Illicit drugs and surgery

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KEYWORDS
Heroin; Cocaine; Intravenous; Anaesthesia; Vascular; Complications

Abstract
Depending on their pharmacology and the ways they are used, illicit drugs can lead to a wide range of medical and surgical problems. The drug-using patient requiring surgery or pain relief needs special attention in order to avoid interactions and complications, especially as most of these patients will be using more than one drug. In order to raise awareness, we review the different drugs, their clinical effects and the problems which may be encountered.

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Introduction
The reader may feel justified in asking why a review concerning drug misuse should appear in a journal of surgery. The main reason is that drug misuse has increased to a point where it impinges on society in general and also on many aspects of medical practice, so that every practitioner needs to be 'streetwise' concerning illicit drugs and their medical and surgical implications. The main reason why drugs are taken is that they affect brain chemistry to produce a pleasurable experience; one authority has summarized this in the expression 'feeling better then well'. 1 With almost all misused substances, this effect is associated with the release of dopamine in the nucleus accumbens. In addition, their individual chemical structures determine their toxicodynamics and toxicokinetics, leading to a wide range of wanted and unwanted effects.

Because of the frequency and complications of drug use, many users end up as patients. Today's clinician therefore needs to have a basic understanding of the ways in which the different illicit drugs produce their effects and to be aware of the short and long term complications of drug misuse together with the steps to be taken in managing the clinical problems which occur. This review provides an update on the extent of drug misuse, some of the commoner substances involved and the clinical situations where awareness is needed.

Extent of misuse
The British Crime Survey for 2002/2003, in a large survey of adults across England and Wales, reported that among 16–59 year olds, 12% had taken an illicit drug and 3% had used a class A drug in the previous year. 2 Cannabis (11%) was the most frequently used agent. People aged 16–24 were more likely to have used drugs; 28% in the last year, with 8% reporting use of class A drugs. Since 1996 there
Heroin and opioids

Heroin (diamorphine; diacetylmorphine) is the most widely abused opioid. The purity of street supplies of this drug can vary from 10% to 90%. Its popularity as an agent of abuse is related to the rapidity of onset of desired effects. This is because heroin crosses the blood-brain barrier very rapidly after which it is broken down almost immediately to monoacetylmorphine and then to morphine, which combines with opioid receptors to produce euphoria, as well as a range of unwanted effects. Heroin can be vapourised by heating the powder placed on a piece of foil and inhaling the vapour ("chasing the dragon"), ‘snorted’ into the nose as powder, or dissolved in acidified water and injected subcutaneously ("skin popping") or most often intravenously. Although use of this drug may start by being ‘recreational’, it soon becomes addictive, and most users end up as injectors. Two weeks of regular use is sufficient to lead to addiction, with withdrawal symptoms ensuing if the drug is abruptly discontinued. The most important toxicological effect of opioids is that they slow respiration through their depressant effect on the respiratory centre, and this is the commonest reason why people die of opioid toxicity. Another major property is tolerance. Tolerance to heroin can be marked: the initial dose to produce an effect is a few milligrams, while ten milligrams or more of pure heroin could be fatal by intravenous injection in a drug-naïve individual. However, the regular user who seeks help from a dependence clinic will be taking about 750 mg of street heroin a day. There can thus be a tenfold or more escalation in dose as dependence develops. Overdose can occur from three main causes. The initial dose may be too much, the supply may be of greater purity than usual (though this should not be a problem for the tolerant user), and tolerance may be lost after a few days' abstinence. When this happens, the dose that was taken regularly just a few days beforehand becomes potentially lethal.

Naloxone acts as an antagonist at opioid receptors, reversing the acute toxic effects of opioids. When treating a patient with a suspected opioid overdose, the basic rules of resuscitation apply; first attend to the airway, ensuring it is open and clear, and giving oxygen. The antidote (naloxone) can then be administered intravenously and/or intramuscularly in a dose sufficient to reverse toxicity (usually 1–2 mg or more). It should be remembered that naloxone has a short half-life. Most opioids, especially the longer acting ones may again become effective after the effect of the naloxone has ‘worn off’.

Opioid withdrawal

Opioids produce a characteristic withdrawal syndrome, distressing but not life-threatening, commencing within 24 h of the last use of the drug. This consists of a flu-like illness, with anxiety, sweating, rhinorrhoea, piloerection ("gooseflesh") and diarrhoea. The syndrome subsides over 7–10 days, but may be abolished by administration of an opioid. Lofexidine is frequently used to manage opioid withdrawal as it controls the symptoms.

