Pharmacotherapy Consult

Angiotensin-Converting Enzyme Inhibitor Overdose: from the Desk of the Editors

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Case Presentation

A 67-year-old female presents to the emergency department with confirmed ingestion of 82 tablets of lisinopril 40 mg.

The patient is hypotensive, with a blood pressure of 72/51 mmHg via arterial line, heart rate of 106 beats per minute, respiratory rate of 22 breaths per minute, weight of 78 kilograms, and Glasgow coma scale of 14. A comprehensive metabolic panel and complete blood count are currently pending. The patient's initial point of care blood glucose is 92 mg/dL. Physical exam findings include cool, clammy extremities, pupils 3 mm equal and reactive, and otherwise normal.

In addition to initial stabilization and decontamination, which of the following acute care plan is most appropriate to initiate first?

A. 50 mL bolus of dextrose 50%, 78 units of regular insulin intravenous (IV) bolus, followed by regular insulin IV continuous infusion at 40 units/hour, and dextrose 50% IV at 150 mL/hr titrated to blood glucose and hemodynamics.
B. Glucagon 10 mg IV bolus, followed by 5 mg/hour
C. 1-liter bolus of lactated Ringer's
D. 10 mg bolus of naloxone

Discussion

Lisinopril is an angiotensin-converting enzyme (ACE) inhibitor, which mechanistically inhibits the conversion of angiotensin I to angiotensin II, resulting in lower levels of angiotensin II, a potent vasoconstrictor. With the lack of circulating angiotensin II, patients with ACE inhibitor overdose are likely to present with hypotension and a benign toxic response compared to other anti-hypertensives. Based on the mechanism of action of ACE inhibitors, patients may develop acute renal failure and electrolyte abnormalities, including hyperkalemia, with toxic ingestion.

The most appropriate course of action for an acute ACE-inhibitor overdose is supportive care, which in this case, would be an intravenous (IV) fluid bolus to increase the patient's blood pressure acutely (Answer choice C). If the patient's blood pressure rises appropriately after fluid resuscitation, no further intervention would be required.[1] If the patient remains hypotensive, additional fluid administration could be warranted, and vasopressors initiated. No specific antidote for ACE-inhibitor toxicity has been identified.

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Initiating a 50 mL bolus of dextrose 50%, 78 units of regular insulin IV bolus, followed by regular insulin IV continuous infusion at 40 units/hour, and dextrose 50% IV at 150 mL/hr titrated to blood glucose and hemodynamics, would likely be ineffective for ACE-inhibitor overdose. The patient would not likely present with profound hypotension. High-dose insulin euglycemic therapy (HIET) is more likely to be effective in treating hypotension from calcium channel blockers or beta blockers.[2,3] HIET helps to improve carbohydrate utilization by cardiac myocytes, improving cardiac function but not combating vasodilation.

A glucagon 10 mg IV bolus, followed by 5 mg/hour would also likely be ineffective for treating hypotension associated with ACE-inhibitor overdose. Like HIET, glucagon can help combat cardiac conduction abnormalities associated with beta-blockers and calcium channel blockers.[3] Glucagon works by increasing cyclic adenosine monophosphate (cAMP) at the sinoatrial node and atrioventricular node, improving cardiac contractility. Unlike HIET therapy, tachyphylaxis to glucagon can develop.

Administration of a 10 mg bolus of naloxone would not likely have any physiologic effect on this hypotensive patient. Naloxone can be administered to improve central nervous suppression in patients presenting with clonidine overdose.[4,5] In a clonidine overdose, naloxone would not improve cardiovascular effects; therefore, supportive care would also be recommended.

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References

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