

Traumatic diaphragmatic rupture: personal experience

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Abstract. 402 thoracoabdominal traumas have been observed since November 1998 and seven of these patients (1.7%) showed a diaphragmatic rupture. Four patients showed a right diaphragm rupture and three a left diaphragm rupture. Road traffic accidents were the main cause of trauma. Early diagnosis was performed in three patients (43%), a delayed diagnosis was made to the other patients (57%): one case was an intraoperative diagnosis (14.2%). Everyone had chest X rays and chest and upper abdomen CT scan. One patient had MRI on a late diagnosis. Thoracotomy was performed in all patients and one case (14.2%) of morbidity and one (14.2%) of mortality were observed

Key words: Trauma, diaphragm, rupture

Introduction

Traumatic rupture of the diaphragm is an increasing event due to thoracoabdominal injuries: these can be divided into penetrating (25%) and non-penetrating ones (75%) (1, 2). Knives, bullets and sharp edges or fractured ribs are the most common penetrating objects in civilian life. Non-penetrating traumas on lower chest or upper abdomen, due to traffic accidents, are mostly responsible of diaphragmatic blunt injuries.

Diaphragmatic rupture occurs in 1-7% of major blunt trauma victims and in 10-15% of patients with penetrating trauma. An increased morbidity and mortality is related to a delayed diagnosis of traumatic diaphragmatic rupture (1).

The aim of this study is to analyse clinical presentation, diagnostic methods and operative approach.

Methods

During the last five years 402 patients occurred to our observation for thoracoabdominal trauma. Traumatic diaphragmatic rupture was observed in seven patients (1.7%): one woman and six men ranging from

23 to 76 years. All the patients led a blunt diaphragmatic trauma and the causes of injury included traffic accidents (n = 4, 57.1%), fall from height (n = 1, 14.2%), iatrogenic injury (n = 2, 28.6%).

Right diaphragm was involved in four patients (57%); three had a liver intrathoracic dislocation. The left diaphragm was interested in three cases (43%): one patient suffered from an associated traumatic flail chest; in two patients herniation of abdominal contents was observed and included stomach, small bowel, colon and spleen in one and small bowel strangulation in another one.

Early diagnosis in less than 24 hours was established in three patients (43%). In two cases diagnosis was delayed and performed from five to ten days after trauma. Even more delayed diagnosis was performed in one referred thoracoabdominal trauma during childhood and, at last, an intraoperative diagnosis was supposed in another patient treated with right thoracotomy for emphysema ten years before.

Diagnostic methods included chest X-ray, Computerized Tomography (CT) scan of the chest and upper abdomen, upper gastrointestinal (GI) study and in one case Magnetic Resonance (MRI).

The operative approach was represented by tho-

racotomy at the seventh interspace. Four patients underwent right thoracotomy; in three cases the liver was easily replaced in the abdominal cavity and the diaphragmatic defect was repaired with a silk interrupted suture. In one patient a Goretex Dual-mesh was placed. Three patients underwent left thoracotomy; in one case the stabilization of the flail chest was associated; in another case stomach, small bowel and colon were replaced in the abdominal cavity and splenectomy was performed and finally a small bowel resection was performed in a case of intrathoracic herniation with strangulation. Silk interrupted suture was performed in each case.

Results

One patient (14.2%) presented post-operative respiratory failure and he needed assisted ventilation in Intensive Care Unit, but fortunately he was dismissed from hospital on the 24th post-operative day. One patient (14.2%), who underwent small bowel resection, presented heart attack and died on the 7th post-operative day.

The other patients did not have complications and they were dismissed from hospital ranging from 7th to 9th post-operative day.

Conclusion

Pain in the upper abdomen and lower thorax, dyspnea, cyanosis and hypotension are typical symptoms of diaphragmatic injury. These symptoms may be masked by concomitant severe injuries to other organs. In case of a small tear and no herniation, specific signs and symptoms may not be present during the acute phase. With larger lesions and herniation of the abdominal contents, breath sounds decrease and bowel sounds may be heard over the lower thorax. With massive herniation there will be signs of a mediastinal shift to the opposite site. Such situation can be observed after some weeks or months from the moment of trauma (4).

Diaphragm penetration is usually diagnosed during exploration for other injuries. To diagnose blunt rupture, a high index of suspicion is required. Although

the first chest X-ray frequently suggests only a raise of the diaphragm or a hemothorax, the physician should be alert to the possibility of a rupture. Gas densities above the usual diaphragm level, along with adjacent plate-like atelectasis, are a strong indication of diaphragmatic rupture. Chest roentgenography, performed after introducing a nasogastric tube in a patient with a left hemidiaphragm raise, may show a stomach dislocation in the left pleural cavity. A Gastrographin swallow roentgenographic examination, carried out by placing the patient in the Trendelenburg position, may confirm the diagnosis. Air insufflation through the nasogastric tube may also outline the stomach. A barium enema contrast study or small series help diagnosing patients with suspected herniations of the colon or of the small bowel. Actually helical CT scanning with axial, sagittal and coronal reformations is reported to reach a sensitivity of 50% and 78% in diagnosing right- and left-sided diaphragmatic injuries respectively (5-7). Finally, MRI presents a high sensitivity in the study of the diaphragmatic outline and shows diaphragmatic defects and intrathoracic herniation. However this technique cannot be performed in emergency situations or multitrauma patients (8, 9).

Traumatic diaphragmatic hernias usually require early surgical treatment so that intestinal obstruction, strangulation and cardiorespiratory embarrassment are avoided (2).

Laparoscopy is regularly used to evaluate abdominal trauma and it reduces the number of unnecessary laparotomies. Laparoscopy is commonly used to repair diaphragmatic rupture (10, 11, 14, 15). Thoracoscopy is performed to evaluate thoracic trauma and to diagnose a diaphragmatic hernia. Diaphragmatic suture is possible when the diaphragmatic lesion is small and the intrathoracic herniation is slight (16-18). Laparotomy is necessarily used when other abdominal injuries are associated. Thoracotomy is performed when there are thoracic injuries, a large tear, a large herniation and an empyema is developed. (12, 13, 19, 20). Strong intrathoracic adhesions, due to old herniation are easily treated with an intrathoracic approach. (4). The diaphragmatic defect is repaired with silk suture, placed interruptedly and when possible, a two-layer closure should be performed. It is the author's practice not to pinch the phrenic nerve since,

usually, the diaphragm is practically motionless and the operative field relatively quiet. In addition diaphragmatic paralysis predisposes to untoward post-operative pulmonary complications, especially in these patients who frequently have rib associated fractures, retained secretions and aspirated vomitus.

In our experience all patients had chest X-rays and chest and upper abdomen CT scan. MRI was used only in a delayed diagnosis (5 days after trauma). A right diaphragm raise was shown and the suspected diaphragmatic rupture with a liver dislocation was so confirmed. All patients underwent thoracotomy.

The thoracic approach with thoracoscopy or thoracotomy is evidently excellent when antero-lateral flail chest is present. We used a personal method for the treatment of flail chest by using Kirschner's wires and the response was excellent. Also in cases of associated flail chest and diaphragmatic traumatic lesions we used the same method with the same response.

Post-operative morbidity was observed in one patient (14.2%). Post-operative mortality was observed in one patient (14.2%) who underwent a splenectomy for a lymphoproliferative pathology ten days before and then small bowel resection for hernia strangulation.

Our own experience, consisting in a small series, agrees with literature about diagnostic methods, aggressive operative treatment and results.

Certainly early diagnosis and treatment reduce intra- and post-operative morbidity and mortality (1, 21).

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