

# Traumatic intercostal pulmonary herniation: a case report

## Travmatik interkostal pulmoner herniasyon: Olgu sunumu

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We report a case of intercostal pulmonary hernia through a defect in the wall of the thoracic cavity which occurred after blunt thoracic trauma. Diagnosis of pulmonary herniation was confirmed radiologically by chest X-ray and computed tomographic scan. After initial inspection by video-assisted thoracoscopy which also revealed a diaphragmatic rupture, a posterolateral thoracotomy was performed. The defect of the thoracic wall was repaired with two reconstruction plates. The hernia was successfully repaired with prosthetic mesh. Review of the literature shows that when required, surgical repair of pulmonary herniation is the treatment of choice.

**Key Words:** Intercostal herniation; lung; trauma.

Bu yazıda, künt toraks travması sonrası torasik kavite duvarında oluşan bir defekt nedeniyle gelişen bir interkostal pulmoner herni olgusu sunuldu. Pulmoner herniasyon tanısı, radyolojik olarak göğüs filmi ve bilgisayarlı tomografi taraması ile doğrulandı. Aynı zamanda diyafragmatik bir rüptür varlığını da gösteren video destekli bir torakoskopi ile gerçekleştirilen ilk incelemeden sonra, bir posterolateral torakotomi operasyonu yapıldı. Torasik duvar defekti, iki rekonstrüksiyon plağı ile tamir edildi. Herni ise protez 'mesh (yama)' ile başarılı bir şekilde tamir edildi. Literatür araştırması, pulmoner herniasyonun tedavisi gerekli olduğunda bunun cerrahi onarım olması gerektiğini göstermektedir.

**Anahtar Sözcükler:** Akciğer; interkostal herniasyon; travma.

Severe blunt chest trauma may result in a diversity of intra-thoracic injuries including the lung, heart, airway or diaphragm. However, traumatic intercostal pulmonary hernia is a rare sequel to traumatic injury. Although spontaneous regression of small hernias has been reported and conservative management has been advocated, larger defects often require surgical treatment.

We describe a case in which an intercostal defect due to rib fractures and lung hernia were successfully repaired with mesh and reconstruction plates.

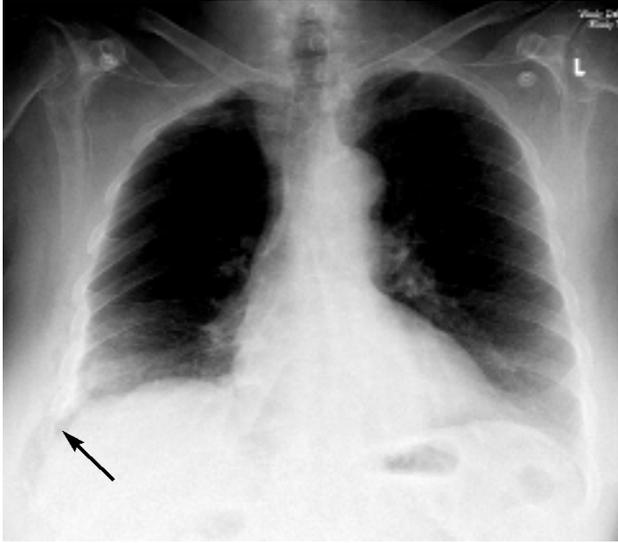
### CASE REPORT

A 70-year old woman was admitted to our hospital with signs of acute respiratory distress and right thoracic pain. Her complaints resulted from blunt thoracic trauma after a fall of the stairway. Her husband mentioned that she had been drinking

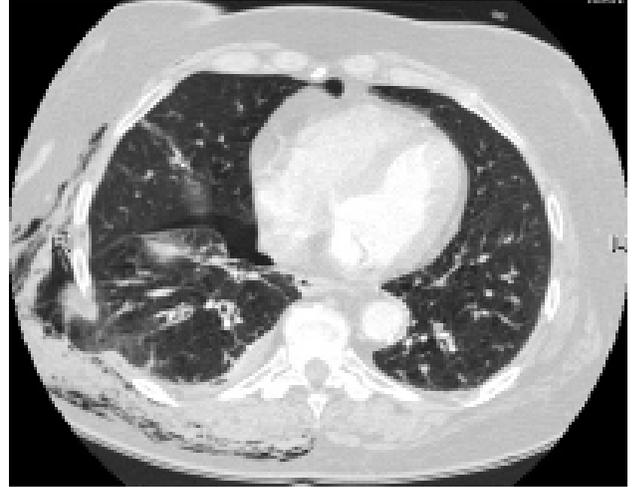
more than 10 alcoholic consumptions that night. Her previous medical history reported mild lung emphysema, lung embolus and a gynecological operation. She used pulmonary medication (for bronchodilation) and also was a heavy smoker. She was very agitated and complained of pain on the lateral, lower half of the right thoracic wall.

