



Middle Lobar Torsion after Upper Lobectomy: A Case Report and Review of the Literature

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Lung torsion is a rare but life-threatening event, with a reported incidence of 0.089% – 0.4%. The first review article on this topic, published in 2016, cited middle lobar torsion after upper lobectomy as the most common scenario. We report a case of postoperative right middle lobar torsion in a 60-year-old man following elective right upper lobectomy for underlying lung adenocarcinoma. A diagnosis based on chest X-ray and bronchoscopy was made on postoperative Day 5. An emergent thoracoscopic detorsion surgery, which was performed immediately after diagnosis, failed to restore lung viability. The patient then underwent middle lobe resection from which he recovered uneventfully. He was discharged on the thirteenth day after re-operation.

Key words: lobectomy, lung torsion

Case Report

A 60-year-old Asian man without past medical history visited our pulmonary outpatient clinic for evaluating an incidental pulmonary mass. A computed tomography (CT) scan demonstrated a right upper lung mass around 3.5 cm in diameter which, after bronchoscopic biopsy and positron emission tomography, was confirmed as an adenocarcinoma without lymph node involvement. The patient initially underwent a two-incisional video-assisted thoracoscopic right upper lobectomy. Consistently, pathologic examination of the excised specimen demonstrated adenocarcinoma without lymph node involvement (pT2aN0, Stage 1B).

Postoperative chest radiography (Fig.

1A) revealed a radiopaque lesion in right upper lung. The white blood cell count was slightly elevated at 11,910 cells/ μ L (range: 3,900 – 10,600 cells/ μ L). On the postoperative Day 1, fever of 38.3°C developed and subsided soon after administering acetaminophen.

On the early morning of postoperative Day 3, the patient presented with fever of 38.3°C and exertional dyspnea. The pulse was 160 beats per minute, the blood pressure was 71/60 mmHg, the respiratory rate was 25 breaths per minute, and the oxygen saturation was 93% while breathing ambient air, which increased to 97% after being given 32% supplemental oxygen. Arterial blood gas revealed pH 7.48, a carbon dioxide tension of 36.2 mmHg (range: 35 – 45 mmHg), and an oxygen tension of 98.8 mmHg (range: 75 – 100 mmHg). There was a decreased breath sounds

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at right lung, while the remainder of the examination was normal. The white blood cell count and C-reactive protein increased 15,480 cells/ μ L (range: 3,500 – 11,000 cells/ μ L) and 277 mg/L (range: < 5 mg/L), respectively. Chest radiography (Fig. 1B) revealed a large, rapidly progressing opacity occupying the right hemithorax. His vital signs were normalized after the administration of ceftriaxone, acetaminophen, intravenous fluids, and pulmonary rehabilitation.

The patient was afebrile and showed stable vital signs for the subsequent two days. A follow-up chest radiography (Fig. 1C) revealed non-resolving and ill-defined opacity in the right hemithorax. Bronchoscopy (Fig. 2) revealed strangulation of the right middle lobe bronchus and an intact right upper bronchial stump on postoperative Day 5. Thoracoscopic re-exploration of the right pleural cavity under the impression of a lung torsion revealed a large angulation of the right middle lobe hilar structure with ecchymotic change of the lung parenchyma (Fig. 3). Since congestion persisted for 30 minutes after restoration of the affected lobe, a thoracoscopic right middle lobectomy was performed. The postoperative course was smooth and the patient was discharged uneventfully on postoperative Day 13 from the date of the initial operation.

Discussion

Lung torsion, a very rare but life-threatening event, has a reported incidence of 0.089% – 0.4%.¹ Given its low incidence, the lack of large-scale studies makes it difficult to produce evidence-based treatment recommendations. Lung torsion is frequently reported after upper lobectomy (74.4%), with the middle lobe being the most vulnerable (41%).¹ Nearly 80% of patients with lung torsion are symptomatic; dyspnea is the most common symptom, followed by fever, chest pain, and cough.¹ The median interval between the date of the first operation and the date of torsion is three days in cases with postoperative lung torsion.¹

