Dilutional hyponatremia during intrauterine adhesion

Severe dilutional hyponatremia in a patient during hysteroscopic of intrauterineadhesion : A case report

YE Yuzhu, LIN Lina

AbstractHysteroscopy is a minimally invasive procedure for the patients of intrauterin adhesion, but may result in potentially disastrous complication labeled transurethral resection of the prostate (TURP) syndrome. Excessive absorption of large scale of distension media under high inflow pressure by openings of venous channels in endometrium, the large volume of transfusion fluid that is beyond the modulation ability of body may produce the most dangerous situation of severe hyponatremia, hypervolemia and hypoosmolality. The consequence of hysteroscopy is mainly determined by the type of distension medium, irrigation pressure, condition of endometrium, preoperative catheterization, type of electrode system and duration of the surgery. A case of hysteroscopic resection of intrauterine adhesion in which severely symptomatic hyponatremia and hypervolemia happended with epidural anesthesia is presented.

Key words: Hysteroscopy, hyponatremia, distension medium, infusion pressure, TURP (transurethral resection of the prostate) syndrome.

1. Introduction

Hysteroscopy technique in the detection and treatment of intrauterine diseases plays an dominant role because of its unique feature of minimal invasion and remains the “ gold standard” mean for the diagnosis of uterine disease, but may result in potentially disastrous complication known as TURP syndrome or hyponatremia and hypervolemia. A hysteroscopy precdure requires an intrauterin installation inserting into the uterine cavity accompanied by a suitable type of distention medium including dextrose 5% in water (D5W), 2. 7% sorbitol, 0. 54% mannitol and saline for the visualization of intrauterine situation. The most common fluid used clinically is D5W for its distinct features of low-viscosity, electrolyte-free, safety and lower cost. TURP syndrome appears when large scale of distension media (D5W) is overly absorbed including the following clinical signs: dyspnea, headache, nausea and vomiting, coma, and even can progress to cerebaral and pulmonary edema. Signs and syndromes are nonspecific when the conditon is in its early stages and, as a result, it’s easy to be ignored. Vigilance and communication of the whole medical team is extremely required to avoid state of illness aggravating. Early management must be rendered as soon as possible for the critically ill patients by anesthetists. We report a case of a 36-year-old woman who developed TURP syndrome during hysteroscopic of intrauterine adhesion herein.

2. Case Report

A 36-year-old, weight 62 kg , no medication or coexisting diseases, ASA physical status II , underwent hysteroscopy treatment because of her reiterative intrauterin adhesion during epidural anesthesia. Past surgical history revealed four times of previous hysteroscopies within the year, both of which were aimed to remedy for her secondary infertility but failed in acquiring satisfactory therapeutic efficacy. There were no positive fingds on the preoperative physical examination and normal values in laborarory results included blood routine test and plasmic electrolytes, and the concerntrations of sodium ion, potassium ion and blood glucose level were 139 mmol/L, 3. 47 mmol/L and 4. 0 mmol/L, respectively. A 12-lead electrocardiogram showed sinus rhythm.

