



A Laparoscopic Approach to Left Diaphragmatic Rupture after Blunt Trauma

A. Ouazzani, E. Guerin, E. Capelluto, G. Landolfo, A. Roman, J. Bruyns & G.B. Cadiere

To cite this article: A. Ouazzani, E. Guerin, E. Capelluto, G. Landolfo, A. Roman, J. Bruyns & G.B. Cadiere (2009) A Laparoscopic Approach to Left Diaphragmatic Rupture after Blunt Trauma, Acta Chirurgica Belgica, 109:2, 228-231, DOI: [10.1080/00015458.2009.11680410](https://doi.org/10.1080/00015458.2009.11680410)

To link to this article: <http://dx.doi.org/10.1080/00015458.2009.11680410>



Published online: 11 Mar 2016.



Submit your article to this journal [↗](#)



View related articles [↗](#)

A Laparoscopic Approach to Left Diaphragmatic Rupture after Blunt Trauma

A. Ouazzani*, E. Guerin*, E. Capelluto*, G. Landolfo*, A. Roman**, J. Bruyns*, G. B. Cadiere*

*Digestive Surgery Department, and **Intensive Care Unit, Saint-Pierre University Hospital, Brussels, Belgium.

Key words. Blunt trauma ; diaphragmatic rupture ; laparoscopy ; synthetic mesh.

Abstract. Diaphragmatic rupture after blunt trauma is rare, but indicates a powerful external impact. Associated lesions are often life-threatening and require a rapid diagnosis and management.

We report a case of a 24-year-old man, admitted to the emergency department after a serious car accident. He complained of a left sided thoraco-abdominal pain with breathing difficulties.

Chest X-ray showed a left diaphragmatic elevation. Computed tomography demonstrated a left haemo-pneumothorax, herniation of the stomach in the chest and a haemoperitonium.

Laparoscopically, herniated organs were re-integrated in the abdominal cavity ; the diaphragmatic tear was repaired by both direct suture and synthetic prosthesis. Closure of a small bowel perforation found during the laparoscopic exploration was also performed.

We consider this therapeutic modality to be an excellent approach in the management of acute left side diaphragmatic rupture in haemodynamically stable patients. Firstly, it permits an inspection of the thoracic cavity through the diaphragmatic tear and secondly, an easy repair of damaged structures in the abdominal cavity.

Introduction

Diaphragmatic rupture after blunt trauma is a rare complication of traffic accidents (1). It occurs most frequently in the left diaphragmatic cupola, since the liver has a protective effect on the right side. Due to the rarity of this lesion and the inadequacy of symptoms, diagnosis might be delayed in 14% to more than 25% of cases (1, 2).

Case report

A 24-year-old male was admitted to the emergency room after a serious car accident. Hetero-anamnesis revealed a

left thoraco-abdominal impact with temporary loss of consciousness. On admission, the patient was conscious and haemodynamically stable. He complained of breathing difficulties and pain on the left side of his body (thorax, abdomen and leg). Physical examination revealed a decreased vesicular murmur in the left hemithorax and an open fracture of the left tibia.

Chest X-ray performed on admission showed an elevation of the left diaphragm (Fig. 1). A thoraco-abdominal computed tomography (CT) revealed a left haemo-pneumothorax with ascension of the stomach into the chest (Fig. 2) and a haemoperitonium with a suspicion of splenic rupture.

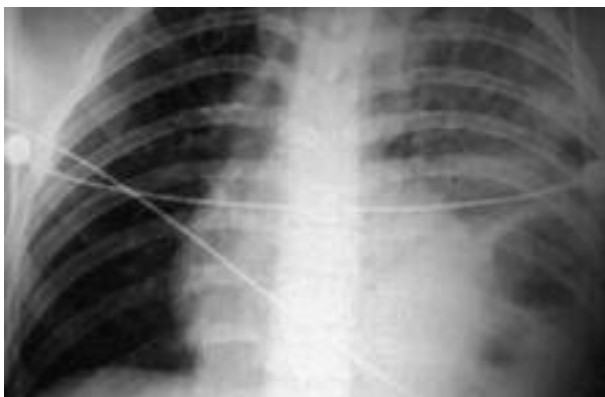


Fig. 1

Chest X-ray : presence of the gastric gas pouch in the chest, misinterpreted as ascension of the left diaphragmatic cupola.



Fig. 2

Thoracic CT showing herniation of the stomach in the left thoracic side.



Fig. 3A

Complete ascension of the stomach, a part of the great omentum and transverse colon through the diaphragmatic tear.



Fig. 3B

Small bowel perforation found during the abdominal exploration : mucosa was exposed.



Fig. 4A

Re-integration of herniated organs in the abdominal cavity and visualization of the diaphragmatic lesion.



