



Case report

Combined hyponatremia and hypocalcemia after intravascular absorption of 1.5% glycine during operative hysteroscopy. A case report



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KEYWORDS

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Abstract Intravascular absorption of distending media may complicate operative hysteroscopy. Consequences differ according to type, amount and speed of absorption of the distending media. We report a case of intravascular absorption of more than one liter of 1.5% glycine. A 36 years old female developed metabolic acidosis, hyponatremia and hypocalcemia during operative hysteroscopy scheduled for resection of a uterine fibroid. Serum sodium reached down to 119 mmol/l and ionized calcium to 0.898 mmol/l. Serial estimations of arterial blood gases and serum electrolytes were followed. Management was successful in preventing serious side effects. Meticulous monitoring of distending media input/output balance remains the cornerstone in prevention of intravascular absorption.

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1. Introduction

Operative hysteroscopy is widely used as a diagnostic and therapeutic tool for a variety of intrauterine pathological conditions. Absorption of distending media during performance of hysteroscopies is possible and consequences differ according to type, amount and speed of absorption of the distending media. Electrolyte-free media e.g. 1.5% glycine is preferred as a distending media when resection of a uterine fibroid is planned via monopolar resectoscope.

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We report a case of intravascular absorption of more than 1000 ml of 1.5% glycine during operative hysteroscopy under spinal anesthesia and its management until full recovery of the patient.

2. Case report

The case involved a 36 years old lady (weight: 67 kg, height: 157 cm) scheduled for operative hysteroscopy. History included repeated vaginal bleeding, anemia, and delayed fertility suspected to be secondary to uterine fibroid diagnosed by hysterosalpingogram. During her visit to the anesthesia clinic, her heart rate (HR) was 80 bpm and blood pressure (BP) was 85/55 mmHg. Preoperative laboratory work-up included complete blood count (Table 1; Pre-op) and a normal bleeding

Table 1 Perioperative laboratory and serial arterial blood gases (ABG) and electrolytes performed for the patient.

	Pre-op	ABG1	ABG2	ABG3	ABG4	ABG5	Post-op
Hemoglobin (gm/dl)	9.1	8.1	8.6	9.3	9.0	8.8	9.2
Hematocrit (%)	29.8	33.7	35.3	36.7	36.2	35.0	30
Platelets (count)	273						256
pH		7.299	7.389	7.423	7.425	7.434	
pCO ₂ (mmHg)		42.7	32.8	34.3	36.1	34.0	
pO ₂ (mmHg)		72.8	131.4	100.8	97.9	102.1	
HCO ₃ (mmol/L)		20.5	19.4	21.9	32.2	22.2	
BE (mmol/L)		-5.9	-5.0	-2.1	-1.0	-1.6	
Sodium (mmol/L)		119.8	128.2	134.0	132.9	133.2	137
Potassium (mmol/L)		3.55	3.44	3.07	2.81	3.47	3.8
Calcium (mmol/L)		1.000	0.898	0.919	0.873	1.086	
Chloride (mmol/L)		97.0	97.2	98.2	98.6	98.6	101

Preoperative (Pre-op), ABG (arterial blood gases), Postoperative (Post-op).

profile. She was classified as American Society of Anesthesiologists (ASA) II and was convinced with spinal anesthesia.

On the day of the procedure, the patient was admitted to the day-procedure unit where no intravenous (IV) fluids were started. Due to busy operating room (OR) schedule, the procedure was delayed for few hours. When the patient was shifted to OR, she had been completed 14 h fasting. She was attached to standard monitors. Her HR was 84 bpm and BP was 148/68 which decreased to 108/62 mmHg after premedication with 2 mg midazolam IV. The patient was preloaded with hydroxyethyl starch (HES) 130/4 solution (Voluven, Fresenius Kabi, Hamburg, Germany) while spinal anesthesia was induced with heavy bupivacaine 0.5%, 12 mg intrathecally in the sitting position. Propofol 1% IV infusion was started in a rate of 15 ml/h and 6 l/m of oxygen was applied via a face mask. Heart rate ranged between 58 and 64 bpm and BP between 85 and 98/48 and 62 mmHg.

