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A 64-Year-Old Man with Traumatic Right Middle Lobe Lung Herniation Successfully Managed Conservatively

Authors' Contribution:
Study Design A
Data Collection B
Statistical Analysis C
Data Interpretation D
Manuscript Preparation E
Literature Search F
Funds Collection G

ABCDEF Walter J. Morales Borrero
ABCDE José Maldonado Vargas

Section of Diagnostic Radiology, School of Medicine, University of Puerto Rico (UPR) Medical Sciences Campus, San Juan, Puerto Rico

Corresponding Author: Walter J. Morales Borrero, e-mail: walterjohans@gmail.com
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Patient: Male, 64-year-old
Final Diagnosis: Right lung hernia • trauma
Symptoms: Chest pain • shortness of breath
Medication: —
Clinical Procedure: Chest tube • conservative management
Specialty: Thoracic Surgery • Radiology • Trauma Surgery

Objective: Rare disease

Background: Intercostal lung hernias can be congenital or acquired and involve a protrusion of lung tissue beyond the thoracic cage. Post-traumatic intercostal lung hernias can present with symptoms of pain and dyspnea or can be asymptomatic. This report is of a case of traumatic right middle lobe lung herniation through the intercostal junction of the fourth and fifth ribs in a 64-year-old man that was successfully managed conservatively.

Case Report: This is the case of a 64-year-old man who presented to the Emergency Department reporting intense pain in the right hemithorax and shortness of breath after blunt trauma to the chest following a fall from the second floor of his house. The initial chest X-ray revealed a moderate right pneumothorax. Immediately afterward, a computerized tomography scan of the chest revealed a right middle lobe intercostal lung herniation through a defect in the costochondral junction of the fourth and fifth ribs. Despite the aforementioned imaging findings, the patient did not develop respiratory distress warranting a surgical correction of his intercostal hernia. Therefore, a conservative approach based on close clinical observation and pain management was employed, without further reported complications. Follow-up after 1 year was unremarkable for complications, increased morbidity, or further visits to the hospital.

Conclusions: This report has presented a rare case of intercostal lung herniation following trauma that was confirmed on imaging. Furthermore, this case has shown that surgical intervention is not required in asymptomatic patients, as this patient was managed conservatively and remained asymptomatic at follow-up.

Keywords: Emergency Medical Services • Lung • Radiography, Thoracic

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Background

Intercostal lung herniation (ILH) consists of pulmonary parenchyma protruding through the confines of the thoracic wall [1,2]. The most commonly accepted classification is that of the Morel-Lavallee lesion, which categorizes ILH based on etiology and location [2]. ILHs can be either congenital or acquired. Congenital hernias comprise approximately 18% of cases and usually present in childhood following thoracic wall malformations, such as rib (or intercostal muscle) hypoplasia or agenesis [3-5]. However, acquired hernias account for 82% of cases and are subdivided into spontaneous, traumatic, post-surgical, or pathological types [2,3,5]. Most commonly, acquired hernias are seen following thoracic surgery or trauma [2-4,6]. For traumatic ILHs, the underlying mechanism is based on a combination of a sudden increase in intrathoracic pressure and areas of relative anatomical weakness in the thoracic wall [5,7]. Traumatic ILHs are commonly located in the anterior or posterior chest wall due to fewer muscle layers resulting in focal areas of relative weakness [5,7]. When present, they can be either symptomatic or asymptomatic [2]. Common symptoms of traumatic ILHs include hemoptysis, pain, shortness of breath, cough, and bulging at the hernia site [5,7]. In some patients, use of the Valsalva maneuver can help accentuate the hernia site on physical examination [7]. Potential complications of ILHs include pulmonary parenchyma strangulation, necrosis, pneumothorax, and pneumomediastinum [8,9].

The diagnosis of ILH can be difficult if the treating physicians rely on clinical findings alone since the patient can present asymptomatically or with nonspecific symptoms [2]. Moreover, the etiology of ILH is not always clear and might not be suspected clinically. For example, Maeda et al reported the case of a patient with no history of trauma or surgery who presented with cough, dyspnea on exertion, and elevated noncardiogenic creatine kinase and required imaging studies to diagnose a spontaneous ILH [10].

Chest radiography can play a key part in the diagnosis of intercostal pulmonary hernias owing to its wide availability and ease of performance; chest radiography is an important feature in the management of patients who have had traumatic injury. However, the sensitivity of chest X-rays may be limited by the restricted mobility in patients after trauma and the resultant lack of additional and potentially necessary radiographic views. The superimposition of anatomic structures inherent on chest X-rays may not allow for clear delineation of the lung hernia. The use of multidetector CT scans offers a quick tomographic evaluation of the thoracic anatomy and provides value-added, actionable information not readily available on conventional radiographs. Furthermore, with additional multiplanar reformats and volume-rendered 3-dimensional (3D) reconstructions, imaging by CT scan can provide diagnostic confirmation and assessment of the size of the hernia, hernial orifice, and extent of the lesion [3]. These aforementioned features allow for proper surgical planning in patients requiring intervention.

