

Metabolic Acidosis and Hyperlactatemia Requiring Continuous Venovenous Hemofiltration after Intentional Ingestion of Metformin

Dear Editor,

A 52-year-old male with a medical history of cocaine use presented to the hospital complaining of chest pain. Vital signs included a heart rate of 97 beats per minute, blood pressure 151/116 mmHg, temperature 98°F, respiratory rate 16 breaths per minute, and oxygen saturation of 99% on room air. Physical examination was normal, and EKG was unremarkable. Initial laboratory findings were positive for cocaine on urine drug immunoassay and elevated creatine kinase of 1749 IU/L. Complete blood count, troponin, and comprehensive metabolic panel, including creatinine, were all within normal limits. The patient was treated with intravenous fluids for rhabdomyolysis and admitted for further observation and evaluation of his chest pain.

While hospitalized, the patient experienced altered mental status and profound hypoglycemia with bedside glucose of <10 mg/dL. The patient was given one ampoule of dextrose with return to baseline mental status. A comprehensive metabolic panel during this episode revealed a significant metabolic acidosis with 12 mEq/L serum bicarbonate and an anion gap of 34. The patient admitted to surreptitiously taking 60 pills of his 1000 mg metformin while alone in his hospital room. A venous blood gas (VBG) performed showed a pH of 7.02, pCO₂ 23.3, pO₂ 128, bicarbonate 8.0 and lactate >25 mmol/L. The patient was treated with three ampoules of sodium bicarbonate, started on a 10% dextrose infusion and transferred to the intensive care unit for hemodialysis. During dialysis, the patient became hypotensive, obtunded, and tachypneic, requiring immediate endotracheal intubation. Repeat VBG results were pH 6.97, pCO₂ 18.1, pO₂ 138, bicarbonate 6.5, lactate >25 mmol/L, and point of care glucose was 143 mg/dL. The patient was then placed on vasopressor support, continuous venovenous hemofiltration (CVVH), and a bicarbonate drip of 600 mL/hour. The patient remained intubated on multiple vasopressors and CVVH for 4 days and his lactate normalized to 2.0 mmol/L. Serum metformin levels were obtained prior to and during dialysis, with a pre-dialysis level of 67 mcg/mL, levels of 23 and 10 mcg/mL on day 2, and levels of 7.6 and 6.2 mcg/mL on day 3. He was weaned off of vasopressor support and successfully extubated on day 5.

Though potentially useful to obtain in overdose, isolated metformin levels do not always correlate with morbidity and mortality; however, an elevated metformin level and an associated hyperlactatemia are ominous.^[1] In regards to treatment, hemodialysis is performed primarily for acidosis and hyperlactatemia.^[2] Strikingly, our patient's measured metformin levels appreciably decreased in an

almost predictable manner while on CVVH. Although a rare occurrence, as in our case, metformin can cause severe hypoglycemia in overdose and absence of other antidiabetic medications.^[3] Retrospective reviews of metformin overdose have shown an increased incidence of death with a combined serum pH <6.9, lactate >20 mmol/L, and metformin concentration >50 mcg/mL.^[4,5] Our patient survived after intentional metformin overdose with serum pH nadir of 6.90, lactate >25 mmol/L and a pre-dialysis metformin concentration of 67 mcg/mL.

Some literature suggests that continuous renal replacement therapy (CRRT) such as CVVH contains lactate and is not thought to be useful in treating lactic acidosis of any etiology, including sepsis or hypotension. Though not performed specifically in this case, some advocate for the possible use of bicarbonate-based hemofiltration to treat acute renal failure in the setting of lactic acidosis to overcome this conundrum.^[6] CVVH is useful in the treatment of lactic acidosis associated with phenformin, a similar medication to metformin, as in this case.^[7] In a case described by Cheungpasitporn *et al.*, regarding a 28-year-old male with lactic acidosis in the setting of septic shock and multiple organ failure, CVVH proved as useful for treatment.^[8] Schetz provides examples of successful use of CRRT in the treatment of inborn errors of metabolism, tumor lysis syndrome and severe lactic acidosis.^[9]

Declaration of patient consent

The author certifies that he has obtained all appropriate patient consent forms. In the form the patient has given his consent for his images and other clinical information to be reported in the journal. The patient understands that his names and initials will not be published and due efforts will be made to conceal his identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

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