Although our patient typically presented with fever and dyspnea three days after right upper lobectomy, his symptoms were insufficient for early diagnosis as fever and dyspnea are also common in other complications following pulmonary resection. A review of literature revealed various complications after pulmonary resection with the most common being atelectasis, pneumonia, bleeding, pulmonary edema, persistent air leak, bronchopleural fistula, and empyema, followed by less frequent entities including lung torsion, chylothorax, anastomotic dehiscence, wound infection, esophagopleural

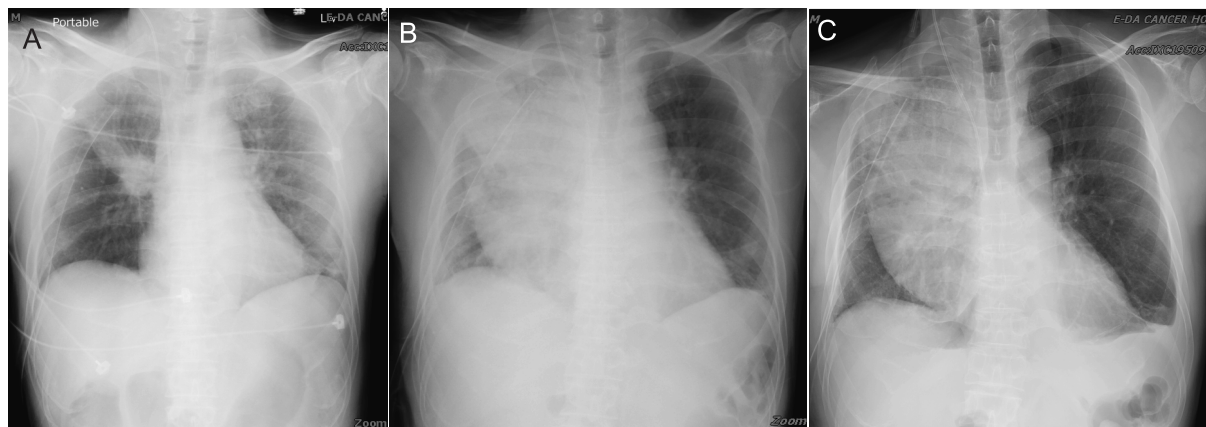


Fig. 1 (A) Routine post-operative chest radiography showed patch opacity in the right upper lung field and increased infiltration in the left lower lung, (B) The CXR showed a rapidly progressed right lung consolidation and an indwelling right chest tube on postoperative Day 3, (C) Ill-defined opacities over the right lung on postoperative Day 5.

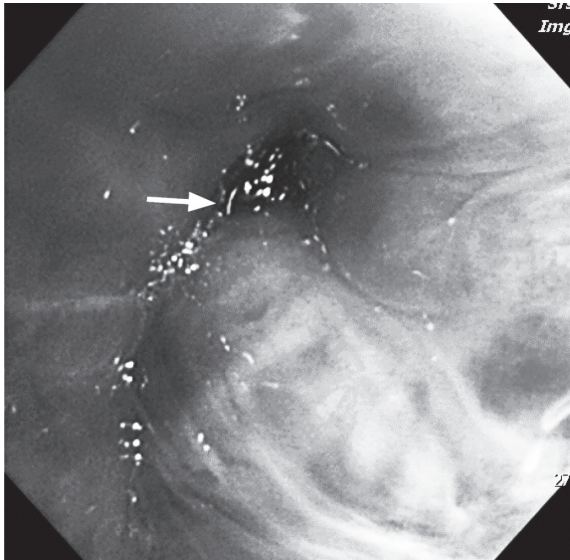


Fig. 2 Bronchoscopic view showing narrowed orifice (arrow site) of the right middle bronchus with erythematous mucosa on postoperative Day 5.