Methadone replacement therapy given daily, orally or by injection is widely used as a way of managing heroin addiction, and has widespread support as it reduces injecting behaviour and criminal activity. However it involves long-term use of another opioid, and so is in effect replacing one addiction with another. Methadone can also be toxic in overdose. The British National Formulary recommends starting with a dose of 10–20 mg, and as little as 50 mg in a single dose could prove fatal for a non-dependent individual. The ‘recreational’ use of methadone occurs and the drug has a street price.
Cocaine

The numbers of people taking cocaine in the United Kingdom are increasing, and complications are becoming more common; there were 146 deaths associated with this drug in 2004 (Fig. 2). Much of the experience about the major complications of cocaine comes from the United States, where use has been widespread for over 30 years. Early animal work studied the management of acute cocaine toxicity, and showed that diazepam was an effective treatment. Cocaine produces its effects mainly due to two related pharmacological properties and one further unwanted property. The first is that it blocks the reuptake of dopamine, which causes the euphoric 'high' but which may also lead to confusion, aggression, hallucinations and possibly convulsions. Reuptake of serotonin is also inhibited. The second main property is that it blocks the reuptake of norepinephrine, which causes marked vascular effects, with a very high blood pressure and frequently chest pain, which is the commonest reason for cocaine users to seek medical advice. The consumption of large amounts can also cause hypotension or cardiac arrhythmias due to its third main property, sodium channel blockade, which is also responsible for its local anaesthetic effect. In addition to the complications mentioned, cocaine use is associated with a wide range of medical and social problems ranging from behavioural disturbances to sudden death. Cocaethylene is the ethyl metabolite of cocaine, produced in the liver when alcohol is present; although its effects are similar to those of cocaine, it has a longer half-life, which helps to explain the concomitant use of cocaine and alcohol. There is no specific antidote for cocaine toxicity; the main medical treatments include oxygen, diazepam to reduce central and peripheral nervous system activity, which can relieve chest pain and lower blood pressure, nitrates to relieve coronary artery spasm and further control blood pressure, and aspirin for the patient with chest pain.

Cocaine hydrochloride, a white powder, is often "snorted" through a straw or a rolled up bank note. The freebase form ('crack' cocaine), is made in small crystals or 'rocks', and is drawn directly into the lungs as vapour produced by flaming a rock with a cigarette lighter. Dissolved crack reaches the brain within 10–14 s when injected into a vein, but when a crystal is vapourised and smoked, the inhaled vapour reaches the brain within 5 s. Peak levels are probably threefold higher than when cocaine powder is inhaled through the nose, and the effect is shorter in duration, lasting about 15 min. In addition to the pharmacological effects of cocaine, crack smoking also presents a range of complications from thermal injury of the pharynx and airways to foreign body inhalation.

Obstetric complications in cocaine users

Spontaneous abortion is more frequent in cocaine users in early pregnancy, and premature labour is also common. Placental abruption occurs in 10% of regular cocaine users, and cocaine accounts for 10% of foetal deaths in the United States of America.

Ketamine

Ketamine (street names include K, special K, kitkat, cat valium) is a dissociative anaesthetic approved for human and veterinary use. It has hypnotic, analgesic, hallucinogenic and amnesic effects, and is abused for the euphoric hallucinations produced, which generally last less than an hour, though coordination and sensation may be affected for up to 24 h. Though often described as a club or rave drug, it is usually taken alone in a dark, quiet environment. It can be "snorted" as powder, and can also be dissolved in drinks, taken as tablets or injected intravenously. At high doses, its dissociative effect may lead to the user being in a trance-like state termed a "K-hole", sometimes with tunnel vision or an out-of-body experience, totally unaware of self and surroundings. Physical effects include tachycardia, mydriasis, increased secretions, vomiting, convulsions and rhabdomyolysis. Near-patient urine tests are available for this drug, and the test for phencyclidine also cross-reacts with ketamine. The user may present with disturbed consciousness, confusion, aggression, or an apparently psychotic state, and may also suffer burns (such as cigarette burns to the fingers) or accidents.