Fig. 4C

Reinforcement of the diaphragmatic closure using a double-faced prosthesis.



Fig. 4B

Direct suture of the left side diaphragmatic rupture by simple stitch.

A left diaphragmatic rupture was diagnosed and the patient was scheduled for immediate surgery (less than 3 hours after the accident). Under general anaesthesia, the patient was placed in a supine decubitus position. We performed a laparoscopy : the pneumoperitoneum was created with a Veress needle through the umbilicus and the intra-abdominal pressure was maintained at 10 mmHg. The first trocar (10 mm) was placed at the level of the umbilicus for the optical system. Two working trocars (5 mm) were positioned on the right and left external edges of the rectus abdominis muscle. Immediate visualization of a large central tendon defect (10 cm long) in the left diaphragm confirmed the diagnosis.

The abdominal exploration showed a complete ascension of the stomach and a part of the transverse colon with the great omentum in the chest (Fig. 3A). The spleen was intact. A large perforation of the small bowel was found, located at 50 cm from the Treitz angle (Fig. 3B). The haemodynamic state of the patient allowed an anti-Trendelenburg position, in order to carefully re-integrate each ascended organ into the abdominal cavity (Fig. 4A). Using the optical system through the diaphragmatic tear, a left lung contusion and a haemothorax were observed. The diaphragmatic tear was repaired by direct suture using separated 2/0 silk stitches (Fig. 4B) reinforced with a dual facing mesh made of polytetrafluoroethylene, fixed with laparoscopic staplers (Fig. 4C). The bowel perforation closure was done with a 4/0 silk stitch.

A protective omentoplasty completed the repair. The abdominal cavity was cleaned with large quantities of physiologic serum and two contact drains were placed in the thoracic and abdominal cavities. A peroperative trans-oesophageal echocardiography was performed to rule out an aortic disruption.

The post-operative course was uneventful. The patient recovered rapidly and was discharged from the intensive care unit two days after surgery. Intestinal transit was re-established on day 4 and normal diet was progressively re-introduced. The patient was discharged home nine days after admission. No sign of recurrence was observed three months after the procedure.

Discussion

Diaphragmatic rupture may occur in all abdominal or thoraco-abdominal traumas.

The most common aetiology is a high-speed impact in traffic accidents (3). However, diagnosis remains difficult, due to the absence of typical clinical signs. Some series report that only 31% of diaphragmatic injuries are diagnosed before surgery (4). Therefore, (hetero-) anamnesis is essential to understand the traumatic circumstances, allowing early detection of this rare lesion. Abdominal or thoracic trauma following a lateral impact due to a motor vehicle collision should sound the alarm for the clinician. Furthermore, the functional loss of hemi-diaphragm results in a 25% to 50% decrease in pulmonary function and the heart may be compressed by the herniated organs leading to a clinical picture of cardiac tamponade (2).

Chest X-ray is an interesting complementary examination. In a retrospective study of 160 patients presenting with a diaphragmatic rupture after blunt trauma, the chest X-ray alone allowed a definitive diagnosis in 61% of cases (1).

According to some studies, thoracic CT allows the diagnosis in 100% of the cases (5) : the combination of

diaphragmatic thickening, focal discontinuity and segmental non-recognition of the diaphragm was 100% sensitive (6). Ultrasonographic examinations can reach a diagnosis rapidly, but remain, with MRI (7), under-used in emergency situations.

Isolated diaphragmatic rupture is rare. Associated injuries are present in 90% to 100% of cases (1, 4, 8, 9), most frequently with rib fractures (32.1-52%), lung contusions (25.5-57.1%), flail chests (7.1-28.6%) and splenic ruptures (16-21.4%). These lesions increase the Injury Severity Score which leads to higher morbidity and mortality rates (1, 10).