fistula, and recurrent tumor.² The diagnostic methods for lung torsion include bronchoscopy, thoracic computed tomography, and chest radiography. In our patient, we could only identify a rapidly progressing ill-defined opacity from his chest radiograph inconsistent with his clinical picture. The treatment for our patient focused on the complications of atelectasis and pneumonia on postoperative Day 3. Despite initial instability of vital signs, severe pneumonia with septic shock was successfully prevented through timely intervention. Although chest CT could be advantageous for early detection of lung torsion, timely diagnosis and management still rely on an experienced interpreter. Bronchoscopy, which was selected for both diagnosis and treatment in our patient, revealed a narrowed orifice, complete obstruction of the bronchus, and a tortuous bronchus suggestive of lung strangulation.¹

Despite the preservation of pulmonary function through repositioning and the prevention of reperfusion insult by direct resection, the optimal treatment for lung torsion has not been clearly elucidated. Indirect resection involving detorsion of the lung may result in potential complications such as ARDS secondary

to the absorption of necrotic tissue and extensive systemic circulation embolism.^{3,4} Recent studies indicate that the viability of the strangulated lung determines the choice of intervention. Previous studies^{5,6} proposed that repositioning the affected lung should be considered within 24 hours of the onset of lung torsion. However, another study described a deadly reperfusion insult following reposition performed 24 hours after the first operation.³ Fatal stroke after an indirect resection within 24 hours of onset has also been reported.⁴ In addition, indirect resection has been shown to be associated with poor patient outcomes.¹ As a result, sacrificing the compromised lung lobe is suggested whenever pulmonary infarction or gangrene is suspected. Infarcted lesions generally present with a markedly swollen, blue-black hemorrhagic surface accompanied by complete torsion.^{7,8} In our patient, the necrotic right middle lung lobe was resected after confirmation of non-viability 30 minutes after reposition without subsequent reperfusion insults. We suggest direct resection for lung torsion after 24 hours of the first operation when pulmonary infarction or gangrene is noted.

Confirmation of the correct positioning of the lung lobes before chest closure and a reduction of mobility are the two major prophylactic approaches to the prevention of lung torsion. In previous studies, several techniques for fixating

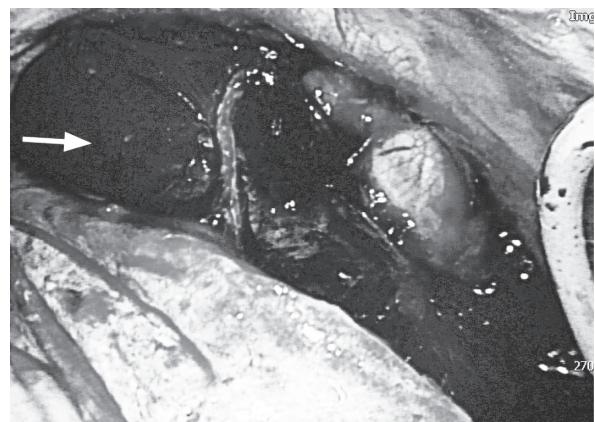


Fig. 3 Right middle lobe (arrow site) showing ecchymotic change during operation.

a floppy lobe have been recommended when a long hilar pedicle or a large complete fissure is observed, including stitching the lung to the adjacent thoracic structures (e.g., pericardial fat pad or pleura), suturing the middle and lower lobes together, or using medical adhesives. These techniques have contributed to maintaining extremely low rates of torsion, with only one reported case of air leaks in emphysematous lungs.⁹ During VATS, preserving the pulmonary ligament could also potentially prevent lung torsion.¹⁰ Nevertheless, some surgeons released the pulmonary ligament after resection of the upper lobe not only to facilitate the expansion of the lower lobe but also to prevent fluid accumulation by decreasing the dead space. Because these methods are mostly introduced via case reports, it is difficult to evaluate and rank their effectiveness. Our not routinely performing prophylactic procedures in the past may contribute to the tragic torsion of middle lobe in this patient. Taking into account the simplicity of the procedure of pleuropexy, we strongly advise its performance in patients at risk of lung torsion after lobectomy.

Conclusion

In conclusion, awareness of lobar torsion after surgery is important. Timely diagnosis and prompt surgical intervention are critical for saving the lung lobe. Direct resection is suggested if surgery is performed after 24 hours of the first operation if pulmonary infarction or gangrene is evident. Prophylactic procedures

for preventing lung torsion are suggested in patients with complete horizontal fissure.

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