MEDICAL PRACTICE

Hospital Topics

Surgical Implications of Some Types of Drug Dependence

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Introduction

As is well known the problems of opiate and barbiturate dependence has altered considerably in the last two decades. This article describes an aspect which has received less comment: the local complications of the injection of these drugs, and their management. The patients reported here were all seen between December 1969 and December 1971.

The injury appears to be principally due to chemical action, which is often aggravated by infection. A list of drugs commonly used and the pH of the solutions is given in the Appendix. The commonest lesions are due to barbiturates (pH 9.3). Heroin causes lesions like these only when it is impure,¹ possibly owing to the lactose and starch in the tablets. Injection into an enclosed fascial compartment may cause damage, particularly in the forearm. This is secondary to ischaemia from vascular compression caused by inflammatory oedema in the muscles. Ischaemic damage may also occur during prolonged narcosis when the blood vessels are occluded owing to pressure of the body on the limb.

Injection into Specific Sites

SUBCUTANEOUS INJECTIONS ("SKIN POPPING")

Injury occurs most commonly after the use of barbiturates, since inadvertent subcutaneous injection occurs often when attempting intravenous injection. The lesion starts as a tender red indurated swelling on the second or third day, gradually increasing over the next three weeks. Small lesions may resolve but many go on to ulcerate leaving a deep punched out defect with a granulating base. There is often concomitant

infection. Healing is slow, often taking two to six months. Around the healed lesion a brownish induration and pigmentation persists and this is often fixed to the underlying deep fascia by extensive scar tissue. These areas are apt to re-ulcerate after minor trauma, especially on the leg. The evolution of this lesion is shown in fig. 1.

INTRAVENOUS INJECTION ("MAIN LINING")

Superficial thrombophlebitis causing thrombosis is extremely common, and all the easily accessible veins become occluded. The addict becomes expert in venepuncture and can use remarkably small veins. Once a deep vein such as the femoral vein has been used by a doctor to obtain a blood specimen he may also use this route—and occasionally addicts also tell one another about it.

Case 1.—A 23-year-old man with a seven-year history of drug abuse had started to inject his femoral veins with barbiturates nine months before admission. He had already had bilateral groin abscesses incised, and on admission he was pyrexial with bilateral groin abscesses with induration of the thigh and oedema of the lower leg (fig. 1). A phlebogram showed iliofemoral thrombosis (fig. 2) and culture of the abscess grew *Staphylococcus pyogenes*. He was treated by derroofing the abscess, bed rest, and antibiotics; the abscess healed in a month, but slight persistent oedema of the leg was present a year later.

Case 2.—A 19-year-old man with a four-year history of drug abuse had been injecting his femoral veins for six months before admission. He had punctured his femoral artery on several occasions and he described blood spurting from the groin on two occasions. Six weeks before admission he had pain in his right groin, which was relieved when he expressed clot and pus. He was afebrile and had a sinus in the right groin (fig. 3). He produced a dark shiny clot 6 in (15 cm) long from the sinus by massaging his groin. It appeared to be a cast of the superficial femoral vein. There was no oedema of the leg, and a swab was sterile on culture. The sinus healed spontaneously with bed rest.

Use of finger veins often results in extravasation and ulcers in the web space. One addict had used the dorsal vein of the penis, which he was the first to admit was unsatisfactory.

FIG. 1—Case 1. Evolution of lesion, most recent being on right thigh. Lesion on left shin was of 12 months duration.

FIG. 2—Case 1. Phlebogram showing iliofemoral thrombosis.

INTRAMUSCULAR INJECTION

The anatomical relationship of the individual muscle injected to the deep fascia has an important role in any sequelae. Injection, especially of barbiturates, leads to inflammation with

FIG. 3—Case 2. Sinus in right groin after frequent puncture of femoral artery.

surrounding oedema and local muscle necrosis. In muscles without a confining osseofibrous compartment local tenderness may be the only initial sign, though subsequently intramuscular fibrosis may cause flexion contractures. The picture is complicated when the muscles are confined in a fibro-osseous sheath, as in the flexor compartment of the forearm. The swelling here causes vascular compression and can lead to Volkmann's ischaemia.

