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"Traumatic Diaphragmatic Rupture with Visceral Herniation : A Case Report."

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Abstract

The diaphragm is a dome-shaped respiratory muscle located near the lower ribs, the exact location is below the chest. Diaphragmatic rupture is a medical condition caused by blunt or penetrating trauma, which often leads to herniation of the abdominal viscera into the thoracic cavity. We presented a case in which a 39-year-old man complained of left chest pain and abdominal pain radiated to his back, after involed in a traffic accident. On physical examination, the left chest was left behind when breathing, a dull sound was found on percussion, with diffuse abdominal tenderness. Thoraco Abdomen CT-scan was performed and it concluded that there was a rupture of the left posterior diaphragm with a diameter of 15 cm which caused herniation of the gastric and intestines to the left of thoracic cavity, accompanied by a collapse of the left lung due to blunt trauma. The patient underwent an explore laparotomy with the aim of repairing his diaphragmatic rupture, and splenectomy procedure to remove the affected spleen. Surgery is a mandatory action in order to repair the diaphragm. The choice of the approach to be used, either laparotomy or thoracotomy depends on other organ abnormalities, acute or latent cases, stable or unstable condition of the patient and also depends on the experience of the operator.

Keywords : Diaphragm Rupture, Herniation

BACKGROUND

Diaphragmatic rupture is a medical condition caused by blunt or penetrating trauma and often results in herniation of the abdominal viscera into the thoracic cavity. (1) The diaphragm develops from the pleuroperitoneal membrane and body wall, the dorsal mesentery of the oesophagus and the septum transversum from the embryo. (4)

The incidence of trauma-induced diaphragmatic rupture is 1 to 7% of all patients with blunt trauma, and 10-15% with penetrating injuries. Diaphragmatic rupture due to trauma is usually associated with multiple injuries because of the large forces resulting rupture of the diaphragm. (1,2)

The pathophysiology of this injury still remain unclear up to this date, but the most accepted hypothesis has described, an increase of intra-abdominal pressure followed by a blunt trauma mechanism which creates a high pressure gradient between chest and abdomen can cause visceral intrathoracic rupture and herniation.(5,7) Normally, there is a positive gradient of 7–20 cmH_2O between intraperitoneal and intrapleural pressures, but during blunt injuries this pressure gradient can exceed 100 cmH_2O and this can lead to rupture and herniation.(6,7)

Diagnostic techniques included X-Ray, Computed Tomography and Intraoperative findings. Clinical diagnosis is relatively difficult because the signs found are similar to other disorders. The signs and symptoms that appear are pain in the chest and abdomen, also respiratory problems. When rupture is found, an operation is required to repair it.(3)

The best management for patients with diaphragmatic rupture is surgery. No cases of diaphragmatic rupture have been found to heal spontaneously. This happens because of the difference in pressure

between the abdominal cavity and the thoracic cavity, causing a slight rupture of the diaphragm, herniation of the abdominal organs will occur into the thoracic cavity.[8] Surgery can be performed either through the thorax (thoracotomy) or abdomen (laparotomy). There are no studies on which type of surgery is considered the best course of action for patients with diaphragmatic rupture, to date.[4]

Figure 1. Whole-body non-contrast CT scan (scout view): detection of left-sided posterior diaphragmatic hernia involving visceral herniation and hematothorax

CASE PRESENTATION

A 39-year-old man admitted to hospital accompanied by his family, he complained pain in his left chest and abdominal pain that radiated to his back after experiencing a traffic accident one hour ago. The patient said that he had driven a motorcycle and hit the car in front of him, then fell to the left, the patient was not wearing a helmet. The patient came with GCS 15 consciousness, respiratory rate 20 breaths per minute and blood pressure 113/70 mmHg. On physical examination, it was found that the left chest was left behind when breathing, a dull sound was obtained on percussion, with diffuse abdominal tenderness, but no signs of peritonitis were found. From the results of the plain chest X-ray, it was found that the left hemithorax was covered with elevation of the diaphragm with 7,8,9 rib fractures. Focused assessment with CT-Scan Thoracoabdominal, and concluded that there was a rupture of the left posterior diaphragm with a diameter of 15 cm which caused herniation of the gastric and intestines into the left thoracic cavity with collapse of the left lung due to blunt trauma due to a traffic accident. The patient also suffered several other traumatic injuries, including multiple left rib fractures, left hemothorax, left lower lobe pulmonary contusion, and 5th degree of splenic laceration.