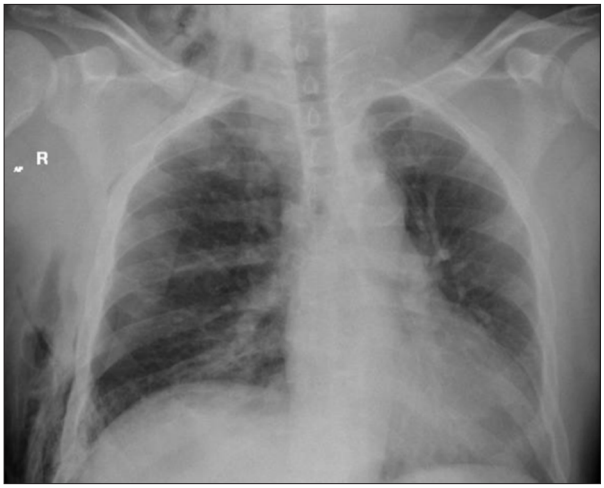

Figure 1. Initial chest X-ray following patient admission to the Emergency Department. Anteroposterior chest X-ray at admission showing a small right pneumothorax. Associated ill-defined opacities in the right lung base consistent with pulmonary contusions are seen. There is also abundant subcutaneous emphysema along the lateral chest wall of the right hemithorax, with underlying multiple rib fractures. No definite evidence of intercostal lung herniation is apparent.

Previously, a surgical approach was usually employed in patients with ILHs [2]. However, there have been some reported cases in which a conservative approach has proven successful [9]. This report is of a case of a traumatic right middle lobe lung herniation through the costochondral junction of the fourth and fifth ribs in a 64-year-old man that was successfully managed conservatively.

Case Report

A 64-year-old man with past medical history of type 2 diabetes mellitus presented to the Emergency Department reporting shortness of breath and intense pain in the right hemithorax after receiving a blunt trauma to the chest following a fall from the second floor of his house the same day. No loss of consciousness, palpitations, or dizziness prior to the fall were reported. The patient's surgical history was remarkable for an appendectomy.

The physical examination showed an adult male, awake and oriented in time, person, and place with shortness of breath. On auscultation, breath sounds were diminished on the right hemithorax. Further examination revealed moderate to severe

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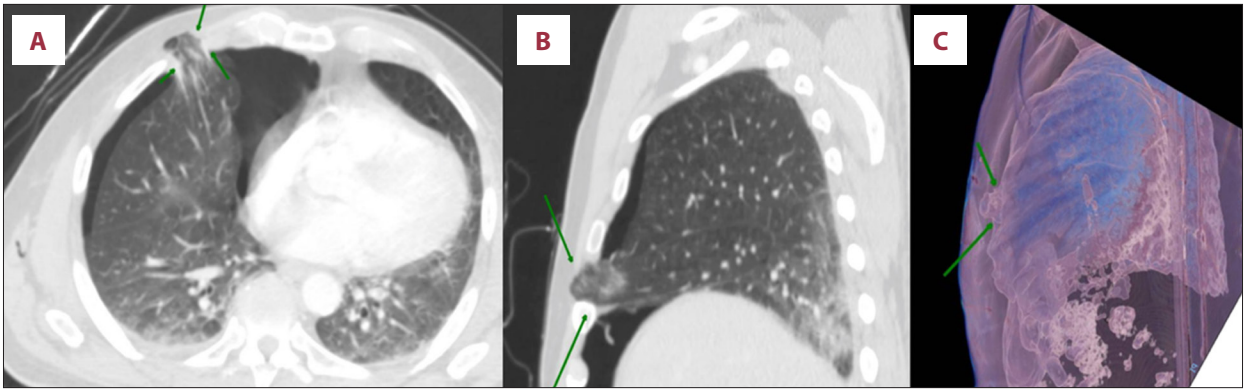

Figure 2. Follow-up chest computed tomography (CT) scan performed in the Emergency Department: (**A**) contrast-enhanced chest CT performed the day of admission showing a moderate right pneumothorax with a concomitant anterior chest wall defect through which a portion of the right middle lobe is herniating (arrows); (**B, C**) sagittal and 3-dimensional reconstruction showing the same anterior wall defect and consequent intercostal hernia of the right middle lobe (arrows).

