

Gamma-hydroxybutyrate overdose and coma: a case report

Meite S. Moser, MD; Roy A. Purssell, MD

Introduction

Gamma-hydroxybutyrate (GHB) has become a common drug of abuse.^{1,2} It is especially popular at rave parties, where many people can be exposed at one time.² GHB is also used by body builders as an anabolic agent, and has reportedly been used as a date-rape drug. Currently it is being investigated for several legitimate medical applications, including narcolepsy treatment and alcohol or opioid withdrawal. GHB should be considered when a patient presents to the emergency department (ED) with undifferentiated coma.

Case report

A 44-year-old male was sitting in a chair at work when he stiffened and collapsed. Paramedics arrived several minutes later and found him unresponsive with pinpoint pupils. There was no witnessed seizure activity. He was given naloxone with no observed response. Because he had vomited and was not protecting his airway, the paramedics attempted intubation with sedation. Despite being administered 20 mg of midazolam in incremental doses, he aroused with each intubation attempt; 6 unsuccessful attempts were made prior to transport.

On arrival in the ED he was afebrile and normotensive with a heart rate of 74 beats/min. Pupils were pinpoint, his Glasgow coma score was 3, and he was receiving assisted ventilation. Initial management included rapid sequence induction and intubation. Complete blood count, electrolytes, and arterial blood gases were normal, and an urgent CT revealed no abnormalities.

Several hours later, the patient became abruptly responsive and agitated, then gradually more cooperative. After extubation, he admitted that he had ingested GHB. The friend who gave him the drug had assured him that GHB was previously available in health food stores and that it would make him feel “good.” Because he is a large man, he took a larger dose than his friend recommended. He remembered feeling good with a “body high” shortly after the ingestion, but was unable to remember the rest of the incident. He was observed overnight and discharged, feeling well, in the morning.

Discussion

GHB was first used medically in the 1960s as an anesthetic agent. It is chemically similar to gamma-aminobutyric acid (GABA) and rapidly crosses the blood–brain barrier (Fig. 1).³ Because of its unpredictable action and lack of analgesic activity it was quickly abandoned as an anesthetic agent. In 1988, following the FDA ban on L-tryptophan,

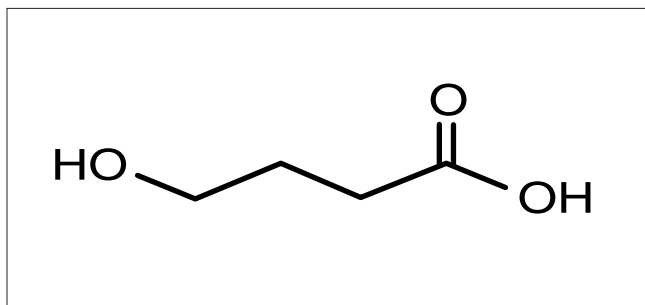


Fig. 1. GHB chemical structure (C₄H₈O₃)

Vancouver Hospital, University of British Columbia, Vancouver, BC

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GHB became a popular over-the-counter sedative agent. The body building community also used it heavily for its (unproven) anabolic effects. During a 6-month period in 1990 there were 57 case reports of illness attributed to GHB, which prompted the FDA to issue a warning on its use and to ban over-the-counter sales.

Currently, GHB is an investigational drug for the treatment of narcolepsy, and published trials suggest that GHB reduces all narcolepsy-related symptoms.⁴ GHB increases delta sleep and improves the continuity of sleep in both normal and narcoleptic patients. Its major side effect in narcoleptic patients is sleepwalking, which naturally occurs during periods of delta sleep. Of interest, growth hormone is normally released during delta sleep, and it may be for this reason that GHB is promoted as an anabolic agent, although there is no evidence to support its effectiveness as such.⁵ GHB shows some promise in the settings of alcohol and opioid withdrawal.⁴

On the street, GHB is sold under a multitude of names (Table 1). It is one of the most popular drugs at rave parties^{2,3,6} and is favoured for its euphoriant effect. It has also been reported to cause sexual stimulation and has several properties that have led to its use as a “date rape” drug. It is highly soluble, colourless and tasteless in the powder form, and it causes the rapid onset of coma. Furthermore, there is no hangover effect and it is difficult to detect. GHB is addictive, and several case reports document withdrawal symptoms upon cessation of use. These symptoms, typically anxiety, tremulousness

and insomnia, subside within a week of discontinuing use.⁵

One reason for its popularity is easy accessibility. GHB can be synthesized in any home lab by ester hydrolysis of gammabutyrolactone (GBL) (a common wood cleaner, paint remover and textile aid), in the presence of sodium hydroxide or lye.^{7,8} Several Internet sites provide simple directions how to make GHB in the home kitchen. With these instructions and \$800 worth of raw materials, one can manufacture GHB with a street value of \$92,000.³ Improper preparation, though, can cause severe toxic reactions, including caustic burns related to sodium hydroxide.

With increasing doses, GHB causes drowsiness, amnesia, bradycardia, coma, respiratory depression and, in some cases, cardiorespiratory collapse (Table 2), although there is individual variability.^{1,6} Unfortunately, this drug does not cause a recognizable toxidrome. Pupil size is variable, and temperature, blood pressure and pulse are often within normal limits on presentation. A common observation in cases of GHB intoxication is that, despite the appearance of a deep coma, patients may become extremely agitated with attempted intubation. This was observed in our patient and led to the administration of a large amount of midazolam. Another feature of GHB intoxication is very rapid awakening from deep coma, which was also observed in our case. Of interest, GHB is often associated with ECG abnormalities: a large proportion of patients exhibit abnormal U waves and some develop heart blocks or ventricular ectopy.^{9,10} Deaths have been reported, but these were post-mortem cases and it is unclear that GHB was the sole cause.⁶ To date, there are no reported in-hospital GHB deaths.

GHB has no antidote or specific treatment. Supportive care — particularly airway support — is all that is required. Naloxone and flumazenil are ineffective; however, 2 reports suggest that neostigmine and physostigmine may have a limited reversal effect.^{9,10}

Nor is there a useful diagnostic test. Lab analysis, particularly forensic analysis, is difficult, and current testing methods may be unreliable. In addition, it is unclear what “normal” GHB levels are, and there may be post-mortem production, leading to false-positive tests.¹¹

Table 1. Street names for gamma-hydroxybutyrate (GHB)

Gamma-OH	Liquid X	Soap
Easy Lay	Liquid Ecstasy	Somatomax PM
Everclear	Nature's Quaalude	Somsanit
Georgia Home Boy	Oxy-sleep	Vita-G
Greivous Bodily Harm	Poor Man's Heroin	Water
Great Hormones at Bedtime	Salt water	Wolfies
Goops	Scoop	Zonked

Table 2. GHB toxicity and dose-response

Dose, mg/kg	Clinical effects
10	Short-term amnesia, hypotonia
20–30	Drowsiness, sleep
50–70	Hypnosis, bradycardia, hypopnea, coma, decreased cardiac output
>70	Possible cardiorespiratory collapse, arrest

Conclusions

GHB use is increasing. Clinicians should consider GHB when patients present with coma of unknown origin. Selected clinical findings may suggest GHB overdose but there is no reliable diagnostic test. Supportive care, particularly airway control, is the key to management.

Key words: GHB, gamma-hydroxybutyrate, overdose.

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Correspondence to: Dr. Meite Moser, Emergency Department, Vancouver Hospital, 855 W 12th Ave., Vancouver BC V5Z 1M9; mmoser@interchange.ubc.ca

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