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NEPHROLOGY - LETTER TO THE EDITOR

Management of plasma hypertonicity resulting from osmotic diuresis

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Editor,

We received inquiries about the report on the management of hypertonicity resulting from osmotic diuresis [1]. The inquiries were focused on the statement that the replacement solutions should be hypotonic, given that patients usually present with hypertonicity, and questioned the use of isotonic replacement solutions in this case. The use of isotonic replacement solutions, e.g., isotonic (0.9%) saline, has been advocated as initial treatment of profound losses resulting from osmotic diuresis from hyperglycemic crises in several guidelines [2–4]. Isotonic saline was also used as initial replacement solution in all four protocols of the PECARN Fluid Trial for the treatment of pediatric diabetic ketoacidosis [5]. The role of isotonic replacement solutions in the management of fluid deficits resulting from osmotic diuresis requires classification.

The major fluid and electrolyte disturbances resulting from osmotic diuresis consist of potentially large deficits of extracellular volume, i.e., sodium salts and water, potassium deficits, and hypertonicity. The rules that guide the correction of these three disturbances differ. Volume replacement should be prompt in patients exhibiting clinical manifestations of hypovolemia to prevent ischemic damage of vital organs. The rate of potassium replacement is guided by the values of serum potassium, which should be monitored frequently during treatment. Finally, the correction of hypertonicity should be slow to prevent neurological complications that may develop when hypertonicity is corrected rapidly.

The initial use of isotonic solutions to correct disturbances caused by osmotic diuresis has therapeutic advantages for both volume replacement and correction of hypertonicity: extracellular volume repletion is prompter when isotonic, rather than hypotonic, saline, is infused and the infusion volumes are equal; serum tonicity does decrease when isotonic saline is infused into a patient with hypertonicity; and in this case the rate of decrease in tonicity is slower than when an equal volume of hypotonic saline is infused. As noted above a slow rate of correction of hypertonicity constitutes one of the major treatment aims. Hypotonic solutions should be used after correction of the volume deficits if hypertonicity persists and oral intake of fluids is inadequate.

The risks of isotonic saline infusion should also be recognized and addressed. First, volume replacement can lead to improvement of the renal function in patients with persistent hyperglycemia, with increase of the volume of hypotonic osmotic diuresis and worsening of the hypertonicity. And second, addition of potassium salts to isotonic saline makes the infusion solution hypertonic. This second risk of the infusion solutions is minimized when the sodium concentration of the solution is decreased by approximately the same level as the level of the potassium salt in the solution. Nevertheless, frequent monitoring of clinical picture, pertinent laboratory measurements, urinary flow rate, and, in severe cases, urinary sodium and potassium concentrations, is critical during fluid replacement of losses from protracted osmotic diuresis.

Compliance with ethical standards

Conflict of interest Both the first and second authors of this letter declare that they have no conflict of interest.

Ethical approval This article does not contain any studies with human participants or animals performed by any of the authors.

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