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Drugs in sport – the role of the physician

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Abstract

Sportsmen have used anabolic steroids since the 1950s and yet it was not until the 1980s that we, as physicians, admitted that they could improve performance. We now find ourselves in the invidious position of being unable to predict convincingly either safety or major health risks with performance-enhancing drug use.

The use of performance-enhancing drugs is no longer limited to the elite athlete. In 1993 the Canadian Center for Drug-free Sport estimated that 83 000 children between the ages of 11 and 18 had used anabolic steroids in the previous 12 months. Recent evidence suggests anabolic steroids are now the third most commonly offered drugs to children in the UK, behind cannabis and amphetamines.

The role of the physician of today is to regain our position of impartiality and objectivity within both the sporting and general community. Only then will we be able to pursue a harm minimisation strategy designed to convince the public that it is better to be the best you can be naturally.

For the majority, the improvement through the use of performance-enhancing drugs can equally be achieved through dietary and training advice. For the elite athlete, what price a gold medal that is tarnished by deceit? Its value then can only lie with the sponsors and politicians, for they can no longer claim to be sportsmen, only entertainers.

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Life is short, art is long, opportunity fleeting, experiment dangerous, judgement difficult. Not only must the physician show himself prepared to do what is necessary; he must also secure the co-operation of the patient, the attendants, and of external circumstances.

Hippocrates, Aphorisms I.1 (IV.485L)

Little has changed for the physician over the centuries. Our role remains to do what is necessary for the benefit of our patients. At times this can lead to an ethical dilemma as we struggle with behaviour we believe to be morally wrong and yet we must put the health and well-being of our patient first.

This dilemma is typified by the use of performance-enhancing drugs in sport and of anabolic steroids in particular. As we struggle to control a problem that has become endemic in sport, are current drug policies providing no more than Pyrrhic victories as we alienate those we have sworn to protect, our patients?

The use of drugs in sport is not new but few drugs have fuelled the public's imagination as anabolic steroids have. With an onset of use in sport by the Russians in the 1950s (Wade 1972) it was not until the 1980s that the medical profession finally accepted their efficacy as

performance-enhancing drugs. This has caused many athletes to doubt our impartiality and knowledge of performance-enhancing drugs. Ultimately, this has led to an increasing reliance, by many, on locker-room anecdotes rather than turning to their physician for a trusted medical opinion.

Prohibition – a flawed strategy in a climate of reward

The sporting authorities have adopted a policy of prohibition for performance-enhancing drug use in sport, but history dictates that this is a strategy doomed to fail. This was seen to good effect in America when in January 1920 the prohibition of alcohol was enacted. Far from its anticipated effect, alcohol consumption increased, organised crime thrived, and corruption among government officials soared.

This policy of prohibition has also caused increased pressure on physicians who are struggling with the ethics of becoming involved with athletes taking performance-enhancing drugs. If we are to advise our patients on the use of performance-enhancing drugs are we then complicit in their drug use, or are we

simply upholding our oath to do our best to protect their health?

The failings of prohibition are most obvious when the rewards are perceived to be great. In 1968 the International Olympic Committee (IOC) decided on a definition of doping and developed a list of prohibited substances. The use of anabolic steroids, such as dianabol, was included on the prohibited substance list for the 1976 Montreal games (Bergman & Leach 1984). Since this time, the number of banned substances has continually been subject to review and addition.

For some countries, such as East Germany, sporting excellence was seen as an inexpensive way to achieve international prestige. This led to the systematic use of performance-enhancing drugs to improve the performance of their athletes, with highly placed officials ensuring that their athletes remained undetected (Franke & Berendonk 1997).

Unfortunately, we now know that this was not an isolated problem. After the Seoul Olympics of 1988, where 2% of drug tests were positive, the Dubin enquiry heard evidence that suggested that in excess of 50% of athletes had been using performance-enhancing drugs (Dubin 1990). The Black enquiry heard evidence that an estimated 70% of the athletes in Australia's international pool were taking or had taken ergogenic aids and 25% of the 1988 Australian Olympic track and field squad had taken, or were taking, ergogenic aids in their preparation for Seoul (Black 1989).

We can conclude that, far from causing a reduction in drug taking by the athlete, usage had increased and government officials had been party to this corruption. The lessons of the 1920s had not been learned.