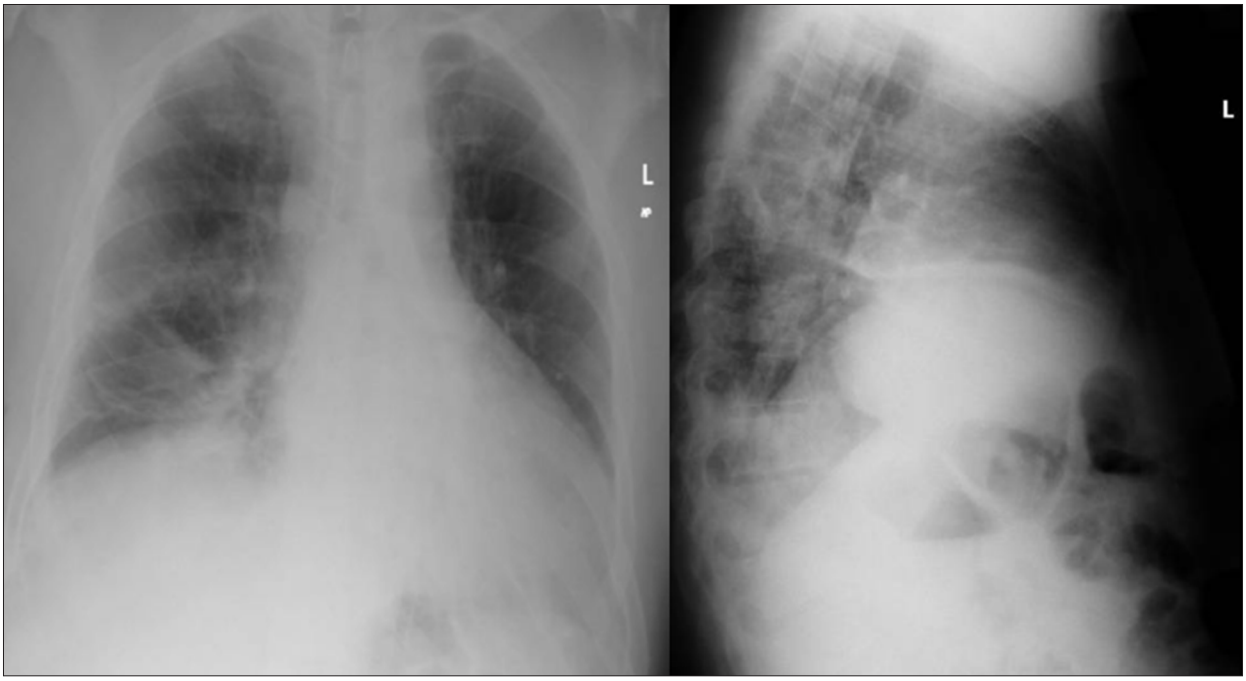

Figure 3. Chest X-rays performed on the day of discharge after clinical improvement. Posteroanterior and lateral chest X-ray performed the day of discharge showing resolution of the right pneumothorax. Additionally, the resolution of the previously observed subcutaneous emphysema is noted. Streaky right lower lung subsegmental atelectatic strands are also noted.

tenderness of the right hemithorax, with an associated chest wall hematoma. No signs of active bleeding were identified. The patient's vital signs were remarkable for a slight tachycardia (pulse was 103 beats per min). Arterial blood gas levels were within the reference range.

Multiple imaging studies were performed following the initial evaluation. An anteroposterior chest X-ray showed a small right pneumothorax with overlying abundant subcutaneous emphysema and basilar ill-defined opacities, which were concerning for pulmonary contusions (**Figure 1**). A follow-up chest CT revealed a moderate right pneumothorax resulting in passive atelectasis and tension upon the adjacent pulmonary parenchyma. Associated right pulmonary contusions were also seen. In addition, multiple rib fractures throughout the chest wall were identified, most notably a set of displaced fractures of the right costochondral junction of the fourth and fifth ribs. The aforementioned fractures were accompanied by a chest wall defect through which a portion of the right middle lobe was herniated (**Figure 2**). An abdominopelvic CT was remarkable for a liver laceration (grade III as per the American Association for the Surgery of Trauma).

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Given the patient's imaging findings, he was admitted to the trauma Intensive Care Unit, where a needle decompression was performed followed by a right thoracostomy tube placement. In the following days, abundant bloody discharge from the thoracostomy tube, of approximately 100 mL per day, was observed. The patient underwent serial complete blood cell counts, which showed stable hemoglobin levels and no indication for blood transfusion. A conservative management approach consisted of intravenous hydration, pain management, and incentive spirometry.

Follow-up chest X-rays to evaluate for the resolution of the observed right pneumothorax were performed (**Figure 3**). On day 8 after the trauma, the patient's thoracostomy tube was removed following the resolution of his previous bloody discharge and right pneumothorax.

