

Management of Adverse Effects from High-Dose Insulin Therapy in Calcium Channel Blocker/Beta-blocker Overdose: An Observational Study

Toxicities brought about by calcium channel blocker (CCB) and beta-blocker (BB) overdose lead to similar physiologic manifestations, and are associated with a high risk of mortality. The use of high-dose insulin (HDI) for treatment of these toxicities leads to comparatively improved outcomes versus typical vasopressor therapies. However, existing studies do not definitively describe supportive care for the adverse effects of HDI (e.g., hypoglycemia, hypokalemia, and hypervolemia). The lack of data in these areas represents an opportunity to further characterize both HDI, and its supportive care. A retrospective chart review of patients admitted to UHealth between 2015 and 2020 was conducted. Patients who received at least 0.5 units/kg/h infusions of regular insulin for the treatment of suspected and/or confirmed beta-blocker or calcium channel blocker overdose were included. The primary outcome was the amount of patients who experienced hypoglycemia (blood glucose < 70 mg/dL) and/or hypokalemia (potassium < 3.3 mg/dL). Need for dextrose infusions (D10W, D20W, D50W) was assessed. Fluid overload was evaluated by the total cumulative fluid status of patients after HDI/dextrose therapy. Additional data on if patients needed continuous renal replacement therapy (CRRT) for an indication of fluid overload was also collected. A total of 10 patients were included in the study. Median age 44 (IQR: 37.5–48), majority female (70%), and median hospital length of stay was 11.5 days (IQR: 3.5–41.8). Patients overdosed on verapamil (50%), amlodipine (20%), propranolol (10%), and atenolol (10%). One patient had an unknown overdose but was presumed to be and treated as a CCB/BB by toxicology. Median initial and maximum rates of HDI were 1 unit/kg/h (IQR: 1–1) and 10.5 units/kg/h (IQR: 5.5–14.3), respectively. Median total duration of HDI infusion was 1.8 days. Six patients incurred hypoglycemia and nine experienced hypokalemia. The average number of push-dose dextrose administrations per patient was 5.5 (standard deviation (SD): 6.5), and the median duration of supportive care dextrose infusion 4.8 days. The median cumulative volume status of patients after HDI and dextrose infusion therapy was positive 10.6 liters. Nine patients were placed on continuous renal replacement therapy over the course of their hospital stay. Four of those patients (44%) were started on CRRT for fluid overload according to nephrology consult notes. HDI therapy is beneficial in the treatment of CCB/BB overdose. Many patients will experience one or more side effects of insulin therapy. Treatment and management of these side effects can lead to volume load and possibly contribute to the need for renal replacement therapy.