Case 3.—A 31-year-old man, who was maintained on 80 mg of heroin and 90 mg methadone a day, had been injecting barbiturates. Four days before admission he had injected barbiturate into the long flexors of the left arm 2 in (5 cm) below the elbow. Swelling and redness had occurred, extending from the injection site to the fingers. The wrist and fingers were held in flexion and could not be extended without pain. The radial pulse could not be felt. Sensation was normal. The forearm showed some blistering and dusky cyanosis. He had a pyrexia of 100°. Two megaunits of penicillin had been given in the casualty department 24 hours before admission when the diagnosis had been cellulitis. Operation had been suggested but rejected in favour of conservative treatment, and he was treated by raising the arm, together with penicillin and cloxacillin—though bacteriological blood culture was sterile. Sensation in the median and ulna nerve distribution was absent after two days in hospital. The radial pulse was present after seven days, when the swelling had subsided a little. Nevertheless, within two weeks of admission an obvious full Volkmann's ischaemic contracture was developing. Electromyography showed denervation of muscles supplied by the median, ulna, and posterior interosseous nerves from just below the elbow. No recovery had occurred 12 months later, and the patient refused any further treatment, though he attends the drug clinic sporadically.

Case 4.—A 30-year-old man was an intermittent drug user. One week before being seen he had injected Tuinal (quinalbarbitone) into his left forearm. There was increasing swelling of the flexor surface of the forearm and the whole hand. Sensation was normal, but the radial pulse was difficult to feel. He was pyrexial and had been treated with tetracycline. Immediate decompression incising the deep fascia from wrist to elbow was performed. The muscles bulged through the fascia and were very oedematous. The radial artery appeared normal. There was no evidence of sepsis. The swelling subsided rapidly and secondary suture of the skin only was performed one week later with no residual muscle or nerve damage.

In cases 3 and 4 injury probably occurred secondary to chemical swelling in the subfascial compartment, possibly complicated by sepsis.

Injury Due to Prolonged Narcosis

These two cases are clinically similar to cases 3 and 4. Circumstantial evidence suggests that ischaemia occurred because of arterial compression by the weight of the body during prolonged narcosis.

Case 5.—A 28-year-old woman was taking methadone and Tuinal but claimed not to have injected herself for 18 months. She had a past history of repeated overdose, and three days before admission took an overdose of Tuinal and may have been unconscious for 36 hours. She woke with a pain and swelling in the left forearm and hand which were getting worse. She was afebrile, the radial pulse was present, and the whole hand up to the wrist was anaesthetic with painful movement of the wrist and fingers. She was treated conservatively with raising the hand and arm and subsequently developed Volkmann's ischaemic contracture (fig 4). Electromyography confirmed impaired median and ulnar nerve conduction in the forearm, though the level was in doubt. Sensation returned in six months to the hand with hyperaesthesia of the finger tips; tenolysis and lengthening flexor tendons was performed 12 months later. At operation a constricting area of fibrous tissue in all the flexor muscles was found 4 in (10 cm) below the elbow. These were dissected free and flexor carpi ulnaris and palmaris and flexor digitorum profundus and sublimis were lengthened 1 in (2.5 cm). To date improvement is slight.

FIG. 4.—Case 5. Volkmann's ischaemic contracture in case of prolonged narcosis.

Case 6.—Eight days before admission, a 22-year-old woman, who was not an addict, had taken an overdose of barbiturates and alcohol in France, where she had been treated by artificial ventilation for four days. On waking she complained of swelling of the forearm and hand with numbness of the fingers. The radial pulse was present but anaesthesia of the dorsal and ventral surface of the hand to the elbow was complete. Her arm was decompressed from elbow to wrist on admission. Operation showed muscle oedema similar to case 4 with necrosis of flexor digitorum sublimis. Sensation in the radial nerve recovered in two days and passive flexion and extension of the wrist and fingers could be performed.

Accidental Injection Sites

The last four cases illustrate various causes for muscle ischaemia after drug abuse.

