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Hyperchloremic metabolic acidosis post hysteroscopy: A place for balanced solutions?

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TO THE EDITOR

Hysteroscopic procedures are at risk of fluid absorption leading to pulmonary or cerebral edema, electrolyte abnormalities, congestive heart failure, and coagulation disturbances.[1] We discuss below the evolution of the different solutes used in hysteroscopy with their electrolytic impact.

A 52-year-old female was hospitalized at the intensive care unit after a uterine polypectomy. She had no important medical history, G4P4, and had already undergone a cholecystectomy and an abdominoplasty. No chronic medication use except oral contraception and a statin was noted. Hysteroscopy for polyp resection and endometrectomy were planned because of menometrorrhagias and anemia. During the intervention, 9 L of NaCl 0.9% was injected in the intrauterine space and 6 L recovered, leaving 3 L of resorption. The operation was interrupted because of hypotension and desaturation. The patient was immediately transferred to the intensive care unit. On arrival, she was alert and oriented, had Glasgow Coma Scale (GCS) 15/15, and was extubated. The vital parameters were as follows: heart rate: 74/min, mean blood pressure 55 mmHg, respiratory rate 19/min, and 92% saturation with ambient air. On physical examination, we noticed abdominal distention and discrete vaginal bleeding. The results of the arterial blood gas were shown in Table 1. Electrocardiography and chest radiograph were normal. Electrocardiogram was normal during acidosis (regular sinus rhythm at 81/min, normal P-R, normal QRS, isoelectric ST, and QT corrected to 437 ms). Chest X-ray did not show any condensation. The diagnosis of hyperchloremic metabolic acidosis was made. The patient was managed with furosemide. She quickly completely recovered and was discharged the day after (Figure 1).

Mechanical morcellation of uterine myomas exposes venous vessels within the vascular fibroid tissue and uterus. These vessels are not coagulated as with electrosurgery. The larger the leiomyoma, the larger the area of vessels exposed to saline and the greater the intravasation.[2] Other mechanisms are resorption through the wall of endometrium and absorption by peritoneum via the Fallopian tubes.[1] Dextran and glycine solutions have been used that lead to the complication of major hyponatremia.[3-5] This has led practitioners to use normal saline to avoid the risk of hyponatremia. Numerous studies have shown that intravenous administration of normal saline leads to hyperchloremic metabolic acidosis due to chlorine overload.[6] This phenomenon is avoided by using balanced solutions buffered with lactate or acetate. Grove et al. have described two cases of non-cardiogenic pulmonary edema linked to massive resorption (6 and 2.2 L, respectively) during hysteroscopies using Lactate Ringer. They observed respiratory failure due to fluid overload without having hyperchloremic acidosis.

The administration of 5% glucose corresponds to administration of free water once the glucose is used by the

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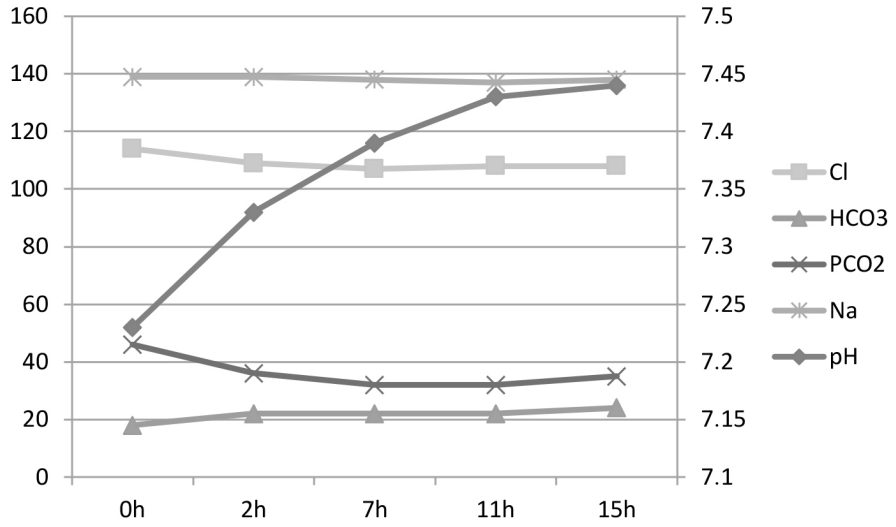

Figure 1: Evolution of the electrolytic and acid base parameters.

Table 1: Blood tests results

Variables	Value	Variables	Value
Hemoglobin	11.3 g/dL	pH	7.23
Platelets	259×10^3/µL	PCO2	46 mm Hg
White blood C.	6.51×10^3/µL	PO2	226 mm Hg
C-reaction protein	7.5 mg/L	Lactate	0.9 mmol/L
APTT	30 s		
Urea	20 mg/dL		
Creatinin	0.56 mg/dL		
Na	139 mmol/L		
K	3.5 mmol/L		
Cl	114 mmol/L		
HCO3	18 mmol/L		
GOT	17 U/L		
GPT	9 U/L		
GGT	14 U/L		
Prealbumin	42 U/L		
Bilirubin tot	0.2 mg/dL		

APTT: activated partial thromboplastin time; GOT: glutamic oxaloacetic transaminase; GPT: glutamic pyruvic transaminase; GGT: Glutamyl transpeptidase.

body. This administration of free water causes dilution of sodium and results in hyponatremia when the sodium is diluted below 135 mmol/L.[7] Regarding 0.9% NaCl, it contains 154 mmol of Na^+ and 154 mmol of Cl^-. In other words, the amounts of sodium and chlorine are equivalent. In the blood, sodium is higher than chlorine (135–145 mmol/L of sodium *vs.* 98–107 mmol/L of chlorine). When administering 0.9% NaCl, proportionally more chlorine is administered than sodium. It follows a loss of the electroneutrality decreed by Stewart; in other words, there is an excess of negative charge, which causes metabolic acidosis.[8] In so-called balanced solutes, part of the chlorine is replaced by an acid, either lactate or acetate, which is used by the body. When administering a balanced solute, lesser chlorine is, therefore, administered than when administering 0.9% NaCl. In other words, we give lesser negative charges with balanced solute than with NaCl 0.9%, and so, lesser metabolic acidosis is caused.[8]

Although the literature is poor concerning the balanced solutions during surgical procedures, the balanced solutions seem to bring a benefit at the electrolytic level and acid–base balance. Randomized studies should be conducted to answer this question.

Authors' Contributions

De Meester D, Honoré PM, and Redant S designed the paper. All authors participated in drafting and reviewing. All authors read and approved the final version of the manuscript.

Consent for Publication

We received consent for publication from the patient.

Conflict of Interest

Patrick M. Honoré is the Editor-in-Chief of the journal. The article was subject to the journal's standard procedures, with peer review handled independently of this editor and his research group.

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