Are "natural" products really that safe: A case of poisoning in the ER

By Gabriella Varga, RN, BN(C), ENCC

Introduction

A 67-year-old female presents to the emergency department (ED) by paramedics (EMS). She is hypotensive, and tachycardic, with an altered level of consciousness. EMS also adds that she might be incontinent with urine and stool. EMS had thought that the patient could be a new onset seizure disorder.

As a triage nurse, it's now up to you to assess and determine the acuity of this patient.

Case report

At 1445 hours, EMS gives the following report: The patient's subjective complaint is a "2 1/2 hour onset of general weakness and dizziness". She decided to call EMS when she noticed that she could not comprehend the conversation she was having with her friend on the phone. She reported blacking out right after the phone call, and woke up hearing a knock on the door by EMS. She staggered to the door and needed to hold onto objects to keep balance, as she felt very "spacey".

The patient's objective findings from EMS are the following: The patient is otherwise healthy and has no known allergies. The only thing different today was she tried a new apricot snack she got from the health food store. Her vital signs are as follows: blood pressure 90/40, heart rate 124, and an oxygen saturation of 97%–98% on room air.

According to the Canadian Triage Acuity Scale, the nurse triaged the patient as a Category 2. The patient needed to be placed in a bed in emergent care, a step-down resuscitation room with full cardiac monitoring capabilities. Due to the high volume and acuity of patients in the ED, a bed was not readily available. The nurses in emergent care were doing their best to quickly arrange a bed for this new patient. They were finding this to be a challenge.

At 1515 hours EMS, who were continuously monitoring the patient as she awaited a bed, approached the triage nurse reporting that the patient's status had changed. Her blood pressure had dropped and she was behaving inappropriately. The patient was rushed onto a hospital stretcher. The emergency nurses started to undress her and noted she was cold and mottled over both her upper and lower extremities. This mottling extended over her trunk to the umbilicus, and the patient had no palpable pedal pulses. Once connected to the cardiac monitor, her blood pressure registered at 74/41 with a heart rate of 116. She was now alert only to person. Two large bore intravenous lines were inserted, and lab work drawn for CBC, electrolytes, INR, and lactate level. Two IV fluid boluses were started under pressure, as per the emergency protocol and the emergency physician (EP) paged stat to her bedside.

The initial triage nurse remembered that in ancient times people crushed fruit seeds, particularly apple and apricot, and mixed it in the food of someone they wanted dead, an ancient form of chemical warfare (Desai & Su, n.d.). Amazed by the connection she had made, she approached the EP with her theory, and the potential cause for these symptoms. The attending physician was hesitant about this diagnosis, but knew with the patients' acuity that an immediate diagnosis needed to be made. Working in another area in the department at the time was an EP who was also a Toxicologist, and requested she discuss the case with the toxicologist.

The nurse was correct in her link between apricots and cyanide! A differential diagnosis of cyanide poisoning was made before any blood results were back. No time was wasted to treat this deadly toxin.

Pathophysiology of cyanide poisoning

"Cyanide is a mitochondrial toxin that is among the most rapidly lethal poisons known to man. Used in ancient times as a method of execution, cyanide causes death within minutes to hours of exposure. It must be recognized rapidly to ensure prompt administration of life-saving treatment" (Desai & Su, n.d.). Cyanide kills by preventing aerobic metabolism within the cells, acting like a cellular asphyxiate and can do so within minutes when ingested in high concentrations (Cooper & Albrezzi, 1990). Cyanide binds to the ferric ion (Fe3+) of the mitochondrial cytochrome oxidase enzyme and creates cytochrome oxidase cyanide, thus stopping oxidative phosphorylation. In other words, the cells cannot use the oxygen in the blood "histotoxic hypoxia" (Desai & Su, n.d.). Another complication of cyanide toxicity is that small amounts also bind with ferrous (Fe2+) iron of hemoglobin, forming cyanohemoglobin, which is unable to transport oxygen, further exacerbating tissue hypoxia (Desai & Su, n.d.).

Clinical presentation of cyanide poisoning

Signs and symptoms will depend on the route, duration and quantity of exposure. Central nervous systems and cardiovascular system dysfunction are most prominent including: headache, anxiety, confusion, vertigo, seizures, loss of consciousness, coma, initial tachycardia and hypertension, then bradycardia and hypotension with arrthymias. Other associated symptoms are nausea, vomiting, abdominal pain, flushed skin leading to cyanosis (late sign), and renal failure. With so many different symptoms, one can understand the difficulty arriving at a diagnosis (Desai & Su, 2009).

Treatment of cyanide poisoning

As always, stabilize the patient's airway, breathing, and circulation. Initiate high-flow oxygen regardless of the oxygen saturation, and commence cardiac monitoring. For the unknown, unresponsive patient, attempt administration of IV naloxone, dextrose and thiamine. Seizures should be treated with a benzodiazepam, and hypotension should be treated with fluids or vasopressors, as required (Desai & Su, 2009).