Upon arrival to surgical operating room, 500 ml lactated Ringer's solution was dripped intravenously as maintenance fluid after standard monitors were placed. The heart rate was 76 beats per minute, respiratory rate was 18 breathes per minute and the oxygen saturation was 99%. Contiuous epidural anesthesia was performed successfully with 0. 5% lidocaine and 0. 375% ropivacaine 15ml totally within 15 minutes. Then the patient was placed in lithotomy position and no catheterization was offered because of the short operation period we had anticipated preoperatively although she expressed her micturition desire. The surgery initially proceeded unevenfully with very steady state of hemodynamics. 8, 000 mL D5W as the irrigation fluid was delivered throught the hysteroscope by gravity pressure (60cm above the patient), and the irrigation pressure for uterine cavity distending was 150 mmHg. Monopolar electrode system was selected for endometrium resection, and controled the watts of electroresection and electrocoagulation within 40 – 60 watts and 60 – 80 watts, respectively. Simultaneous ultrasonographic monitoring was used to identify the sickness of uterus wall and uterine cavity size. A total of 1, 000 mL of lactated Ringer's solution was infused during the 70 minutes of surgery, with a total blood loss of 20 mL. Twenty minutes before the termination of surgery , the patient complainted of difficulty in breathing with simultaneous polypnea, shiver, and sensations of vertigo and nausea. Oxygen saturation dropped from 98% to 90% and recoverd soon after mask oxygen inhalation. Thereupon tramadol 50 mg was administered intravenously, and excellent effect obtained. Approximately 300 mL output of urine when the bladder was squeezed incautiously by ultrasound probe and the patient vomited once just the procedure completed. The patient appeared haziness of spirit-mind but responded appropriately to verbal stimulate. A dorsalis pedis artery blood sample was obtained from the patient, and electrolytes were reported using a blood-gas analyzing device. Results as follows: PH 7. 31; Na^+, 115 mmol/L; K^+, 3. 0mmol/L; ionized Ca^{2+}, 0. 93 mmol/L; Glucose, 27. 8 mmol/L; HCO_3^-, 18. 6 mmol/L. Based on the symptoms mentioned above, TURP syndrome was suspected. An indwelling urinary catheter was inserted immediately and 1, 800 mL urine output was collected totlly at twice. A mixture of 50ml 10% saline and 100ml 0. 9% saline was dripped to raise sodium concentration, meanwhile metoclopramide 10 mg was used for anti-nausea. But there were no diuretic and insulin used in case of aggravating of hypokalemia. Oxygen saturation maintained in 92% after oxygen mask was removed and with a progressive rise. Vital signs on permission to PACU were as follows: blood pressure, 126/79 mmHg; heart rate, 79 beats per minute; breathing rate, 20 breaths per minute; and oxygen saturation, 96%. The patient was transported to postanesthesia care unit (PACU) for continued treatments and review of blood gas analysis. On our arrival into PACU, arterial blood gas (ABG) analysis was performed when the venous transfusion of the hypertonic saline solution ended, revealing PH 7. 36; Na^+, 127 mmol/L; K^+, 3. 0mmol/L; ionized Ca^{2+}, 1. 0 mmol/L; glucose, 22. 9 mmol/L; HCO_3^-, 21. 5 mmol/L; BE, -3. 6 mmol/L. The patient still had low sodium and potassium level from ABG, a mixture of 100ml 10% saline and 100ml 0. 9% saline containing potassium chloride 0. 5 g was supplemented in low-speed intravenously. Nurse anesthetist was asked to record vital signs every 15 minutes. 16: 15~18: 05, the patient got her vital signs stablized gradually and oxygen staturation could maintain over 95%. Review of her blood gas analysis showed: PH 7. 36; Na^+, 137 mmol/L; K^+, 3. 4mmol/L; ionized Ca^{2+}, 1. 0 mmol/L; glucose, 7. 2 mmol/L; HCO_3^-, 23. 2 mmol/L; BE, -3. 6 mmol/L. The patient recieved 500 ml lactated Ringer’s solution totally in PACU, with a total urine output of 850 mL(data from PACU anesthetic chart), and sent back to the ordinary ward without any complaints and Alderete scores 10.