Patient was positioned in the lithotomy position while the upper body was covered with pre-warmed cotton blankets. Then the operative site was cleaned and draped and the procedure started. A Karl Storz (Tuttlingen, Germany) hysteroscope was used during the procedure. Input and output of distending media were monitored. Distending media was 1.5% Glycine solution as an electrolyte-free isotonic solution suitable for monopolar resectoscope. The intrauterine pressure was controlled by a pressure-controlled suction/irrigation pump (Hamou Endomat, Karl Storz, Tuttlingen, Germany). Output of the distending media was collected in one canister via triple-way suction: directly from the hysteroscope, from the floor via a floor-suction device and what was collected in a bin just below the hysteroscope. Due to difficulty to calculate the remaining volume in a glycine bag, the protocol was to estimate distending media input/output balance after consuming each glycine bag.

Diagnosis of a large (7.5 × 7.5 cm) uterine fibroid was confirmed utilizing an intrauterine pressure of 100 mmHg and a 3-L glycine bag. When resection of the fibroid started, intrauterine pressure was increased to 200 mmHg. First 3-L glycine bag was consumed in 32 min and the balance was insignificant. Second 3-L bag was consumed in 15 min with a balance of -800 to -900 ml. However, the calculation was not certain due to soaked floor, drapes and gowns. The patient

was hemodynamically stable with HR: 75 bpm and BP: 95/54 mmHg. Furosemide 10 mg was given IV and IV fluid was restricted and the procedure continued. It was noted that time that the airway was partially obstructed. Therefore, a nasopharyngeal airway was inserted and IV sedation was lightened. A 2-L glycine bag was employed instead of 3-L bag and after 18 min it was consumed leaving a confirmed balance of more than one liter loss (-1000 to -1200 ml). The procedure was terminated, IV fluids were stopped and sedation was terminated. A urinary catheter and a uterine catheter were inserted. Total IV fluids given at that moment were 1 l (the second bag was lactated ringer's solution). An arterial sample was taken for arterial blood gases (ABG) and electrolytes analysis. The results came with metabolic acidosis, respiratory acidosis, hyponatremia (Na: 119.8 mmol/l) and hypocalcemia (ionized Ca: 1.00 mmol/l) (Table 1, ABG1). Another 30 mg of furosemide was given IV and an arterial line was inserted. The patient was kept in OR for the possibility of airway intervention or hemodynamic resuscitation. The patient was allowed to awaken gradually. Auscultation of the chest revealed no crackles. Neurologically she had no deficit although she remained confused for short period. The patient was hypothermic with core (tympanic) temperature of 35.5 °C. Active warming with forced-air warming system (Bair-Hugger, Arizant Healthcare Inc., MN, USA) at 43 °C started. Hypothermia was attributed to poor control of room temperature, weak warming of the patient depending on pre-warmed cotton blankets and the use of large volume (8 l) of distending media in room temperature.

Afterward, an ABG and electrolytes sample was sent every hour. Results of the 2nd sample came with Na of 128 mmol/l and ionized Ca of 0.898 mmol/l (Table 1, ABG2). Temperature increased to 36.1 °C with hemodynamic stability; therefore, the patient was shifted to post-anesthesia care unit (PACU) where active warming continued. The patient developed nausea that was treated with ondansetron 4 mg IV. Hypocalcemia was treated with 1 g of calcium chloride slowly infused over 30 min.

Results of 3rd ABG and electrolytes sample came with Na of 134.0 mmol/l (Table 1, ABG3). With urine volume of about 3000 ml, IV fluids (Normal saline) were restarted in a rate of 110 ml/h. The 4th ABG revealed hypokalemia (K: 2.8 mmol/l) and was treated with 20 meq of KCl infused over 30 min

(Table 1, ABG4). Patient complained of pain that was treated with 1 g of paracetamol IV. After the 5th ABG, patient was considered stable to be shifted to the ward after removal of arterial line (Table 1, ABG4). A venous blood sample was sent to the laboratory and results are listed in Table 1 (Post-op). The following morning, the patient was visited, reassessed and discharged home.