During the patient's hospitalization, there were no reported incidences of respiratory deterioration or need for emergent (or non-emergent) thoracic surgery. The patient was subsequently discharged from our institution.

The patient was contacted 1 year following the aforementioned events for follow-up questioning. He reported no subsequent respiratory complications following discharge. In addition, the patient did not require further visits to the ED and has been able to continue his lifestyle without post-traumatic sequelae.

Discussion

This case report presents a 64-year-old man diagnosed with a post-traumatic ILH that was managed conservatively without reported complications 1 year after the trauma. Currently, the prevalence and incidence of lung herniations is unknown, with approximately 300 cases reported in the literature [2,4,8,11]. When diagnosed, ILHs pose a challenge to the treating physicians since the few described methods of management are described only in case reports [9]. While many reported cases present varying surgical approaches in an attempt to prevent life-threatening complications, the employment of a conservative approach can be appropriate in selected cases.

This case report describes a patient presenting to the ED with a right frontal, middle lobe ILH following a traumatic fall on his right chest. Like most traumatic ILHs, the patient's hernia was located anteriorly through the costochondral joints of the fourth and fifth ribs because of the relative area of weakness in this location compared with that of the remainder of the thoracic wall [5,7]. The diagnosis of ILH and concomitant right pneumothorax was confirmed via 3D reconstructions of the thorax on a multidetector CT scan. Once the ILH was diagnosed, the patient underwent conservative management without subsequent complications.

In the present case, our patient was managed with a regimen of pain management, incentive spirometry, intravenous hydration, and close monitoring since his clinical presentation did not suggest active pulmonary tissue strangulation. Following clinical improvement and pneumothorax resolution, the patient was discharged without reported complications. The follow-up interview after 1 year was unremarkable for respiratory deterioration, further visits to the ED, or increased morbidity. Similar to our patient, a case published by Bikhchandani et al of a post-traumatic ILH was managed conservatively using a similar approach of pain management, incentive spirometry, and close monitoring [9]. In their case, the patient had ILH resolution during hospitalization and was subsequently discharged. A follow-up examination 1 month later was unremarkable. Another case report by Rao et al described an elderly patient presenting with a spontaneous ILH that was managed successfully with over-the-counter pain medications and was resolved at the 6-month follow-up [12]. These cases suggest that, despite the varying surgical approaches suggested in the past, a conservative approach can be appropriate in selected cases.

A conservative approach has also been suggested in pediatric patients. A case by Kolar et al presented a patient with traumatic ILH that was managed with pressure dressings (gauze and adhesive tape) and with weekly follow-up examinations until resolution [13]. Another similar case of a pediatric patient diagnosed with a traumatic ILH by Carrouget et al described conservative management, also based on pressure bandaging, with subsequent resolution after 3 weeks [14].

Currently, multiple surgical approaches have been presented. For example, a case report by Chiang et al described a post-traumatic incarcerated left upper lung intercostal hernia that was repaired by thoracoscopy [4]. Another case report by Mirza et al discussed the first documented intercostal hernia repair using a bio-prosthetic device [11]. Additionally, Clark et al presented a traumatic ILH that was managed successfully with a polytetrafluoroethylene patch [5]. In Europe, Subotic et al successfully managed an ILH with chest wall reconstruction using Mersilene mesh and Synthes plates [15]. Although these approaches have proven successful, inherent risks to chest wall reconstructions include wound infection, altered respiratory mechanics, and poor wound healing in patients with risk factors, such as diabetes, which was present in our patient [16,17].

Presently, there are no guidelines regarding the management of intercostal pulmonary hernias. We support the use of the CT scan with multiplanar reformats and volume-rendered 3D reconstructions for the diagnosis of intercostal pulmonary hernias, in particular for those acquired by trauma or surgery. Additionally, we agree with using a conservative approach as the initial management, owing to the possibility of spontaneous reduction. We also recommend that close monitoring for

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clinical deterioration should be managed with a conservative approach. In patients with symptomatic ILHs, a surgical approach should be considered, providing the benefits outweigh the risks. The management of intercostal pulmonary hernias must be tailored on an individual basis after careful physical examination aided by imaging to prevent potential life-threatening complications.

Conclusions

This report has presented a rare case of ILH following trauma that was confirmed on imaging. This case has shown that surgical intervention is not required in asymptomatic patients, as this patient was managed conservatively and remained asymptomatic on follow-up.

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Department and Institution Where Work Was Performed

Section of Diagnostic Radiology, University of Puerto Rico Medical Sciences Campus, San Juan, Puerto Rico.

Conflicts of interest

None.

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