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Symptomatic pneumopericardium – A rare complication following retroperitoneal laparoscopic nephrectomy: A case report

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ABSTRACT

INTRODUCTION AND IMPORTANCE: Pneumopericardium is collection of gas in pericardial space. Retrospective reviews have described pneumopericardium as a complication of laparoscopic surgery, however, without any symptoms. By this report, we present a case who developed acute cardiopulmonary symptoms after retroperitoneal laparoscopic radical nephrectomy because of pneumopericardium.

CASE PRESENTATION: A 40-year-old Vietnamese woman was admitted due to left flank pain. She was diagnosed with left dysfunctional hydronephrosis and right urolithiasis. Six hours post-operation of an elective retroperitoneal laparoscopic radical nephrectomy, she suddenly developed severe substernal chest pain and dyspnea. Evaluations for acute myocardial infarction and pulmonary embolism were immediately ordered with no abnormality. However, computed tomography scan of the chest showed pneumopericardium, pneumomediastinum, subcutaneous emphysema, gas collection in sub-peritoneal space and next to the aortic arch. She was then closely monitored and effectively managed by conservative treatments.

CLINICAL DISCUSSION: Pneumopericardium is a rare complication of laparoscopy and mainly detected by radiographical measures incidentally. Several case studies reported symptomatic pneumopericardium, as in our presenting case. Some factors might contribute to the mechanism of our case that include retroperitoneal approach, thoroughly dissection the renal helium area and long-lasting operation. Postoperative collection of carbon dioxide is well self-limited; therefore, conservative treatments are efficient for stable cases.

CONCLUSION: Pneumopericardium following laparoscopy is uncommon, and mostly subclinical. However, it can manifest as acute cardiopulmonary symptoms and signs that require carefully evaluation. The presence of gas in pericardial space is a negative prognosis factor itself; consequently, clinicians should be aware of when managing pneumopericardium subsequent to laparoscopic procedures.

1. Introduction

Though thoracic complications following laparoscopic procedures are uncommon, the incidence differs from approaches with extraperitoneal or retroperitoneal surgery has significant higher figure [1]. Various pathologies possibly result in postoperative chest pain which requires careful and thorough evaluation for avoiding negative sequalae. When immediate life-threatening conditions such as myocardial infarction, pulmonary embolism can be efficiently excluded, chest pain due to gas collection in thoracic cavity should be investigated. Pneumopericardium and pneumomediastinum have been reported since the early era of laparoscopy as potential complications [2]. However, a majority of cases had no symptom and only incidentally detected by imaging measures [3].

We hereby present a case of a 40-year-old woman who developed substernal chest pain and dyspnea six hours following retroperitoneal laparoscopic radical nephrectomy. She was then diagnosed with pneumopericardium and pneumomediastinum after being excluded other cardiopulmonary conditions. This case report has been reported in line with the SCARE Criteria [4].

2. Presentation of case

A 40-year-old woman with Body Mass Index of 27 kg/m2, complained of left flank pain and was diagnosed with right urolithiasis, left dysfunctional hydronephrosis due to ureteral stone. Her medical history included hypertension and type II diabetes mellitus without any treatments. Blood glucose level and blood pressure were properly controlled before starting treatment course.

Right percutaneous nephrolithotripsy (PCNL) with double J stent insertion was performed for dealing with right ureteropelvic stone and a part of disseminating renal stones. None of abnormali-

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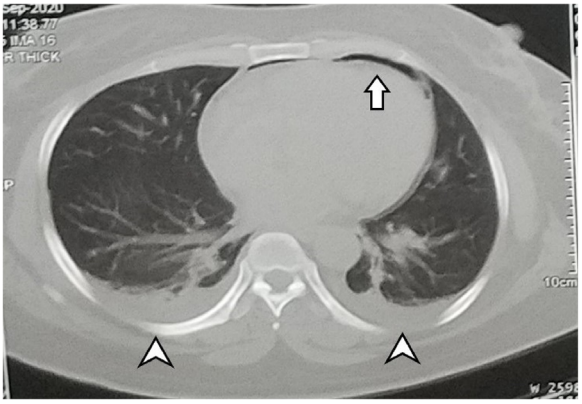

Fig. 1. Computed tomography scan showed gas in mediastinum (arrow) and bilateral pleural effusion (arrowhead).

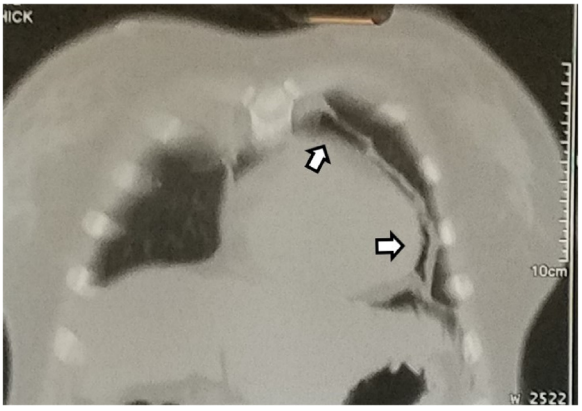

Fig. 2. Computed tomography scan showed gas in pericardium (arrow).

ties was noted in post-PCNL recovery period. Two weeks following PCNL, the patient underwent left ultrasound-guided percutaneous nephrostomy prior to elective retroperitoneal laparoscopic radical nephrectomy by an experienced surgeon. The surgery was performed in 150 min of time. Carbon dioxide was the gas of choice, insufflation pressure never exceeded 12 mm of mercury (mmHg), no unexpected intraoperative events was described.

