Journal of Medical Toxicology (2019) 15:45–48
https://doi.org/10.1007/s13181-018-0675-3

CASE REPORT

Deliberate Self-poisoning with a Lethal Dose of Pentobarbital with Confirmatory Serum Drug Concentrations: Survival After Cardiac Arrest with Supportive Care

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Received: 16 April 2018 / Revised: 28 June 2018 / Accepted: 6 July 2018 / Published online: 2 August 2018

Abstract

Introduction Pentobarbital (PB) is a euthanasia drug in doses of 2 to 10 grams, causing death within 15–30 minutes. We report a case of recovery from lethal pentobarbital deliberate self-poisoning with confirmatory serum drug concentrations.

Case Report A 45-year-old male purchased 20 grams of PB powder over the Internet. He ingested this powder and then alerted his mother 10 minutes later. She found him unresponsive and commenced cardiopulmonary resuscitation (CPR). Within 20 minutes of ingestion, emergency medical services arrived and initiated advanced life support. On arrival to the emergency department, heart rate was 116 bpm, BP 117/62 mmHg, on an epinephrine infusion. He was hypotonic and hypothermic, with absent brainstem reflexes. ECG and CT brain were normal. Activated charcoal was administered and he was admitted to ICU. He remained comatose with absent brainstem reflexes until day 5. Cerebral angiogram on day 3 was normal. Qualitative urine testing detected pentobarbital suggesting ongoing drug effects as the cause of coma. He was extubated on day 10, eventually making a full recovery. At 2.5 hours post-ingestion, PB concentration was 112 mg/L; PB peaked at 116 mg/L at 29 hours; PB was 2 mg/L at 190 hours and undetectable over 200 hours post-ingestion.

Discussion Average PB concentration in fatalities is reported around 30 mg/L. This patient survived higher serum concentrations with early CPR and prolonged cardiorespiratory support in the ICU. Assessment of brainstem death should be deferred until PB has been adequately eliminated.

Keywords Barbiturates · Pentobarbital · Overdose · Poisoning · Cardiac arrest

Introduction

Pentobarbital (Nembutal) is a short-acting barbiturate sedative-hypnotic that is widely used in veterinary practice for anaesthesia and euthanasia. It is also recommended as a drug for euthanasia or assisted suicide due to its rapid onset of coma and perception of a peaceful death. These popular media reports of pentobarbital being a peaceful method of suicide have led to increased interest in obtaining it from jurisdictions where it is less regulated [1]. It is unlikely that any resuscitative measures will be undertaken in these circumstances.

We report a case of survival following deliberate self-poisoning with a potentially lethal dose of pentobarbital obtained via the Internet, in a patient who regretted his actions and sought help almost immediately. Confirmatory serial serum drug concentrations are presented in the context of the patient's clinical course.

Case History

A 45-year-old male impulsively ingested 20 grams of pentobarbital (Nembutal) that he had purchased via the Internet from a source overseas 2 years previously. He had a history of bipolar affective disorder, trigeminal neuralgia, and chronic pain. His regular medications included venlafaxine,

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gabapentin, and asenapine. He alerted his mother 10 minutes after taking the overdose. She immediately contacted emergency medical services (EMS). When she returned to him, he was on the floor and unconscious, and she immediately commenced cardiopulmonary resuscitation (CPR). EMS arrived 10 minutes after the call (approximately 20 min post-ingestion) and found him to be in a pulseless electrical activity cardiac arrest. CPR continued and advanced life support (ALS) measures were commenced. He received two intravenous doses of 1 mg epinephrine during initial resuscitation, with return of spontaneous circulation (ROSC) occurring after 10 min. The patient was intubated and ventilated. He had a further brief cardiac arrest 30 minutes later, with ROSC being achieved after another 2 minutes of CPR and a further 1 mg epinephrine. He was commenced on an epinephrine infusion at 100 μg/min, given a 500-mL bolus of normal saline, and transported to the emergency department (ED).

The patient arrived in ED 95 minutes after the initial call to EMS. On presentation, he was unconscious (GCS 3/15) with no additional sedation, had fixed dilated pupils, and was apnoeic on the ventilator with absent brainstem reflexes. He was hypothermic (33.8 °C). Heart rate was 116 bpm and BP was 117/62 mmHg on an epinephrine infusion at 100μg/min. Venous blood gas showed pH 7.02, pCO_2 60 mmHg, HCO_3 15 mmol/L, and lactate 11.9 mmol/L. Serum ethanol, paracetamol, and salicylate were undetectable. ECG was unremarkable and CT brain revealed no acute abnormality. A single dose of 50 g activated charcoal was administered via NGT and he was admitted to the ICU.

