



Delayed Subcutaneous Emphysema in an Acute Weight Loss Female following Robotic Surgery

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Robotic-assisted laparoscopy with the use of carbon dioxide (CO₂) for insufflation is rapidly adopted procedure for gynecological surgery. Insufflation of the abdomen with CO₂ can potentially cause complications such as hypercarbia, subcutaneous emphysema (SE), pneumothorax, and pneumomediastinum. The incidence of SE ranges from 0.43% to 77%. Numerous potential mechanisms were proposed for the development of these complications. Several authors speculated that the surgical time, surgical ports, age, and peritoneal insufflation pressures are related to the development of these complications. These potentially lethal complications must be diagnosed and managed promptly. We experienced a case who developed delayed massive SE extended to neck and face after robotic ovarian cystectomy, it perhaps due to weaker tissues bonding fascial planes because she was acute weight loss within 1 month.

Key words: Laparoscopy, subcutaneous emphysema, acute weight loss

INTRODUCTION

Robotic-assisted laparoscopic application of this gynecological surgery has been demonstrated to be a feasible minimally invasive alternative to the open abdominal technique insufflation with carbon dioxide (CO₂) of the abdomen for laparoscopic procedures and is considered to be relatively safe. However, it can potentially cause complications such as subcutaneous emphysema (SE), hypercapnia, pneumothorax, and pneumomediastinum.¹ SE, a well-known complication of laparoscopic surgery, results from leakage of CO₂ into the subcutaneous tissue.² If there was complication, it is mostly found after surgery immediately. To the best of our knowledge, its occurrence after robotic-assisted laparoscopic ovarian cystectomy has not been reported. We present the case of a patient who underwent Robotic ovarian cystectomy for endometrioma, complicated by delayed massive SE.

CASE REPORT

A 35-year-old female, height, 168 cm and weight, 56 kg body mass index (BMI) = 19.8 kg/m², who was classified as the

American Society of Anesthesiology Physical Status I due to being relatively robust without any systemic disease. She was diagnosed with endometrioma of the right ovary base on the results of the sonography and laboratory study that revealed elevated cancer antigen 125. She had acute weight loss from 70 to 56 kg in 2 months, and she was scheduled for robot-assisted laparoscopic ovarian cystectomy.

Anesthesia was induced using intravenous fentanyl (2 µg/kg) and 2% lidocaine (1.5 mg/kg). General anesthesia was maintained with target-controlled infusion propofol infusion and 1.0 L/min flow with 50% oxygen.³⁻¹¹ The mean blood pressure was kept between 80–100 mm Hg. The end-tidal CO₂ (Et CO₂) pressure was maintained at 35–45 mmHg. The CO₂ insufflation pressure, in this case, was 12 mmHg and maintained throughout. The operative time was 92 min. At the end of the procedure, propofol was discontinued, and the lungs were ventilated with 100% oxygen at a fresh gas flow of 6 L/min. When the patient regained consciousness by name with spontaneous and smooth respiration, the endotracheal tube was removed, and the patient was sent to the postoperative

Received: January 14, 2018; Revised: January 15, 2018;
Accepted: January 22, 2018

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How to cite this article: Nian-Cih H, Hou-Chuan L, Yu-Ting H, Zhi-Fu W. Delayed subcutaneous emphysema in an acute weight loss female following robotic surgery. J Med Sci 2018;38:188-91.

anesthetic care unit for further care. We did not find any SE on her body in the postoperative anesthetic care unit.

Four hours after surgery, the patient complained of crepitus sensation on the abdomen, and then, SE was diagnosed. In addition, 6 h later, her crepitus sensation progressed to the chest and associated with shortness of breath with a mild decrease in SpO₂ to 92% in room air, which was corrected by additional oxygen through nasal cannula.

In the next morning, the crepitus was also palpated and extended to her upper extremities, neck, and face. Her chest radiograph [Figure 1] showed SE over bilateral lower neck, chest wall, and abdominal wall. In addition, the right subphrenic lucency is noted as potentially due to postoperative residual intraperitoneal gas. Five days after surgery, she was discharged and her SE was resolved 2 weeks later without any clinical sequelae.