Once cyanide toxicity has been diagnosed, immediate administration of the antidote is required. Most cyanide kits include amyl nitrate, sodium nitrite, and sodium thiosulfate. The nitrates reduce blood cyanide by binding to methemoglobin, therefore decreasing the binding of the cytochrome oxidase and increasing cellular respiration. The sodium thiosulfate enhances the transformation of cyanide to less toxic thiocyanates, which is excreted through the kidneys (Borron, 2006).

Until IV access is obtained, break open the amyl nitrate ampoule in front of the patients' nose or between the patient and the oxygen delivery system for 30 seconds. This can be repeated up to three times. Once IV access is obtained, administer the sodium nitrite 10 mg/kg over 10 minutes followed by the IV sodium thiosulfate 1.65 ml/kg. According to the patient's condition, the clinician might want to administer the sequence again (Desai & Su, 2009).

If hydroxycobalamin is available, the recommended dose is 100 mg/kg IV. Hydroxycobalamin binds to intracellular cyanide and is also excreted through the kidneys (Koschel, 2006).

Delayed sequelae for cyanide poisoning

Even though the patient is diagnosed and treated, they could still develop long-term effects from the cyanide toxicity. Survivors may develop delayed onset of Parkinsonism or other neurologic sequelae such as impaired motor reaction, reduced verbal fluency and symptoms such as dystonia, bradykinesia, slowed speech and retropulsion (Koschel, 2006). The basal ganglia are very sensitive to cyanide toxicity and may have a secondary injury from being in a hypoxic state. The patient should be followed up by a neurologist and radiographic imaging, either CT scan or MRI. Cerebral changes have been noted up to several weeks after the exposure (Desai & Su, 2009).

Clinical implications of complementary and alternative medicines

Apricot kernels, also known as laetrile, amygdalin, Chinese almond, Prunus Kernel or Vitamin B17, are currently banned from Canada, and are primarily supplied from Mexico (Moss, Khalil, & Gray, 1981). The lethal dose is 50 to 60 apricot kernels. There have been several theories disproving that laetrile is effective against cancer cells. Its first noted use in medicine was in 1845 in Russia. Laetrile made its way to America in the 1920s. At that time, it was reported toxic and the use of laetrile was stopped. In the 1950s it made a comeback. Produced in a synthesized form and reported to be nontoxic, it gained popularity again in the 1970s (National Cancer Institute, 2006).

Ernest (2010) reported that 90% of patients diagnosed with cancer admit to using some form of "complementary and alternative medicine" (CAM) and may not openly disclose this information unless specifically asked. A recent study by Drew and Myers (1997) in Australia noted that out of 3,004 patients, 48.5% of the population had used at least one form of alternative medicine. Although it is commonly thought that "natural" products are all safe, evidence has shown that use of some alternative medicine can be harmful. Not only could one experience adverse effects from CAM, there are medication incompatibility effects as well. Some herbs can alter the effects of prescribed medication and, unfortunately, the use of CAM is not routinely included in patients' drug histories or in reports of adverse effects. Health care professionals need to understand the importance of asking all patients if they use any alternative, natural, or homeopathic medicines, a practice that is not consistently carried out at some facilities.

Discussion

The staff opened the cyanide antidote kit, which included 2 ampoules of amyl nitrate, IV sodium nitrate, and IV sodium thiosulfate. Since IV access was already established, the EP administered 300 mg of IV sodium nitrate, followed by 50 mls of sodium thiosulfate.

The patient proceeded to vomit approximately 10 times. By 1645 hours, nearly two hours post arrival to the ER, she was alert and orientated x3 with vital signs within normal limits. Initially the mottling remained, but was decreasing in size. Shortly after the antidote was administered, her lab work results were as follows: WBC 19, Lactate 19.7, anion gap 26, creatinine 104, and a methemolglobin at 10.4. The rest of her chemistry was unremarkable. Her initial ECG showed sinus tachycardia with nonspecific ST and T wave abnormalities.

At this time, the only complaint noted by the patient is that she felt "spacey", was slightly nauseated and had a mild

headache. By 1855 hours, her mottling had decreased significantly to the point where it was almost completely gone and she reported feeling much better. At that point, the patient had admitted to eating a handful or so of the apricot snack. ICU was consulted and suggested continued cardiac monitoring, watching for prolonged QT intervals and monitoring for acute renal failure, improvement of metabolic acidosis and the development of rhabdomyolosis.

Repeat lab works done at 2115 hours showed: WBC 11.2, lactate 1.6, anion gap 12, creatinine 64 and a blood pH of 7.31.

Considering the patient had all the known indicators of a potential poor prognosis, she made an astounding recovery. She was admitted to hospital for a total of two days and discharged home to follow-up with her family physician and by a neurologist.

The Ottawa Carleton Public Health Unit was notified about the case. Their personnel contacted the health food store to have the product pulled from the shelves until further investigations could be done.

Intuition is an important tool we use in nursing. We are not born with it—it comes to us through feelings, knowledge, and experience. If you find yourself in a moment where you feel there is more than meets the eye, don't dismiss it… question it.

About the author

Gabriella Varga graduated from Algonquin College in 1999 and continues to pursue her education through Athabasca University. She currently works at The Ottawa Hospital in Emergency Medicine, which is her true passion, and aspires to teach critical care nursing in the future.

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