Two cases of near-fatal gamma-butyrolactone (GBL) ingestion and intoxication

R. Van Vugt and C. M. Hofhuizen

Abstract. We present two cases of GBL intoxication. Patient A is a 45-year-old man who lost consciousness after drinking a clear unknown liquid. He was brought to the Emergency Department (ED) after he was intubated. His partner notified the liquid could be GBL, a prodrug for GHB. He regained consciousness 16 hours later in the intensive care unit (ICU) where he could be successfully extubated. Patient B is a 25-year-old man who was found unconscious at home with next to him an empty bottle of GBL. He was intubated in the intensive care unit. He could be extubated after 12 hours. GBL intoxication is becoming a more frequent problem and overdosage of GBL can rapidly occur because of its rapid onset and high potency when compared to GHB. We discuss the clinical course and complications after GBL ingestion and intoxication.

Key words: Gamma-butyrolactone (GBL) ; intoxication ; respiratory failure ; hypotension ; coma.

INTRODUCTION

Gamma-Butyrolactone ( -butyrolactone or GBL) is a an organic compound, especially a lactone, with molecular formula C4H6O2 (Fig. 1). The substance exist as a colourless, oily liquid and is low hygroscopic. It is a solvent and reagent in chemical reactions. It can also be used as a muscle relaxant, anti-depressant and sedative. At low doses it produces a relaxed and stoned feeling promoting confidence and reducing inhibition, at higher doses it acts like a narcotic and can be used as an anaesthetic. Because GBL is converted into gamma-hydroxybutyraat (GHB) in the liver by lactonases, the effects seem very similar (1). However, because of the lipophilic nature of GBL, it has a faster onset after oral administration and it is more potent compared to GHB (2).

We present here two cases of a 25 and 45-year old man who lost consciousness at home after drinking a clear liquid. These are what we believe the first near-fatal reported cases of intoxication with GBL in the Netherlands.

PATIENT A

A 45-year-old man was brought to the Emergency Department (ED) unconscious (Glasgow Coma Score E1M1V1) after he drank a clear unknown liquid. His partner immediately warned the emergency services. Because of his comatose state and marked respiratory depression he was intubated without any additional medication by the Helicopter Emergency Medical Service (HEMS). His medical history revealed gastric surgery, cholecystectomy and hypertension for which he used irbesartan, hydrochlorothiazide and metoprolol. The partner notified the medical team the liquid could be GBL.

In the ED the ventilation was continued. His temperature was 36.2°C. The heart rate was 62/minute and a blood pressure of 92/51 mmHg. The pupils were small bilaterally and sluggishly reactive to light. He had some myoclonus and the electrocardiogram was normal. The chest x-ray showed no abnormalities. Arterial blood gas analysis revealed a metabolic and respiratory acidosis. Blood glucose was 6.9 mmol/l (4.5-5.6 mmol/l). A standard toxicology screen was negative for alcohol, barbiturates, opiates, amphetamines, and cocaine. His partner suspected he had drunk 50 ml of GBL which is equipotent with 385 mg/kg GHB, a severe intoxication.

The patient was admitted to the ICU where he became hypotensive requiring norepinephrine infusion. A diagnosis of GBL intoxication was made based on his partners statement. Supportive treatment was continued. There was no need to take additional measures. The patient awoke abruptly.

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16 hours after arrival and could be successfully extubated. He completely recovered and could be discharged several hours later.

PATIENT B

A 25-year-old man was admitted to the ED due to his comatose state. His neighbour found him unconscious at home, and next to him an empty bottle of GBL. Paramedics instituted oxygen with a non-rebreathing mask and the patient was immediately transferred to the hospital.

