Figure 3 Cavity following debridement.

sible for the red colour, potassium chlorate, graphite varnish, and polyvinyl chloride. Flares can easily be obtained and legally held without a firearms license. This situation is unlikely to be affected by the proposed changes to firearms legislation. Because of its relatively large size and shape compared to an ordinary .22 round, its kinetic energy is rapidly overcome by air resistance. However, at short range it is capable of causing serious penetrating injury.¹

In the second world war and the Korean war, major wounds to the thorax were associ-

ated with a mortality of approximately 40%.² This highlights the need to consider thorough surgical debridement in all gunshot injuries, not just those from rounds with high energy transfer. There may be little indication from the appearance of the entry wound of the cavitation and tissue damage caused, particularly from this type of explosive ordinance. The flare is designed to burn vigorously in flight for six seconds with an intensity of 10 000 candles. Therefore, if the flare strikes the body within a short time of firing, it will continue to burn within the tissues for several seconds before it would otherwise have burnt out and landed harmlessly. We feel that our patient was lucky to escape with only soft tissue injury, although he had a relatively long period of hospital inpatient treatment (three weeks).

This case highlights the need to maintain a high index of suspicion in all types of penetrating trauma when initially assessing the extent of injury. In this case the history and charring around the entry wound gave an indication of the mechanism of injury. The wound was treated by thorough surgical debridement in the standard fashion and resulted in good clinical outcome.

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Gamma hydroxybutyrate—a coma inducing recreational drug

John M Ryan, Ian Stell

Abstract

The effects of γ hydroxybutyrate, a coma inducing recreational drug, are described and illustrated by case reports of five patients presenting to accident and emergency (A&E). All had depressed levels of consciousness. There was strong circumstantial evidence of γ hydroxybutyrate ingestion in all cases, and laboratory evidence in two. All recovered with supportive treatment. γ Hydroxybutyrate has become a fashionable recreational drug. The majority of people who have ingested it will recover spontaneously without long term sequelae but its toxic effects may be dramatic while they last, particularly when it is taken with other drugs or alcohol.

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Keywords: γ hydroxybutyrate; seizure; recreational drug; hypothermia

We report five cases of coma arising from misuse of γ hydroxybutyrate, also known as sodium oxybate. This drug, commonly known

as GHB, Liquid X, or Liquid Ecstasy, is a non-illegal drug which is used recreationally for its ability to produce euphoria. Toxic effects include drowsiness, headache, nausea, respiratory depression, seizures, and coma. These effects may be more pronounced when taken in conjunction with alcohol and other drugs. Patients usually recover after a few hours of supportive care.

γ Hydroxybutyrate was first reported as a drug of abuse in 1990 in North America and has been available in the United Kingdom, mostly in night clubs and among body builders, since at least 1994. This drug and its toxic effects should be known to doctors responsible for patients who present unconscious or with seizures.

Case reports

All the patients presented to A&E having taken γ hydroxybutyrate in combination with various other drugs or alcohol.

CASE 1

A 37 year old woman was brought to hospital after collapsing at home. A witness described a seizure, which was followed by deep uncon-

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sciousness. Her condition improved over the following three hours and she was observed overnight. The following morning she admitted having taken γ hydroxybutyrate. Serum taken during the recovery period was later analysed by mass spectrometry and showed a γ hydroxybutyrate concentration of 42.5 mg/litre. (Concentrations greater than 30.5 mg/litre are associated with drowsiness.¹) A blood sample taken eight hours later showed a concentration of 0.1 mg/litre and the urine concentration was 32.8 mg/litre. Traces of amphetamines, cannabis, and benzodiazepines were also detected in the urine.

CASE 2

A 23 year old man presented with a history of having taken half a bottle of γ hydroxybutyrate, three benzodiazepine tablets, and three pints of lager. He had been trying to climb a fence when he slumped over and had what witnesses thought was a brief fit. He subsequently remained unconscious. On arrival at the scene the ambulance crew reported a Glasgow coma score (GCS) of 3. This improved to 6 in the accident and emergency (A&E) department 90 minutes later and returned to normal after a further three hours. Shortly afterwards he took his own discharge.

CASE 3

A 30 year old man was brought to the A&E department having been found unconscious in the street. On arrival he had a GCS of 3, was hypothermic with a temperature of 32.8°C, hypotensive, and hypercapnic (P_{CO_2} 7.0). He rapidly improved and his GCS had returned to normal after three hours, when he discharged himself. He admitted having taken γ hydroxybutyrate, alcohol, and cocaine.

CASE 4

A 25 year old man collapsed at a table in a night club. On arrival in the A&E department he had a GCS of 4. He was hypothermic with a temperature of 34.2°C and was noted to be hypotonic. Ninety minutes later he had a brief convulsion. Shortly afterwards he regained consciousness, vomited, and then rapidly improved. He was discharged three hours later. He admitted having had two bottles of beer, one Ecstasy tablet, and one and a half bottles of γ hydroxybutyrate. The serum concentration of γ hydroxybutyrate taken shortly after arrival was 2.2 g/litre. Serum MDEA, MDMA, and MDA (metabolites of Ecstasy) totalled 0.43 mg/litre. (After a recreational dose, levels may peak at 1 mg/litre.)

