CASE REPORT

Anabolic steroid-induced cardiomyopathy underlying acute liver failure in a young bodybuilder

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INTRODUCTION

Heart failure may lead to subclinical circulatory disturbances and remain an unrecognized cause of ischemic liver injury. We present the case of a previously healthy 40-year-old bodybuilder, referred to our Intensive-Care Unit of Hepatology for treatment of severe acute liver failure, with the suspicion of toxic hepatitis associated with anabolic steroid abuse. Despite the absence of symptoms and signs of congestive heart failure at admission, an anabolic steroid-induced dilated cardiomyopathy with a large thrombus in both ventricles was found to be the underlying cause of the liver injury. Treatment for the initially unrecognized heart failure rapidly restored liver function to normal. To our knowledge, this is the first reported case of severe acute liver failure due to an unrecognized anabolic steroid-induced cardiomyopathy.

CASE REPORT

A 40-year-old male bodybuilder was transferred to our Intensive-Care Unit of Hepatology for treatment of severe acute liver failure. The patient had a history of anabolic steroid abuse over the last 10 years, self-administered in cycles of 6-10 wk, with a 2-3 wk suspension period between cycles. The most frequently used anabolic steroids were: methandrostenolone, stanozolol and oxymetholone (oral); and nandrolone decanoate, testosterone enanthate and trenbolone enanthate (intramuscular). Notably, he used massive doses of all anabolic steroids, including trenbolone enanthate (500-700 mg per week). There was no history of alcohol abuse or acetaminophen intake. He had no family history or past personal history of liver or cardiovascular diseases. The patient was in good physical condition until approximately one month prior to admission, when he experienced increasing fatigue, decreased exercise tolerance and general malaise. Although he stopped exercising and self-administrating the drugs, these symptoms continued to progress and he subsequently developed anorexia, recurrent vomiting, right upper-quadrant abdominal pain and progressive jaundice in the 4 d prior to admission.

No history of dyspnea, orthopnea, paroxysmal nocturnal dyspnea or edema could be elicited. At initial evaluation in the patient’s local hospital, laboratory
testing revealed an increase in serum transaminases (aspartate aminotransferase, 7897 IU/L; alanine aminotransferase, 7125 IU/L), coagulopathy (international normalized ratio, 3.3; factor V, 15%), hyperbilirubinemia (total bilirubin 6.8 mg/dL), high ammonia levels (73 umol/L) (normal, 11-32), acute renal failure (creatinine, 3.8 mg/dL), hyponatraemia (126 mmol/L) and high lactate dehydrogenase (LDH) level (7140 IU/L). An abdominal ultrasound revealed hepatomegaly and patent flow of the inferior vena cava and hepatic veins. By the end of the first day, the patient was transferred to our Intensive Care Unit of Hepatology, with the suspicion of anabolic steroid-induced toxic hepatitis.

On transfer, the patient appeared to be an athletic young male in no acute distress and was able to lie flat (Figure 1). Blood pressure was 96/60 mmHg, pulse was 120 beats/min, and respiratory rate was 26 breaths/min. He was conscious with no signs of hepatic encephalopathy. Additional findings on physical examination included generalized jaundice, no evidence of jugular venous distension, clear lung fields and distant heart sounds. He had an enlarged tender liver and no stigmata of chronic liver disease. His extremities were warm, with slight pretibial edema. Laboratory data were similar to those on admission, with markedly depressed values of factor V (15%) and factor VII (6%). Free testosterone and delta 4-androstenedione concentrations were elevated. Acetaminophen level was undetectable. Serology of known hepatotropic viruses was negative. Antinuclear antibodies were undetectable and serum copper and ceruloplasmin were normal. On chest X-ray, the cardiothoracic index was augmented with clear lung fields. The case was presented to our liver transplantation centre. After correction of hyponatraemia with saline, in an attempt to obtain a mildly hyperosmotic state and prevent cerebral edema, symptoms and signs of congestive heart failure became evident, with pulmonary congestion and elevated central venous pressure. Echocardiogram showed a dilated cardiomyopathy with an estimated ejection fraction of 15% and a large thrombus in both ventricles. A diagnosis of severe toxic cardiomyopathy associated with anabolic steroids was made after ruling out other causes of non-ischemic dilated cardiomyopathy, including infectious, autoimmune and metabolic causes. With aggressive therapy for cardiac failure with dopamine, dobutamine and watchful diuresis, the patient’s liver function improved dramatically. There was a rapid fall in serum transaminases and LDH levels. Four days after admission, the international normalized ratio was < 2.0 and low-molecular weight heparin therapy was started. Serial echocardiograms showed the disappearance of the intraventricular thrombus and improvement in left ventricular function (the fractional shortening increased up to 25%). Coronary angiography disclosed no lesions. After a 16-d hospitalization, the patient was discharged with oral anticoagulation. He is presently in the New York Heart Association functional class II, working as a nightclub security agent. However, not enough time has elapsed since treatment to assess full recovery of pathological changes and heart performance.

