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Case Report

Incidental discovery of intercostal pulmonary hernia: A case report[☆]

Amine Cherraqi, MD^{*}, Jihane El Houssni, MD, Mustapha Outznit, MD, Kaoutar Imrani, MD, Khadija Benelhosni, MD, Nabil Moatassim Billah, MD, PhD, Ittimade Nassar, MD, PhD

Central Radiology Department, CHU Ibn Sina, Rabat 10000, Morocco

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ABSTRACT

Lung hernias are rare. They are defined by the protrusion of lung parenchyma through a defect in the chest wall. A distinction is classically made between supraclavicular, thoracic or diaphragmatic hernias and congenital or acquired hernias. The latter can be classified by etiology as post-traumatic, postoperative, or pathological but can be spontaneous (even rarer) caused mainly by coughing efforts. The diagnosis is guided by the clinical presentation and confirmed by radiographic analysis, especially CT scan. The management, by conservative or surgical approach, depends on the clinical condition of the patient, the characteristics of the hernia and the existence or not of complications. We report the case of a 58-year-old patient, chronic smoker with no history of trauma, who presented with a chronic cough not improved by symptomatic treatment and in whom the clinical examination was without particularities. Chest CT scan showed discrete pulmonary emphysema with an intercostal pulmonary herniation at the level of the right fifth intercostal space associated with a bony outgrowth at the level of the middle arch of the right fifth rib. The pulmonary protrusion occurred through a parietal defect between the fifth rib and the bony protrusion. The management consisted of conservative treatment of the hernia with close clinical and radiological follow-up and medical treatment of the pulmonary emphysema and chronic cough associated with smoking cessation and hygienic and dietary rules.

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Introduction

Lung hernias are rare, defined as a protrusion of the lung parenchyma through a defect in the intercostal muscles between adjacent ribs and are to be differentiated from eviscerations which correspond to the externalization of lung

parenchyma through a wound [1]. The first case of pulmonary hernia was described in 1499 by Roland and corresponded to a supra-clavicular hernia [2]. And since then, only a little more than 300 cases have been reported in the literature [1]. Depending on the etiology, Morel-Lavallée classified pulmonary hernias as congenital and acquired. The latter are generally of traumatic or iatrogenic origin, especially af-

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^{*} Corresponding author.

E-mail address: Dr.amine.cherraqi@gmail.com (A. Cherraqi).

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ter thoracic surgery, or may be acquired, known as "spontaneous," often induced by an effort to cough, a sneeze, or even a "false movement," without any notion of obvious trauma [3]. Pulmonary hernias may be asymptomatic or revealed by pain or even hemoptysis following incarceration or strangulation of the lung parenchyma [4]. We report the case of Incidental discovery of intercostal pulmonary hernia, in a patient presenting a chronic cough with a brief review of the literature.

Case report

A 58-year-old man, with no medical or surgical history, chronic smoker not weaned, who presented a chronic cough for more than 6 months, unimproved by symptomatic treatment, with no sputum, no fever, no chest pain, no weight loss, and no history of trauma, which motivated a consultation in our training. The clinical examination found a patient in good general condition, eupneic, hemodynamically stable, the pulmonary auscultation was without abnormality and the rest of the physical examination was without particularities. A frontal chest X-ray was performed and was without significant abnormality. A thoracic computed tomography (CT) was ordered and showed some fine bilateral apical and centrolobular pulmonary emphysema bullae more marked on the right side. With individualization of lung parenchyma protrusion from the lower part of the ventral segment of the right upper lobe through a parietal defect of the junction between the anterior and middle part of the fifth right intercostal space, associated with septal thickening and small overlapping cystic images opposite probably related to incipient fibrosis of the protruding lung parenchyma (Fig. 1). On the other hand, maximum intensity projection (MIP) images were acquired and volume-rendered 3-dimensional (3D) reconstruction images were also performed and showed a bony outgrowth at the level of the middle arch of the fifth right rib. The lung parenchyma protruded through a parietal defect between the rib and the bony outgrowth (Fig. 2) that was probably related to a neglected old rib fracture. The diagnosis retained was that of an intercostal pulmonary hernia that measured 2×1.5 cm with a neck measuring 1.8 cm with fibrosing involvement of the surrounding lung parenchyma. Given the small size of the hernia and the neck, the risk of strangulation was low, and the therapeutic decision was conservative treatment of the hernia with close clinical and radiological follow-up and medical treatment of the pulmonary emphysema and chronic cough associated with smoking cessation and hygienic-dietary rules.

