Case Report

Spontaneous posterior lung herniation: A case report and literature review

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ABSTRACT

Intercostal lung hernias are uncommon and usually a consequence of trauma or surgery. True spontaneous lung hernias are extremely rare, with only 51 cases identified over the past four-and-half decades. We report a case of nontraumatic chest wall ecchymosis secondary to spontaneous posterior-lateral lung herniation followed by a review of the literature. Interesting radiographic images are presented. The pathophysiology and therapeutic options of this condition are discussed. The case highlights that advanced chronic obstructive pulmonary disease (COPD) may be an etiological factor for the development of this rare entity, with cough being the precipitating event. Given the increasing prevalence of COPD, the authors believe further awareness of this pathology is needed.

KEY WORDS: Chronic obstructive pulmonary disease, cough, and smoking, spontaneous lung herniation

INTRODUCTION

Lung herniation is defined as a protrusion of lung parenchyma outside of the thoracic cavity through a chest wall defect. This rare condition can be classified both anatomically and by etiology. As early as 1847, hernias were described as cervical, thoracic, or diaphragmatic and either congenital or acquired.[1] Acquired hernias can be traumatic or pathologic, as a result of a neoplastic or inflammatory process. Lung herniation without antecedent injury is historically considered “spontaneous.” The latter usually is the result of an acute increase in intrathoracic pressure that accompanies coughing, sneezing, and heavy lifting or blowing, causing the lung parenchyma to herniate through an intercostal space. From 1968 to 2000, 16 spontaneous hernias were reported, all of which were described as anterior.[2] A careful review of the literature identified twenty more cases from 2000 until the time of this review. We report a case of a spontaneous posterior-lateral hernia presenting as chest wall ecchymosis and provide a review of the literature with associated risks.

CASE REPORT

A 71-year-old male with advanced chronic obstructive pulmonary disease (COPD), 100-pack-year smoking history, on long-term oxygen therapy presented to the hospital reporting 1 week of cough that was productive of yellowish sputum and pleuritic pain. He also had developed a small bruise on his right chest wall 1 day after he began coughing. On the day of admission, he awoke with an extensive bluish discoloration and swelling of his right chest. Cough and inspiration worsened his...
swelling. He denied fever, chills, sweats, weight change, or hemoptysis, noticing that, a week earlier, he received antibiotics and oral steroids for acute bronchitis. He was not anticoagulated, and cilostazol was the only relevant medication. He denied any easy bleeding, previous/current chest trauma, or surgical intervention. Chest examination revealed diffuse wheezing bilaterally and decreased breath sounds over the right lung base. A mildly tender hematoma extended from his right mid axilla to his iliac crest. A computed tomography (CT) scan of the chest demonstrated a right lower lobe lung herniation between the 8th and 9th rib into the posterior-lateral right chest wall with a large surrounding hematoma [Figure 1]. Following admission, he was observed for 24 h, and there was no worsening of the hematoma, with a stable hematocrit. The patient requested conservative watchful management. Over time, his hematoma/swelling resolved without recurrence.

**DISCUSSION**

Using Medline, we performed a literature search from January 1968 to April 2020. The search was limited to English using a combination of terms: lung AND herniation AND chest wall AND hernia. These are summarized in Table 1. We identified 52 cases of spontaneous chest herniation (including our case). Our identified patient population was male predominant (only two females), with a median age of 58 years. Thirty-three patients (63.4%) were documented as current or previous smokers with COPD assigned in 25 of 52 (48%) cases. Nineteen patients (36%) were described as obese. Cough was associated in 37 of 52 (71%) cases. While location was not described in all cases, herniation occurred on the left side in 26 of 49 (53%), posterior in 15 of 33 (45%) patients, and between the 8th and 9th intercostal space in 16 of 46 (34.7%) patients. The size of the herniation was >10 cm in most cases (15/20 [75%]) when size was reported. Previous chest surgery (three patients) and rib fracture (six patients) occurred in only a small number. One patient had Ehlers–Danlos disease. Of the 46 patients where treatment was described, 36 (78%) underwent primary surgical or patch repair.

