Maintenance Intravenous Fluids in Children – The Verdict was Already Out?

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Maintenance intravenous fluid (IVF) is a common and essential part of treatment in hospitalized children to maintain hydration in those in whom enteral fluid intake is not possible. An ideal IVF should match the daily fluid volume requirements and should contain electrolytes in appropriate concentrations to replenish ongoing loss and daily needs. There has been an ongoing debate on the tonicity of IVF for maintenance requirements over the past few decades. Tonicity or osmotic pressure exerted by the IVF on the semipermeable cell wall membrane is determined by the electrolyte concentration; the major contributor being sodium. Hypotonic maintenance IVF has been traditionally used in children based on theoretical calculations by Holliday and Segar in 1950s which yielded a fluid composition of 3 mEq/dL of sodium and 2 mEq/dL of potassium [1]. In acutely ill states, excess secretion of arginine vasopressin retains free water and can exacerbate hyponatremia associated with administration of hypotonic fluids. This results in a range of mild to severe hyponatremia, in extreme cases manifesting as hyponatremic encephalopathy. Isotonic fluids have been recommended since 2003 as a maintenance IVF in hospitalized children to prevent these complications [2]. In recent years, there has been a fear of inducing complications like hypernatremia, volume overload, edema and hypertension with use of isotonic saline.

In this issue of journal, Bagri et al. compared isotonic normal saline (0.9% sodium chloride with 5% dextrose) vs. hypotonic half normal saline (0.45% sodium chloride with 5%

dextrose) as maintenance fluid of choice in a single centre randomized controlled trial [3]. The primary outcome was incidence of hyponatremia (<130 mEq/L) at 24 h which was comparable between the groups. Similarly, the incidence of hypo or hypernatremia was comparable at 24 and 48 h of admission. However, the serum sodium was significantly higher in the normal saline group compared to N/2 saline (138.3 ± 6 mEq/L vs. 135.1 ± 4.4 mEq/L; p value <0.01). Based on the results of this study, it would be imprudent to conclude that N/2 saline does not cause hyponatremia as the observed rate of hyponatremia is 6.7–8% whereas, the rate presumed for sample size calculation was 35%, almost 5 times that of actual incidence. The study is therefore underpowered to make any recommendations based on the findings.

Evidence based recommendations based on many randomized trials and systematic reviews continue to recommend isotonic IVF as maintenance fluid of choice [4, 5]. There are real concerns with use of isotonic 0.9% normal saline like, hyperchloremic metabolic acidosis, systemic inflammation and renal tubular injury which have been addressed in recent trials. Balanced crystalloids like Plasmalyte or Ringer's Lactate fare better in these aspects compared to normal saline and warrant further investigation as maintenance fluids in hospitalized children.

Compliance with Ethical Standards

Conflict of Interest None.

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