2. Discussion

Hysteroscopy has gained widely used in diagnostic and therapeutic in gynecologic surgery for many special advantages, but is not devoid of risks especially when hysteroscopy is applied to resection of extensively endometrial lesion. Excessive absorption of irrigation fluid during hysteroscopic surgery from uterine cavity is the main cause of TURP syndrome or water intoxication, of which reported incidence is 0. 2% [1]. The TURP syndrome mainly has clinical symptoms in cardiovascular system, respiratory system and nervous system including elevation of blood pressure, bradycardia, dyspnea, pulmonary edema, cerebral hemia and even death. The severity of consequence is associated with multiple factors, analysis of this case were as follows. The patient’s uterine cavity has low compliance and severe adhesion, so an intrauterine pressure (IUP) of 150 mmHg is required to obtain excellent visual conditions of bilateral tubal orifices. 8, 000 mL D5W as the irrigation fluid is delivered into uterine for uterine distension in 70 minutes operation time. Based on clinical research, the absorptivity of distension media by body is within the range of 10 – 30 ml/min only when the irrigation pressure is less than 100 mmHg [2]. Therefore, we estimated 700 – 2, 100 mL D5W is absorbed into circulatory system approximately, along with an infusion of 1, 000 mL lactated Ringer's solution. As a result, 1, 700 – 3, 100 mL is administered into blood intravenously at least, and even more. Hyperglycemia caused by excessive absorption of D5W produces hyperglycemic hyperosmolar status and then makes intracellular fluid transfers to outside the cell, which bings about exacerbating of hyponatremia status. The patient received high frequency hysteroscopy procedure in the short term leads to large-scale and severe damage of endometrium, allowing the distension fluid entering into blood circulation more easily, which contributes to hypervolemia in a more faster pace. As one of essential factors, excessive irrigation pressure plays a crucial role in distension fuild over absorption in the condition that endometrial venous sinus are widely open in hysteroscopic electric resection. In our case, we have to raise the pressure to 150 mmHg for a clear surgical vision of uterine cavity, therefore, rendering excellent chance for fluid entering into body. No catheterization was performed preoperatively, thus a large amount of fluid accumulates in bladder and circulation system. To sum up, in this case, fluid overload, hyperglycemic hyperosmolar status, high intrauterine pressure, disruption of endometrial vessles and lack of preoperative catheterization lead to a significant increasement of circulating volume and a sharply reduce of plasma colloid osmotic pressure. Extracellular free water in brain are transported from the outside to the inside of the cell, which results in cerebral edema and causes intracranial hypertension. A serious of neurological syndromes develop including dizziness, headache, nausea, vomiting, and haziness of spirit-mind. Likewise, as a consequence of irrigation fluid overload and dilution of the plasma protein concentration, pulmonary hydrostatic pressure elevated, leading to the accurrence of acute pulmonary edema and pulmonary interstitial edema. The ventilation/perfusion imbalance occurs, and then manifests in dyspnea, hypoxemia and a sustained downward trend of oxygen saturation, etc.

Timely recognition and urgent corresponding treatment measures should be taken in the early course of water intoxication to prevent the condition deteriorated. In a general way, for every liter of hypotonic fluid absorbed, the serum sodium concentration will decrease by 10 mmol/L(10 mEq/L) [3]. The result of ABG analysis of the patient’s dorsalis pedis artery blood sample indicates severe hyponatremia ($Na^+ < 120$ mmol/L) occurrs. In addition to the routine monitoring of vital signs and oxygen inhalation therapy, specific treatment with hypertonic saline is necessary for sever symptomatic hyponatremia. Infusion of hypertonic saline is an effective treatment for correction of hyponatremia and also plays the role of plasma expander. In this report, 4% saline, a blend of 50 ml 10% saline and 100 ml 0. 9% saline, are injected at a very slow rate of 3 - 4 ml/ (kg*h), making that the elevation of sodium concentration is with 1 - 2 mmol/L per hour properly [4]. The primary target should be to correct the high sodium level to mildly hyponatraemic level rather than binging it down to normal sodium concentrations. The Adrogué-Madias formule is applied to calculate increase in sodium concentration after hypertonic saline therapy. Sodium deficit formula is as follow: (desired change in sodium) × TBW, among which TBW (total body water) is 0. 6 × body weight in kg in men and 0. 5 × body weight in kg in women. æ²» ç--æ°´ä¸æ¯’æ-¶è¡¥é’ é€Ÿåº¦ä¸🏎å®œè¿‡å¿« ï¼Œé🚹¿å…🏎è¡€ç®¡åˆºæ¿€å’Œæ¸-é€📈æ€§è„±é«“ éž˜ç»¼å🛢ˆå¾🚹çš„ å📈‘ ç” ŸMore vigorous correction risks precipitation of osmotic demyelination syndrome.