In 1996 the Home Office tried to address concerns about this issue in the UK, making 48 anabolic steroids, any other anabolic steroid falling within a generic definition of such substances, esters and ethers of these, five polypeptide hormones (human chorionic gonadotrophin and growth hormones) and clenbuterol class C schedule drugs (Misuse of Drugs (amendment) regulations 1996, Misuse of Drugs act 1971 (modification) order 1996). Importantly, while this made it an offence to supply these drugs or possess with intent to supply, it did not make it an offence to possess or use them personally.

In the UK this means, however misguided, that the use of performance-enhancing drugs is not illegal in the eyes of the law. Prohibition lies within the rules of the sporting authorities. This should empower the doctor to treat the patient.

For some there is an ethical dilemma, for the health monitoring and giving advice to patients using performance-enhancing drugs may be perceived as collusion in the patient's 'cheating'. But we must not forget that we are obliged to protect our patients from harm.

Performance-enhancing drugs – the real problem

The patients who should concern the physician most are not the high profile, elite athletes but the youth and other members of society who are being increasingly drawn to the use of performance-enhancing drugs.

In 1988 a study of 12th grade male students in the USA found that 6.6% had used or were using anabolic steroids – extrapolating to between 250 000 and 500 000 adolescent anabolic steroid drug users (Buckley *et al.* 1988). In 1993 the Canadian Center for Drug-free Sport estimated that 2.8% of children between the ages of 11 and 18 had used anabolic steroids in the previous 12 months – extrapolating to 83 000 schoolchildren (Melia 1994). Also in 1993, in a study for the Department of Health it was estimated that 5% of gym users in the UK were currently using anabolic steroids (Korkia & Stimson 1993).

Far more troublesome is a survey of 1000 schoolchildren in Sefton, England in 1998. This showed that anabolic steroids had been the third most commonly offered drug behind cannabis and amphetamines, revealing that 6.4% of boys and 1.3% of girls had been offered anabolic steroids (Clarke 1999).

We can begin to understand this when we observe that our youth are being bombarded with images of the body beautiful and of sporting achievements fuelled by supplements and drugs.

In toy stores figurines have taken on dimensions associated with the extremes of nature and are sold with advertising campaigns using bodybuilding terms such as 'massive', 'chiselled' and 'ripped' (e.g. the 1997 advertising campaign for Kenner toys' Legends of the Dark Knight premium collector series figures). Even our most popular icons have been drawn into the performance-enhancing drugs debate. In 1991, DC comic's hero Batman struggled with the issues surrounding performance-enhancing drugs and the resulting problems. Is it much wonder that body dysmorphia, 'biggerexia', is a problem for young men just as anorexia is a major problem for women? (Pope *et al.* 2000).

It is here that the role of the physician becomes of prime importance, particularly in the primary care setting. It should be our role not to judge the drug user against our own moral values but rather to look at the problem, identify the patients at risk and attempt to minimise both the harm to the individual and the community.

Harm minimisation – a way forwards

Needle exchange is one of the cornerstones of the UK policy for harm minimisation within the drug-using population. As HIV and hepatitis B and C became major problems in the drug-using community, through the sharing of injecting equipment, needle exchanges allowed drug users access to clean injecting equipment and advice.

Used injecting equipment is safely disposed of in an effort to minimise the risk to the community of used equipment being discarded inappropriately.

In the North East of England it was estimated that 60% of people accessing needle exchanges were not heroin users but were injecting anabolic steroids (personal communication from M Harrison and M Gilroy, needle exchange co-ordinators). Clearly, this group had realised that they were at the same risk of blood-borne infections as those users of illicit drugs.

Many of these patients were informing the needle exchange co-ordinators that they felt isolated from medical care with their own general practitioners often unwilling to offer any monitoring of their drug taking or give advice other than to stop using anabolic steroids due to the 'immense harm' they can cause.

Just as we denied the efficacy of these drugs for performance enhancement, in spite of the obvious performance effects that many athletes had noticed, in predicting calamity we once more demonstrated a lack of insight into the complexities of this problem. In truth the athlete had come to believe that we really didn't know what we were talking about, increasing their reliance on locker-room anecdotes and advice from other drug users.

In reaction to this information Health Authorities, such as Durham, felt the need to set up specific clinics to address the issues being raised and institute a harm minimisation programme also raising awareness of this situation within the community. Taking the lead from people working with illicit drug users, a harm minimisation policy is a logical approach to this problem.

