BRASH syndrome associated with angiotensin receptor blocker and SGLT2 inhibitor

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Dear Editor,

BRASH syndrome is a relatively new entity, defined as a combination of bradycardia, renal failure, atrioventricular nodal blockade, shock, and hyperkalemia [1]. According to the Advanced Cardiac Life Support (ACLS) algorithm, if there are signs of shock due to bradycardia, atropine should be administered, and if atropine does not work, percutaneous pacing should be considered [2]. However, bradycardia due to BRASH syndrome does not respond to this algorithm [3].

An 83-year-old woman was brought to the emergency room complaining of severe general malaise that progressed to syncope. She had type 2 diabetes and hypertension for 20 years. She is currently taking azilsartan 20 mg/day, bisoprolol 5 mg/day, ipragliflozin 50 mg/day, and metformin 500 mg/day. On arrival, her vital signs showed a blood pressure of 68/44 mmHg, a temperature of 36.8 °C, a respiratory rate of 22 breaths/minute, and an oxygen saturation of 99% on 3L/min of nasal cannula oxygen. Blood work showed blood glucose 363 mg/dL, sodium 123 mEq/L, potassium 7.8 mEq/L, urea nitrogen 76.9 mg/dL, creatinine 3.26 mg/dL, and HbA1c 10.2%. The ECG monitor showed a marked bradycardia with a wide QRS and a peaked T wave. We performed a 12-lead ECG, which showed significant bradycardia of 24 beats per minute with atrioventricular nodal blockade. A diagnosis of BRASH syndrome was made based on the presence of symptomatic bradycardia with ECG findings, baseline renal dysfunction, hyperkalemia,

and long-term ingestion of beta-blocker. We started massive saline infusion with rapid-acting insulin 0.1U/kg/hour, and 10 mL of 8.5% calcium gluconate hydrate was infused. As the serum potassium level decreased with insulin drip infusion, her bradycardia improved. The next day, her blood tests revealed blood glucose 189 mg/dL, sodium 136 mEq/L, potassium 5.6 mEq/L, urea nitrogen 42.2 mg/dL, creatinine 2.13 mg/dL. The ECG at this time showed a heart rate of 57 beats per minute, and a peaked T wave disappeared.

Treatment of BRASH syndrome is aimed at rapid management of hyperkalemia, with intravenous calcium to stabilize the cardiac membrane [4]. Hyperkalemia in this case was triggered by angiotensin receptor blocker (ARB) and sodium-glucose cotransporter 2 (SGLT2) inhibitor. ARBs inhibit renal excretion of potassium. SGLT2 inhibitors have osmotic diuretic and natriuretic effects [5]. Therefore, in this case, dehydration caused by SGLT2 inhibitor led to decline in renal function, which, combined with delayed potassium excretion by ARB, led to rapid progression of hyperkalemia. The lesson from this case is that BRASH syndrome can occur with commonly used drugs to treat hypertension and diabetes, such as ARBs and SGLT2 inhibitors.

Declarations

Conflict of interest The author declares no conflict of interest.

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