A rare case of an intercostal lung herniation with fractures of the fifth and sixth ribs after thoracic surgery

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A B S T R A C T

INTRODUCTION: Lung herniation is a rare condition defined as a protrusion of the pleural-covered lung parenchyma through an abnormal defect or weakness in the thoracic wall. Postoperative lung herniation is reported to result from a preceding operation with inadequate closure of the chest wall.

PRESENTATION OF CASE: A 77-year-old woman was admitted to our hospital for treatment of hemoptysis and nausea. One year previously, she had undergone wedge resection of the right lower lobe (S6) for treatment of primary lung adenocarcinoma. Upon admission, chest radiograph and chest computed tomography showed a right lung herniation through the fifth enlarged intercostal space with right fifth and sixth rib fractures. She underwent surgical closure of the intercostal hernia using synthetic materials with fixation of the fifth and sixth ribs. The patient had developed no recurrence 9 months after surgical repair.

DISCUSSION: In the present case, adequate closure of the right pleural cavity was ensured by fixation of both fifth and sixth ribs during the preceding video-assisted thoracic surgery for the primary lung carcinoma. Our patient may have had some exacerbation factors for lung herniation, increased intrathoracic pressure, attenuation of chest wall by prolonged coughing and rib fracture, and high abdominal pressure due to her hunched-over posture.

CONCLUSION: It is important to know some exacerbation factors for postoperative intercostal lung herniation. Addition of monofilament-suture fixation of the ribs to patch repair is very effective for lung herniation repair in patients with concurrent lung herniation and rib fractures.

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1. Introduction

Lung herniation is a rare condition defined as a protrusion of the pleural-covered lung parenchyma through an abnormal defect or weakness in the thoracic wall [1]. The major causes of lung hernia are chest trauma, thoracotomy, and spontaneous occurrence. We herein reported the rare case of a 77-year-old woman who developed an intercostal herniation with the rib fractures after thoracic surgery for primary lung carcinoma. The research work has reported in line with the SCARE criteria [2].

2. Presentation of case

A 77-year-old woman was admitted to our hospital for treatment of hemoptysis and nausea. One year previously, she had undergone wedge resection of the right lower lobe (S6) for treatment of primary lung adenocarcinoma (pT1aN0M0, pStage I A) in our hospital with postoperative follow-up. She had a history of esophageal hiatal hernia and gastroesophageal reflux disease. She had required a wheelchair since undergoing right bipolar hip arthropasty and was constantly in a hunched-over posture because of kyphosis.

Upon admission, physical examination revealed no palpable tumor on the right chest wall, but chest radiograph and chest computed tomography showed a right lung herniation through the fifth enlarged intercostal space (Fig. 1) with right fifth and sixth rib fractures (Fig. 2B and B). Blood examination in our hospital showed evidence of inflammation (white blood cell count of 12,000/μL and C-reactive protein concentration of 1.20).

One week later, she underwent surgical closure of the intercostal hernia in our hospital. Thoracic surgery specialist with 11 years' experience performed the operation. Intraoperatively, the intercostal lung herniation was found between the fifth and sixth ribs, and the fifth and sixth ribs were fractured. When the thick herniation sac of the parietal pleura was opened, the right collapsed lung fell into the right pleural cavity. The herniation was about 8 × 5 cm in size (Fig. 3A). No adhesions were present between right lung and chest wall; thus, there was no need to resect the herniated lung. We performed surgical closure using synthetic materials with fix-
Fig. 1. A chest radiograph showed right lung herniation through the enlarged fifth intercostal space.

Fig. 2. (A) Transverse chest computed tomography image shows the right lung herniation with the fifth and sixth fractured ribs (red arrows). (B) Preoperative three-dimensional computed tomography shows the right lung protruding into the thoracic wall through the fifth enlarged intercostal space (yellow arrows).
3. Discussion

Lung herniation is rare. It was first reported in 1499 [3], and only about 300 reports of this condition have been published [3,4].

Lung herniation is anatomically classified according to its location as cervical, thoracic, abdominal or thoracoabdominal [5,6]. Two etiologic groups of lung herniations are recognized: congenital and acquired. Congenital lung herniation occurs in 20% of all cases, and the acquired lung herniation occurs in 80% of all cases [7]. Congenital herniation is caused by attenuation of the endothoracic fascia [5]. Acquired herniations most commonly develops as a result of chest trauma, after thoracic operations, or spontaneously [6].

In the present case, intercostal pulmonary herniation occurred as a result of a previous thoracic operation for treatment of primary lung carcinoma. In a previous report, postoperative pulmonary herniation occurs after from 3 months to 8 years [6]. Postoperative lung herniation reportedly results from a preceding operation with inadequate closure of the chest wall [5]. In minimal invasive video-assisted thoracoscopic surgery, the lack of the fixation of the ribs during chest closure is considered a cause of intercostal lung herniation [1,3]. In the present case, adequate closure of the right pleural cavity was ensured by fixation of both fifth and sixth ribs during the preceding video-assisted thoracic surgery for the primary lung carcinoma.

Another possibility is that our patient’s herniation occurred spontaneously. Spontaneous lung hernias usually develop due to increased intrathoracic pressure by coughing and following rib or cartilage fracture [6]. Our patient may have had some exacerbation factors for lung herniation, increased intrathoracic pressure, attenuation of chest wall by prolonged coughing and rib fracture, and high abdominal pressure due to her hunched-over posture.

The indication for surgical treatment of lung herniation includes an increasing size, pain, and any signs of incuvaion, and respiratory dysfunction.

There are three main surgical methods for repair of lung herniation. One is excision of the hernial sac and direct suture of the defect [8]. The second is suture repair using periosteal flaps [9]. Finally, the third is the use of synthetic materials such as knitted monofilament polypropylene (Marlex) mesh or a polytetrafluorethylene patch. Suture of the hernia sac or the use of periosteal flaps may be sufficient for bridging small defects [1]. Surgical repair using synthetic materials is performed in many larger defects. The synthetic materials provide adequate coverage, and no recurrence has been reported.

In the present case, after performing standard surgical repair using synthetic materials, we added surgical monofirament fixation of the fractured fifth and sixth ribs. Jacka and Lusion [10] placed wire sutures in addition to intrathoracic politytetrafluoroethylene
patch, and Smith and Jamplis [9] reported suturing of the periosteal flaps and reinforcement by steel wire. Some authors have suggested approximation of the ribs with monofilament sutures [3,8]. In patients with concurrent rib fractures, surgical fixation of the ribs after repair of the lung herniation is thought to be very effective.

4. Conclusion

It is important to know some exacerbation factors for postoperative lung herniation. Addition of monofilament-suture fixation of the ribs to patch repair is very effective for lung herniation repair in patients with concurrent lung herniation and rib fractures.

Consent

Written informed consent was obtained from the patient for publication of this case report and accompanying images.

Conflict of interest statement

All authors declare no conflicts of interest.

Author contribution

AH acquired the data and wrote the article. KK, YT, HN, TK, TF and HY coordinated and critically revised the study. All read and approved the final manuscript.

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Ethical approval

Ethical approval has been exempted by our institution.

Guarantor

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