Amphetamine and methamphetamine

These drugs and related compounds possess marked stimulant and sympathomimetic effects, related to their similarity to catecholamines. Euphoria, central nervous system stimulation, appetite suppression, a subjective feeling of energy, tachycardia and other symptoms occur. Addiction occurs but is not as common as with heroin or cocaine.

Ecstasy

3,4-Methylenedioxymethamphetamine (MDMA, ecstasy) is related to amphetamine. It has acquired a reputation as a dance drug, because of its unique pharmacological effects, which can be summarised as the three "Es": euphoria, empathy and energy. It causes the release of large amounts of serotonin in the central nervous system, followed by depletion, and possibly neurotoxicity. Dopamine is also released. Serotonin release also leads to secretion of antidiuretic hormone, so that any excess water consumed is not eliminated by the kidneys. There are a number of medical problems related to MDMA consumption, though few could be considered 'surgical'. However, there have been several reports of pneumothorax and pneumomediastinum occurring among ecstasy users. It is presumed that this relates to energetic dancing with a form of forced Valsalva manoeuvre against a closed glottis.

Cannabis

Tetrahydrocannabinol, the active ingredient combines with receptors in the brain and periphery to cause mental effects together with vasodilatation and tachycardia. Effects last a few hours, but the drug can persist in tissues for a long time. Acute overdose is unlikely to be fatal, but
heavy use appears to be cumulative and can lead to agitation, hallucinations and paranoid behaviour.

Volatile substance abuse (VSA)

Although they are not strictly speaking illicit, it is worth being aware that the misuse of volatile substances (gases, glues, aerosols and solvents) is the commonest form of substance misuse in 11–12 year old children, and is more common than taking cannabis; the figure for VSA rose from 4% to just over 6% in the 13–15 year age group. The lifetime prevalence for VSA among British school children is said to be 12%, one of the highest figures in Europe. The prevalence of VSA is equal between girls and boys, though deaths are commoner among boys by over 4:1.

The main effects are comparable to being drunk though with a very rapid onset and the potential for disturbing hallucinations. VSA may lead to sudden cardiac death, even on first exposure. Cardiac arrhythmia is seen acutely and longer-term usage may lead to a congestive cardiomyopathy. Airway injury and choking relating to chemical aspiration may also be fatal. Other complications include hepatic and renal impairment, bone marrow suppression, optic atrophy, cochlea damage and infertility as well as incidental complications such as accidents and drowning.

Khat

Khat (Cathula edulis) is a plant that grows on high ground in North Africa. The leaves are chewed, and produce a psychological effect for up to about 48 h after they are picked. In general, the plant has a mild amphetamine-like stimulant effect. The plant material tastes very astringent, and has to be chewed as a large wad for about an hour, swallowing the copious saliva produced, before any effects occur. Abdominal bloating and belching are linked with chewing it. Dependence occurs. Anxiety, insomnia, depression and psychotic symptoms may occur in regular users. Peptic ulcers are a common side effect; haemorrhoids are also common, and the incidence of myocardial infarction is increased in long-term users.

Surgical problems due to drug misuse

Venous access

Repeated use of veins for intravenous self-administration of drugs leads to major damage to superficial veins, which are very likely to become thrombosed. Users may then move on to use deeper vessels such as the femoral vein, or more unusual ones such as penile veins. Some users end up by making use of rectal and vaginal venousplexuses for access, which can bring further complications. Sometimes with the assistance of a friend or fellow user or even a mirror, the veins in the neck, both superficial and deep may be accessed. When the patient needs intravenous access, there may not be any suitable superficial veins available. While often a ‘nuisance’, this can be fatal in an emergency situation. Alternative routes (for example, jugular or intraosseous) may need to be considered.

Arterial injury

Attempted deep venous access brings with it the risk of arterial damage. This is a particular risk in the femoral region where critical ischaemia of the entire leg may result from arterial damage or thrombosis. This may require urgent vascular surgical intervention, repair and/or embolectomy.

Deep venous thrombosis (DVT)

DVT is common among intravenous drug users, especially those who use the groin as an injection site. Other factors such as lying in one position while intoxicated probably also play a part. The added problem in the patient with a deep vein thrombosis is poor compliance with medication regimes that may require anticoagulants such as warfarin and regular blood tests for up to 3 months.

