

Impact of intraoperative fluid management on electrolyte and acid-base variables

Hina Walia MBBS, Mohammad Hakim MBBS, Rebecca Miller BS, Dmitry Tumin PhD, David Martin MD, Joseph D. Tobias MD
Department of Anesthesiology & Pain Medicine, Nationwide Children's Hospital and The Ohio State University, Columbus, Ohio

Background

- ❖ During major surgical procedures, intravascular volume can be maintained with the administration of isotonic fluids such as Lactated Ringer's (LR), Normal Saline (NS) or Normosol-R® (NR).
- ❖ During intraoperative care, acid-base status may be followed as an indirect measure of intravascular resuscitation and tissue perfusion.
- ❖ Inadequate resuscitation may result in a rising lactic acid concentration, which will be reflected as an increasing base excess.
- ❖ However, an increasing base deficit may also occur merely due to the administration of a large volume of normal saline which results in a dilutional acidosis.
- ❖ This dilutional acidosis may not occur when LR or NR are used for intraoperative resuscitation.
- ❖ The primary objective of the current study was to determine differences in base deficit status based on the fluid used for intraoperative status.
- ❖ The secondary objective was to determine differences in serum pH and lactate levels. can be mitigated to improve a child's health.



Methods

- ❖ The study was IRB approved. Following informed consent, fluid administration during spinal surgery was randomized to LR, NS or NR. As clinically indicated, arterial blood gas and electrolyte values were obtained using point-of-care monitoring.
- ❖ Base deficit, pH, and lactate levels at each measurement and between measurements were compared across fluid type administered using a two-sample t-test.

Table 1: Measurements of base deficit, pH, and lactate by type of fluid administered (N=23)

Measurement	Fluid types			NR vs. NS	NR vs. LR	NS vs. LR
	NR (N=7)	NS (N=9)	LR (N=7)			
	Mean ± SD	Mean ± SD	Mean ± SD	P	P	P
Base Deficit						
First	-0.9±1.6	0.1±2.1	0.7±1.4	0.325	0.070	0.521
Second	-0.4±1.9	-2.3±2.6	0.4±2.1	0.131	0.436	0.040
Change	0.4±1.1	-2.4±1.5	-0.3±2.4	0.001	0.484	0.043
pH						
First	7.4±0.1	7.4±0.6	7.4±0.0	0.647	0.869	0.704
Second	7.4±0.0	7.4±0.0	7.4±0.0	0.175	0.690	0.359
Change	0.0±0.0	0.0±0.0	0.0±0.1	0.094	0.643	0.369
Lactate						
First	1.1±0.4	1.3±0.6	5.4±10.9	0.536	0.322	0.274
Second	1.1±0.5	1.5±0.7	1.2±0.5	0.208	0.707	0.316
Change	0.0±0.4	0.3±0.4	-4.2±10.6	0.190	0.321	0.227

Results

- ❖ The study cohort included 23 patients: NR (7), NS (9), and LR (7).
- ❖ For the study cohort, the mean age was 13 ± 2 years and weight was 53 ± 11 kg.
- ❖ 13 of the 23 patients had an increase in BD during the procedure.
- ❖ 10 patients had an increase in BD ≥ 2, of whom 7 received NS and 3 received LR.
- ❖ Compared to patients receiving either NR or LR, patients receiving NS experienced a greater increase in BD between the first and second measurements (NS: -2.4 ± 1.5 vs. NR: 0.4 ± 1.1, p=0.001 and LR: -0.3 ± 2.4, p=0.043).

Discussion

- ❖ During spinal surgery, fluid resuscitation with Normosol-R® or Lactated Ringer's prevented an increase in BD compared to Normal saline.
- ❖ The pH and lactic did not differ among the three fluids.

References:

1. Awad S, Allison SP, Lobo DN: The history of 0.9% saline. Clin Nutr 2008; 27:179-188.
2. Scheingraber S, Rehm M, Sehmisch C, et al: Rapid saline infusion produces hyperchloremic acidosis in patients undergoing gynecologic surgery. Anesthesiology 1999; 90:1265-1270