Intra-arterial injection occurs often in addicts without further sequelae. They learn to recognize the significance of the pain and do not proceed with the injection. Nevertheless, continued intra-arterial injection may have serious sequelae which are probably correlated with the concentration used.³

Case 7.—A 21-year-old woman had started taking "pills" (amphetamines) at 15 and graduated to heroin and methylamphetamine by the age of 17. She also used methadone and pentobarbitone (Nembutal) when available. She had had several previous admissions with overdoses. Twenty-four hours before admission she had injected Tuinal into her right radial artery in the upper

forearm. There was immediate intense burning pain down the radial side of the forearm and hand spreading to the radial four fingers, which were white and cold. The forearm was slightly swollen; the radial pulse was absent; and there was loss of sensation in the ring, index, and middle fingers and thumb. She was treated with a continuous infusion of heparin 10,000 U six hourly for five days and cervical sympathectomy was performed. Two months later, when demarcation was complete, the terminal phalanx of the ring finger and the whole of the middle and index fingers were amputated, together with an amputation through the proximal interphalangeal joint of the thumb, which then had a pedicled skin graft.

INTERNEURAL INJECTION

Direct injection into nerves has not been diagnosed in the patients seen, though cases have been described with subsequent fibrosis and loss of function. Late resection is sometimes possible.

Systemic Complications

In the management of these patients the possibility of systemic complications should be remembered. Firstly, septicaemia is common and occurred in three of 100 consecutive cases.³ Secondly, bacterial endocarditis is commoner in addicts than normal controls, and it accounted for 8% of deaths in addicts in New York between 1950 and 1961.⁴ Thirdly, lung complications may occur, including pneumonia, fibrosis, granuloma, and lung abscess. These are associated with respiratory depression and inhalation during narcosis, and are also major causes of mortality and morbidity in addicts.⁵ Moreover, in 100 consecutive cases seen in London³ pneumonia was the reason for admission in six. Fourthly, viral hepatitis is endemic among addicts, especially those who share needles. Even in those who do not have Australia antigen in their sera the results of liver function tests are abnormal in a higher proportion of addicts than in normal controls. Possibly malnutrition and direct hepatotoxicity of the drugs play a part in this.⁶ Fifthly, abdominal pain may occur, due to mechanical or function obstruction, and it may be difficult to differentiate the condition from Münchhausen's syndrome.^{7,8}

Management

Clinical assessment must be completed as far as possible at the first attendance. It is easy in these patients to underestimate the damage and pain suffered because of the drug abuse. Apart from a general examination a note should always be made about the pulses and neurological state distal to the lesion.

INVESTIGATIONS

X-ray films of the site may show radio-opaque products from the crushed tablets or broken needles (fig. 5). Gas from gas-forming organisms has been described in addicts seen in the U.S.A.⁷ A chest radiograph should be taken when indicated clinically or before giving a general anaesthetic because of the high incidence of chest complications in these patients. Venepuncture may be very difficult in these patients, and this often restricts the choice of blood tests. Nevertheless, anaemia from malnutrition and liver impairment are common in addicts and a haemoglobin and liver function tests should be done if possible before giving the patient anaesthetic. In view of the higher incidence of septicaemia and bacterial endocarditis, blood culture should be done in all patients with pyrexia if possible.

FIG. 5—X-ray film showing site of broken needle.

TREATMENT

Treatment should be early and radical, and planned with regard to the high incidence of non-attendance at follow-up clinics and to the tendency for patients to discharge themselves and to neglect themselves immediately the pain has eased.

Superficial lesions should have early wide débridement. Drains on the whole are better avoided because of the tendencies mentioned. In the occasional drug user, ulcers may be excised, grafted, or sutured, but in the true addict topical treatment only is usually more practicable.

Subfascial lesions into the limbs, especially in the forearm, constitute a surgical emergency. Swelling of the forearm in an addict—whether secondary to ischaemia or direct injection—needs immediate wide decompression from wrist to elbow. As the cases presented show, it is too easy to be fooled or persuaded into attempting conservative management with disastrous results.