Confirmation of lung herniation typically requires chest imaging. The diagnosis can be made with chest radiographs, but thoracic CT can help better characterize the wall defect. Cardinal signs and symptoms include a bulge, less often ecchymosis (reported in 15 previous cases) and localized pain. While, in most cases, hernias were described as posterior or anterior, our review of the available images would more aptly classify them as anterolateral or posterolateral (which occurred in our patient).

Our review suggests that the presence of COPD or smoking is strongly associated with spontaneous lung herniation. The increased risk of lung herniation in patients with COPD may be attributed to both dynamic hyperinflation and respiratory muscle weakness. Dynamic hyperinflation produced by incomplete emptying of the lungs in expiration in patients with COPD results in increased spacing between the ribs. The flattening of the diaphragm that occurs with hyperinflation results in contractions that are inward instead of downward, thereby paradoxically pulling the inferior ribs inward with its movement. This paradoxical movement, known as “Hoover’s sign,” may explain the frequency of herniation occurring between the 8th and 9th ribs. In the studies cited above, the severity of COPD was not described; however, it may be reasonable to consider that those with a greater degree of hyperinflation may be at the greatest risk. In addition, respiratory muscle dysfunction is now recognized as an important aspect of COPD with important clinical consequences. While inspiratory muscle weakness is at least partially attributed to hyperinflation (placing the inspiratory muscles at a mechanical disadvantage), expiratory muscle weakness is a feature of the generalized myopathy observed in patients with COPD. A brief, but significant increase in intrathoracic pressure, such as occurs when coughing, can result in herniation of lung parenchyma in patients with advanced COPD.

Surgical repair of lung hernias may be necessary, particularly in those with refractory symptoms and in those with recurrent infections, hemoptysis, or other signs of impending incarceration. Repair can be by primary closure or through the placement of a prosthetic patch, muscle flap, or fascia lata used to close the defect, mainly when dealing with larger defects (which occurs in most cases).1-4 Palliative treatment (i.e., using compression bandages) can be considered when surgical repair is contraindicated or in less symptomatic patients. Those electing conservative management require close follow-up and a repeat chest CT when physical findings change because of the risk of hernia incarceration. In our patient, the hernia was small, and conservative management was sufficient.

