Case Report

A 19-year-old man was transferred to our emergency department due to impaired consciousness, vomiting, and tonic-clonic seizures. The patient's family had found him unconsciousness lying on the floor of his house. The patient reported no history of head trauma and denied any seizure-provoking experiences. He had a history of living-donor liver transplantation at 10-years-old, which had been effectively controlled without rejection with administration of tacrolimus 2 mg/day.

On arrival, he was unconscious with a Glasgow Coma Scale score of 5 (E2V1M2). His height and body weight were 167.4 cm and 48.6 kg, respectively. Vital signs included blood pressure 136/86 mmHg, heart rate 106-113 beats per minute, fever of 37.8 °C, and symmetrically increased deep tendon reflexes. His pupils were 4 mm bilaterally with prompt light reflex. A blood gas analysis showed lactic acidosis (pH 7.012, lactate 7.8 mg/dL). The laboratory data was white blood cells, 21000/μL; hemoglobin 14.6 g/dL; serum creatine kinase, 498 IU/L; sodium 146 mmol/L; potassium, 3.1 mmol/L; blood glucose 96 mg/dL; blood urea nitrogen 12.7 mg/dL; creatinine 0.66 mg/dL; magnesium 1.9 mg/dL; total bilirubin 0.8 mg/dL; aspartate aminotransferase 32 IU/L; alanine aminotransferase 79 IU/L; and lactate dehydrogenase 506 IU/L.

After sedation and control of seizures with midazolam, intratracheal intubation was required and controlled ventilation was performed, as well as fluid resuscitation with Ringer's solution and prompt stabilization of the patient's cardiovascular status. Electrocardiogram presented supraventricular tachycardia. Tachycardia remained even after fluid resuscitation, administration of amiodarone, and restoration of electrolyte balance. Brain CT and magnetic resonance imaging demonstrated no abnormalities in the intracranial region. Abdominal CT revealed multiple high-density deposits in the gastrointestinal tract, suggesting recently ingested tablets (Figure 1). Although drug screening tests (Triage®, Biosite, San Diego, CA, USA) were negative, we assumed that his deteriorated consciousness was attributed to an overdose of undetermined sedative drugs based on the CT findings. His parents had denied any underlying psychiatric disease or history of drug abuse.

However, the following day, his family found an empty bottle of caffeine in the trash. A suicide note was found in his cell phone, in which he purportedly mentioned that he was ending his life. It was assumed that he had ingested approximately 78 caffeine 200 mg tablets (16.5 grams of caffeine). Considering the half-life of caffeine and fair recovery of clinical symptoms, blood transfusion was not performed. Intravenous lipid emulsion was administered as soon as the caffeine ingestion was reported. The blood samples taken at the visit were sent to a reference laboratory to evaluate the concentration of caffeine. The results were positive for caffeine (>50.0 mg/dL). The patient became conscious the following day and reported that he obtained a bottle of caffeine tablets via the internet and ingested the tablets in a suicide attempt. Currently, the patient is well without any neurologic complications.