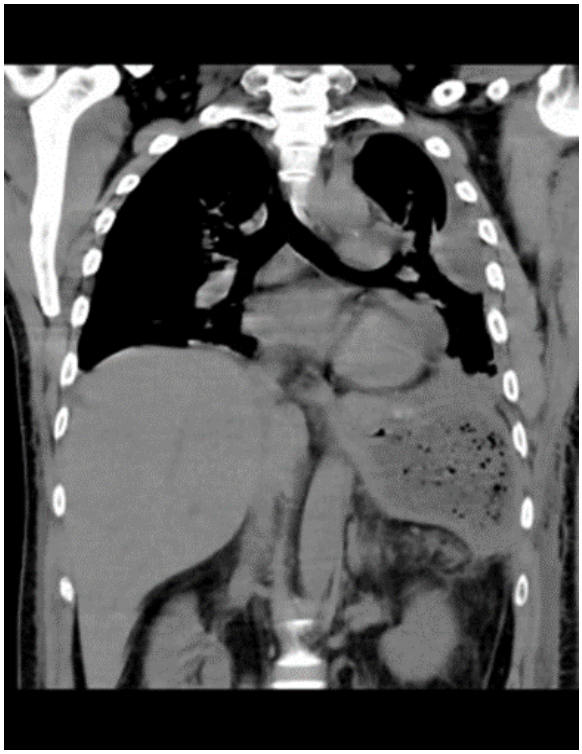

Figure 2. CT scan showed diaphragmatic rupture and intrathoracic bowel herniation

The patient had undergone an exploratory laparotomy to repair the ruptured diaphragm and also had a splenectomy procedure performed to remove the damaged spleen. Intraoperatively, the stomach and intestines were returned to the abdominal cavity and the diaphragm was sutured with interrupted sutures using non-absorbable sutures on the ruptured side of the diaphragm on the

left posteriorly. No gastric ischemia or perforation was found. All of the intra-abdominal organs and the left lung were intact. The operation was carried out for 3 hours. The patient was placed on a chest tube with left intrapleural Water Sealed Drainage (WSD) and an intra-abdominal drain on the left subdiaphragm. The patient eventually recovered and was discharged after 2 weeks of hospitalization. At 2 weeks after follow-up the patient was in good condition.

DISCUSSION

The diaphragm is a dome-shaped respiratory muscle located near the bottom of the rib cage, just below the chest.2 The actual incidence of diaphragmatic rupture is difficult to ascertain because the diagnosis is usually missed and delayed, ranging from 1 to 7% of all blunt trauma patients, and 10 -15% with penetrating injuries, and this number is expected to increase due to the increasing number of traffic accidents each year. The most common causes of blunt injuries are high-speed traffic accidents and penetrating injuries are knife attacks and gunshot wounds.(1)

Penetrating or blunt trauma to the chest and abdomen can cause diaphragmatic rupture, is usually associated with multiple injuries because great force is required to rupture the diaphragm, and is usually fatal. The most frequently herniated organs on the left side are the stomach (80%), omentum, small intestine, large intestine, and spleen.(1) This is because these organs are structurally weak because they are pleuroperitoneal membranes. Diaphragmatic rupture on the left is more common than on the right because of the protective effect of the liver, underdiagnosis of right hemidiaphragm rupture and weak location of the left hemidiaphragm due to embryonic fusion.(4) Diaphragmatic rupture following blunt trauma generally results in a wider wound than that caused by penetrating trauma has a size of about 5-15 cm.