ï¼Œè¯¥ç»¼å🛢ˆå¾🚹

å¤„ ç🛢†ä¸🏎å½“ å📈¯é🚹-ç•™æ°¸ä¹…æ€§ç¥žç»📈ç³» ç» Ÿå¹¶å📈‘ ç-‡(éƒ-æ🗎ƒï¼¶ï½Œï½🚹ï½ˆï½📈ï½“ ã€€ï¼®ï¼¦ï¼Žï¼¨ï½™ï½“ ï½” ï½…ï½’ï½📈ï½“ ï½ƒï½📈ï½🛢ï½‰ï½ƒã€€ï½’ï½…ï½“ ï½…ï½ƒï½” ï½‰ï½📈ï½Žã€€ï½📈ï½†ã€€ï½🚹 ã€€ï½Œï½🚹ï½’ï½‡ï½…ã€€ï½“ ï½•ï½, ï½🏎ï½•ï½ƒï½📈ï½“ ï½🚹ï½Œ

ï½†ï½‰ï½, ï½’ï½📈ï½‰ï½„ ã€€ï½•ï½“ ï½‰ï½Žï½‡ã€€ï½‰ï½Žï½” ï½… ï½’ï½🏎ï½‰ï½” ï½” ï½…ï½Žï½” ã€€ï½, ï½‰ï½🏎ï½🚹ï½Žï½•ï½🚹ï½Œã€€ï½•ï½” ï½…ï½’ï½‰ï½Žï½…ã€€ï½🏎ï½🚹ï½“ ï½“ ï½🚹ï½‡ï½…ã€€ï½🚹ï½Žï½„ ã€€ï½🚹 ã€€ï½, ï½‰ï½🛢ï½📈ï½Œï½🚹ï½’

ï½’ï½…ï½“ ï½…ï½ƒï½” ï½📈ï½“ ï½ƒï½📈ï½🛢ï½…ï¼šï½🚹 ã€€ï½ƒï½🚹ï½“ ï½… ã€€ï½’ï½…ï½🛢ï½📈ï½’ï½” ï¼» ï¼ªï¼½ï¼Žï¼ªã€€ï¼²ï½…ï½🛢ï½’ï½📈ï½„ ã€€ï¼ï½…ï½„ ï¼Œï¼’ï¼🛢ï¼🛢ï¼•ï¼Œï¼•ï¼🛢ï¼ˆï¼-ï¼‰ï¼šï¼•ï¼“ ï¼” ï¼🏎ï¼•ï¼” ï¼-ï¼Ž(é«˜å®¹é‡📈æ€§ä½Žé’ è¡€ç-‡å📈ˆç§°æ°´ä¸æ¯’) (æ-£å¸¸è¡€æµ†æ¸-é€📈åŽ‹ 280-320 mmol/L) (limiting correction to <12 mEq/L per d and <18 mEq/L per 48 h

)ã€, æº¶æ¶²ä¸é’ ç¦» å🛢æµ“ åº¦ä¸🏎å📈¯è¿‡é«˜ï¼Œä¸€èˆ¬é€‰æ‹©3%ï½ž5%çš„ é«˜æ¸-æ°¯åŒ–é’ æº¶æ¶²å📈Šæ-¶ã€🚹é€, åº¦è¡¥å……ã€

, é€‰æ‹©åˆ©å°¿å‰‚, æ-¶åº” æ³¨æ„ç-…äººé’¾ç¦» åæ° ´å¹³ï¼Œä½Žé’¾è¡€ç-‡çš„ ç-…äººéœ€æ…Žç”¨åˆ©å°¿è¯ï¼Œé˜²æ-¢ä½Žé’¾è¡€ç-‡åŠ é‡ï¼Œé€ æˆæ›´å¤šå¹¶å‘ ç-‡ï¼Œå¾-ä¸å¿å¤±ã€, åˆ©å°¿å‰‚, ä¸€èˆ¬é€‰æ‹©æ¸-é€æ€§åˆ©å°¿å‰‚, å'Œè¢¢åˆ©å°¿å‰‚, ï¼Œå¦, 20%ç”˜éœ²é†‡ã€é€Ÿå°¿ã€

