Balanced crystalloids versus saline for perioperative intravenous fluid administration in children undergoing neurosurgery: a randomized clinical trial

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Objectives

To assess the effects of a balanced crystalloid solution *versus* saline on metabolic profile and brain relaxation in children undergoing neurosurgery

Design

A prospective, randomized, single-center, open trial

Setting

Operating room and pediatric intensive care unit in an university teaching hospital

Patients

49 children aged between 6 months and 12 years

Intervention

Patients were randomized in a 1:1 ratio to receive a balanced crystalloid (Plasma-Lyte) or saline during brain tumor resection and 24h postoperatively

Measurements

Serum electrolyte and arterial blood gas analyses were performed at the beginning of surgery, after surgery, and at postoperative day 1. Brain relaxation score was assessed by the neurosurgeon after *dura-mater* opening. Primary outcome: ΔCl^- (absolute difference in serum chloride concentrations measured after surgery and at baseline).

Conclusion

In children undergoing brain tumor resection, saline infusion increased variation in serum chloride compared to balanced crystalloid. These findings support the use of balanced crystalloid solutions in children undergoing brain tumor resection

Results

Saline *versus* balanced crystalloid infusion resulted in:

- **increased** ΔCl^- [6 (3.5; 8.5)] vs [0 (-1.0; 3.0) mmol L⁻¹; $p < .001$]
- **increased** $\Delta\text{base excess}$ [-4.4 (-5.0; -2.3) vs -0.4 (-2.7; 1.3) mmol L⁻¹; $p < .001$]
- **increased hyperchloremic acidosis incidence** [17/25 (68%) vs 5/24 (21%); $p < .01$]
- **Comparable** brain relaxation score between groups.

Figure 1 – Chloride (A), sodium (B), and base excess (C) levels at baseline, after surgery, and postoperative day 1

Figure 2 – Brain relaxation score

Legend: 1, slack brain; 2, mild brain herniation; 3, moderate brain herniation; 4, severe brain herniation