At the site of pain there was a swelling which enlarged during a Valsalva maneuver. A standard chest X-ray showed subcutaneous air on the right lateral-basal side and rib fractures. No pneumothorax was seen (Fig. 1). Subsequently, a computed tomographic (CT) scan was obtained which demonstrated protrusion of pulmonary tissue through a defect in the thoracic wall at the site of the rib fractures. There also was a small right ventral pneumothorax (Fig. 2).

Due to her severity of symptoms (chest pain and dyspnea) it was decided to operate on the same day.



**Fig. 1.** Standard X-ray showing subcutaneous air on the right lateral-basal side at the site of fractured ribs (arrow).

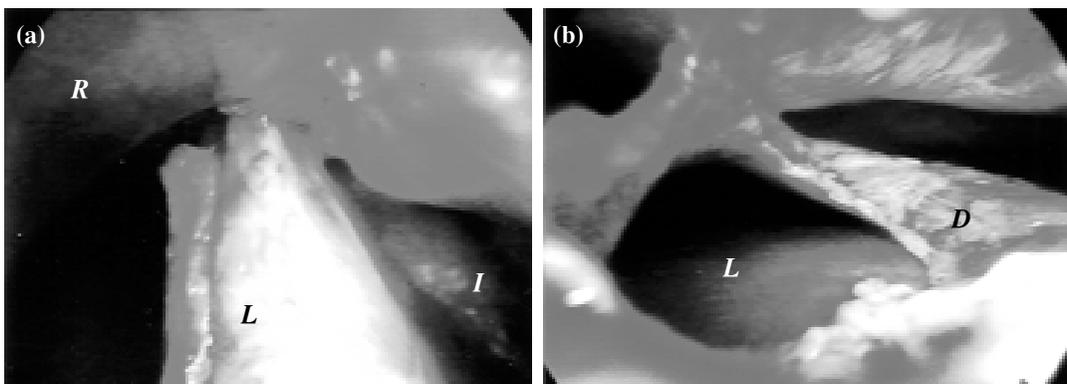


**Fig. 2.** CT scan demonstrating massive subcutaneous emphysema and protrusion of pulmonary tissue through a defect in the right lateral thoracic wall at the site of the rib fractures.

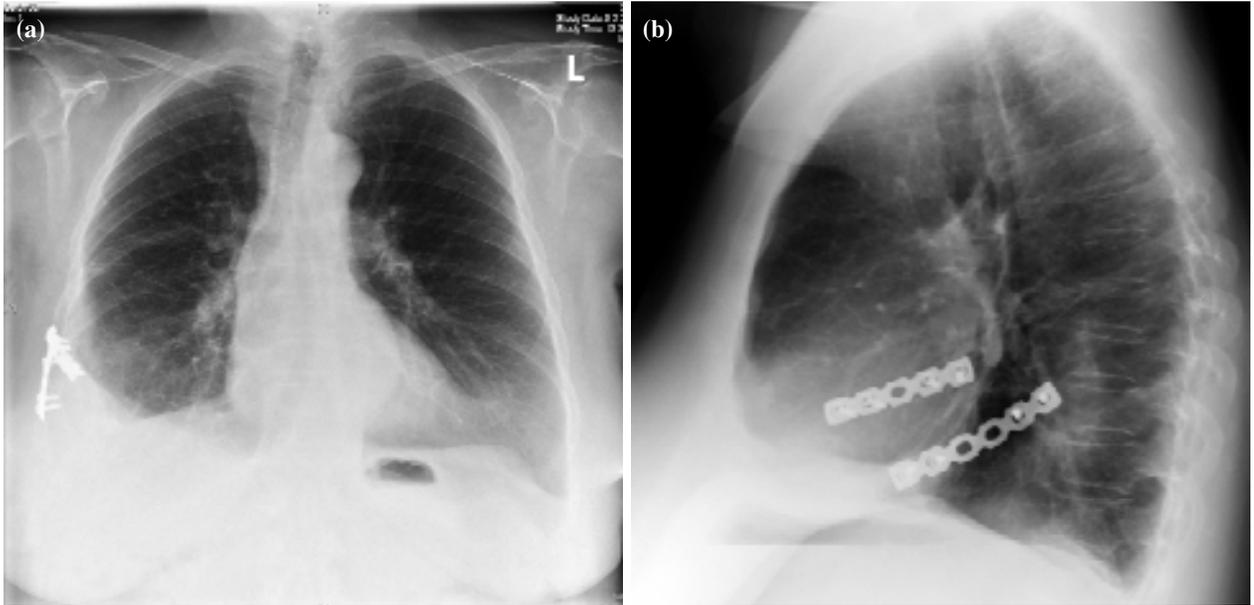
Pre-operatively, a lung physician was consulted who prescribed peri-operative administration of corticosteroids and bronchodilators. Because the patient was considered a high-risk patient, both mechanical compression stockings and pharmacological prophylaxis (low-molecular heparin) were utilised peri-operatively to reduce the risk of venous thrombo-embolism.

