Gamma-hydroxybutyrate toxicity mimicking basilar artery stroke

Introduction

The recreational drug gamma-hydroxybutyrate (GHB) is an analogue of gamma-aminobutyric acid, an inhibitory CNS neurotransmitter, which at high doses may cause convulsions, respiratory depression and coma. The differential diagnosis of acutely impaired conscious level, particularly in conjunction with focal neurological findings includes cerebrovascular disease, such as brainstem stroke whose prompt identification is essential to minimize the risk of catastrophic brain injury.

This article describes the case of a 30-year-old man who presented with a sudden collapse in a nightclub.

Discussion

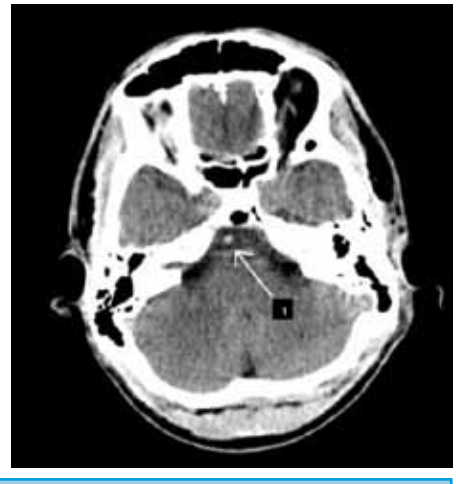
GHB is an analogue of gamma-aminobutyric acid, the predominant inhibitory CNS neurotransmitter, and is used as a recreational drug. As Wood et al (2011) describe, at lower doses users may experience euphoria with only mild adverse effects including nausea and tremor. Increasing doses may enhance euphoria but with risk of convulsions, respiratory depression and coma. Pupil size may be variable with both constricted and dilated pupils being reported (Klein et al, 2008).

An initial diagnosis of basilar artery ischaemic stroke was made in this case in view of the brainstem signs and hyperdense basilar artery on computed tomography of the brain. On reflection, the hyperdense basilar artery may have been associated with sympathomimetic drug-related vasoconstriction or dehydration. However, the 85–95% mortality associated with untreated basilar artery occlusion described by Sairanen et al (2011) and potential for 30% reduction in death or dependency with thrombolysis within 3 hours prompted rapid therapeutic intervention (Wardlaw et al, 2009).

A distinct difference between brainstem stroke and this case, in which the authors suggest that CNS depression was the result of GHB toxicity, is the rate of improvement with patients with GHB-induced coma typically improving within hours with supportive care, as reported by Wood et al (2011). This is exemplified by the need for increasing sedation within hours of admission to achieve stable mechanical ventilation. Furthermore, magnetic resonance brain imaging was normal and even with successful clinical resolution of ischaemic stroke after thrombolysis, infarction on diffusion-weighted magnetic resonance imaging is expected. While thrombolysis has low complication rates in stroke mimics, correct identification and management can avoid inappropriate treatment and protocols including computed tomography angiography have been suggested by Chang et al (2011) to improve diagnostic accuracy.

Yeung et al (2011) describe the potential that cocaine and/or mephedrone may have caused basilar artery vasoconstriction leading to the computed tomography findings, but vasoconstriction sufficient to produce neurological signs of this severity would also be expected to produce diffusion-

Figure 1. Computed tomography of the brain at presentation demonstrating hyperdense basilar artery sign (arrow 1).



Dr NSN Graham *is Foundation Year 1 Doctor,* **Dr J Birns** *is Consultant in Stroke Medicine, Geriatrics and General Medicine,* **Dr PI Dargan** *is Consultant Physician and Clinical Toxicologist,* **Dr DM Wood** *is Consultant Physician and Clinical Toxicologist and* **Dr A Bhalla** *is Consultant in Stroke Medicine, Geriatrics and General Medicine, Guy's and St Thomas' NHS Foundation Trust and King's Health Partners, London SE1 7EH*

Correspondence to: Dr A Bhalla (ajay.bhalla@kcl.ac.uk)

Case Report

A 30-year-old previously fit and well man collapsed suddenly in a night club. His Glasgow Coma Scale was 3/15 and there was see-saw breathing secondary to airway obstruction with vomitus. Cardiorespiratory and abdominal examinations were otherwise unremarkable. Neurological examination revealed pinpoint pupils unreactive to light, dysconjugate gaze and brisk reflexes with normal tone. Creatine phosphokinase was elevated at 454 IU/litre (range 0–229 IU/litre) but all other laboratory investigations including haematocrit, white cell count, platelet count and serum sodium were normal. Electrocardiogram was also normal. Computed tomography brain imaging showed a hyperdense basilar artery consistent with thrombus (*Figure 1*). A diagnosis of acute ischaemic stroke was made and the patient received intravenous thrombolysis with alteplase 0.9 mg/kg within 2 hours of symptom onset.

