CASE REPORT

Strong diabetes

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The case of a 36-year-old male professional bodybuilder is reported. He presented to the accident and emergency department with right upper quadrant pain. This was on the background of a 15-year history of anabolic steroid and growth hormone misuse. Examination revealed mild hepatomegaly and a random blood sugar of 30.2 mmol/l. There was no evidence of ketonuria or acidosis. Biochemical evidence of hepatitis was found, and the patient was in acute renal failure. He was given a sliding scale of insulin and an intravenous infusion of crystalloid. The hepatitis and hyperglycaemia settled with conservative treatment. It is believed that this is the first reported case of frank diabetes precipitated by supraphysiological recreational growth hormone misuse.

A 36-year-old man was admitted to the casualty department with deranged liver function and hyperglycaemia. He had experienced significant weight loss (40 kg), over a 12-month period, associated with polyuria (12 l/day), polydipsia and polyphagia.

He was 165 cm and weighed 90 kg (body mass index 33). His blood pressure was 132/71 mm Hg. He had a 3 cm hepatomegaly, a random blood sugar of 30.2 mmol/l, and was clinically and biochemically dehydrated (urea 15, creatinine 156). There was evidence of acute hepatitis (alanine aminotranferase 519). Arterial blood gas analysis showed no evidence of acidosis (pH 7.388, P_{CO_2} 4.72, P_{O_2} 11.35, H_{CO_3}–20.9, base excess BE-3.4), and urinalysis revealed 3+glucose and 3+protein, but no ketonuria.

He was given a sliding scale of insulin with intravenous fluids. Ultrasound of his abdomen revealed a 16 cm hepatomegaly with bilaterally mildly enlarged kidneys (13.5 cm).

He openly admitted to a 15-year history of anabolic steroid misuse and 3 years of growth hormone misuse (table 1). A year after starting growth hormone, he had documented evidence of hyperglycaemia (blood glucose 12–15 mmol/l), and self-medicated with insulin. Twelve months before his admission, he stopped all insulin use after a series of hypoglycaemic episodes at the gymnasium.

During his 5-day admission, his biochemistry improved. Hepatitis serology and autoantibody screen yielded no abnormality. His blood sugar also spontaneously improved, and he was discharged home. He resolved to give up all non-prescribed drugs.

At 6 weeks, all his hyperglycaemic symptoms had disappeared. A glucose tolerance test demonstrated that his hyperglycaemia had completely resolved. His hormonal profile was consistent with hypogonadatrophic hypogonadism.

DISCUSSION

Many people using performance-enhancing drugs do not consider it a form of misuse. Rather, they see the drugs as a tool for self-realisation and self-expression. They consider themselves well informed, and embark upon complex regimens to limit complications. There has been a reported increase in the prevalence of growth hormone misuse among professional and amateur athletes and bodybuilders all over the world.[1] Growth hormone excess is characterised by insulin resistance at the hepatic and muscular level,[2] resulting in a counter-regulatory effect of insulin. It is therefore reasonable to assume that exogenous administration of growth hormone, to supraphysiological levels, could lead to hyperglycaemia. This is certainly true in acromegaly where the direct actions of growth hormone and insulin-like growth factor 1 can lead to insulin resistance, hyperglycaemia and frank diabetes.

Our patient used insulin to treat concurrent hyperglycaemia, but it is also used as a performance-enhancing drug.[3] It increases the synthesis of glycogen and proteins and thereby inhibits catabolism in muscle and liver. With concomitant hyperaminoacidaemia it has been demonstrated to be anabolic.[4] Its use is therefore prohibited in patients without diabeties.[5]

Owing to the repercussions of its use, documented growth hormone misuse among athletes is likely to represent only the ''tip of the iceberg''. It is thought to be widespread, and is on the list of banned substances published by the World Anti-Doping Agency. It is a naturally occurring substance and therefore poses challenges in its detection.[6] Present assays do not differentiate between synthetic somatotrophin analogues and natural growth hormone. It has consequently become a common substance of misuse over the last decade,[7] especially given the stringent screening tests for anabolic steroids.

Growth hormone and insulin are presently freely available over the internet with costs ranging from £60 to £300 for a typical month's supply. With the world wide web, users also have easy access to a huge amount of information about the effects of these drugs and various ''recommended regimens''. The question of whether growth hormone really enhances performance is highly debatable and there is still no consensus in the medical fraternity.[8] But what is urgently needed is a full understanding of the various chronic effects of growth hormone misuse.

There have been no studies to monitor the chronic effects of growth hormone misuse in healthy young people who otherwise have no growth hormone deficiency. Most studies here have focused on the acute effects it has on muscle mass and physical performance.[9 10] Therefore, it is not known whether

What is already known on the topic

- It is widely accepted that anabolic steroids and, more recently, growth hormone have been used as performance-enhancing drugs.
- Supraphysiological doses of growth hormone have been demonstrated to cause hyperglycaemia.

What this study adds

- We believe that this is the first example of frank diabetes caused by supraphysiological doses of growth hormone.

Table 1 Drug regimen

	Week												
	1	2	3	4	5	6	7	8	9	10	11	12	13
Growth hormone	4 IU per day					8 IU per day							
Insulin	8 iu per day												
Testosterone propionate	1000 mg per week										1000 mg per week		
Deca durabolin	800 mg per week				600 mg per week								
Oxymethalone	100 mg per day												
methandrostenolone	100 mg per day												
Testosterone enanthate					1000 mg per week	800 mg per week							
Liothyronine sodium					50–200 μg per day								
Boldenone dndecylenate						600 mg per week							
Clenbuterol hydrochloride						240 μg per day							
Fluoxymesterone								20 mg per day					20 mg per day
Mesterolone											100 mg per day		
Anastrazole											1 mg per day		
Stanozolol											10 mg per day		
Trenbelone acetate											100 mg per day		
Spironolactone													10
β-HCG					2500 IU three times a week				2500 IU three times a week		2500 μ three times a week		

Anastrazole, a non-steroidal aromatase inhibitor, blocks the peripheral conversion of testosterone to oestrogen, thus reducing feminising side effects such as gynaecomastia.
β-HCG, β-human chorionic gonadotropin, β-HCG was used to limit the hypogonadatrophic effects of exogenous testosterone.

growth hormone misuse simply unmasks latent type 2 diabetes at an early stage, or whether it actually induces diabetes in an individual without diabetes otherwise. Our case illustrates that those taking the substance are well aware of this potential effect. This was highlighted by the patient's self-treatment with insulin. He therefore avoided coming into contact with the medical world for a prolonged period.

The very fact that we see so little in the way of complications is testament to the knowledge that these users have. Treatment of these particular patients requires us to know their mindset, and to know what motivates them. This will allow us to identify, and therefore educate, them with regard to the potential pitfalls of using performance-enhancing drugs. We would recommend checking for hyperglycaemia in those taking supraphysiological doses of growth hormone. Moreover, in those cases where diabetes resolves, we would recommend long-term follow-up for diabetes mellitus screening.

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COMMENTARY

This paper documents yet another hazard of growth hormone misuse. As with other users, this athlete misused other substances over a period of many years. As the author states, knowing the mindset of these patients is an important requirement for treatment.

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