The decision was taken to treat supportively, and not institute any extracorporeal elimination techniques. On day 1 in ICU, he developed polyuria, with urine output peaking at 300 mL/h, and hypernatraemia (serum Na 149 mmol/L), so he was treated with one dose of desmopressin.

He required vasopressor support with norepinephrine infusion (peak dose of 30 μg/min) for the first 5 days of his admission. He remained comatose without sedation, with absent brainstem reflexes, prompting discussions around the diagnosis of brain death. A four-vessel cerebral angiogram was performed on day 3. This showed normal cerebral perfusion. Urine sent for qualitative analysis by gas chromatography-mass spectrometry (GC-MS) detected pentobarbital, confirming ongoing drug effects as the likely cause for persistent coma. On day 5, there was return of gag reflex on suctioning and eye opening to painful stimuli. Propofol infusion was commenced to enable endotracheal tube tolerance from day 7. However, extubation was delayed due to the development of aspiration pneumonitis. He was finally extubated on day 10 post-overdose and was discharged to the medical ward the next day. He required an additional 10 days in the hospital for ongoing treatment of his aspiration pneumonitis and physiotherapy for reconditioning. He made a complete neurological recovery and confirmed the ingestion of 20 grams of pentobarbital powder mixed with water. He was discharged to an inpatient mental health facility on day 22 post-overdose. He remained an inpatient there for a further 3 weeks, before being discharged home, with ongoing outpatient psychiatric follow-up.

Serial serum pentobarbital concentrations were retrospectively assayed by high-performance liquid chromatography/mass spectrometry (HPLC/MS) and are summarised in Fig. 1. Peak concentration was 116 mg/mL at approximately 29 hours post-ingestion (therapeutic 1.8–4.7 mg/L).

Written consent for publication of this case was obtained and provided to the journal.

Discussion

We report a case of survival following deliberate self-poisoning with a potentially lethal dose of pentobarbital. In overdose, ingestion of pentobarbital rapidly leads to sedation and depression of medullary centres leading to respiratory and cardiovascular depression, which progresses to coma, apnoea, and death. In a series of 261 cases of oral ingestion of 10 to 12 grams of pentobarbital as a sole agent for assisted suicide, median time to death was 23 minutes [2].

This case is unusual in that the patient sought help within a few minutes of ingesting a lethal dose of pentobarbital, prior to the onset of collapse and coma. Therefore, he was able to receive BLS in the form of CPR by his mother almost immediately after collapsing, and ongoing ALS care in a timely fashion via EMS. Aggressive supportive care was continued in-hospital for a prolonged period until the patient recovered fully, without adverse neurological sequelae.

In the management of this patient, it was decided not to initiate extracorporeal elimination techniques in the light of recent reviews of the evidence suggesting a lack of clinical effectiveness of dialysis in poisoning with short-acting barbiturates, such as pentobarbital [3, 4].

Serum pentobarbital concentrations are shown in Fig. 1. These reveal a peak concentration of 116 mg/L at 29 hours post-ingestion (therapeutic 1.8–4.7 mg/L), suggesting possible ongoing absorption despite a single dose of activated charcoal. These concentrations confirm ingestion of an amount sufficient to cause death without medical intervention. The concentration fell slowly over the next 10 days. Elimination half-life was variable: initially 63 hours (42–90 hours), then 29 hours (90–140 hours), and finally 15 hours (140–190 hours). This may reflect auto-induction of hepatic metabolism, which has been reported during therapeutic use [5].