3. Discussion

Many factors were included for the fluid overload to occur in the current case. Intrauterine pressure was allowed to rise to the maximum that the pressure-controlled suction/irrigation pump can get (200 mmHg). The employment of an intrauterine pressure that is not exceeding mean arterial blood pressure seems to be a more safe practice [1]. Literatures investigating the total volume of distending media could be used during hysteroscopy are deficient. Limiting absorbed volume of distending media to 1000 ml is questionable. This was based upon expectation of fall of serum sodium by 10 mmol/l for absorption of 1000 ml of distending media [2]. Assuming normal serum sodium level in the current patient, serum sodium may fall to greater extent (i.e. > 10 mmol/l) with absorption of 1000 ml distending media. Serum sodium fell rapidly to 119 mmol/l with absorption of 1000–1200 ml in the current patient. This raises the possibility that greater level of hyponatremia could be resulted by a limited volume of intravascular absorption.

The use of 3-L glycine bags and waiting for its full consumption for performing input/output balance delayed reaching a confirmed diagnosis of intravascular absorption. Moreover, studies proved that 3-L bags may be filled with a volume exceeding 3 l by about 2.8–6% [3,4]. In the current patient, absorption of 1000–1200 ml needed only 20 min to be commenced which went parallel to the start of resection of the uterine fibroid and disruption of venous sinuses. An alternative protocol is to use 2-L bags and temporarily hold the procedure to calculate the balance every 10 min [5]. To decrease intravascular absorption, vasopressin may be injected intracervically which was not the case in the current patient [6].

Consequences of absorption of 1.5% glycine were metabolic acidosis, hyponatremia and hypocalcemia. Metabolic acidosis was mainly due to dilutional effects on serum bicarbonates [7]. Another possible explanation is that acute volume expansion stimulates sodium diuresis and decreases reabsorption of solute in the proximal tubules resulting in increased renal bicarbonates wasting [8]. Hyponatremia results from absorption of the hypotonic, electrolytes-free solution. Glycine is metabolized in the liver to ammonia and free water increasing reduction in serum osmolality [1]. Hyponatremia in the current case fortunately was corrected rapidly and without using hypertonic fluids. Cessation of IV fluid and administration of IV furosemide were enough for treating the current case. Additionally, hypoosmolality stimulates osmoreceptors in the hypothalamus which inhibits the release of vasopressin from the posterior hypothalamus and leads to diuresis [9]. This may explain the potentially rapid correction of serum sodium with formation of about 3000 ml urine two hours after termination of the procedure. Hypocalcemia was not recorded in many cases after hysteroscopy [10]. It could be explained in the present patient by the complexes that result from calcium

and oxalic acid which is a metabolic product of glycine [11]. Hypocalcemia may be dilutional as well [10]. The importance of hypocalcemia comes from the effect of calcium on vascular tone and myocardial functions.

Many factors helped early survival of the patient. Unintended limited preoperative hydration for more than 14 h was a contributing factor in protecting the patient from massive effects of volume overload like pulmonary edema and cerebral edema. Limitation of preoperative hydration is not supported by published evidences; however, it is a recommendation of some authors [1]. Early use of furosemide 10 mg that was escalated to 40 mg and cessation of IV fluid when the diagnosis was confirmed were crucial factors. Early and multiple ABG and electrolytes sampling was important in diagnosis and further management until full recovery of the patient.

Spinal anesthesia was employed in the current case. General anesthesia has the advantage of less probability of intravascular absorption [12]. In the current case we felt it advantageous that spinal anesthesia was employed as early assessment of mental status was easy. However, mechanical ventilation may still be an important choice if full picture of pulmonary or cerebral edema developed.

In the current patient, preoperative serum electrolytes were not obtained as they are not considered as routine preoperative laboratory investigations in patients below 40 years old in our institution. However, it seems essential to include serum electrolytes in patients known to have resection of uterine fibroid.

In conclusion, we report a case of metabolic acidosis, hyponatremia and hypocalcemia after intravascular absorption of 1.5% glycine during operative hysteroscopy under spinal anesthesia. Continuous and meticulous monitoring of input/output balance of distending media is the cornerstone in prevention of intravascular absorption. Early use of furosemide and cessation of IV fluid are important for early and effective management.

Conflicting interest

Nil.

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