Under general anesthesia and double-lumen intubation, the patient was initially operated by a video-assisted thoracoscopic surgery (VATS) to assess the severity of injury. Inspection of the thoracic cavity showed protrusion of lung tissue through a large defect of the thoracic wall on the

lower dorsal side. In addition, a rupture of the diaphragm without apparent damage to the liver was seen (Fig 3a and b). Due to the combination of injuries it was decided to convert to a right lateral thoracotomy. After the right lung was deflated, the herniated lung tissue was reduced into the thoracic cavity. The damaged lung segment was resected with a linear stapler (Ethicon Endosurgery). After this, the diaphragmatic defect was closed primarily with a Mersilene suture. Inspection of the defect in the thoracic wall showed fractures of the 6th, 7th and 8th rib, with a large dislocation of the 7th and 8th rib. After anatomical reduction of the fractured ribs, two reconstruction plates (Synthes) were



**Fig. 3.** (a) Thoracoscopic image showing herniation of lung tissue through a defect in the thoracic wall. (R: Rib; L: Lung; I: Intercostal defect). (b) Thoracoscopic image showing a right-sided diaphragmatic rupture. (D: Diaphragm; L: Liver).



**Fig. 4.** Standard X-ray (anterior-posterior) (a) and lateral (b). Postoperative situation (after removal of suction drains) showing fixation of the fractured ribs by two osteosynthesis plates. The right lung is fully insufflated and subcutaneous air has disappeared.

moulded to the curvature of the rib, bridging the fracture site in the middle. Subsequently, the plates were fixated with 3.5 mm bi-cortical screws (Synthes) on both sides (Fig. 4a, b). The remaining defect was closed intra-thoracically with Vicryl mesh (Ethicon Endosurgery) which was fixed to the fascia of the intercostal musculature with interrupted 1.0 Vicryl sutures (Ethicon Endosurgery). Thoracic drainage was accomplished with two suction drains, followed by closure of the thoracic cavity. Postoperative recovery was uneventful and the patient was discharged six days after the operation. During outpatient follow-up visits at three weeks and six months, she did not reveal any physical complaints from her surgical intervention.

## DISCUSSION

Herniation of the lung through the intercostal muscles is a rare phenomenon. The first accurate classification of lung hernias was described by Morel-Lavalle in 1847.<sup>[1]</sup> In general, 20% of reported cases of lung herniation are congenital, and 80% are acquired. Although some cases of spontaneous pulmonary herniation have been described, the majority of acquired pulmonary hernias have a traumatic origin. Spontaneous hernias may occur in the presence of local impairment of the thoracic wall and concomitant increased intrathoracic pres-

sure. This phenomenon has been reported after vigorous coughing.<sup>[2,3]</sup> Traumatic intercostal hernias are often associated with rib fractures due to blunt thoracic trauma,<sup>[4]</sup> but may also occur after penetrating injury or surgical intervention.

Most frequently, there is a history of injury with a deformity of the thoracic wall. If present, there is pain and discomfort at the site of thoracic wall swelling, which may increase in size with forced expiration and the Valsalva maneuver. Diagnosis of intercostal pulmonary herniation can be confirmed radiologically. Although standard and oblique chest X-rays may visualize a pulmonary hernia, the accurate localisation and extent of pulmonary protrusion is determined by a CT-scan.

When reviewing the literature, there has been controversy about the conservative management of pulmonary hernias. Spontaneous regression has been observed in small asymptomatic hernias,<sup>[5]</sup> however, it is now generally accepted that large hernias or hernias which have a risk of incarceration are treated by surgical repair.<sup>[6,7]</sup> Although it is usually not necessary to stabilise rib fractures with reconstruction plates after blunt chest trauma, we employed this method due to the severity of injuries in this patient in an attempt to reduce blunt chest-injury associated morbidity, such as improved pain

relief and respiratory mechanics.<sup>[8]</sup> These lightweight reconstruction plates are clinically safe and do not have to be removed in time. It has been reported that spontaneous intercostal pulmonary hernias can be successfully repaired by VATS.<sup>[9]</sup> However, in this case of traumatic pulmonary herniation, we primarily used VATS to determine the extent of intrathoracic injury. In our patient, multiple injuries were encountered during VATS: pulmonary herniation, rib fractures, an intercostal thoracic defect, but also a diaphragmatic rupture that was not demonstrated on the pre-operative CT-scan. In our opinion, intercostal pulmonary hernia repair in the presence of multiple injuries is warranted by conventional thoracotomy and not by VATS.

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