



## TRAUMATIC EXTRA THORACIC LUNG HERNIATION: A CASE SERIES AND A REVIEW OF THE LITERATURE

<sup>1,2</sup>D Pazooki, <sup>1</sup>Granhed, H., <sup>2</sup>Zeratiaan, S., <sup>2</sup>Haghighikian, M., <sup>2</sup>Hosseini, M., <sup>2</sup>Mousavie, S.H., <sup>3</sup>Mesbah, M., <sup>2</sup>Negahi, A.R. and <sup>1</sup>Lundgren, J.

<sup>1</sup>Sahlgrenska University Hospital, Department of Surgery, Gothenburg Sweden

<sup>2</sup>Iran University, Hazrat Rasol Akrm Hospital, Department of Surgery and Cardiovascular surgery Tehran Iran

<sup>3</sup>Iran University, Hazrat Rasol Akrm Hospital, Department of Cardiovascular & Thoracic anesthesia Tehran Iran

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### ABSTRACT

A lung herniation is a protrusion of the lung beyond the normal boundaries of the thoracic cavity through a defect in the thoracic wall. Extra thoracic lung herniation can be either congenital or acquired, acquired lung hernias can be further subdivided according to cause[1]. Traumatic lung herniation is an exceptionally rare complication to blunt and penetrating trauma[2].

**Method:** In this article we present a case series of 14 patients that suffered lung herniation secondary to trauma and a review of the literature.

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## INTRODUCTION

Lung hernia are classified in several ways, they are divided into congenital and acquired, acquired hernias can be further classified according to etiology and the location of the hernia. The most widely accepted classification is still the Morel-Lavellee classification originally presented in 1847 based on a case series of 32 patients (A., 1847) (see Table 1). Spontaneous hernias can affect all locations with trans diaphragmatic being the rarest type (Sharma, 2001). Chronic obstructive pulmonary disease and congenital defects in the structures the limit the thoracic cavity like Sibson's fascia in the case of cervical hernias or incomplete distribution of intercostal muscles in intercostal hernias (Sharma, 2001).

#### \*Corresponding author: <sup>1,2</sup>D Pazooki

<sup>1</sup>Sahlgrenska University Hospital, Department of Surgery, Gothenburg Sweden

<sup>2</sup>Iran University, Hazrat Rasol Akrm Hospital, Department of Surgery and Cardiovascular surgery Tehran Iran

Spontaneous hernias are rare and trauma remains the most common cause and account for up to 80% of hernias (Bowley, 2001). Both blunt and penetrating trauma can cause lung herniation. Examples of blunt trauma that have been known to cause lung hernias are cardiopulmonary resuscitation (Emberger, 2011), and motor vehicle accidents where the patient was wearing a three-point seatbelt and suffered a costochondral joint disruption in addition to a flail chest (May, 1995), also known as seatbelt syndrome. Penetrating trauma and minimally invasive surgery such as video-assisted thoracoscopy also have been shown cause hernias (Temes, 2001; Ishibashi, 2007 and Hauser, 1997), it appears that major thoracic interventions requiring a large opening are less likely to cause hernias than less invasive methods. Lung hernias appear to arise in areas where the chest wall is weak due to injury, congenital defects or anatomical weaknesses. Hernias caused by blunt chest trauma for example frequently manifest where the chest wall is only made up of one muscle layer close to the sternum (May, 1995 and Soreide, 1975), while being

rare in the posterior areas of the chest where the trapezius, latissimus dorsi and rhomboid muscles offer support. In the patient lung hernias are typically asymptomatic and the patient presents with a crepitant mass protruding through the chest wall (Soreide, 1975). In some cases, this mass increases in size when the intra-thoracic pressure is increased by performing Valsalva manoeuvre or simply coughing. Hernias can also be painful for the patient and may become the seat of frequent infections. Hernias are typically not visible on the chest x-ray and are typically visualized on a CT-scan (Weissberg, 2002). Most asymptomatic hernias require no intervention, but surgery may be indicated to relieve pain, prevent strangulation of pulmonary tissue etc.

**Table 1. Modified Morel-Lavellee Classification**

Localisation:	Cervical
	Thoracic
	Diaphragmatic
	Mediastinal
Etiology:	Congenital
	Acquired
	-traumatic
	-pathological
	-spontaneous
	-post surgical

### Case series

We collected the records of every patient diagnosed with a lung hernia following trauma at Sahlgrenska University Hospital between 2010 and 2015. A total of fourteen patients were found. All patients suffered pulmonary contusion, haemothorax and pneumothorax. For more information, see Table 2.

**Table 2. Patients**

	All Patients:	Blunt Trauma:	Penetrating Trauma:
Number of patients	14	12	2
Male gender	10	8	2
Female gender	4	4	0
Mean ISS score ± SD	12,5 ±10,5	12,8 ±11,2	10,5 ±7,8
Injury localisation:			
- Right:	2	2	0
- Left:	12	12	2
Blunt trauma:			
-MVA	8		
-Fall	3		
Other	1		
Penetrating trauma:			
- Firearm	2		
*LH diagnosed/suspected on initial CXR/CT:	13	13	1
Operation before CT/CXR	1	0	1
*LH diagnosed during initial operation	0	0	1
Mortality	0	0	0
Associated injuries			
3> Rib fractures	12	11	1
Liver			
Spleen	2	1	1
Management:			
Laparotomy:	4	4	0
Thoracotomy:	9	8	1
Thoracotomy w laparotomy:	5	4	1
Lung resection:	5	5	0

### DISCUSSION

The most common type of trauma giving rise to lung hernia in our material is blunt trauma to the thorax that simultaneously

causes multiple rib fractures, all but one presented with haemothorax and all presented with pneumothorax. A reasonable hypothesis is that blunt trauma that causes both structural damage to the thoracic wall and a sudden increase of intra thoracic pressure is the type most likely to cause a lung hernia. With penetrating trauma being a possible but less common aetiology. In our material CT scans proved to be reliable for diagnosing lung hernias. In our material patients rib fractures were fixated in case of a flail chest and an extra-thoracic mesh was used to prevent re-herniation. Due to the rarity of the condition there are no studies to rely on but in all our patients this method produced good results. Although lung hernias remain rare with less than 300 cases described in the English literature it is a diagnosis the surgeon should be aware of in trauma patients presenting chest pain after trauma, thoracic surgery or flail chest etc.

### Conclusion

Intercostal lung hernia is an extremely rare disorder in which part of the lung contents herniate through the chest wall. Lung herniation is rare but should be considered in case of chest pain after thoracic trauma, Flail chest, Thoracotomies, minimally invasive mitral valve surgery, pulmonary transplantation. Surgery with the use of patches is recommended in symptomatic patients with good results. Lung hernias are rare and usually benign in nature there is a real potential for complications and it is important for physicians to be educated about this condition. Knowledge of the benign nature of lung hernias provides reassurance and avoids unnecessary imaging and invasive procedures.

**Disclosure:** The authors declare no conflicts of interest.

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