While common, intravenous lesions seldom need treatment. Superficial thrombophlebitis is taken for granted by the addict. In deep lesions the addict presents late, often with a combination of chemical and septic thrombophlebitis. There may well have been several episodes. There is no place for direct surgical attack on the veins or for anticoagulants. Treatment should be confined to the sepsis and post-thrombotic sequelae.

Injury after intra-arterial injection of barbiturates depends on the concentration used, the rate of injection, the nerve supply to the artery, the state of arterial circulation before injection, and the distribution of the artery.³ Injury appears to be partly due to spasm and partly due to thrombosis. Some prophylaxis is possible in suggesting to patients that they make as dilute a solution as possible for mainlining. Treatment of the established lesion depends on its duration after injection. Pain and spasm may be reduced by local infiltration with procaine or in the forearm with a brachial block. Papaverine 40-80 mg intra-arterially above the damaged area has been suggested, but its effect has not been widely confirmed. Heparin 20,000 U immediately and 10,000 six-hourly, to reduce propagated clot should certainly be tried in the first 48 hours.

If there is any swelling early exploration and fascial decompression should be performed. Direct surgery of the

artery and thrombectomy may help if the lesion is less than six hours old.

Drug Maintenance

Withdrawal symptoms from opiates start with a craving for the drugs, anxiety, restlessness, and a running nose.³ In the next stage there is an exacerbation of these features, together with lacrimation and yawning followed by mydriasis, pilo-erection, tremors, hot and cold flushes, aching muscles and limbs. If untreated, the patient develops insomnia, and increased blood pressure, body temperature, respiratory and pulse rate, with restlessness and nausea. Finally, the patients develop diarrhoea and vomiting and blood changes such as haemoconcentration and leucocytosis; this occurs over 24-36 hours. Withdrawal of barbiturates is associated with anxiety, muscle twitching, tremor, progressive weakness, dizziness, distortion of visual perception, nausea, vomiting, weight loss, grand-mal type fits, and delirium tremens. Because these withdrawal features may be so severe, the addict should be asked what maintenance dose of drugs he gets; this may be cross-checked later with the drug dependence clinic, the chemist who supplies his drugs, or the Home Office register. Usually these drugs should be continued. Extra analgesia can be given with aspirin, codein, or normal amounts of opiates. It is important to remember that Fortral (pentazocine) is an opiate antagonist and will produce withdrawal symptoms in an addict, leading to complete lack of patient co-operation.

Appendix

Drugs Commonly Used by Addicts, and pH of the Solution

Tuinal (quinalbarbitone). 2 x 200 mg crushed and fixed with 5 ml to 10 ml water from any available source including lavatory pans. Used intravenously. Sedative. pH 9-35.

Pentobarbitone (Nembutal). 4 x 100 mg. Used as above. pH 9-2.

Methyl Phenidate hydrochloride (Ritalin). 10 mg x 20 with 5 to 10 ml water. Used intravenously and subcutaneously. C.N.S. stimulant, intermediate effect between caffeine and amphetamines. pH 5-9.

Marzine (1-benzhydryl-4-methyl piperazine monohydrochloride) (cyclizine hydrochloride) 2 to 3 x 50 mg mixed with 5 to 10 ml water. Used intravenously. Used in motion sickness, drowsiness, blurred vision. pH 6-55.

Phenmetrazine hydrochloride (Preludin). 25 and 50 mg tabs. used two to three per "fix" in water. Used intravenously and subcutaneously. C.N.S. stimulant and appetite suppressant. pH 6-7.

Dexamphetamine sulphate sustained release capsules (Dexedrine Spansule). 10 and 15 mg. Two or three per "fix." pH 7-4.

L & D amphetamine 1:3 mixture (Durophet) 7-5, 12, 20 mg capsules x 4 per "fix." Used intravenously and subcutaneously. C.N.S. stimulant. pH 7-4.

Linctus Methadone (Physeptone, amidone) [(±)-6-dimethylamino-4; 4-diaphenylheptane-3-one] hydrochloride. Used intravenously, and subcutaneously. Analgesic, minimal euphoria. pH 4-4.

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