Initially most cases of diaphragmatic rupture are often overlooked especially in the acute phase because of other associated injuries. Diagnosing diaphragmatic rupture is often difficult to establish and easily missed due to non-specific signs and findings.(3) Neglected diagnosis of diaphragmatic rupture injury which eventually presents as a hernia which can appear years later with potentially fatal complications. Delayed diaphragmatic rupture and diaphragmatic hernia should be considered in patients with blunt abdominal trauma and gastrointestinal or respiratory complaints, especially patients with a history of recent trauma.(10) Diaphragmatic rupture is usually treated by laparotomy. The most common therapeutic approaches for diaphragmatic rupture are thoracotomy or laparotomy. At laparotomy, regardless of whether the diagnosis is suspected or confirmed preoperatively, a full evaluation of both diaphragms should be carried out, and consideration should also be given to other injuries such as a hematothorax that may arise and are more urgent to treat first if there is a rupture of the diaphragm. All herniated viscera should be carefully returned and moved to their original position.(1,6) The diaphragmatic tissue is carefully repaired using non-absorbable monofilament sutures. In some cases complicated by adhesions and extensive defects, MESH is sometimes required to help manage the defect.(2,10)

The American Association for Trauma Surgery (AAST) Organ Injury Scaling Committee proposes a classification system for diaphragmatic injuries: Grade 1 contusions; Grade 2 laceration <2cm; Grade 3 lacerations 2–10 cm; Grade 4 laceration >10 cm or with tissue loss <25 cm^2; and Grade 5 laceration with tissue loss >25 cm^2.(7,8) According to this classification system, our patient's case was a grade 4 diaphragmatic injury.

In multitrauma patients with diaphragmatic rupture as in our case, patient survival is determined by the severity of the associated injury, timely diagnosis and early intervention.(5) In this regard, our patient had undergone a CT-Scan with clinical evaluation as the main

determining factor for deciding on exploratory surgery. CT Scan is more accurate in establishing the diagnosis compared to X-ray, another diagnostic method that has been carried out is by laparotomy, but in 15% of cases of diaphragmatic rupture it is missed. Trauma to the diaphragm is often discovered incidentally during laparotomy for other organ injuries. Thoracoscopy is preferred over laparotomy especially for detecting chronic diaphragmatic hernias.[3] In chronic cases, repair may be difficult or even impossible. Delay in detecting and repairing diaphragmatic rupture can increase morbidity and mortality. A significant complication of diaphragmatic rupture is traumatic diaphragmatic hernia, where organs such as the gastric that have entered thoracic cavity can strangulate and cause ischemia.[3,10]

CONCLUSION

Diaphragmatic rupture should be suspected in all trauma patients, especially if they have blunt abdominal and lumbar trauma. High suspicion with detailed information about the mechanism of injury and the use of appropriate diagnostics are the most important factors in establishing the correct early diagnosis of diaphragmatic rupture. There is a differential diagnosis of diaphragmatic rupture in adult patients with upper abdominal symptoms or chest X-ray depicting diaphragmatic elevation, therefore it is necessary to ask whether there is a history of trauma, whether it occurred a few days ago or years ago. If no abnormalities are found, serial chest X-rays and high-quality CT scans in stable patients can be performed to diagnose diaphragmatic rupture and other abnormalities in the thoracic and abdominal organs.

Surgery is a mandatory action to repair the affected diaphragm. The management approach can be in the form of laparotomy, thoracotomy, and laparoscopy which is determined from the acute or latent case, stable or unstable patient condition, and operator experience. In most cases, repaired diaphragmatic rupture has a good prognosis. The mortality rate is around 15-40% but the presence of other organ injuries plays a major role in determining the prognosis.

CONFLICT OF INTEREST

All authors declared that there is no conflict of interest related to the publication of this article.

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