CASE 5

A 24 year old woman collapsed unconscious after taking one Ecstasy tablet, 30 minutes after taking a whole bottle of γ hydroxybutyrate. On arrival at the A&E department she was comatose, with a GCS of 4, a pulse rate of 48/min, and a temperature of 34.5°C. She was managed conservatively and awoke spontaneously after three hours. She recovered fully and was discharged after 10 hours.

Discussion

HISTORY

γ Hydroxybutyrate was first synthesised about 30 years ago during research into γ amino butyric acid (GABA). Since then it has been used as a general anaesthetic, a treatment for insomnia and narcolepsy, an aid to childbirth, and as a treatment for alcoholism.^{2,3} Many scientific papers have reported its low toxicity and lack of serious adverse effects when used for therapeutic purposes. This is in contrast to the dangers of the drug in abuse.⁴

During the 1980s its ability to stimulate growth hormone was recognised and it became widely used by body builders. In 1990 the Food and Drugs Administration in the USA banned over the counter sale of γ hydroxybutyrate following a number of reported incidents of acute poisoning, and several American states made its possession illegal.⁵

Since Spring 1994 it has been available in dance and night clubs around London where it has become known as "Liquid Ecstasy". It is not a controlled drug in the United Kingdom, so possession is not an offence. However, unauthorised manufacture and distribution is an offence and there have been prosecutions under the Medicines Act.

γ Hydroxybutyrate is made relatively easily from common ingredients. The recipe is even available to people with access to the Internet. The sodium salt is produced as a powder or as a solution in water, and is often marketed in professional looking bottles which contrast sharply with the quality of manufacture (fig 1).

Figure 1 A typical appearance of a bottle of γ hydroxybutyrate.

PHARMACOLOGY

γ Hydroxybutyrate, chemical formula $\text{COOHCH}_2\text{CH}_2\text{CHOH}$, is a normal constituent of mammalian metabolism and is found widely in the body. It is believed to be a neurotransmitter. It temporarily inhibits the release of dopamine in the brain and stimulates both growth hormone and prolactin release. It is both a metabolite and precursor of GABA. It is well absorbed orally, readily crosses the blood-brain barrier, and is subsequently metabolised to carbon dioxide. The pharmacokinetics are complex. The response to a low dose is unpredictable and elimination appears to be capacity limited, so the half life increases with larger doses. Its central nervous system depressant effects appear to be potentiated by other psychoactive drugs, particularly alcohol. No clinically effective antidote has been identified.

Since it was first manufactured, γ hydroxybutyrate has been used in various ways. It causes remarkable hypotonia, which has led to its use in France and Italy as an aid to childbirth. It causes a protein sparing effect which reduces the breakdown rate of body proteins. This effect, which is mediated by growth hormone, has led to its use among body builders. It is a potent hypnotic and sufficient doses will induce sleep within a matter of minutes, which has led to its use as an anaesthetic agent. It is also effective in decreasing the symptoms of alcohol and opiate withdrawal and has been used for the treatment of narcolepsy and in psychotherapy.

ABUSE

Most users ingest a capful of the liquid form of γ hydroxybutyrate (5–10 ml) and gain the desired effects within 15 to 60 minutes. In toxic quantities it may cause drowsiness, dizziness, hypothermia, nausea, and sometimes vomiting. Ataxia and incoordination are also commonly seen. Headache is sometimes reported. A moderate slowing of the heart rate is common and small changes in blood pressure may occur. Sufficiently large doses can cause

sedation, epileptic seizures, and loss of consciousness. Although recovery is usual within three hours, some patients have required intubation and mechanical ventilation.⁶ In each case described above γ hydroxybutyrate was taken with other substances, but it was the only agent common to each. The repeated pattern of sudden loss of consciousness followed by rapid recovery after a few hours would not be explained by any of the other substances taken, and offers compelling evidence that γ hydroxybutyrate was the cause.

The amount of γ hydroxybutyrate abuse in the United Kingdom has been reflected by the number of calls to the National Poisons Information Service (London) over the last two years, averaging one per week (personal communication: NPIS London). Physical dependence on γ hydroxybutyrate from chronic use is rare although it has been described.⁷

CONCLUSION

γ Hydroxybutyrate has become a fashionable drug on the dance and club scene in the United Kingdom. Accident and emergency staff need to be aware of its existence and its potential effects. The majority of people who have ingested it will recover spontaneously without long term sequelae, but its toxic effects may be dramatic while they last, particularly when it is taken with other drugs or alcohol.

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Pneumococcal pericarditis presenting as an out of hospital cardiopulmonary arrest

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Abstract

Serious complications of pneumococcal pneumonia have become uncommon with effective antibiotic treatment. Purulent pericarditis is a rare though well described complication of untreated pneumococcal sepsis. A case of untreated pneumococcal pneumonia complicated by purulent pericarditis is described. This presented as an out of hospital asystolic cardiopulmonary arrest.

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Keywords: *Streptococcus pneumoniae*; untreated pneumonia; purulent pericarditis; out of hospital cardiopulmonary arrest

Case report

A 29 year old man presented with an out of hospital asystolic cardiopulmonary arrest. Though previously well, he had suffered for two weeks with a “flu-like” illness. Musculoskeletal chest pain had been diagnosed four days before presentation, when he developed pleuritic symptoms. He had complained of