Abscess formation and gas gangrene

Intramuscular drug injection may lead to local necrosis and sometimes to anaerobic infection causing gas gangrene. Diagnosis and management of these cases is urgent, as the deterioration is often rapid and a fatal outcome is common. Surgical debridement may be required, and hyperbaric oxygen if available can have a dramatic effect on the infection, since the anaerobic organisms are killed by an increased oxygen tension in the tissues.

Tissue compression, crush injury and ischaemia

Other complications of prolonged immobility following illicit drug administration include compartment syndrome and neuropaxia. Compartment syndrome occurs when perfusion pressure falls beneath tissue pressure in a closed anatomical space: a myofascial compartment. Tissue necrosis occurs and may lead to permanent functional impairment, loss of limb, renal failure and death. Compartment syndrome should be suspected in a tense and tender limb, particularly if the pain appears worse than expected. Symptoms and signs have been described as the five Ps; pain, paraesthesia, pallor, poikilothermia and pulselessness. Particular care should be taken in the patient with impaired consciousness and a high index of suspicion is warranted. An elevated blood creatine phosphokinase and urine myoglobin support the diagnosis. The pressure in the muscle compartment may be measured with a 21-gauge needle attached to a flushed pressure transduction line, however the pressure threshold for fasciotomy is not clear.

Neuropaxia may result from crush injury to a nerve. An example of this is the ‘Saturday night palsy’ of the radial nerve first described in relation to its crushing as the subject, after alcohol, sat slumped with an arm over the back of a chair. The radial nerve is thus compressed where it passes around the humerus.

The vascular supply to the nasal septum may be compromised by cocaine-related vasoconstriction. This has led to the popular recognition of ‘cocaine nose’ where destruction of the septum may be so extensive that in
extreme cases, the individual nares are lost, leaving one large opening.

General trauma

As with all recreational drugs, an increased risk of trauma is evident. This may relate to road traffic accidents, fights or other mechanisms of injury related to an impaired mental state. Drug and drug trade related knife wounds and shootings are becoming increasingly common in the UK.

Body packing and stuffing

'Body packing' is the transport of illicit drugs by internal concealment in some form of sealed container such as a condom. Packages may be swallowed or inserted per rectum or per vaginam. When used in a planned manner to smuggle drugs, such individuals may also be known as 'swallowers' or 'mules'. 'Body stuffing' more usually refers to urgent concealment of often less well enclosed drugs when arrest is thought imminent. In 1973, the first clinical complication of 'body packing' was reported. The patient had presented with small bowel obstruction having swallowed a condom filled with hashish; surgical removal was required. In addition to mechanical obstruction of the gastrointestinal tract, other complications relate to leakage or rupture of the container followed by acute intoxication with what may be a large dose of whatever is contained within, most commonly heroin or cocaine. Approaches to management consist of controlling the symptoms of toxicity together with remov-...Illicit drugs and surgery 369

Diagnosis of drug misuse

Diagnosing drug misuse is important, because symptoms may be due to this cause, and drug-misusing patients often do not disclose their habit. Management may be specific for the drug involved, the risk of blood-borne infection is increased for staff, and patients may also attempt to steal drugs from the pharmacy trolley. Manipulative and drug seeking behaviour are unfortunately common in these patients. There is thus a need to know. In some cases, drug use may be apparent from the history and examination, but if it is not, the doctor should not be complacent. Problems such as presentation with cardiac pathology in a young person, behavioural disturbances, unexplained coma or collapse, etc. may each be due to the patient’s drug misuse, and there is a clinical indication for the use of a near-patient urine test in order to provide an on-the-spot answer. Test strip analysis may include opioids (which do not give a positive result with methadone), tetrahydrocannabinol, cocaine, methadone, phencyclidine (which usually cross-reacts with ketamine), amphetamine, methamphetamine (which usually cross-reacts with MDMA), and methadone. Most of these tests stay positive for 24–48 h after the last use of the drug concerned, but do not indicate whether the patient is under the influence of the drug.

Perioperative medical and anaesthetic issues

Patients with problematic drug abuse may present acutely in relation to a complication of drug abuse as outlined above. Additionally, they may require surgery for an unrelated matter. The majority of recreational drug users are younger individuals who may not usually have a detailed pre-operative assessment. Additionally, due to bed pressures and increasing use of day case scheduling, they may have their ‘history’ taken without adequate privacy. It is important to have a high index of suspicion and raise the issue of recreational substance use along with the more usual enquiries about alcohol and tobacco. When a history of drug use is offered, polydrug use should be considered. It has been reported that 83% of drug-abusing patients (in treatment) use two or more substances. Acknowledging the right to complete confidentiality and stressing the need to avoid potentially serious drug interactions may produce a more honest answer.