On arrival at the hospital, the patient was unconscious with a Glasgow Coma Score of E1M5V2. His airway was non-obstructed and his respiratory rate was 11/minute. He was hemodynamically stable with a pulse of 64/minute and a blood pressure of 106/56 mmHg. Body temperature was normal. The pupils were small bilaterally and reactive to light. Arterial blood gas analysis revealed a combined metabolic lactic and respiratory acidosis. Blood glucose was 5.7 mmol/l (4.5–5.6 mmol/l).

After his admission to the ICU his saturation decreased and his pulmonary function deteriorated. He was intubated because of his comatose state and respiratory depression. His chest X-ray revealed a complete atelectasis of the left lung and a bronchoscopy was performed to open the lung. Hereafter, ventilation improved and he awoke several hours later and could be extubated. He made a full recovery. He confirmed that he had ordered GBL on the internet because of multiple social problems.

DISCUSSION

We present two cases of near-fatal GBL intoxication. Both cases were complicated by a rapid onset of coma, respiratory failure and hypotension requiring fluid therapy and vasopressors.

The number of poisonings by the partydrug GBL reported in the Netherlands has increased from 11 in 2008 to 31 in 2009 and is associated with substantial morbidity and costs (3). Wood et al. demonstrate that self-reported GHB ingestion was much more common than GBL ingestion, but every year the GBL incidence increases (4). LIECHTI et al. showed the same in a Swiss study (5). These data suggest that GBL use may be more common than previously thought and they suggest that there should be further debate about the legal status of the precursors of GHB (3, 5). It is currently easy to order it online.

It is important to note that GHB and GBL will be missed by standard toxicology screens. Where GHB or GBL intoxication is suspected, the drug can be detected in specimens of blood or urine. Because of the laborious analysis, it can take a while before the result is known. However, quick whole blood and urine sample GHB and GBL screening analysis are currently becoming increasingly widespread available (6).

The risk of overdose when using GHB or GBL is great because of the narrow therapeutic index and the synergistic effect with ethanol. However, because of its lipophilic nature, GBL is absorbed faster and is therefore more likely to cause an overdose than GHB. An additional problem is the variability in effect between individuals. Severe GHB poisoning may lead to coma, lactic acidosis and respiratory failure. Fortunately, most patients regain consciousness within a few hours and almost fully recover within seven to eight hours, although several fatal cases have recently been reported. Table 1 presents the clinical signs related to dose (7).

The mainstay of treatment in cases of GHB or GBL intoxication is provision of appropriate supportive care, preferably in an intensive care setting. Precautions should be taken to prevent aspiration, especially in view of the high incidence of vomiting. The airway should be secured (8).

Frequent use of GHB/GBL, even for a long period of time but at moderate doses, does not appear to cause significant physical dependency in the greater majority of users. In most cases complete withdrawal or temporarily abstaining from their use is achieved with minimal or no difficulty. However, when consumed in excessive amounts with a high frequency of dosing, physical and psychological dependence can develop (9). The National Poisons Information Centre in the Netherlands is consulted by practitioners more...
frequently the last years because of patients who show withdrawal symptoms after abrupt discontinuation of these agents (3).

We presented two cases of severe GBL poisoning causing coma, respiratory failure and hypotension. Because of the wide variability of effects of GBL, its synergistic effect with ethanol and its rapid onset after ingestion, overdosage of GBL can rapidly occur. Because of the increasing recreational use of GBL and its current legal status, GBL intoxication is becoming a more frequent problem encountered in the emergency department. Further debate about its legal status is necessary.

References


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<thead>
<tr>
<th>Toxic dose GHB (7)</th>
<th>Effect</th>
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<tr>
<td>10-40 mg/kg</td>
<td>euphoric, increased libido, increased need for contact, short-term amnesia and hypotonia, dizziness and sleep induction</td>
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<td>40-70 mg/kg</td>
<td>nausea, drowsiness, dizziness, convulsions, hypothermia, unconsciousness with moderate analgesia for 1-2 hours</td>
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<td>&gt; 70 mg/kg</td>
<td>decrease in cardiac output, respiratory depression, seizures and/or coma</td>
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