Case 1: #Molly presents with new-onset seizures

A previously healthy 16-year-old girl presented to the emergency department following a first-episode generalized tonic-clonic (GTC) seizure that she experienced while at a rave. On presentation, the patient was cooperative, but lethargic and drowsy. Her initial vital signs included a blood pressure of 113/64 mmHg, a heart rate of 97 beats/min, a respiratory rate of 16 breaths/min, an oxygen saturation of 98% on room air and an axillary temperature of 36.4°C. A noncontrast head computed tomography scan was performed and was normal. An electrocardiogram demonstrated a prolonged QT interval of 460 ms. The patient experienced a second GTC seizure while in the emergency department and was treated successfully with 6 mg (0.15 mg/kg) of intravenous lorazepam. However, shortly thereafter, she required intubation for airway management and was transferred to the paediatric intensive care unit. Poison control, neurology and clinical pharmacology teams were consulted. Further history and investigations during her subsequent hospital admission revealed the cause of her symptoms.

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CASE 1 DIAGNOSIS: HYPONATREMIC SEIZURES SECONDARY TO DRUG INGESTION

Initial laboratory investigations revealed a sodium level of 115 mmol/L. The patient received two boluses of 3% saline, which resulted in an increase in sodium level to 132 mmol/L. Her sodium level normalized at 143 mmol/L after additional correction with normal saline. The initial creatinine phosphokinase (CPK) level was also elevated (1591 U/L; normal range 45 U/L to 230 U/L). The patient complained of generalized soreness and lower extremity myalgia with movement. Her CPK level reached a peak of 123,942 U/L, warranting hyperhydration with alkalized intravenous fluids. In addition, her liver enzyme levels became elevated, with peak aspartate aminotransferase and alanine aminotransferase levels of 931 U/L and 321 U/L, respectively.

A review of her urine toxicology screen revealed the presence of methamphetamine and methylenedioxymethamphetamine (MDMA), and her serum screen was positive for methylone. These findings were corroborated on history when her friend disclosed that the patient had ingested two capsules of 'Molly', or 0.4 g of MDMA, following which she had consumed 10 L of water at the music festival. This led to a diagnosis of hyponatremic seizures due to excessive water intake and rhabdomyolysis secondary to MDMA ingestion.

Frequently referred to as 'Molly' or ecstasy, MDMA is a commonly used illicit drug that has its use deep-rooted in the electronic dance music scene (1). While the prevalence of ecstasy use among the general Canadian population is approximately 1%, youth 15 to 24 years of age have the highest rates of use among all Canadians (3.8% in 2010), with students in grades 7 to 12 demonstrating relatively high consumption rates (3.4% to 7.2%); use does not vary significantly according to sex (2).

Structurally related to amphetamines, MDMA is primarily metabolized by cytochrome 2D6. However, because MDMA is also a potent inhibitor of this enzyme, it can inhibit its own metabolism, thereby increasing the plasma concentration of MDMA. Through its interaction with monoamine transporters, MDMA stimulates serotonin, dopamine and norepinephrine release in the brain and causes the secretion of cortisol, oxytocin and antidiuretic hormone (ADH), leading to its desirable effects of energy and mood elevation. The active metabolites of MDMA may cause liver injury. Heart rate and blood pressure elevations may increase the risk for stroke and myocardial infarction, with a higher risk for sudden cardiac death or coronary artery disease in individuals with conduction abnormalities or cardiomyopathies.

Furthermore, MDMA is associated with a dose-related increase in body temperature and poses the risk for serotonin syndrome (SS), which may present with muscle rigidity, diaphoresis, tremors and confusion. Serotonin syndrome or other features that are commonly associated with MDMA ingestion, such as hyperpyrexia and excessive physical activity with suppressed recognition of overexertion cues, may cause heat stroke or rhabdomyolysis, with CPK levels up to 100,000 U/L (1). Moreover, ADH release causes free water uptake in the collecting tubules which, in conjunction with excessive water consumption secondary to dehydration and overheating, can result in severe hyponatremia, leading to seizures or cerebral edema (3). The present case demonstrates the importance for health care providers to maintain a high index of suspicion for substance use, specifically MDMA, among adolescents presenting with new-onset seizures. A confidential and thorough evaluation using the HEADDSSS (Home, Education/Employment, Activities, Diet, Drugs, Suicide, Sexuality and Safety) screen along with other validated assessment tools, such as those available on the Collaborative Mental Health Care or

Centre for Addiction and Mental Health (Toronto, Ontario) websites, can assist health care providers in identifying additional high-risk behaviours in adolescents.

CLINICAL PEARLS

- Dilutional hyponatremia secondary to drug ingestion should be considered in teenagers who present with new-onset seizures.
- MDMA, or ecstasy, can cause symptomatic dilutional hyponatremia through its association with excessive water consumption and ADH secretion.
- Profound rhabdomyolysis may occur with MDMA use due to hyperpyrexia from serotonin syndrome or overexertion.

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