In the literature, the choice of the best surgical approach in cases of acute diaphragmatic rupture is controversial. Until the nineties, although laparotomy was the first choice because of the frequency of associated intra-abdominal lesions (4, 9), peroperative intra-thoracic exploration was impossible via this single surgical approach. Indeed, in stable patients with right-sided rupture or delayed diagnosis of diaphragmatic rupture and, considering the probability of adhesions between the intra-thoracic herniated organs (mainly the liver) and a chronic hernia, the access through a thoracotomy remains preferable (2). In recent years, the laparoscopic approach may represent an alternative in acute diaphragmatic rupture for patients in a steady haemodynamic state (11). In cases of simple diaphragmatic rupture, without associated lesion, some authors propose to defer operation if no other indication mandates immediate surgery, without increased mortality (1). However, associated lesions may be difficult to rule out formally. In common with other authors (11-13), we think that the laparoscopic approach in acute diaphragmatic ruptures after blunt trauma allows easy recognition of associated thoraco-abdominal injuries. Careful reduction of the herniated structures and safe repair of the injured organs can be performed, avoiding thoracotomy and/or laparotomy, and their associated morbidity. Concerning the closure technique for the diaphragmatic defect, MATTHEWS (14) *et al.* report a series of six patients presenting an acute left diaphragmatic rupture. A primary repair was done laparoscopically without recurrence after a mean follow-up of 7.9 months. As performed in our case, a synthetic prosthesis can be used in order to reinforce the repair (12). The laparoscopic approach mandates a supine position and minimal intraperitoneal pressure (10 mmHg), allowing optimal management of both airways and a steady haemodynamic state. Haemodynamic instability is highly suspicious of injury to vital thoraco-abdominal organs, which necessitates immediate thoracotomy and/or laparotomy (10). A diaphragmatic lesion communicating with oesophageal hiatus seems to be difficult to repair laparoscopically and needs an open approach allowing adequate exposure (14).

Conclusion

Diaphragmatic rupture remains a difficult diagnosis. Morbidity and mortality depend on the severity of associated injuries and the delay of diagnosis. In haemodynamically stable patients, the choice of laparoscopy in acute left diaphragmatic rupture allows early diagnosis and repair of associated injured organs through a minimally invasive approach, avoiding thoracotomy and/or laparotomy and their associated morbidity.

References

1. BERGERON E., CLAS D., RATTE S. *et al.* The impact of deferred treatment of blunt diaphragmatic rupture : a 15-year experience in six trauma centres in Quebec. *J Trauma*, 2002, **52** : 633-640.
2. SHAH R., SABANATHAN S., MEARN S. A. J. *et al.* Traumatic rupture of the diaphragm. *Ann Thorac Surg*, 1995, **60** : 1444-1449.
3. HOANG A. D., DE BACKER D., BOUAZZA F. *et al.* An undiagnosed rupture of the right hemidiaphragm-hepatothorax : a case report. *Acta Chir Belg*, 2002, **102** : 353-355.
4. MEYERS B. F., MCCABE C. J. Traumatic diaphragmatic hernia. An occult marker of serious injury. *Ann Surg*, 1993, **218** : 783-790.
5. SCAGLIONE M., PINTO F., GRASSI R. *et al.* The diagnostic sensitivity of computerised tomography in closed trauma of the diaphragm. A retrospective study of 35 consecutive cases. *Radiol Med*, 2000, **99** : 46-50.
6. NCHIMI A., SZAPIRO D., GHAYE B. *et al.* Helical CT of blunt diaphragmatic rupture. *Am J Roentgenol*, 2005, **184** : 24-30.
7. BARBIERA F., NICASTRO N., FINAZZO M. *et al.* The role of MRI in traumatic rupture of the diaphragm. Our experience in three cases and a review of the literature. *Radiol Med*, 2003, **105** : 188-194.
8. LEE W. C., CHEN R. J., FANG J. F. *et al.* Rupture of the diaphragm after blunt trauma. *Eur J Surg*, 1994, **160** : 479-483.
9. VAN VUGT A. B., SCHOOTS F. J. Acute diaphragmatic rupture due to blunt trauma : a retrospective analysis. *J Trauma*, 1989, **29** : 683-686.
10. WILLIAMS M., CARLIN A. M., TYBURSKI J. G. *et al.* Predictors of mortality in patients with traumatic diaphragmatic rupture and associated thoracic and/or abdominal injuries *Am Surg*, 2004, **70** : 157-162.
11. COUGARD P., GOUDET P., ARNAL E. *et al.* Traitement des ruptures de la coupole diaphragmatique par cœlioscopie en décubitus latéral. *Ann Chir*, 2000, **125** : 238-241.
12. KUHN R., SCHUBERT D., WOLFF ST. *et al.* The repair of diaphragmatic rupture by laparoscopic implantation of a polytetrafluoroethylene patch. *Surg Endosc*, 2002, **16** : 1493-1495.
13. SMITH CH., NOVICK T. L., JACOBS D. G. *et al.* Laparoscopic repair of a ruptured diaphragm secondary to blunt trauma. *Surg Endosc*, 2000, **14** : 501-502.
14. MATTHEWS B. D., BUI H., HAROLD K. L. *et al.* Laparoscopic repair of traumatic diaphragmatic injuries. *Surg Endosc*, 2003, **17** : 254-258.

A. Ouazzani, M.D.
 CHU Charleroi, Bd Paul Janson
 6000 Charleroi, Belgium
 Tel. : 00 32 485 319473
 Fax : 00 32 719 21250
 E-mail : aouazzan@ulb.ac.be