The concentration of pentobarbital reported to cause deep coma with cardiorespiratory compromise is in the region of 30 mg/L [6]. Upon presentation, our patient had a concentration greater than four times this, with absent brainstem reflexes for 5 days, prompting discussions around the diagnosis of brain death. There are reports of patients whom a diagnosis

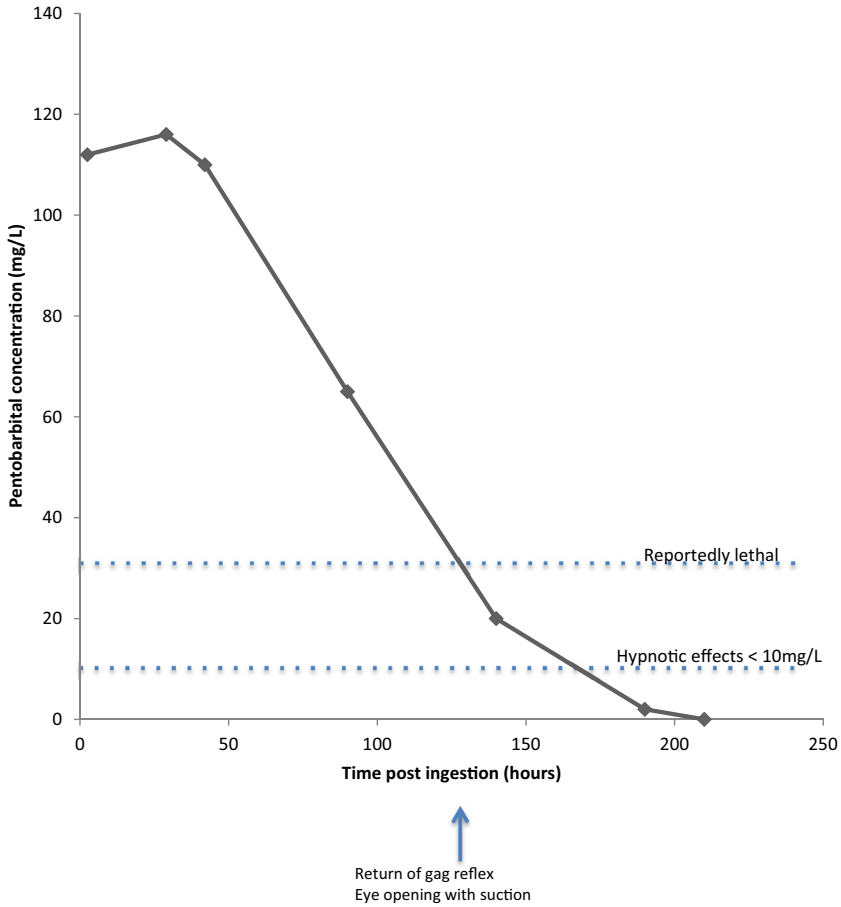

Fig. 1 Serial serum pentobarbital concentrations and time post-ingestion. The lower dotted line represents the concentration at which deep sedation is commonly seen (10 mg/L). The upper dotted line represents the average lethal concentration (30 mg/L)

of brain death was considered following overdose of other drugs, such as baclofen, only for them to subsequently recover [7]. A recent position statement from the American College of Medical Toxicology cautions against determination of brain death until ongoing intoxication is excluded [8].

It is noteworthy that, in this case, it took 5 days for the concentration to fall below 30 mg/L, which also corresponded with a return of brainstem reflexes. However, during this early period of brainstem inactivity, angiography demonstrated normal cerebral perfusion and urine samples screened positive for pentobarbital. It is therefore important for clinicians to recognise that deep coma may be prolonged following pentobarbital overdose. Notably, steps should be taken to ensure that a sufficient amount of the drug has been eliminated prior to embarking upon clinical assessment of brain death.

One limitation of this case is that enhanced elimination techniques, such as hemodialysis may have been effective in reducing the time to return of brainstem reflexes and the duration of intubation, especially in the context of a massive ingestion. However, the serial serum pentobarbital concentrations and correlation with the clinical status are noteworthy, especially the time course to clinical recovery.

In conclusion, this patient ingested a potentially lethal dose of pentobarbital confirmed by serum concentrations. Timely basic and advanced life support measures were provided at the scene, with ongoing support in the ICU leading to neurological recovery. Brainstem reflexes were absent until pentobarbital concentrations fell significantly, reminding clinicians to be cautious when considering the diagnosis of brain death following drug overdose.

Sources of Funding None

Compliance with Ethical Standards

Informed Consent Consent for publication of this case was obtained and provided to the journal in accordance with JMT policy.

Conflict of Interest AG is a section editor for JMT but was not involved in reviewing or editorial evaluation of this manuscript. DD and SG have no conflicts of interest to declare.

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