DISCUSSION

The incidence of SE associated with laparoscopy surgery ranges from 0.3% to 13.5%.^{12,13} However, delayed SE is a rare complication after laparoscopic procedure. The mechanism of SE is when gas or air spread through deep fascial planes to subcutaneous tissue from the port sites,¹⁴ through the peritoneo-pleural communication,¹⁴ diaphragmatic defects,¹⁵ or from the gastrointestinal tract following mucosal disruption.¹⁶ However, the mechanism of delayed SE was still unknown. Murray *et al.*¹⁷ reported that CO₂ can enter the weaker tissues and migrate along fascial planes into the subcutaneous. In addition, Lee *et al.*¹³ reported that the suture method during laparoscopic surgery could be another reason for the development of SE, which is most responsible

for emphysema due to likely leakage of the CO₂ that was infused into the abdominal cavity subcutaneous tissue. This procedure may cause loosening of the port site, possibly enabling intraabdominal CO₂ to leak into the subcutaneous tissue. Second, the large peritoneal surface tissue area exposed to CO₂ is associated with SE.¹⁸ Mekaru *et al.*¹⁹ reported a 40-year-old female and her BMI was 19.1 and developed a delayed pneumothorax and SE after laparoscopic ovarian cystectomy. Wolf *et al.*²⁰ found a relationship between low BMI and increase in CO₂ elimination, which suggested that weight might influence the development of SE. This explained a latent pocket of CO₂ in the large peritoneal cavity which following delayed absorption of CO₂.²¹ In our case, acute weight loss (BMI 19.8 kg/m²) within 1 month and skin sags were noticed in her whole body. Furthermore, robotic ovarian cystectomy as the sacrocolpopexy may increase insufflation complications including massive SE, possibly because of the extensive retroperitoneal dissection, operating time, and patient positioning.²¹ In addition, she was being placed in the semi-fowler's position may accelerate the gas from abdominal fascia to chest, neck, and face postoperatively. SE is usually self-limiting and resolve over several hours or sometimes after 3–4 days.²² Severe SE may cause severe hypercarbia in cases in which a large amount of CO₂ is infused into the circulation through the blood vessels distributed in the subcutaneous tissue. Further, SE may also develop in the prefascial planes, causing life-threatening complications such as pneumothorax, pneumomediastinum, and pneumopericardium.²³

Pneumothorax and pneumomediastinum present with a sudden onset of unilateral thoracic pain and dyspnea. Physical examination findings depend on the size of the pneumothorax; decreased breath sounds, hyperresonance to percussion on the affected side, desaturated, tachycardia, and/or decreased arterial blood pressure. A chest radiograph further supports the diagnosis. Pneumopericardium was asymptomatic and was diagnosed incidentally at radiography. Some patients reported abdominal pain as the initial symptom,²⁴ and some mimics acute myocardial ischemia, severe enough to cause electrocardiograph abnormalities.²⁵ Physical examination may show tachycardia, distended neck veins, and hypotension. Computed tomography can determine the pneumothorax, pneumomediastinum, and pneumopericardium if unclear by physical assessment.

Management of these life-threatening complications requires closely monitor of the patient's condition. Patent airway and sustain the patient at a normal pH value. Adequate hydration and sodium bicarbonate administration may be necessary for excessive acidosis. Moreover, tube thoracostomy may be necessary when the patient is hemodynamically unstable or has a compromised ventilatory status in pneumothorax.



Figure 1: A chest radiograph after the robot-assisted laparoscopic ovarian cystectomy showed pneumoperitoneum with extensive subcutaneous emphysema surrounding the abdominal and chest wall (left > right side), extending into the neck region

Delayed subcutaneous emphysema following robotic surgery

Pneumopericardium is relatively stable if it does not generate a tension effect on the heart, but if the tension pneumopericardium it requires immediate evacuation of the pericardial air.

The following are recommended to reduce the likelihood of SE: awareness of its potential; physician vigilance; attention to detail regarding abdominal entry; monitoring insufflator settings for pressure, and volume of gas with alarm settings; shorten the procedure; reduce the number of attempts to enter the abdomen; and monitor Et CO₂.²¹ Dramatic physical changes that occurred because of massive SE prompted remarkable patient concern and anxiety. Therefore, explanation and reassurance may be necessary for the patient postoperatively.

CONCLUSION

Among our case, low BMI, acute weight loss with skin sags, the sutured techniques, and semi-fowler's position were the confounding factors to delayed severe SE.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

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