Discussion

Pulmonary hernias are a rare entity. It is estimated that just over 300 cases have been reported in the literature [1,5] and are defined by the protrusion of lung parenchyma covered with its pleural sheets beyond the limits of the thoracic cavity through a defect in the chest wall, diaphragm, or mediastinum, without any skin invasion. By abuse, so-called "covered eviscerations" are often included [1,6]. Pulmonary hernias were first

described in 1499 by Roland [2] and were classified in 1845 by Morel-Lavallée, who received 32 cases and created a classification that remains the simplest and most relevant according to their location and mechanism [3]. This classification distinguishes supraclavicular, thoracic or diaphragmatic hernias and congenital or acquired hernias.

Congenital hernias are often associated with costal or cartilage defects such as rib hypoplasia, intercostal hypoplasia, or weak endothoracic fascia [6,7]. Most congenital hernias are detected in childhood, but sometimes they may remain asymptomatic and manifest later in life [6].

Acquired hernias can be divided into traumatic, consecutive, pathologic, or spontaneous. The "consecutive" hernia is a hernia of delayed onset after trauma, secondarily disappeared to be included in the post-traumatic category, along with postoperative hernias [1,3]. The mechanism of acquired pulmonary hernias involves intercostal muscle weakness associated with conditions that increase intrathoracic pressure such as coughing and heavy lifting. Predisposing factors include environmental and operative trauma, chronic obstructive pulmonary disease, inflammatory or neoplastic processes, and chronic steroid use [6,8].

Cervical lung hernias account for approximately 35% of all lung hernias [9] and present when a portion of the lung protrudes through the anterior region of the thoracic inlet and develops between the anterior scalene muscle and the sternocleidomastoid muscle, as a result of weakness in Sibson's fascia (suprapleural membrane) [1,9]. Intercostal lung hernias account for approximately 60%-80% [9], resulting from a protrusion of the lung parenchyma through a zone of weakness in the chest wall between the ribs. This is often due to trauma and can occur either immediately or years after the event. Diaphragmatic lung hernias are rare [9]. Approximately, 18% of pulmonary hernias are congenital, 52% are post-traumatic, 29% are spontaneous, and 1% are pathological, meaning, associated with infectious or tumor involvement of the chest wall [1].

Spontaneous pulmonary hernias usually develop as a result of an acute and intense increase in intrathoracic pressure, through intense coughing, sneezing, blowing on a musical instrument, glass blowing, or intense heavy lifting, in addition to localized weakness of the chest wall that could lead to rib or cartilage fracture [10,11]. Spontaneous hernias are most often intercostal, located anterior to the chondrocostal junction, between the 7th and 11th ribs [10]. A zone of weakness exists at this point, below the pectoralis major muscle and the transverse thoracic muscle, the external intercostal muscle being reduced to a simple aponeurosis, the internal muscle originating more laterally. A second area of weakness exists behind the costal angle, with the medial and internal intercostal muscles arising only more laterally. Nevertheless, hernias are less frequent here, probably because of the large amount of parietal muscle coverage (paravertebral, lumbar, rhomboid, trapezius) [1,10]. Brock noted that all spontaneous anterior hernias reported in the literature occurred in men, a third of whom were obese and half of whom were smokers [10].

Clinically, pulmonary hernia is manifested by a brutal chest pain, sometimes associated with dyspnea or hemoptysis, with secondary appearance of a subcutaneous curvature of the

