


Delayed pneumothorax after laparoscopic sigmoid colectomy in a patient without underlying lung disease

SAGE Open Medical Case Reports
2: 2050313X14554940
© The Author(s) 2014
Reprints and permissions:
sagepub.co.uk/journalsPermissions.nav
DOI: 10.1177/2050313X14554940
sco.sagepub.com


Richie K Huynh¹ and Andrew S Ross^{1,2}

Abstract

We present an unusual case of a delayed pneumothorax occurring approximately 72 h post-operatively in a patient without any underlying lung disease who had undergone laparoscopic sigmoid colon resection. The patient was in her mid-40s with a body mass index of 28.0 and had no history of smoking. Her spontaneous pneumothorax manifested without any precipitating events or complications during recovery. There was no evidence of any infectious process. There were no central line attempts and all ports were placed intra-peritoneally, and there was no evidence of any subcutaneous emphysema. One possible mechanism of injury that we propose is barotrauma from an extended period of time in Trendelenburg position. Notably, the only abnormal finding throughout the entire post-operative period preceding the delayed pneumothorax was a PO₂ desaturation the day before. This case highlights the necessity to examine and investigate any desaturation post-operatively and deliberate its possible significance. Furthermore, it demonstrates that, even during a normal recovery period for a patient without any underlying lung disease or risk factors, spontaneous pneumothorax could still develop in a delayed fashion multiple days post-operatively from a laparoscopic procedure.

Keywords

Pneumothorax, sigmoid colectomy, laparoscopic, surgery

Date received: 19 May 2014; accepted: 10 September 2014

Background

Pneumothorax occurs either as a primary spontaneous pneumothorax (PSP) or as a secondary spontaneous pneumothorax (SSP). PSP precipitates without any preceding event in patients who have no known lung disease, while SSP manifests in the setting of an underlying lung disease. We present an unusual case of a delayed pneumothorax that occurred approximately 72 h post-operatively in a patient without any underlying lung disease who had undergone laparoscopic sigmoid colon resection.

In the majority of cases, PSP often results from a subpleural bleb rupture.¹ In the United States, PSP has an incidence of 7.4 per 100,000 in men as compared to only 1.2 per 100,000 in women.² Known risk factors include smoking, family history, Marfan syndrome, homocystinuria, and thoracic endometriosis. Several case reports have also shown PSP occurring in anorexia nervosa patients.^{3–5} Typically, PSP presents when the patient is at rest and occurs when patients are in their early 20s; PSP, in fact, is very rare after the age of 40 years.⁶ Factors associated with increased risk of

recurrence of PSP include the female gender, tall stature in men, low body weight, and failure to stop smoking.^{7,8} SSP, on the other hand, occurs in patients with underlying lung disease. The most commonly associated lung diseases include chronic obstructive pulmonary disease, cystic fibrosis, primary or metastatic lung malignancy, and necrotizing pneumonia (bacterial or fungal pneumonia, *Pneumocystis jirovecii* pneumonia, tuberculosis, etc.).^{9,10}

¹Division of Surgery, Integrated Medical Science Department, Charles E. Schmidt College of Medicine, Florida Atlantic University, Boca Raton, FL, USA

²Department of Colon and Rectal Surgery, Boca Raton Regional Hospital, Boca Raton, FL, USA

Corresponding Author:

Richie K Huynh, Division of Surgery, Integrated Medical Science Department, Charles E. Schmidt College of Medicine, Florida Atlantic University, 777 Glades Road, Building 71, Boca Raton, FL 33431, USA.
Email: rhuynh@fau.edu



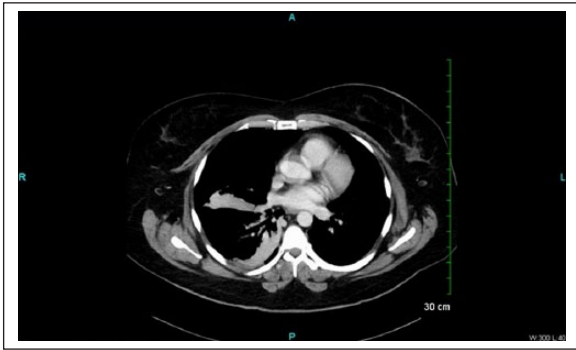


Figure 1. CT of the chest. There is atelectasis at the right lung base and a large pneumothorax, measuring up to 6.4 cm in AP diameter.