The patient was intubated and mechanically ventilated. Intravenous naloxone had no effect on conscious level and within 4 hours he required escalating doses of propofol to maintain sedation while receiving ventilatory support. After 24 hours, he was allowed to wake and extubated, and physical examination was normal. Fasting lipids and magnetic resonance brain imaging were also normal (*Figure 2*). The patient admitted to ingesting a 'liquid drug' in the night club and toxicological analysis of his urine from presentation (using gas-chromatography mass spectrometry) confirmed the presence of gamma-hydroxybutyrate (GHB), in addition to cocaine and mephedrone, and no other sedatives. Detailed questioning revealed a prior history of 'occasional' drug use including GHB and cocaine, and rare alcohol use or smoking. A final diagnosis of GHB toxicity was made and the patient was discharged neurologically intact.

weighted magnetic resonance imaging abnormalities and the patient had no evidence of acute sympathomimetic toxicity on presentation. BJHM

Chang J, Teleb M, Yang JP, Alderazi YJ, Chapple K, Frey JL, Restrepo L (2011) A model to prevent fibrinolysis in patients with stroke mimics. *J Stroke Cerebrovasc Dis* June 1 (Epub ahead of print)

Klein M, Remi T, Pfister HW, Straube A, Rupprecht A, Weckbach S, Pfefferkorn T (2008) Mimicking of cerebral herniation through gamma hydroxybutyric acid therapy. *Am J Crit Care* **17:** 593–5

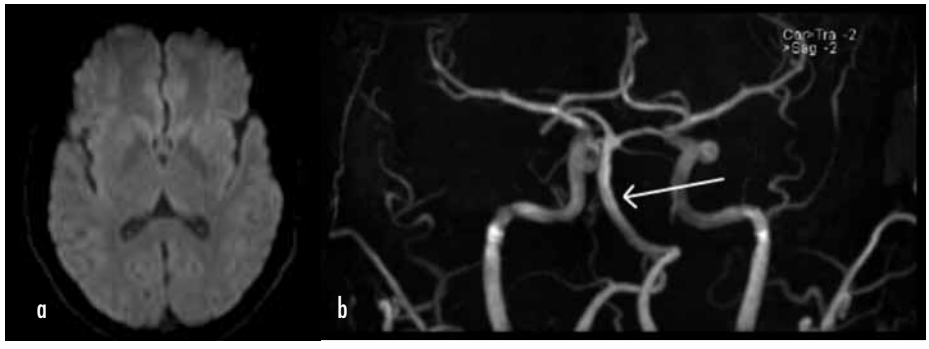
Sairanen T, Strbian D, Soinne L et al; Helsinki Stroke Thrombolysis Registry (HSTR) Group (2011) Intravenous thrombolysis of basilar artery occlusion: predictors of recanalization and outcome. *Stroke* **42:** 2175–9

Wardlaw JM, Murray V, Berge E, Del Zoppo GJ (2009) Thrombolysis for acute ischaemic stroke. *Cochrane Database Syst Rev* **7**(4): CD000213

Wood DM, Brailsford AD, Dargan PI (2011) Acute toxicity and withdrawal syndromes related to gamma-hydroxybutyrate (GHB) and its analogues gamma-butyrolactone (GBL) and 1,4-butanediol (1,4-BD). *Drug Test Anal* **3:** 417–25

Yeung M, Bhalla A, Birns J (2011) Recreational drug misuse and stroke. *Curr Drug Abuse Rev* **4:** 286–91

Figure 2. a. Normal diffusion-weighted magnetic resonance image of the brain excluding acute infarction and (b) magnetic resonance angiogram demonstrating normal basilar artery (arrow).



LEARNING POINTS

- The recreational drug gamma-hydroxybutyrate (GHB) is an analogue of gamma-aminobutyric acid, the predominant inhibitory CNS neurotransmitter.
- GHB may cause significant CNS depression.
- Acute GHB toxicity should be considered in patients presenting with coma.
- Basilar artery stroke mimics include acute recreational drug toxicity with drugs such as GHB.
- Correct identification and management of basilar artery stroke and its mimics can avoid inappropriate treatment.
- With supportive care, acute GHB toxicity is typically associated with a rapid improvement in level of consciousness.

Unusual malignant ureteral obstruction and management

A 39-year-old woman was diagnosed with metastatic grade 2 left breast invasive ductal carcinoma. She developed renal failure as a result of obstruction of the left kidney, evident from the urinoma and associated hydronephrosis on computed tomography scan (*Figure 1*). Cytology from the collection did not show any malignant cells ruling out a second primary malignancy.

Ureteral metastases commonly cause no symptoms as they are usually extra-luminal. Ureteral metastases causing urinoma formations are a rarity in the literature (Talreja and Opfell, 1980).

In ureteric obstruction caused by metastasis, the obstruction can be removed by endoluminal stenting or nephrostomy. However, when there is progressive disease and the objective is to palliate, nephrostomy would be the choice of management, as it offers a direct route of drainage which is independent of the ureteral disease and normalizes renal function to allow resumption of chemotherapy and relief of flank discomfort. BJHM

Dr Charles Yuen Yung Loh *is House Officer in Urology,* **Mr Suresh Venugopal** *is Specialist Registrar in Urology and* **Mr Patrick Cutinha** *is Consultant Urological Surgeon in the Urology Department, Royal Hallamshire Hospital, Sheffield S10 2JF*

Correspondence to: Dr CYY Loh (chloh_yy@hotmail.com)

Talreja D, Opfell RW (1980) Ureteral metastasis in carcinoma of the breast. *West J Med* **133**(3): 252–4

Figure 1. a. Coronal and (b) axial computed tomography images of the left-sided urinoma secondary to malignant metastatic ureteral obstruction (white arrow).