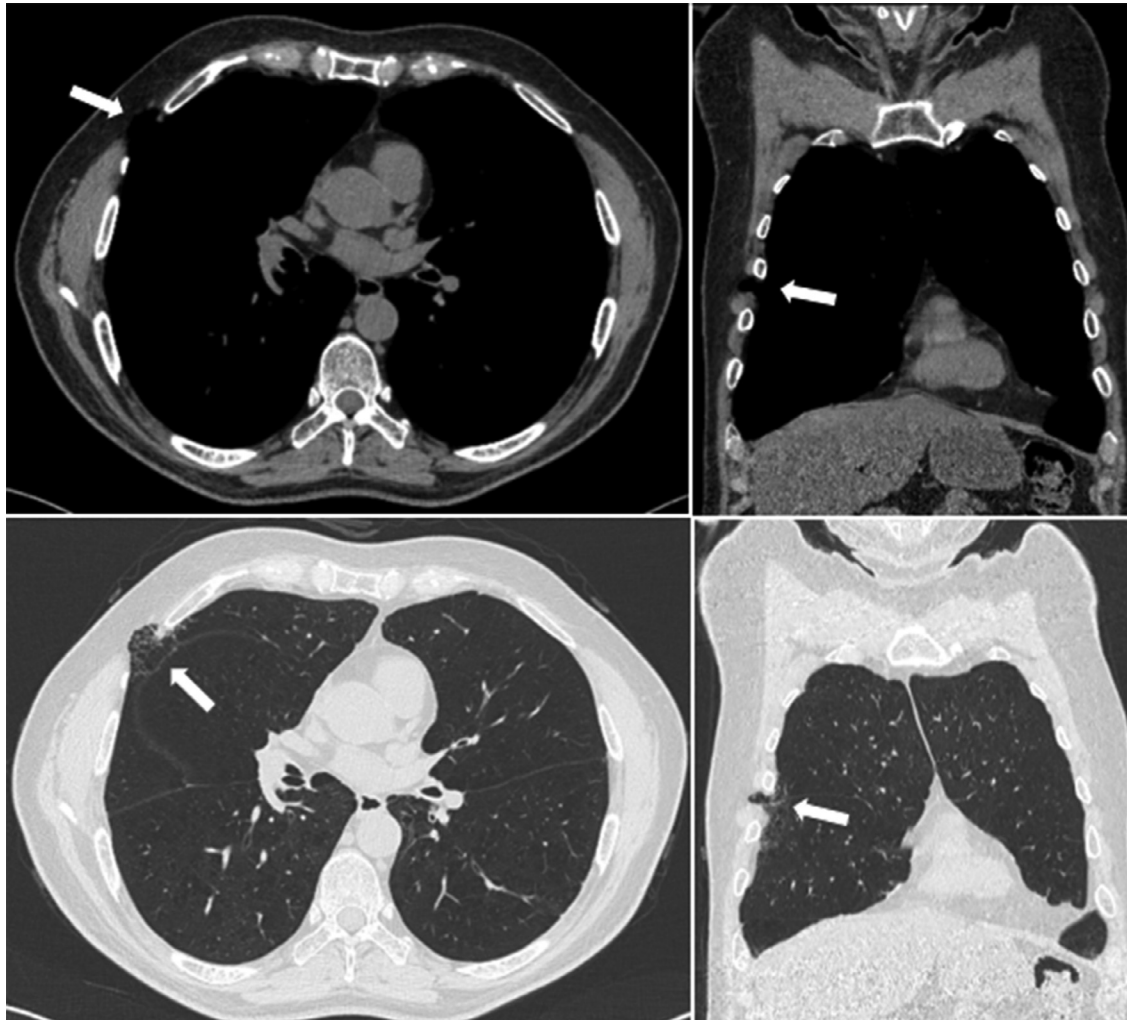


Fig. 1 – Axial and coronal sections of a thoracic CT scan in mediastinal and parenchymal window showing fine bilateral apical and centro-lobular pulmonary emphysema bullae more marked on the right side. With individualization of a lung parenchymal protrusion from the lower part of the ventral segment of the right upper lobe through a parietal defect at the level of the fifth right intercostal space, associated with septal thickening and small cystic images abutting it probably related to the onset of fibrosis of the protruding lung parenchyma.

chest wall, impulsive to coughing or physical tension. It is rarely asymptomatic, of fortuitous discovery or of delayed appearance. Palpation reveals a crepitus swelling, often ecchymotic, increased by Valsalva maneuvers, often reducible. Respiratory distress with paradoxical breathing may exist in rare cases of large hernias [6,12]. However, it is difficult to establish an early clinical diagnosis, because the pain of pulmonary hernia simulates that resulting from intercostal neuritis or neuralgia [13].

The differential diagnosis of a palpable painful chest wall mass also includes subcutaneous emphysema, bronchopleural fistula, chest wall lipoma, parietal abscess, cutaneous metastases, as well as delayed post-traumatic subcutaneous seroma or rupture of the pectoralis major tendon, especially after chest wall trauma [14].

The initial radiological evaluation can be done by standing chest X-ray, front and profile, with inspiration, which remains the first-line examination. However, it is often without

significant abnormality or of difficult interpretation and can be made more sensitive by the realization of tangential images with Valsalva maneuver. It shows an aerated, parenchymal, extra-thoracic image, with a "lung beyond the rib" sign on the side view and a "lucent lung" sign on the front view, and is often associated with subcutaneous emphysema and enlargement of the inter-costal space involved [1,15,16].