CT: computed tomography; AP: anteroposterior.

In this case, the patient was in her mid-40s with a body mass index (BMI) of 28.0 and had no history of smoking or any known underlying lung disease. Her spontaneous pneumothorax occurred in a delayed fashion, manifesting on the third post-operative day without any precipitating events during recovery.

Case report

A 45-year-old Hispanic female patient with a history of multiple episodes of recurrent diverticulitis, irritable bowel syndrome, and endometriosis presented for an elective laparoscopic-assisted sigmoid colon resection. She had a BMI of 28.0, and she had no known underlying lung conditions or diseases. Past surgical history included a cesarean section and laparoscopic hysterectomy with endometrial excision occurring many years ago. She was not on any prescription medications, had no known drug allergies, and was a lifelong nonsmoker and a nondrinker.

A four-port laparoscopic sigmoidectomy was performed with pneumoperitoneum introduced directly through a 5-mm Endoview catheter and maintained in the range of 12–15 mmHg as per protocol. The sigmoid colon revealed evidence of chronic diverticulitis with adhesions to the left pelvic side wall and a subacute inflammatory mass. An intracorporeal colorectal end-to-end anastomosis (EEA) was constructed without difficulty, and no leak was demonstrated with an air infusion test. The patient was returned to the Post-Anesthesia Care Unit for recovery in stable condition.

The patient's initial post-operative course was unremarkable. She was entered into a routine enhanced recovery protocol including early ambulation and feeding. Analgesia was obtained with intravenous acetaminophen and non-steroidal anti-inflammatories, limiting the use of parenteral narcotics. Deep vein thrombosis prophylaxis was provided with subcutaneous heparin and intermittent compression stockings.



Figure 2. Chest X-ray. Elevation of the right hemidiaphragm is noted. A pigtail catheter is in place, and the pneumothorax has been resolved.

On the second post-operative day, it was noted that her PO_2 dropped to 89%, which responded well to 2 L of nasal oxygen. Early in the morning of the third post-operative day, the patient suddenly became tachycardic and developed a temperature of 102.0°F. Her white blood cell count was 16,600 at that time. Because of the sudden quick change in her status, the patient was sent for an emergent computed tomography (CT) of the abdomen and pelvis, which revealed no evidence of an acute intra-abdominal process; however, a large right pneumothorax was identified (Figure 1). A pigtail catheter was placed in the right pleural space under sedation and local anesthesia with immediate resolution of the patient's symptoms. A post-procedure chest X-ray revealed expansion of the right lung (Figure 2).

Blood and urine cultures were negative. The patient was then discharged on the sixth post-operative day, tolerating a regular diet without any respiratory complications, on oral amoxicillin/clavulanate and with instructions to follow-up at outpatient care.

Discussion

The patient was a female in her mid-40s with a BMI of 28.0 and without any known underlying lung disease; moreover, she had no history of smoking or any of the common risk factors for spontaneous pneumothorax.^{3,4,8} There was no evidence of any infectious etiology. There were no central line attempts and all ports were placed intra-peritoneally, and there was no evidence of any subcutaneous emphysema.

A review of the literature demonstrates that pneumothorax is a rare but known complication of laparoscopic procedures utilizing pneumoperitoneum.^{11–14} The reported cases, while sharing similarities with this case, occurred in an intra-operative context rather than post-operatively. The precise cause of pneumothorax is often not certain but attributed to iatrogenic damage to the diaphragm or other less-defined mechanisms including CO_2 diffusion across congenital diaphragmatic defects or immaturity of the membranes separating the thoracic and abdominal cavity.^{13,14} In this case, there were neither signs of iatrogenic diaphragmatic damage nor

any evidence of congenital defects. Moreover, the spontaneous pneumothorax in this case occurred in a delayed manner approximately 72 h post-operatively with the patient in stable condition and without any significant prior developments. To our knowledge, there has been no reported case of a pneumothorax occurring as a complication of a laparoscopic procedure that develops several days after surgery and in a patient without any underlying lung disease or risk factors for PSP.

As both typical PSP and SSP are not consistent with the patient's history and presentation, other explanations for the pneumothorax must be explored. First, simple CO₂ diffusion occurring in a slow manner through an iatrogenic but sub-clinical defect created through previous laparoscopic surgery is a possible mechanism but unlikely as previous surgeries occurred many years ago.