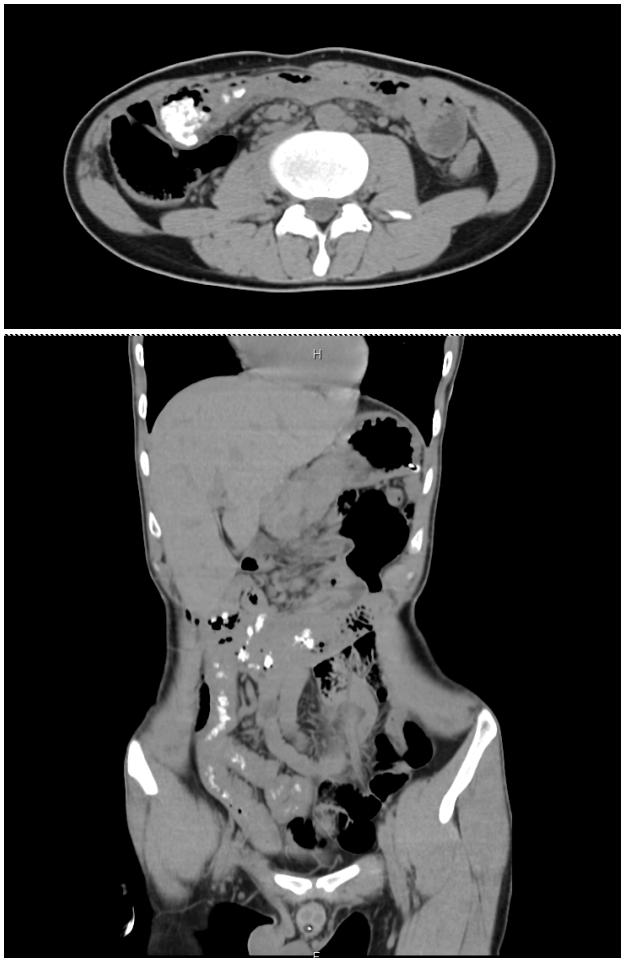

Figure 1: High-density deposits in the duodenum and small intestine, suggesting an overdose of drug tablets

Discussion

Caffeine is a natural alkaloid methylxanthine extracted from tea leaves, coffee beans, and numerous other plants. It is widely available in beverages such as energy drinks, food, over-the-counter drugs, and herbal and dietary supplements. Caffeine is also a common ingredient in medications, with doses of 30-200mg in many prescription drugs used to treat acute respiratory depression, neonatal sleep apnea, and most commonly headaches and migraines, including intravenous administration for spinal anesthetic-related headache. Thus, caffeine is widely available; however, it has been recognized as an addictive substance and can lead to lethal arrhythmia in large doses. Death from caffeine poisoning, although uncommon, does occur. The direct cause of death is generally ventricular dysrhythmia, although caffeine-related cardiovascular effects are not confined to arrhythmogenesis.

Suzuki *et al*. emphasized that caffeine intoxication-related deaths mainly occur in young and middle-aged persons with common psychiatric diseases. In half of the cases, the origin of the caffeine was unidentified; nevertheless, dietary sources or over-the-counter drugs containing caffeine were suspected. As it becomes easier to obtain caffeinated products, continuous monitoring of the number of deaths from caffeine intoxication, in addition to detailed investigations of the caffeine's origin, will be necessary [1].

The potential pharmacological effects of caffeine can be explained by three mechanisms of actions: the antagonism of adenosine receptors, the mobilization of intracellular calcium storage, and the inhibition of phosphodiesterases, which increase noradrenaline and sensitize dopamine receptors.

When consumed orally, caffeine is absorbed rapidly and completely. Caffeine undergoes hepatic metabolism, mainly by CYP450 1A2 isoenzyme. Approximately 85% of a dose is excreted in the urine within 48 hours. The plasma half-life is two to 10 hours (mean four hours) in adults. Blood caffeine concentrations within 80-100 mg/L are generally considered lethal in humans, requiring the ingestion of a large quantity of the drug, typically exceeding 5 gram [2]. However, correlations between blood levels and clinical effects are difficult to establish due to individual variability, tolerance, or preexisting disease states.

Treatment consists of oxygen, hydration, paracetamol to control hyperthermia, and sodium bicarbonate for acute control of acidemia. For seizure control, the patient was initially treated in the emergency room with midazolam infusion with subsequent valproate infusion. Intralipid seems to initially carry the stimulant drug away from the brain and heart to less well-perfused organs [3]. Hemoperfusion has previously been carried out to treat patients with caffeine intoxication [4,5].

Many chemical substances or drugs can be detected in the gastrointestinal tract using plain CT. Also, some toxic substances such as carbon tetrachloride and other chlorinated hydrocarbons are radiopaque and may appear on abdominal X ray [6,7]. The diagnosis of an overdose is usually based on the patient's complaints or a situation with a comatose patient who has a psychiatric disease. However, making an accurate diagnosis of caffeine intoxication can be challenging for such patients without witness of ingestion of overdose of caffeine. We propose a diagnostic method to help with making the differential diagnosis for such unconscious patients using abdominal CT examination [8].

Conclusion

As obtaining caffeinated products becomes easier, caffeine intoxication, sometimes critical and fatal, has been constantly growing, especially among children and youngsters. Although the addictive potential of caffeine has long been reported, awareness about caffeine abuse is still lacking. Our experience suggests the usefulness of CT for making a differential diagnosis in unconsciousness patients. Awareness and recognition of the typical clinical symptoms of caffeine intoxication may be critical in the emergency room.

References

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