nandrolone [8]. Often the users are not aware of the effects of these agents on their behavior, mood and personality. Literature regarding the incidence and treatment of specific aspects of anabolic steroid induced mood disorders are limited. Hence this case of a 21 year old woman who presented with anabolic steroid induced mood disorder is reported here.

Case
A 21 year old female from middle socioeconomic background was brought to our hospital by her parents with complaints of irritability, aggressive behavior and disturbed sleep since 3 months. She had no history of similar complaints in the past. Premorbidly, she was described as a compliant girl who avoided social interactions and had no desire for close friendships or relationships. She used to be overweight due to which she had low self-esteem. While studying in college, she started going to gym for losing weight. Encouraged by her trainer she developed an interest in bodybuilding and at his instruction she started taking weekly Stanozolol injection. She reports taking these injections for about 3 months following which she took oral tablets of the same drug on alternate days for 4-5 months. She had protein supplements and followed high protein diet along with the medications. She denied using any other psychoactive substances.
Gradually she started having changes in her behavior. She dropped out of college claiming she was not interested in that course. She developed a close relationship with her trainer. She started demanding money from her parents for medicines, protein supplements and for her training fees. She resorted to aggressive behaviors and assaults against her parents when her demands were not met immediately. Other times she had outbursts of crying and threatened to commit suicide if her parents would not give what she wanted. She never showed any remorse after assaulting and injuring her parents. She did not report any psychotic symptoms

other than occasional ideas of reference. She did not have any pervasive symptoms of depression or anxiety.

Along with behavioral changes, she also developed facial widening, acne, facial hair and deepening of voice. She developed irregular menses which progressed to amenorrhea.

On examination, she was well built with a muscular body and had widened masculine appearing face. Acne and facial hair were present. Her higher mental functions were intact and no psychotic features were observed. She was often observed to become aggressive and violent or breaking into crying spells when her demands were not met. On one such occasion, she assaulted her mother, threatened to destroy hospital equipment and assaulted even the staff who tried to stop her.

Lab investigation

CBC revealed Hemoglobin level of 13.7, slightly low MCV and MCHC, elevated RDW. Serum sodium was 132 mEq/L. Lipid profile showed low HDL of 36 mg/dl. Other blood parameters were normal.

Treatment

She was treated with mood stabilizers Valproate and Oxcarbazepine, antipsychotic Amisulpride and benzodiazepines with which there was gradual improvement in the intensity and frequency of the behavioral outbursts. During the aggressive spells she had to be tranquilized using intramuscular haloperidol and promethazine. She was discharged at request after 10 days of hospitalization.

Discussion

Anabolic-androgenic steroids (AAS) are synthetic drugs derived from testosterone. These drugs are regularly self-administered by body builders, athletes and power lifters to enhance their sportive performance [2]. AAS are able to increase the size of muscle fibers as well as muscle strength. They may be used in oral or intramuscular preparations [2]. The users employ these agents at doses much higher than therapeutic doses and use multiple steroids simultaneously, a practice known as 'stacking' [2].

AAS abuse was shown to be linked to certain social and psychological traits of the user, like low self-esteem, low self-confidence, suffered hostility, childhood conduct disorder, and tendency to high-risk behavior [2]. Significant psychiatric symptoms including aggression and violence, mania, and less frequently psychosis and suicide have been associated with steroid abuse [3]. Long-term steroid abusers may develop symptoms of dependence and withdrawal [3]. It has been shown that AAS users have higher levels of alertness, lower tolerance to frustration or poor performance, and loss of impulse control [4]. The typical sudden and exaggerated aggressive AAS-induced response to minimal provocations has been termed as "roid rage" [4]. A significant incidence of violent crimes and physical partner abuse during AAS use has also been reported [4]. People who use AASs have a higher probability to be drug and alcohol abusers [8].