One possible mechanism of injury that we propose is barotrauma from an extended period of time in Trendelenburg position. Because the total operating time was 2 h and 15 min, there was not an inordinate amount of time that the patient was kept in Trendelenburg position. However, this patient may have had an asymptomatic, anatomical abnormality predisposing her to barotrauma in Trendelenburg position. This mechanism, then, is a possible alternative explanation. It is also plausible that the procedure did not produce the pneumothorax; however, this patient does not fit the typical profile for PSP and had none of the risk factors. It is also unlikely that a mid-40s, overweight female without any lung conditions or history of smoking would develop both a pleural bleb and its incidental rupture all at once without any provocation. It is known, however, that post-operatively patients are at risk of atelectasis, which may have further contributed or exacerbated an initially subclinical barotrauma injury, producing a delayed presentation.

Notably, the only abnormal finding throughout the entire post-operative period preceding the delayed pneumothorax was the PO₂ desaturation to 89% the day before. Transient drops in oxygen saturation, including to levels in the upper 80s or even lower 90s, often occur for a variety of different reasons but can be quickly attributed to a mechanical or monitoring error or modest post-operative atelectasis and simply corrected with nasal oxygen without careful consideration of etiology. In this case, that finding was the only warning sign of an impending complication; thus, this case highlights the necessity to judiciously examine and investigate any desaturation post-operatively and deliberate its possible significance.

Ultimately, the definitive mechanism of the pneumothorax remains unclear. The atypically delayed pneumothorax described here underlines the possibility that, even during a normal recovery period for a patient without any underlying lung disease or risk factors, pneumothorax can still develop in a delayed fashion multiple days post-operatively from a laparoscopic procedure.

Institutional approval/waiver and informed consent for reporting cases

The institutions involved in this article do not require ethics approval for reporting individual cases. Additionally, the institutions involved in this article do not require informed consent to be obtained for reporting individual cases.

Declaration of conflicting interests

The authors declared no conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

References

1. Sahn SA and Heffner JE. Spontaneous pneumothorax. *N Engl J Med* 2000; 342: 868–874.
2. Light RW. *Pleural diseases*. 6th ed. Philadelphia, PA: Lippincott Williams & Wilkins, 2013.
3. Morse JL and Safdar B. Acute tension pneumothorax and tension pneumoperitoneum in a patient with anorexia nervosa. *J Emerg Med* 2010; 38: e13–e16.
4. Biffi WL, Narayanan V, Gaudiani JL, et al. The management of pneumothorax in patients with anorexia nervosa: a case report and review of the literature. *Patient Saf Surg* 2010; 4: 1.
5. Corless JA, Delaney JC and Page RD. Simultaneous bilateral spontaneous pneumothoraces in a young woman with anorexia nervosa. *Int J Eat Disord* 2001; 30: 110–112.
6. Bense L, Wiman LG and Hedenstierna G. Onset of symptoms in spontaneous pneumothorax: correlations to physical activity. *Eur J Respir Dis* 1987; 71: 181–186.
7. Sadikot RT, Greene T, Meadows K, et al. Recurrence of primary spontaneous pneumothorax. *Thorax* 1997; 52: 805–809.
8. Guo Y, Xie C, Rodriguez RM, et al. Factors related to recurrence of spontaneous pneumothorax. *Respirology* 2005; 10: 378–384.
9. Noppen M and De Keukeleire T. Pneumothorax. *Respiration* 2008; 76: 121–127.
10. Chen CH, Liao WC, Liu YH, et al. Secondary spontaneous pneumothorax: which associated conditions benefit from pigtail catheter treatment? *Am J Emerg Med* 2012; 30: 45.
11. Hillelsohn JH, Friedlander JI, Bagadiya N, et al. Masked pneumothorax: risk of valveless trocar systems. *J Urol* 2013; 189: 955–959.
12. Ludemann R, Krysztopik R, Jamieson GG, et al. Pneumothorax during laparoscopy. *Surg Endosc* 2003; 17: 1985–1989.
13. Mehran A, Brasesco O, De Velasco E, et al. Intra-operative pneumothorax complicating laparoscopic Roux-en-Y gastric bypass. *Obes Surg* 2004; 14: 124–128.
14. Cha SM, Jung YH, Kim DS, et al. Spontaneous pneumothorax during laparoscopy-assisted Billroth-I gastrectomy. *Korean J Anesthesiol* 2010; 58(4): 405–408.