The first thing the physician must ascertain is the type of performance-enhancing drug user they are dealing with to allow them to develop a strategy of care. As with all medical examinations, one must take a history, perform an examination and then decide on further investigations.

There are four general groups of patients that use performance-enhancing drugs:

1. Those who are seriously involved in their sport and see the use of performance-enhancing drugs as a tool to achieve their ultimate goal. They tend to have a definite plan of use, have often read around the subject and feel they are making an informed judgement. The physician's role here is to gain trust and monitor their health. With time one can then engage more fully in a harm minimisation strategy.
2. Those who have recently become involved in sport or started attending the gym. They may see performance-enhancing drug-taking as part of the culture that they wish to subscribe to or as a short cut to their goal. Often with a lack of understanding of effective diet, training techniques and effects of performance-enhancing drugs, their use of these agents is more amenable to change.
3. Occupational users such as doormen, police and prison warders. They have a definite objective; often feeling threatened by aspects of their work they believe they must increase their size and aggression both to threaten and protect others. This group is very much like group 1.
4. The 'recreational user' using these drugs in an effort to enhance sex drive, aggression, stamina and a sense of well-being. The use of illicit drugs is also common in this group.

For the majority of people, advice on training and diet will bring about the desired effect in their performance without the need for drugs. Supplements of proven benefit such as creatine monohydrate (Greenhaff 1996) afford an opportunity to use drug-free alternatives for performance improvement.

Exploring the patient's aims and goals allows a dialogue to convey interest and an awareness of their informed decision. At worst this will afford the opportunity of monitoring and advice if problems arise, at best it will persuade the patient not to use drugs at all. Performance-enhancing drugs do work but the benefit they provide is of little moment for the majority of people using them and this can often be explained.

For those patients intent on using performance-enhancing drugs one must explore the drugs to be used, use of multiple drugs (stacking), style of drug taking (injecting and/or oral usage) and proposed doses the patient intends to use. This will allow the physician to seek areas of harm reduction.

The ideal is not to use performance-enhancing drugs at all but if the patient will not be swayed from using them then one should advise against high dose and oral regimes, also encouraging the patient to use short courses (cycles) of drugs rather than remaining on them continuously.

An average cycle is for 6–12 weeks with a similar duration off-cycle. For high-level bodybuilders some remain on cycles for up to 1 year, potentially longer. Clearly, one should advise to use the lowest possible doses of drugs and have long cycles off of the anabolic steroids to allow the hypothalamo-pituitary axis and other systems time to recover.

Ironically, it may be safer to advise the patient to inject non-17 α -alkylated drugs than continue to use drugs orally. Oral drugs tend to be 17 α -alkylated to protect against hepatic metabolism but this also renders them potentially more toxic to the liver.

If advice is to be given on injecting drug use the patients must have access to a needle exchange system to minimise the risk of abscess formation, hepatitis B and C and HIV transmission. One should also advise the patient not to inject individual muscle groups but to inject in the upper outer gluteal region to minimise the risk of injection trauma.

The injection of joints and injured muscle tissue is to be dissuaded, as many of the patients erroneously believe that these drugs will have similar effects to corticosteroids (personal communications from patients at DISCUS, the drugs in sport clinic and user's support, Chester le Street, Durham).

As with any medical examination following the taking of a history, a full examination should be performed with investigations for haematological and biochemical monitoring and other tests such as an ECG to assess electrical criteria for left ventricular hypertrophy and the QT interval.

However, an awareness of the drugs used and their potential side effects is of importance.

Performance-enhancing drugs used

Beyond the use of illicit drugs, these are the following categories of drugs used:

