Acquired Anterior Thoracic Lung Herniation and Repair: A Rare Case and Discussion

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Abstract

We report a case of acquired anterior thoracic lung herniation in a 63-year-old female. This painful herniation developed four years after uncomplicated video-assisted thoracic surgery for lung cancer resection and adjuvant radiation for concomitant breast cancer. The herniation site was remote from all prior incisions, and demonstrated intercostal muscle denervation and radiation fibrosis. The 8 cm x 10 cm chest wall defect was reconstructed with inlay PROCEED mesh and reinforced with a pedicled latissimus dorsi flap. Five months postoperatively the patient had complete resolution of symptoms, no evidence of herniation, and a stable wound.

Introduction

Traumatic lung herniation is a rare condition that may result from blunt force or as a complication of video-assisted thoracic surgery (VATS). About 300 cases of lung herniation have been described in the literature to date. There is evidence that small incisions from thoracoscopic procedures have a higher risk for lung herniation than incisions from larger, more invasive thoracic surgeries. This increase in risk is possibly due to the nature of incision closure, which is often less precise in VATS. To our knowledge, there have been no reported cases of acquired lung herniation at sites distant from VATS incisions when thoracoscopic damage is suspected. Intercostal nerve injury is a likely etiology of remote herniation and has previously been implicated in post-thoracotomy pain syndrome.

Case Presentation

We present a rare case of acquired lung herniation through the right anterior intercostal space in a 63-year-old female. The patient presented with a six-month history of worsening right chest pain exacerbated by coughing, Valsalva, and associated dyspnea. There was a visible 10 cm protrusion of lung and pleural tissue in the third intercostal space at the midclavicular line (Fig. 1). The patient is a former smoker with COPD who underwent a lumpectomy and adjuvant radiation for stage 1 breast cancer, four years prior. During radiation treatment, a VATS right upper lobectomy was performed to remove a primary bronchoalveolar carcinoma. The lung herniation was remote to previous incision sites from both the lumpectomy and VATS procedures. A chest CT scan demonstrated herniation of lung tissue through the anterior third intercostal space. No evidence of recurrent malignancy was identified. All other radiographic and laboratory values were normal.

Repair focused on reduction of the lung components, identification of the complete defect, creation of a stable hernia repair, and coverage with well-vascularized overlay tissue. The right pectoralis major muscle was reflected to expose the 10 cm defect in the third intercostal space. No identifiable intercostal muscle or tissue existed between the two rib segments from the sternocostal junction to the midclavicular line (Fig. 2).

Adherent pleura was dissected, the full scope of the defect was delineated, and a chest tube was placed. PROCEED mesh was used as an inlay and secured with cerclage sutures to surrounding ribs (Fig. 3). The pectoralis major muscle was repaired over the mesh and an ipsilateral pedicled latissimus flap was inset over the...
defect field for well-vascularized soft tissue reinforcement (Fig. 4). The patient was discharged on postoperative day 4 with a viable flap and no signs of infection or pneumothorax. She had aggressive physical therapy postoperatively and retained full range of motion and strength. At six months, she had no pain or bulging in the right chest upon cough or Valsalva.

**Discussion**

Lung hernias are subdivided into congenital and acquired cases. Congenital lung hernias account for 18% of cases and involve developmental chest wall defects. Acquired lung hernias can be further classified as traumatic, spontaneous, or pathologic. Traumatic events include surgical procedures and blunt force. Spontaneous lung hernias can be triggered by chronic coughing, COPD, forceful Valsalva, chronic steroid use, or heavy lifting. Pathological events leading to lung herniation may be inflammatory or neoplastic in nature.

Lung hernias are also classified by location. Seventy percent are thoracic, while the remainder are cervical and diaphragmatic. The anterior chest wall is inherently prone to lung herniation because only a single layer of intercostal muscle exists parasternally. Lateral and posterior lung herniations are rarely problematic due to the greater support provided by side and back muscles.

Most lung hernias are asymptomatic. However, symptomatic patients may present with bulging through the chest wall, which becomes more apparent upon coughing or Valsalva. Symptomatic lung hernias are associated with pain and shortness of breath. Computed tomography (CT) scans are best used to demonstrate features of a lung herniation. CT scans can both clearly identify hernia dimensions and highlight defects in the thoracic wall and pleural space. Traditional x-rays are insufficient to confirm a diagnosis because lung herniation and thoracic wall defects will not be apparent unless they are at an exact tangent to the x-ray plane.

We believe the lung herniation presented here was likely caused by a combination of events including denervation of muscle in the third intercostal space, resulting from distant VATS, and soft tissue damage from radiation. Fibrosis of muscles after radiation compromises...
blood supply and innervation, which possibly contributed to the defect. Muscles themselves can also become weakened and easily fatigued following radiation.\(^{11}\)

Many procedures using thoracoscopy can be performed in a more invasive manner, but patients often elect the use of VATS over an open procedure with hopes of a better cosmetic result. While thoracoscopy involves a small incision, less cost, and a shorter hospital stay, lung herniation through the incision site is possible. The risks and consequences of lung herniation must be weighed against the benefits of thoracoscopy.

There are multiple points during VATS procedures at which injury may occur. The incision may be made with less care, leading to muscle or fascial injury, costal cartilage damage, or muscle denervation. There may also be damage from excessive cautерization or poor dissection.\(^{2,3}\)

The large and worsening defect in this patient required surgical repair. Although smaller defects in the chest wall can be approached with mesh and rib suturing alone, lung hernias due to missing ribs or extensive trauma may require the support and blood supply associated with muscle flaps.\(^{2}\) A latissimus dorsi muscle flap was used to reinforce the large inlay mesh repair and provide a reliable source of vascularized tissue to the radiated field. Pedicled muscle flaps are well-tolerated by patients in other procedures. In this case, it resulted in both long-term reduction of the hernia and regaining of strength and range of motion.

**Conclusion**

With the growing use of VATS, iatrogenic nerve or muscle injury may soon become a common cause of traumatic lung herniation. Greater understanding of lung herniation etiology and implementation of better thoracoscopic techniques that minimize such complications are both warranted. Surgical correction with inlay mesh and a pedicled muscle flap can lead to a successful resolution of herniation symptoms.

**References**