, è‹¥æ•ˆæžœä¸å¥½ï¼Œå¯é‡‡ç”¨è¡€æ¶²æ»¤è¿‡æˆ-è…¹è†œé€æžã€, æ‚£è€…æœ¯ä¸å‡ºçŽ°ä¸€è¿‡æ€§é«˜è¡€ç³-è¾¾27. 8 mmol/Lï¼Œä¸ ´åºŠè¯•éªŒè¯æ˜Žè¡€ç³-ä¸€è¿‡æ€§åé«˜ï¼œ20 mmol/L, ä¸ä¼šå‡ºçŽ°æ˜Žæ˜¾çš„ ç-…ç" Ÿç†æ"¹å˜ï¼Œè¡€ç³- åœ¨æœ¯åŽ4å°æ-¶åŽä¼šæ¢å¤è‡³æ£å¸¸æ°´å¹³ï¼Œæ•…æœ¯ä¸- å¯¹äºŽè¡€ç³-çš„ æ£€æµ‹æ˜¯æœ€é‡è¦çš„ é¢„ é˜²æ-¹æ³•ï¼Œä¸ ´åºŠä¸Šå¯æ ¹æ®è¡€é'¾å'Œè¡€ç³-æµ" å®¦ç»¼åˆè€ƒè™' æ˜¯å¦ç»™äºˆèƒ°å²›ç´ æ²» ç–ã€, ï¼ˆå†™ç" µæž é-®é¢˜ ï¼‰

è¡Œå®« è…" é•œç-…äººåº" æ³¨æ„ï¼šï¼ˆ1ï¼‰è‹¥æ- æ¤Žç®¡å†…é˜» æ» žçš„ ç¦ å¿Œç-‡ï¼Œé¦-é€‰ç¡¬è†œå¤-é˜»

æ» žï¼Œä¼˜ç‚¹åœ¨äºŽç-…äººä¿æŒ æ¸…é†'çŠ¶æ€ ï¼Œæ°´ä¸- æ¯'çš„ ç-‡çŠ¶èƒ½é€šè¿‡è¯¢é-®æ-©å' çŽ°ã€, ä½†åœ¨

å…¨éº» æ‰‹æœ¯ä¸æ‰€æœ‰å˜åŒ-çŽ°å‡ä¼šè¢« ç›' æŠ¤ä» ªçš„ æ-£å¸¸ä½" å¾ æ‰€è¦†ç›-è€Œæ- æ³•äº†è§£ç-…äºº

å†…çŽ¯å¢ƒæ"¹å˜ã€, ï¼ˆ2ï¼‰æ‰‹æœ¯å‰å¯å šé¢ „ é˜²æ€§ä½¿ç"¨æ"¶ç¼©å å®« å†…è†œè¡€ç®¡çš„ è¯¯ç‰©å‡å°' æœ¯ ä¸è¡€ç®¡å¼€æ"¾å'Œå‡ºè¡€ [5] , å» ºè®®æœ¯å‰ç•™ç½®å¯¼å°¿ã€, æ ‰‹æœ¯ç" µå‡è¿‡ç¨‹åº" æŽ§åˆ¶è†¨å®« åŽ‹åŠ›ä¸º

80~100mmHg 6] ï¼Œå°½é‡æŽ§åˆ¶è†¨å®« æ¶²ä½“ é‡ã€ç¼©çŸæ‰‹æœ¯æ—¶é—´60minä¹‹å†…ï¼ˆå¼•ç”¨anaethestic considertionï¼‰ï¼ˆæŽ§åˆ¶åœ¨90minå†…ï¼šéƒæƒï¼‰ï¼Œ

é˜²æ¢æ¶²ä½“ å¤§é‡å¿« é€Ÿè¿›å…¥è¡€ç®¡ç€é‡Šä½“ æ¶²ã€ï¼ˆ3ï¼‰å¯†åˆ‡è§‚å¯Ÿè†¨å®« æ¶²å…¥å‡ºé‡å·®ï¼Œç”µ è§£è´¨è†¨å®®æ¶²å·®ï¼ž1. 5Læˆ-éžç”µè§£è´¨å½å®®æ¶²å·®ï¼ž1. 0Lï¼Œåº”æš‚åœæ‰‹æœ¯(Issacson