We have already noted the higher incidence of problem drug abuse in young trauma patients. Prisoners must also be considered high risk. A survey reported by the European Monitoring Centre for Drugs and Drug Addiction showed that this is a very common problem across the EU. In the UK prison population, 77% report having used drugs and 33% have injected. Physical clues on examination may also be helpful. Injection ‘track-marks’, phlebitis, abscesses and scarring provide direct evidence of a chronic problem. Multiple tattooing and body-piercing may also have an association. Signs that a patient may be acutely intoxicated depend on the substance(s) involved and include miosis/mydriasis, hyper/hypotension, sweating, tremor, pyrexia, an abnormal affect or bizarre behaviour, respiratory depression (slowing of respiration is characteristic of opioids) and a reduced conscious level.

Blood-borne infections such as hepatitis and HIV are more common in the drug abusing population. This can be attributed not only to spread by shared contaminated needles and syringes, but also to an association with increased high-risk sexual behaviour. Clearly staff dealing with such patients will require an increase in protective precautions, the notification of all relevant ward and theatre staff and special handling measures for blood and other potentially infective materials.

Information regarding a patient’s drug habit may be very important in planning their anaesthetic care. The problem of managing peri-operative analgesia is considered below. However, many other factors can impact upon the safe conduct of anaesthesia. Patients that smoke or inhale illicit substances may have considerable airway damage and significant chronic obstructive pulmonary disease. The use of sympathomimetic drugs such as cocaine, amphetamines and related compounds may be associated with greater pressor responses to stimuli such as oro-tracheal intubation and surgical incision, a greater amount of anaesthetic agent may be required including a higher concentration of volatile anaesthetic. Halothane should be avoided in view of a higher incidence of cardiac arrhythmias. The abuse of volatile solvents can mimic alcohol intoxication and is most commonly seen in school-age males. Chronic
use can lead to cardiomyopathy and dysrhythmia, a sensitivity to sympathomimetic agents and myocardial depression with volatile anaesthetic agents. 1,1,1-Trichloroethane, a commonly abused solvent is structurally very similar to halothane (2-bromo-2-chloro-1,1,1-trifluoroethane).

Abuse of depressant agents such as benzodiazepines and barbiturates can be expected to lead to reduced anaesthetic requirements in the acutely intoxicated, but resistance to anaesthetic agents should be anticipated in the chronic user.

A history of drug abuse could be considered a contraindication to day-case surgery. Local, regional or axial (spinal and epidural) anaesthetic techniques may be particularly useful.

Acute pain management in opioid users

Planning the analgesic requirements of a patient with a history of substance abuse can be very challenging. A multidisciplinary approach is ideal with contributions from the surgical and anaesthetic teams and a pain service if locally available. Opioid users may display both tolerance and physical dependence, making prediction of their analgesic needs difficult. It is important to establish whether the patient is an ‘active’ or ‘recovered’ abuser. If they are currently using opioids or are on a methadone programme their present dose regime should be established. It may be difficult to distinguish whether requests for increased pain relief relate to actual pain or are a feature of addiction. Patient controlled analgesia (PCA) usually involves morphine and is a commonly used mode of postoperative pain management. However, in opioid-abusing patients there is a risk of increased use for chemical gratification.

Re-exposure to opioids in ‘recovered’ addicts risks re-establishment of drug-craving. Intravenous boluses of opioids in an unanaesthetised drug user patient should be avoided. In many situations, it may be appropriate to simply continue their maintenance dose and provide additional analgesia with non-opioid agents such as paracetamol and non-steroidal anti-inflammatory drugs (NSAIDs). Local, regional or axial (spinal and epidural) anaesthetic techniques may be particularly useful and can often meet all analgesic requirements, even after major surgery.19

Conclusion

It should be clear from this review that there is a need to understand the link between the pharmacology of illicit drugs and their potential clinical effects. Medical and surgical complications of drug misuse are common, and an understanding of the problems involved can lead to a better grasp of the problems which may occur in the individual patient and also to the more rational management of toxicity.

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