Six hours following the operation, she suddenly felt nervous, developed pain in substernal area and dyspnea. On physical examination, her vital signs were pulse of 150 beats per minute, blood pressure of 130/80 mmHg, respiratory rate of 25 breaths per minute, room-air pulse oximetry (SpO2) of 95%; subcutaneous emphysema was on bilateral chest walls; auscultation of lungs and heart was unremarkable. Bedside electrocardiogram (ECG) showed atrial fibrillation. A cardiologist, who was referred to, ordered Digoxin 0.125 mg intravenous administration, Metoprolol 25 mg by mouth and oxygen therapy. As a result, symptoms relieved after 20 min. Nevertheless, 3 h later, she once again complained of severe substernal pain and dyspnea with vital signs within normal limits. ECG revealed regular rhythm, D-dimer was 2.42 μg/mL (normal range is <0.5 μg/mL), Troponin I hs was 5.97 pg/mL (normal range is <15.6 pg/mL), other blood tests were within normal limits. The diagnoses of acute myocardial infarction and pulmonary embolism were therefore temporarily excluded. Computed tomography scan of the chest was performed and it showed pneumopericardium, pneumomediastinum, bilateral pleural effusion, subcutaneous emphysema, gas accumulating sub-peritoneal space and next to the aortic arch (Figs. 1 and 2). The patient was transferred to Intensive care unit (ICU) in hemodynamically stable status. Following days in ICU, either ECG or Troponin I hs or D-dimer was carried out for evaluation overlapped conditions but no unexpected figures were found. Treated with conservative regimes in ICU for 6 days, she was clinically improved and was discharged after additional monitoring in urology department for 3 days.

3. Discussion

Pneumopericardium is the presence of gas in pericardial space, which can be caused by trauma, positive pressure ventilation, unknown causes, therapeutic procedures [5], and recently recorded, COVID-19 pneumonia [6]. In large retrospective reviews of urological laparoscopy, pneumopericardium rarely occurred, moreover, all of the cases were incidentally detected without any symptoms [3,7]. To our knowledge, several case studies reported chest pain and dyspnea in post-laparoscopic procedures because of pneumopericardium, as what arose in our presenting case [8,9]. Post-operation chest pain and dyspnea are uncommon but emergent that should initially be evaluated by diagnostic algorithm to rule out life-threatening conditions such as acute myocardial infarction and pulmonary embolism [10].

There were some factors might contribute to the presence of gas in pericardial and mediastinal space following laparoscopy, some of them were likely to play a role in our case. Congenital diaphragmatic abnormalities, especially on the left side, are proposed as route for gas accumulating in thoracic space [11]. However, such defects were not noted during the surgery of our case. Another well documented factor is the approach by extraperitoneal or retroperitoneal space which is of significant association with abnormal gas collection [3,7], and with decrease in carbon dioxide elimination with time [1]. Furthermore, retroperitoneal radical nephrectomy with thorough dissection renal hilum area might induce gas to transport to the mediastinum along the great vessels, and from there into the pericardial or pleural space [11,12]. Similar observation was also described by Zhao L.C. that 7 out of 10 patients having pneumomediastinum experienced laparoscopic nephrectomy (pyeloplasty and cryosurgery in the remainders) [3]. Operative time larger 200 min was demonstrated as an independent risk factor for presence of subcutaneous emphysema, pneumothorax or pneumomediastinum [13]. Even not reach to the figure of 200 min, in our case, the combination of long-lasting operation (150 min of time) with working area next to great vessels could induce spreading gas widely.

The presence of gas in pericardial space is a negative prognostic factor with ensuing cardiac tamponade might be up to 37% of cases, and even if not developing to tension, pneumopericardium was associated with 58% of death [14]. Therefore, close monitoring in such cases is crucial for preventing dangerous sequelae. Gas collection in pericardium, mediastinum, and beneath the skin are usually self-limited thanks to high tissue permeability and rapid absorbance of carbon dioxide [11]. In clinically stable patients with pneumopericardium or pneumomediastinum following urological laparoscopy, conservative management was efficient and no further intervention needed [3,7].

4. Conclusion

Though pneumopericardium following laparoscopy is rare and mostly subclinical, after life-threatening cardiopulmonary conditions carefully excluded, it should be considered as a possible diagnose once patient develops chest pain or dyspnea. Some factors that might induce the condition include extraperitoneal approach, long-lasting surgery, and dissection closely to large vessels. Conservative regimes with watchful monitoring are appropriate for hemodynamically stable conditions.

Timeline

Day 1	Being admitted due to left flank pain and diagnosed with right urolithiasis, left dysfunctional hydronephrosis
Day 9	Right PCNL
Day 12	Discharge for preparation of elective nephrectomy
Day 22	Left ultrasound-guided percutaneous nephrostomy
Day 27	14h30: Left retroperitoneal laparoscopic radical nephrectomy 21h30: Substernal chest pain, dyspnea 21h50: Symptoms relieved
Day 28	1h: Symptoms re-emerged 2h: Transferred to ICU
Day 34	Transferred back to urology department
Day 37	Discharge

Declaration of Competing Interest

The authors report no declarations of interest.

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Ethical approval

This case report had been approved of the ethical committee of Saint Paul hospital, Hanoi, Vietnam.

Consent

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

Author contribution

Trung Kien Ngo: Direct surgeon, project administration.
Duy Binh Le: Investigation, writing - review & editing.
Hoang Thao Bui and Van Khiet Pham: Data curation, supervision.

Registration of research studies

Not applicable.

Guarantor

Duy Binh Le, MD.

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