æŠ¥é“ ï¼Œæ¯å¸æ”¶ 1000 mléžç”µè§£è´¨è†¨å®« ä»‹è´¨ï¼Œè¡€é’ çº¦ä¸‹é™10 mmol/Lï¼Œå»ºè®®å¸æ”¶é‡è¾¾1000ï½ž2000 ml æ—¶å³åº”åœæ¢æ‰‹æœ¯: Issacson KBï¼Ž Complications of hysteroscopyï¼» Jï¼½ï¼Ž Obstet Gynecol Clin North Amï¼Œ1999ï¼Œ26(1): 39ï¼51ï¼Ž

)ï¼Œæ£€æµ‹è¡€æ¸…é’

ç¦» åæµ“ åº¦ï¼Œæ£€æµ‹ç”Ÿå‘½ä½“ å¾ã€è¡€æ°§é¥±å’Œåº¦å’Œå°¿é‡ã€ï¼ˆ4ï¼‰éšæ—¶ç›‘ æµ‹è¡€ç”µè§£è´¨çš„

å˜åŒ-ï¼Œåšåˆ°æ-©æœŸå‘ çŽ°ä½Žé’ è¡€ç-‡ï¼Œæ-©å¤„ ç†æ-©æ²»ç–ï¼Œé˜²æ¢ç-…æƒ…æ¶åŒ-ã€ï¼ˆ5ï¼‰æœ¯å Ž

å¿…é¡» ç§¯æžè·Ÿè¸ªç-…äººçš„ ä½“ å¾ å˜åŒ-ã€

æ°´ä¸æ¯’åœ¨å¤-ç§‘ æ‰‹æœ¯ä¸ï¼Œå°¤å…¶è…” é•œæ‰‹æœ¯ï¼ŒåŒ…æ‹¬å®« è…” é•œã€TURPç‰ï¼Œè‹¥ä¸

äºˆä»¥é«˜åº¦é‡🏎è§†ï¼Œå°†å¸¦æ🗎¥ä¸¥é‡🏎çš„ å🛢Žæžœï¼Œæ‰€ä»¥åœ¨ä¸´åºŠä¸Šä¸€æ–¦å🗠‘ çŽ°æ°´ä¸æ¯’å¿…é¡» å🗠Š

æ–¶å¤„ ç🛢†ï¼Œé˜²æ¢æ🚹¶åŒ–è€Œå🏎±å🗠Šç–…äººç”Ÿå‘½ã€‚

Reference

[1] Jansen FW, Verdevoogd CB, Ulzen KV, et al. Complications of hysteroscopy: aprospective multicenter study [J], Obstet Gynecol, 2000, 96 (2): 266 – 270.

[2] Rhymer JS, Bell TS, Perry KC, et al. Hyponatremia following transurethral resection of the postate [J]. Br Jurol, 1985, 57(4): 450ï¼🏎452.

[3] Prost AM, Liberman RF, Harlow BL, Ginsburg ES. Complication of hysteroscopic surgery: predincting patients at risk. Obster Gynccol. 2000; 96: 517-520

[4] Cooper JM & Brady RM. Intraoperative and early post-operative complications of operative hysteroscopy. Obstetric and Gynecology Clinics of North America 2000; 27: 347-365

[5]Romer T. Benefit of GnRH analogene treatment for hysteroscopic

surgery in patients with bleeding disorders [J]. Gynecol. Obstet Invest, 2003, 50: 112-120.

[6]Murdoch JA. Tong JG. Anesthesia for hysteroscopy. Anesthesiol Clin North Am. 2001; 19: 125-140

[J]. ä¸å›½å¾®åˆ›å¤-ç§‘ æ🗎, å¿-, 2009, 9(12): 1097-109

è„±é«“ éž˜ï¼šWitz CA, Silverberg KM, Burns WN, Schenken RS, Olive DL. Complications associated with the absorption of hysteroscopic fluid media. Fertil Steril 1993; 60: 745-56.