1. Androgenic and anabolic steroids: boldenone, clostebol, danazol*, drostanolone, epitostanol, ethyloestrenol*, fluoxymesterone*, formebolone, furazabol*, mepiotestane, mesterolone, methandienone*, methenolone, methyltestosterone*, nandrolone, norethandrolone*, oxabolone, oxandrolone*, oxymetholone*, prasterone, quinbolone, stanolone, stanozolol*, testosterone and trenbolone. (*Denotes 17 α -alkylated.) The most commonly used of these are the testosterone esters alone or as the mix sustanon 250 (testosterone propionate, phenylpropionate, isocaproate and decanoate), nandrolone decanoate (deca-durabolin) and methenolone (primobolan).
2. 'Protective': tamoxifen (for gynaecomastia), clomiphene, human chorionic gonadotrophin (hCG; for testicular shrinkage and to stimulate recovery post usage), ketoconazole shampoo (for male pattern baldness (Pierard-Franchimont *et al.* 1998)).
3. Polypeptide (anabolic) hormones: insulin, insulin-like growth factor, human growth hormone.
4. Stimulants/weight loss: amphetamines, ephedrine, pseudoephedrine, phenylpropanolamine, caffeine, caffeine/ephedrine/aspirin mix ('T5'), thyroxine, tri-iodothyronine and clenbuterol.
5. Diuretics (for weight loss – also used to enhance muscle definition pre-competition): frusemide, bumetanide, spironolactone and ethacrynic acid.
6. Dehydrating agents (to enhance muscle definition): glycerol.
7. Analgesics: nalbuphine hydrochloride (nubain). This is increasingly becoming a drug of abuse as some patients using this progress to heroin, which can be more readily obtained.
8. 'Hardeners': aminoglutethamide. Used in the treatment of metastatic breast cancer, this blocks the

production of adrenal steroids and the conversion of androgens to oestrogens. Apparently, it also enhances muscle bulk and definition (personal communication from competitive bodybuilder).

9. 'Blood boosters': erythropoietin (EPO), fluocarbon, recombinant haemoglobin.
10. Oral hypoglycaemics: metformin, gliclazide.
11. Growth hormone stimulator: L-dopa, gamma amino butyric acid (GABA – high level of conversion to GHB), gamma hydroxybutyrate (GHB). Used also for insomnia, sexual anxiety and inhibitions, tranquilliser and induction of euphoria (Phillips 1991).
12. Muscle 'pump': alprostadil (caverject). This is used in bodybuilding prior to posing to cause individual muscle groups to swell.
13. Masking agents: probenecid, epitestosterone, ethacrynic acid and others.
14. Drug abuse we are as yet unaware of.

Problems associated with performance-enhancing drug use

This is an area of controversy as the risk of significant major side effects may have been overstated in the healthy population using anabolic steroids (Windsor & Dumitru 1988, Friedl 1993). However, as studies in this area are notoriously difficult, and there is no reporting of side effects to a central body, whilst one cannot predict universal harm from using anabolic steroids the potential risks should be monitored. For women the obvious masculinising effects can be damaging.

Counterfeit products

As the patients will generally be using counterfeit products one is unable to advise on the relative safety of each product. Growth hormone being used by bodybuilders, purchased on the black market, was found to contain no more than glucose, which had not been prepared in a sterile manner (personal communication from medical information department, Pharmacia-Upjohn). Often, counterfeit products will contain anabolic steroids of indeterminate dosage but with no quality control the label on the product may bear little resemblance to the contents. This in itself constitutes a health risk but substitute prescribing would be fraught with logistical and monitoring problems.

Cosmetic

This accounts for the bulk of the problems seen with the use of anabolic steroids. Acne is often seen on the back as well as facially and can have a tendency to be cystic. Male pattern baldness is noted, as is hirsutism, oily hair and skin, striae distensae and comedones. Distressingly, for some

men, gynaecomastia can be induced secondary to the aromatisation of the androgens. This may need to be dealt with surgically despite discontinuing the use of anabolic steroids (unpublished case from the author's personal records). In women, breast atrophy can be induced.

Cardiovascular

This area is felt by some to be the area of greatest risk for patients using anabolic steroids (Glazer 1991). However, there is no epidemiological data to support this. In part this may be due to the under-reporting of problems such as myocardial infarction, cardiomyopathy and cerebrovascular accidents but just as the lowering of high density lipoprotein (HDL) is well recognised with some anabolic steroids, some also reduce the independent risk factors Lp(a) (Albers *et al.* 1984, Crook *et al.* 1992, Cohen *et al.* 1996) and fibrinogen (Anderson *et al.* 1995).

The development of cardiomyopathy has been suggested with anabolic steroid use (McKillop *et al.* 1986) but this has not been confirmed in studies (Salke *et al.* 1985, Zuliani *et al.* 1988). Even the claim that hypertension is induced by anabolic steroids appears to be without foundation as there is no study to date that shows clinically significant elevations of blood pressure with anabolic steroid use. Despite this it would seem prudent to anticipate the potential for a 1–5% risk of hypertension being induced in long-term anabolic steroid users, as seen with the oral contraceptive pill (Louden 1991).