A study [5] which recruited 492 male, bodybuilders, explored the relationships between Anabolic-androgenic steroid use with psychopathy, risk-taking, anger, and physical problems. It showed that bodybuilders with a prior history of AAS use exhibited heightened odds of psychopathic traits, sexual and substance use risk-taking behaviors, anger problems, and physical problems compared to those with no prior history of AAS use. Another study [9] which assessed the frequency of affective and psychotic symptoms in athletes taking anabolic steroids used structured interviews of 41 body-builders and football players who had used steroids and showed that nine subjects (22%) displayed a full affective syndrome, and five (12%) displayed psychotic symptoms in association with steroid use.

Mechanism

Several experimental studies have focused on the mechanisms involved in neuropsychiatric effects of AASs, but the pathways and the molecular processes are still unclear [8].

AASs may induce NMDA receptor phosphorylation which increases excitatory neurotransmission, resulting in aggression [8]. Modulation of tryptophan (Trp) metabolism may underpin some of the behavioral effects of androgenic-anabolic steroids (AAS) [6]. Euphoria, arousal, and decreased anxiety observed with moderate use of AAS and exercise may involve enhanced cerebral serotonin synthesis and function by increased release of albumin-bound Trp. Aggression, anxiety, depression, personality disorders, and psychosis, observed on withdrawal of AAS or with use of large doses, can be caused by decreased serotonin [6]. Exercise and intake of excessive protein and branched-chain amino acid may aggravate the effects of large AAS dosage [6]. Chronic administration of high doses of AASs may cause anxiety-like behavior through the corticotrophin release factor enhancing GABAergic inhibitory effects from the central amygdala onto the bed nucleus of the stria terminalis [8].

The orbitofrontal cortex may play a role in the aggressiveness and violent behavior. Reduction of the orbitofrontal cortex has been observed in cases of AAS use[8].

Other serious adverse effects of AAS include sexual dysfunction, alterations of the cardiovascular system, and liver toxicity [2]. AASs are capable of increasing erythropoietin secretion leading to increase of hematocrit and erythrocytosis. AAS abuse has been associated with an increased risk of thrombosis, increased LDL and decreased HDL. Long-term administration of high doses of AASs may lead to serious consequences such as hypogonadism, neurodegeneration, cardiomyopathy, atherosclerotic disease, coronary artery disease and sudden cardiac death. Oxidative stress, apoptosis, and protein synthesis alteration are common mechanisms involved in AAS-related damage in the whole body [8].

The female AAS users face further problems due to androgenic actions of these agents on their physical appearance, facial features, skin, menstrual functions and fertility. The anabolic androgenic effects of AAS are related to the androgen receptor (AR)-signaling action. Androgen receptors are widespread in human tissues and organs [8]

Data is limited regarding effective treatment strategies for AAS induced mood disorders. Though there are several case reports of patients with AAS induced psychiatric syndromes treated with antipsychotics with variable results, there is a need for further research to develop evidence based treatment strategies for these conditions. Chronic AAS users may require tapering of the agents since abrupt discontinuation may precipitate severe depression and suicide. Guidelines for tapering of different agents need to be developed.

Most of the reports and research data available on the subject of AAS induced mood disorders concern male users and there have not been much studies about the neuropsychiatric and other effects these agents exert on female users. Therefore this case of the 21 year old female who developed masculinizing effects of the steroids, polycythemia, and decreased HDL levels along with the behavioral changes after using Stanozolol is relevant.

Conclusion

This case report describes a 21 year old female bodybuilder who developed changes in mood and personality following use of anabolic androgenic steroid Stanozolol. The drug also caused masculinizing effects on her appearance and voice, menstrual irregularities, acne, changes in lipid profile and polycythemia. She showed moderate response to treatment with mood stabilizers and antipsychotics.

AAS abuse should be considered a public health issue considering that most of the users are young, the drugs are capable of producing serious adverse effects and that most of these drugs are easily obtained. Some measures which may be useful to prevent the abuse of anabolic steroids include information campaigns regarding AASs and other doping agents in schools, improving knowledge among healthcare workers, proper doping screening tests and legislation to prevent easy availability of these drugs [7, 8]. Further research is also required to study the epidemiology, social processes, mechanism of causation, diagnosis and treatment of anabolic steroid induced neuropsychiatric syndromes in both male and female population.

Note on patient consent

Informed written consent was taken from the patient.

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