Pulmonary Edema Due to Fluid Overload During Operative Hysteroscopy: Case Report

Operatif Histeroskopi Sırasında Volüm Yüklenmesine Bağlı Pulmoner Ödem

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ÖZET Şiddetli hiponatremi ve sıvı yüklenmesi operatif histeroskopinin nadir fakat önemli komplikasyonudur. Submukoz myomun histeroskopik rezeksiyonu için alınan 45 yaşında, 68 kg ağırlığında kadın hasta sunulmaktadır. Genel anestezi altında histeroskopik rezeksiyonun yaklaşık 60. dakikasında SpO_2 %90 değerine düştü. Oskültasyonda ral saptanması üzerine endotrakeal tüp içinden aşırı sekresyon aspire edildi. Hastada şiddetli hiponatremi (109 mEq/L) ve düşük osmoliteye (221 mosm/kg) neden olan ciddi absorbsiyon sendromu gelişmesi nedeni ile girişim sonlandırıldı ve 40 mg iv furosemid uygulandı. Hasta iki saat süre ile postoperatif bakım ünitesinde izlendi. Postoperatif fiziksel ve mental durum normaldi. Hasta ertesi gün herhangi bir komplikasyon olmaksızın hastaneden taburcu edildi.

Anahtar Kelimeler: Histeroskopi; sıvı-elektrolit dengesizliği; pulmoner ödem

ABSTRACT Severe hyponatremia and fluid overload are rare but important complications of operative hysterescopy. A 45 year-old, 68 kg female patient is presented who was admitted for hysteroscopic resection of submucous myoma uteri. Approximately 60 minutes after hysteroscopic resection under general anesthesia, the value of SpO_2 declined about 90%. Because of rales on auscultation, the bronchi was aspirated through the endotracheal tube and excessive secretions were sucked out. She suffered from severe absorption syndrome leading to severe hyponatremia of 109 mEq/L and low osmolality of 221 mosm/kg necessitating discontinuation of the operative procedure. The patient was monitored in the Post Anaesthetic Care Unit for two hours. Postoperatively, physical and mental status was normal. The patient was discharged from the hospital in the following day without any complications.

Key Words: Hysteroscopy; water-electrolyte imbalance; pulmonary edema

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Complications due to hysteroscopy are rare and occur more frequently with operative hysteroscopy (OH) than with diagnostic hysteroscopy. Among hysteroscopic procedures, myomectomies and resection of uterine septa have significantly higher rates of complications, especially excessive fluid absorption. Meticulous fluid management might limit the number of serious complications of these higher-risk procedures. The more clinically significant complications are uterine perforation, haemorrhage, pulmonary edema, congestive heart failure, fluid overload and electrolyte imbalance.[1-5]

We report a patient who developed pulmonary edema and severe hyponatremia complicated with fluid overload during OH. Diagnosis and management of fluid overload during operative endoscopic procedures is discussed in this case report.

CASE REPORT

A 45 year-old, 68 kg female patient was admitted for hysteroscopic resection of submucous myoma uteri. Patient's physical examination and preoperative routine laboratory data were unremarkable. Following admission to the operating room, standart monitoring including electrocardiography (ECG), noninvasive blood pressure, peripheral oxygen saturation (SpO_2) was performed. Arterial blood pressure was 110/80 mmHg, heart rate was 80 bpm, oxygen saturation was 99%. Anesthesia was induced with thiopental 400 mg iv and fentanyl 0.1 mg iv. succinylcholine 100 mg iv was injected to facilitate tracheal intubation, and anesthesia was then maintained with 70% nitrous oxide and 5% desflurane in oxygen. For intraoperative fluid replacement, 0.9% NaCl solution was infused at approximately 200 mL/h. After induction of general anaesthesia, hysteroscope was connected to irrigation solution which contained 5% Mannitol solution (Rezosel 5% mannitol OSEL, bioflex, İstanbul, TURKEY). Irrigation solution was infused into the uterine cavity under a hydrostatic pressure of 150-180 mmHg with the help of hysteromat (Hamau Endomat, Karl Storz, Tuttlingen, Germany) and the height of the irrigation solution was 100cm. Approximately 60 minutes after hysteroscopic resection, the value of SpO_2 declined about 90%. Because of rales on auscultation, the bronchi was aspirated through the endotracheal tube and excessive secretion was sucked out. Total amount of irrigation solution was 9000 mL and pulmonary edema complicated with fluid overload was thought.

Immediately, electrolyte status was evaluated. Serum Na^+ concentration; serum osmolality; PaO_2; $PaCO_2$ were 109 mEq/L; 221 mosm/kg; 96.2 mmHg; 37 mmHg consecutively. Because of acute hyponatremia, hysteroscopic procedure was discontinued rapidly and 40 mg furosemide was injected iv. Urinary output increased to 600 mL. Repeated blood gassess at the 10^{th} min of desaturation; serum Na^+ concentration; serum osmolality; PaO_2 and $PaCO_2$ were 120 mEq/L; 245 mosm/kg; 63.6 mmHg and 41.4 mmHg consecutively. The evaluation of blood gasses at the 20^{th} min of desaturation; PaO_2; $PaCO_2$; serum Na^+ concentration and serum osmolality were 76.8 mmHg; 38.2 mmHg; 135 mEq/L; 270 mosm/kg consecutively. Urinary output increased to 1300 ml at that time. Because of the correction of patient's electrolyte imbalance and oxygenation, the patient was extubated and observed in the Post Anaesthetic Care Unit for two hours. Postoperatively, physical and mental status was normal. In the postoperative first hour, electrolyte status was reevaluated. Serum Na^+ concentration; serum osmolality; PaO_2; $PaCO_2$ were 143 mEq/L; 285 mosm/kg; 150.1 mmHg; 34.5 mmHg consecutively (Table 1). The patient was transferred to the hospital ward in the postoperative third hour due to stable vital signs and normal electrolyte levels. The patient was discharged from the hospital in the following day without any complications.