**CONCLUSION**

Spontaneous lung hernias are rare and usually anterior or anterior-lateral. A bulge between the ribs is usually noted, and ecchymosis may or may not be present. Advanced COPD appears to be a predisposing condition. As COPD
| Author (year) | Age | Gender | Smoker | COPD | Obese | Cause | ICS location | Anterior/lateral/posterior | Side | Size (largest dimension, cm) | Previous trauma or surgery | Associated rib fracture | Repair | Bruising | Picture |
|--------------|-----|--------|--------|------|-------|-------|--------------|---------------------------|------|-----------------------------|--------------------------|------------------------|--------|----------|---------|
| Periera (2010) | 53  | Male   | NS     | NS   | NS    | Heavy lifting Cough | 6th and 6th ICS          | NS             | Left | 81                          | Yes                      | No                     | NS     | NS       | lateral |
| Mizea (2011) | 65  | Male   | Yes    | Yes  | Yes   | Cough | 5th, 6th, and 7th | Posterior lateral    | Left | NS                          | No                       | Yes                    | Primary | Yes      | Posterior lateral |
| Ryan (2008) | 72  | Male   | NS     | No   | NS    | Cough | 8th-9th       | Posterior lateral    | Left | 10                         | No                       | No                    | Observe | Yes      | Posterior lateral |
| Shanker (2010) | 63  | Male   | Yes    | Yes  | Yes   | Cough | 4th and 5th   | Anterior lateral    | Left | 10                         | Yes (CABG)               | No                    | Primary | NS       | Posterior lateral |
| Evans (2005) | 49  | Male   | NS     | NS   | NS    | Cough | Cervical     | Thoracic inlet      | Right | 10                         | Ehlers-Danos             | No                    | Primary | NS       | Posterior lateral |
| Tack (2000) | 62  | Male   | Yes    | NS   | Yes   | Cough | NS           | NS                | Left | NS                         | No                       | No                    | Compress | Yes      | Posterior lateral |
| Jastrow III (2009) | 72 | Male   | Yes    | NS   | Yes   | Cough | 8th-9th      | Posterior lateral    | Right | NS                          | Yes                      | No                    | Primary | Yes      | Posterior lateral |
| Sulaiman (2006) | 57  | Male   | Yes    | Yes  | Yes   | Cough | 8th-9th      | Lateral             | Left  | 10                        | No                       | Yes                   | Delayed primary   | No       | NS       | Posterior lateral |
| Rubio (2020) | 71  | Male   | Yes    | Yes  | No    | Cough | 8th-9th      | Posterior lateral    | Right | NS                         | No                       | No                   | Observe | Yes      | Posterior lateral |
| Neilson (1973) | 76  | Male   | NS     | NS   | NS    | Cough | 9th-10th     | Anterior lateral   | Left  | 30                         | Primary                  | Patch                  | Anterior | lateral |
| Donato (1973) | 58  | Male   | NS     | Yes  | No    | Abn   | 7th-8th      | Anterior lateral    | Right | 8                          | No                       | No                   | NS       | NS       | Anterior |
| Noyez (1984) | 19  | Male   | Yes    | NS   | NS    | Cough | 7th-8th     | Right               | 20    |                            | Primary                  | Patch                  | Anterior | lateral |
| Sloth-Neilson (1984) | 70 | Male   | NS     | NS   | NS    | Cough | 8th         | Right               | 15    |                            | No                       | No                   | Primary | NA       | NA      |
| Togashi (1984) | 70  | Male   | NS     | No   | NS    | Cough | 7th-8th     | Left                | 15    |                            | No                       | No                   | Primary | Patch    | NA      |
| Rob (1984) | 54  | Male   | Yes    | NS   | Yes   | Cough | 8th-10th    | Left                | 15    |                            | No                       | Observe               | No       | NS       | Lateral |
| Scullion (1991) | 60 | Male   | Yes    | NS   | Yes   | Cough | 9th-10th    | Right               | NS    |                            | No                       | No                   | Primary | NS       | Lateral |
| Sonnett (1991) | 52  | Male   | Yes    | NS   | 8th   | Cough | 7th-8th     | Lateral             | Right | 10                        | No                       | No                   | NS       | NS       | Lateral |
| Gaude (1991) | 60  | Male   | Yes    | Yes  | Abn   | Cough | 6th-7th     | Left                | 10    | 24                         | No                       | No                   | Observe | NS       | Lateral |
| Plandovskii (1991) | 65 | Male   | NS     | NS   | NS    | Cough | 8th-9th     | Left               | 20    |                            | Primary                  | No                    | NS       | NS       | Anterior |
| Floz (1991) | 48  | Male   | Yes    | Yes  | NS    | Cough | 2nd-3rd     | Anterior           | Left  | NS                         | No                       | No                   | Primary | NS       | Anterior |
| Goverde (1991) | 70  | Male   | Yes    | NS   | NS    | Cough | 8th-9th     | Right               | NS    |                            | No                       | No                   | Primary | NS       | Anterior |
| Broek (1991) | 44  | Male   | NS     | NS   | Yes   | Sneze | 8th-9th     | Anterior           | Right | 12                         | No                       | No                   | No       | Patch    | NA      |
| Bragg (1991) | 72  | Male   | Yes    | Yes  | Yes   | Cough | 8th-9th     | Anterior           | Right | 12                         | No                       | No                   | No       | Patch    | NA      |
| Weissburg (1991) | 50 | Male   | Yes    | NS   | No    | Cough | 3rd-5th     | Anterior           | Right | 10                         | No                       | No                   | Observe | Yes      | Anterior |
| Ross (1991) | 42  | Female | NS     | Yes  | NS    | Cough | 1st-2nd     | Anterior           | Right | 3.5                        | No                       | No                   | Observe | No       | NA      |
| Rozi (1991) | 80  | Male   | Yes    | Yes  | Yes   | Cough | 8th         | Lateral           | Right  | NS                         | No                       | No                   | Primary | NS       | Anterior |
| Zadori (1991) | 70  | Male   | Yes    | Yes  | Yes   | Cough | 8th         | Anterior           | Right  | NS                         | No                       | No                   | Primary | NS       | Anterior |
| Vincze (1991) | 47  | Male   | Yes    | Yes  | Yes   | Cough | 8th         | Lateral           | Right  | NS                         | No                       | No                   | No       | Surgery  | No      |
| Habib (1991) | 55  | Male   | Yes    | NS   | Yes   | Cough | 8th         | Lateral           | Right  | NS                         | No                       | No                   | Primary | NS       | Anterior |
| Ross (1991) | 67  | Male   | Yes    | Yes  | Yes   | Cough | 8th         | Lateral           | Left   | NS                         | No                       | Yes                  | Primary | NS       | Anterior |
| Kana (1991) | 72  | Female | Yes    | Yes  | Yes   | Cough | 8th         | Posterior lateral  | Left   | NS                         | No                       | Yes                  | Mesh    | Primary  | Lateral |