Hepatic

Abnormal liver function tests are common with anabolic steroid use but the main concerns are the development of peliosis hepatitis or liver tumours. The occurrence of these serious problems is rare with almost all reported cases associated with 17 α -alkylated anabolic steroid use and occurring in patients with pre-existing medical conditions (Haupt & Rovere 1984). Methyltestosterone use in transsexuals has also shown changes suggestive of prepeliotic lesions (Westaby *et al.* 1977).

While there have been no reports of cholestatic jaundice in athletes using androgens this remains a well-recognised side effect of androgen use (Mehita 2000).

Genitourinary

Infertility is a common effect of anabolic steroid use and this has been utilised by the WHO in the research for a male contraceptive (Schurmeyer *et al.* 1984, WHO Task Force on Methods for the Regulation of Male Fertility 1990). A reduction in testicular volume can be observed. As the treatment for prostatic carcinoma is androgen blocking there is a theoretical risk of prostatic carcinoma; however, there is only one recorded case, that of a 38-year-old bodybuilder (Roberts & Essenhigh 1986). A

link is therefore not conclusive. Clitoral hypertrophy is well recognised; this can be distressing for some but a boon for others as it may aid the attainment of orgasm. Menstrual irregularities are also common in women using androgenic anabolic steroids.

Musculoskeletal

If used by prepubertal children there is a risk of epiphyseal closure following initial growth. Ligamentous rupture may be due to the excessive loads put on insertion points but there are animal studies to suggest the collagen structure may be altered (Michna 1987). The development of acromegaly is a clear risk of excessive use of growth hormone.

Psychological

In World War II some German troops allegedly used androgens to enhance aggression (Wade 1972). Increased aggression is a problem for some athletes but actively desired by others to allow better training and competition. Increased libido is well recognised as are features such as irritability and reckless behaviour (Pope & Katz 1992). Conversion of depression to paranoid reaction has also been documented (Wilson *et al.* 1974). However, some studies have shown no relationship with antisocial behaviour and testosterone levels but a correlation between response to provocation and high levels of testosterone (Olweus *et al.* 1980).

Endocrine

Secondary hypogonadotropic hypogonadism can be induced due to the feedback inhibition of both the hypothalamus and the pituitary gland (Alen *et al.* 1985).

Haematological

Altered coagulation has been noted but controlled trials in surgical and other high risk patients to look at protection from thrombosis using anabolic steroids did not show benefit (Blamey *et al.* 1984, 1985). Androgens enhance erythropoiesis by increasing the production of erythropoietin and can cause polycythaemia and a raised haematocrit (Kennedy & Gilbertson 1957, Evens & Amerson 1974). Anabolic steroids may alter humoral immunity lowering IgG, IgM and IgA but the clinical significance of this is unclear (Calabrese *et al.* 1987).

Infection

Abscess formation at injection sites is relatively common but two reported cases of HIV in bodybuilders who had shared injecting equipment act as a salutary lesson on the risks taken by injecting drug users (Scott & Scott 1989,

Henrion *et al.* 1992). Hepatitis transmission is therefore also a risk. Unsterile products and procedures will also put the injecting drug user at risk.

Injection injuries

As with all injections, direct and indirect trauma to nerves and soft tissue is a possibility.

Conclusion

Being a physician remains a vocation. However misguided their actions, all patients deserve a non-judgemental approach to their problem.

We must not forget, 'Drug misusers have the same entitlement as other patients to the services provided by the National Health Service. It is the responsibility of all doctors to provide care for both general health needs and drug related problems, whether or not the patient is ready to withdraw from drugs.' (Department of Health 1999).

For the majority, the use of performance-enhancing drugs is not required to allow them to reach their sporting or physical goals. We must put an end to the myth that the use of performance-enhancing drugs will bring about dramatic changes in physique and performance. There must be a greater awareness of the pressures upon our youth and the psychological effects that this can cause. However, proper research is required to fully evaluate the risks of performance-enhancing drug use to allow us to enable the patient to make an informed choice.

For the athlete who persists in using performance-enhancing drugs surely they can no longer call themselves sportsmen and women, merely entertainers.

What goes around comes around eventually. It can be 10 years, 15 years, it all comes out in the wash and then where are you – a gold medal isn't as gold any more.

Graeme Obree (two times world pursuit champion).

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