TABLE 1: Hemodynamics and serum electrolyte status.

	PaO2 (mmHg)	PaCO2 (mmHg)	SpO2 (%)	Osmolality (mosm/L)	Na+ (mEq/L)
60. min	96.2	37	90	221	109
70.min	63.6	41.4	90	245	120
80.min	76.8	38.2	95	270	135
PACU	150.4	34.5	98	285	143

DISCUSSION

Use of the hysteroscope in modern gynaecological practice continues to develop as a diagnostic and management tool for intrauterine disease. Operative hysteroscopy is now an accepted alternative to hysterectomy for women with menorrhagia. The advantages of OH are associated with its short operating time, rapid post-operative recovery and low morbidity. However, there are

concerns about the potential serious complications which can occur during and following OH, and it is important that both surgeons and anaesthetists are aware of these complications.[1,3,6]

Dilutional hyponatremia and excessive intravascular volume are well known complications associated with transurethral resection of prostate (TURP), and they occur because of absorption of irrigation fluid through the open venous sinuses during surgical resection of the prostate. However, the techniques used in TURP are not entirely comparable to hysteroscopic surgery as the uterus has a very thick wall, which requires higher distension pressures. The instilled solutions are reabsorbed through the peritoneum and open uterine venous channels producing a hyperhydration syndrome. The physiopathology includes cardiovascular overload and haemodilution, causing pulmonary, cerebral and tissue edema.The main complications of OH are fluid overload, hyponatremia, hypo-osmolality, haemorrhage, uterine perforation, and, rarely, gas or air embolism. Fluid overload with hyponatraemia and hypo-osmolality occurs in up to 6 % of cases and it can be fatal.[6,7] Therefore, all possible measures should be taken to prevent it or to detect it and treat it early.

Pratesi R and collageus[7] informed that the volumes of arterial oxygen saturation and end tidal carbon dioxide obtained on line were the first warning signals in their case report. In our case, suddenly decrease in SpO_2 was the first warning signal for pulmonary edema due to fluid overload.

During hysterescopic surgery, the hydrostatic pressure needed to distend the uterus is greater than that required for distention of the bladder. In addition, the prolonged resection time and extensive raw surface exposure during hysteroscopic procedures increase the likelihood of irrigating fluid absorbtion. Excessive intravasation can entail fluid overload, pulmonary edema, congestive heart failure and electrolyte imbalances.[6,8]

Bennett KL and colageus[4] inform that maintaining equilibrium between women's intrauterine pressure and mean arterial pressure decreases the risk of uterine distention fluid absorption into the vasculature and fluid overload complications. Perioperative nurses need to monitor women's mean arterial pressure before and during hysteroscopic procedures and maintain fluid infusion pump pressures at or below women's mean arterial pressure to decrease the potential for intravasation.

Witz CA and collageus[9] recommend that meticulous attention to intraoperative fluid balance is imperative. In addition, a multichannel hysteroscope is necessary to keep intrauterine pressure low and most complications may be avoided by closely monitoring fluid balance intraoperatively.

Huang HW and collageus[3] presented two cases of fluid overload with acute pulmonary edema and electrolyte imbalance from hysteroscopy with different distention media. They inform that the prerequisite for treatment of hysterescopic fluid overload is knowing the nature of the intravasation fluid and it should be promptly treated to prevent neurological sequelae. Almost all serious complications of OH can be avoided if proper precautions are taken and close communication is maintained between the gynecologic surgeon, the anesthesiologist and nursing staff.

Pasini A and collegous[1] evaluated 697 women who underwent operative hysteroscopy in their department. They informed that the most import complications were uterine perforation (1.7%), intraoperative hemorrhages (6.9%) and excessive hypotonic fluid absorptions (5%). Hyponatremia and hypokalemia(hypo-osmolarity result) were never serious.

We had observed two fluid overload cases with severe hyponatremia during hysteroscopy in the previous years.[10] However, the cases were more serious, the amount of irrigation solution used in these previous cases was much more than in this case. Also, the durations of surgery were longer than this case. Initially, we thought different reasons for desaturation in that cases and desaturation was compensated with increasing

inspirated oxygen concentration. But, this approach corrected desaturation for short duration and desaturation occured again. When we evaluated blood gasses because of desaturation after extubation, we observed fluid oveload and decreasing in PaO_2, hypoosmolality and hyponatremia. And that cases needed reintubation and transferring to intensive care unit and treatment hypertonic saline. Because of shorter duration of operation and less amount of irrigation solution used, this case was more moderate than our previous cases. In our previous experience, we diagnosed the fluid overload at the end of surgery and after extubation and patients required reintubation. In this case, fluid overload diagnosis was suspected immediately after desaturation occured. Blood gas analysis proved that there was fluid overload and decreasing of PO_2, dilutional hyponatremia, hypoosmolarity. Surgery was discontinued and furosemid was injected immediately.

Learning from our previous experience, we had saved from hospitalization time and occupation of intensive care unit. SpO_2 decrease may be an important finding of pulmonary edema due to fluid overload during the operative hysteroscopy. So close monitouring is very important for early diagnosis and treatment of serious complications that may be catastrophic.

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