Contd...
Table 1: Contd...

| Author (year)       | Age | Gender | Smoker | COPD | Obese | Cause     | ICS location | Anterior/lateral/posterior | Side | Size (largest dimension, cm) | Previous trauma or surgery | Associated rib fracture | Repair | Bruising | Picture  |
|---------------------|-----|--------|--------|------|-------|------------|--------------|---------------------------|------|-----------------------------|---------------------------|-------------------------|---------|----------|----------|
| Dahlkemper (2019)   | 46  | Male   | Yes    | Yes  | Yes   | Cough     | 7th and 8th  | Posterior lateral         | Left | No                          | No                        | Surgery                | Yes      | Posterior lateral |
| Mahony (2019)       | 65  | Male   | Yes    |      |       | Cough     | 8th          | Posterior lateral         | Left | No                          | No                        | Observe                | No       | Posterior lateral |
| Hamid (2018)        | 65  | Male   | Yes    |      |       | Abn motion| 7th and 8th  | Lateral                  | Right| No                          | No                        | Blowhole incision     | No       | Anterior lateral  |
| Cox (2018)          | 71  | Male   | Yes    | Yes  |       | Cough     | 8th and 9th  | Posterior lateral         | Right| No                          | No                        | Surgery                | No       | Posterior lateral  |
| Mraidha (2017)      | 48  | Male   | Yes    |      |       | Cough     | Cervical     | Anterior                  | Right| No                          | No                        | Surgery                | No       | Posterior lateral  |
| Cherian (2017)      | 61  | Male   | Yes    | Yes  | Yes   | Cough     | 8th and 9th  | Posterior lateral         | Right| No                          | No                        | Observe                | Yes      | Posterior lateral  |
| Maeda (2017)        | 71  | Male   | Yes    | Yes  | Yes   | Cough     | 8th          | Posterior lateral         | Right| No                          | No                        | Surgery                | Yes      | Posterior lateral  |
| Wani (2015)         | 65  | Male   | Yes    |      |       | Cough     | 8th and 9th  | Posterior lateral         | Left | No                          | No                        | Observe                | Yes      | Posterior lateral  |
| Gazitua (2015)      | 65  | Male   |        |      |       | Valsalva maneuver | 8th and 9th  | Anterior lateral         | Left | No                          | No                        | Surgery                | Yes      | Posterior lateral  |
| Detorakis (2014)    | 40  | Male   |        |      |       | Cough     | 3rd and 4th  | Anterior lateral         | Left | 5.45 cm axially×2 cm anteroposteriorly×4.7 cm craniocaudally | No                        | Yes                    | Yes      | Anterior lateral  |

NS: Not significant, NA: Not available, CABG: Coronary artery bypass grafting, COPD: Chronic obstructive pulmonary disease, ICS: Intercostal space, Abn motion: Abnormal motion as the cause
has become increasingly prevalent worldwide, awareness of this condition is recommended.

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There are no conflicts of interest.

**REFERENCES**
1. Morel-Lavallée A. Hernies du poumon. Bull SocChir Paris 1845-1847;1:75-195.
2. Brock MV, Heitmiller RF. Spontaneous anterior thoracic lung hernias. J Thorac Cardiovasc Surg 2000;119:1046-7.
3. Jastrow KM 3rd, Chu D, Jaroszewski D, Huh J, Bakaeen F. Posterior lung herniation after a coughing spell: A case report. Cases J 2009;2:86.
4. Sloth-Nielsen J, Jurik AG. Spontaneous intercostal pulmonary hernia with subsegmental incarceration. Eur J Cardiothoracic Surg 1989;3:562-4.