The reference radiological examination is the thoracic CT, again optimized by Valsalva maneuver. It confirms the diagnosis, characterizes the hernia, its location, size, extent, content, objectifies the parietal defect, possible fractures and/or costal disjunctions, specifies the state of the underlying lung parenchyma and, finally, specifies the anatomical relationships with the pectoral and intercostal muscles. Thus, multi-planar reconstruction images in the axial, sagittal, and coronal planes better define the exact location and size of the thoracic parietal defect, as well as the dimensions of the herniated lung parenchyma. Minimal intensity projection (MinIP) can be

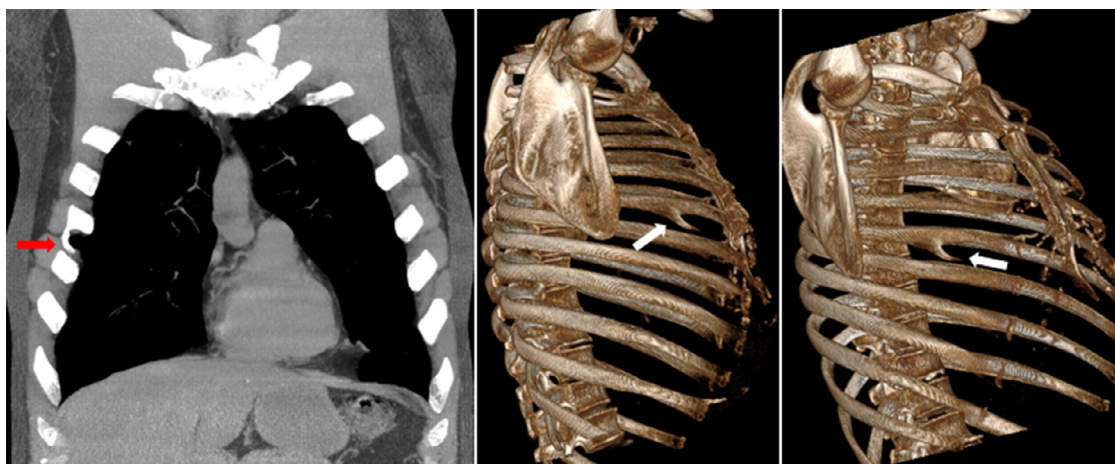


Fig. 2 – Volume-rendered maximum intensity projection (MIP) and 3-dimensional (3D) reconstruction images showing a bony outgrowth at the level of the middle arch of the right fifth rib. The lung parenchyma protrudes through a defect between the rib and the bony outgrowth (Fig. 2) that is probably related to an old neglected rib fracture.

useful in excluding bronchial occlusion especially in large and medium caliber bronchi. In addition, MIP images, allow to exclude strangulation of the lung parenchyma or infarction of the pulmonary vessels. Volume-rendered 3-dimensional reconstructions visualize the entire thoracic involvement and can be extremely useful in assessing the extent of disease, which is paramount for surgical planning and management [1,6,17–19].

Thoracic ultrasound can be useful in the diagnosis of pulmonary hernias when CT is not immediately available or if the presentation is atypical. It allows the evaluation of lesions of the lung, chest wall, pleura, diaphragm and parts of the mediastinum, and it can also guide a possible biopsy. It has the advantage of being available, accessible, non-irradiating and less expensive. Pulmonary hernias present on thoracic ultrasound as hyperechoic intercostal lesions by the presence of swollen lung parenchyma with an absent hyperechoic pleural line between the 2 ribs of the intercostal space [6,15,20].

The spontaneous evolution of pulmonary hernias is unconditionally towards enlargement of the hernial neck with chronic parenchymal damage, associated with an increased risk of strangulation and respiratory distress by paradoxical respiration [1].

Conservative management with radiological follow-up seems reasonable in the majority of patients, in the absence of complications, such as strangulation, hemoptysis, respiratory distress, increase in the size of the hernia or presence of visceral organs [21]. However, the presence of any of these complications requires immediate surgical intervention [6]. Surgical treatment consists of reducing the hernia, resecting the sac, and restoring continuity and parietal strength [1]. Surgical options are multiple and include wires, soft synthetic patches, judet staples, and sliding staples. Soft prosthetic patches have fewer restrictions on normal chest mechanics compared to more rigid implants. Bioprosthetic implants reduce the risk of infection [22,23]. Finally, in addition to surgical treatment, management must be global, including smoking cessation, cough control, dietary hygiene and functional rehabilitation [1].

Conclusion

Spontaneous pulmonary hernias are rare, often induced by chronic intra-thoracic hyper-pressure and decreased parietal resistance. Following a coughing effort, a sneeze or a "false movement," a tear of the intercostal space occurs and its dehiscence. Chest CT with multiplanar reconstructions and maximum (MIP) and minimum (MinIP) projection images allows confirmation of the diagnosis and planning of management. Conservative treatment is usually sufficient for mild and moderate hernias, but for larger or more complicated hernias, a surgical approach is necessary.

Ethics approval

Our institution does not require ethical approval for reporting individual cases or case series.

Patient consent

Written informed consent was obtained from a legally authorized representative(s) for anonymized patient information to be published in this article.

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