DISCUSSION

Although the diagnosis of ischemic liver injury can be straightforward in the presence of a clinically evident hemodynamic insult, heart failure may also lead to subclinical circulatory disturbances and remain an unrecognized cause of liver injury[1,2]. Remarkably, in a recent report only around one-half of the patients with ischemic liver injury had been in a state of shock[3]. Isolated cases of unrecognized cardiomyopathy as the cause of severe ischemic liver injury have been reported in the recent literature[4-7]. In these cases, as in our patient, a cardiomyopathy lacking many of the symptoms and signs of congestive heart failure was the cause of the ischemic liver injury, with striking clinical and laboratory evidence of severe liver failure, leading to the possibility of liver transplantation as a rescue therapy. Our patient was an athlete without a history or clinical evidence of heart disease on presentation, and was referred to our Intensive Care Unit of Hepatology for treatment of severe acute liver failure. Several features led to a delay in the diagnosis of the underlying heart disease. Firstly, he was an athletic young male with none of the classic cardiovascular risk factors. Secondly, anabolic steroids are known hepatotoxic drugs[8,9], with only a few reports of severe cardiac toxicity in the literature[10,11]. Thirdly, for unclear reasons, symptoms of congestive heart failure were initially absent; theoretically, the severity of his right-sided heart failure in combination with a low output state may account for this[10,11]. Finally, cardiac and hepatic diseases share many similar clinical features, such as fatigue, decreased exercise tolerance, hepatomegaly and edema. This case highlights the fact that ischemic injury of the liver should always be considered in the differential diagnosis of acute hepatitis[12]. Retrospectively, some features may have suggested an ischemic rather than a viral or toxic cause of liver injury, including an early massive rise in LDH levels-a ratio of serum alanine aminotransferase to LDH of less than 1.5 may suggest ischemic injury[12]; and a concomitant early rise in the serum creatinine level (additional evidence of end-organ hypoperfusion)[13]. Chest X-ray also revealed

**Figure 1** The patient was an athletic young male, with significant jaundice, in no acute distress and able to lie flat.
cardiomegaly, despite no evident pulmonary congestion. The rapid fall in serum transaminases after therapy for cardiac failure is characteristic of ischemic liver injury. The medical history of this patient was significant for chronic self-administration of massive doses of anabolic steroids, including trenbolone enanthate, a strictly underground long-active steroid. Although anabolic steroids are associated with significant liver toxicity, toxic hepatitis induced by anabolic steroids with predominantly hepatocellular injury is extremely rare. More frequently reported hepatotoxic effects include cholestatic liver injury, development of hepatic adenomas and peliosis hepatis. There have been a few reports of severe cardiovascular events associated with anabolic steroid abuse, including cases of severe dilated cardiomyopathy in otherwise young healthy patients. Experimental studies and non-invasive imaging studies in bodybuilders have demonstrated a dose-dependent impairment of myocardial function after long-term anabolic steroid therapy. It has been proposed that increased fibrosis of the myocardium may be mediated by aldosterone-like effects. The reversibility of such myocardial effects after discontinuation of the drugs is still unknown. A partial recovery of left ventricular function a few months after cessation of anabolic steroid abuse has been reported in two body builders.

Anabolic steroid consumption is becoming more widespread and their adverse effects, including cardiovascular and hepatic toxicity, are expected to increase in the years to come. To the best of our knowledge, this is the first reported case of severe liver failure due to an unrecognized anabolic steroid-induced cardiomyopathy. Awareness of this unique presentation will allow for prompt treatment of this potentially fatal cause of liver failure.

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