

## Bilateral diaphragmatic injury diagnosed by laparoscopy

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Rupture of the diaphragm from blunt trauma is uncommon, but greatly improved prehospital care and transportation of victims has increased the frequency at which patients who sustain this injury arrive at the emergency room alive.

We report a case of bilateral diaphragmatic rupture from blunt abdominal trauma in a 33-year old man. Diagnosis was established by laparoscopy after suggestive chest X-rays, liver scintigraphy, CT scan and magnetic resonance imaging.

The methods used to diagnose this condition are analyzed.

**UNITERMS:** Diaphragmatic hernia, blunt abdominal trauma, laparoscopy.

**T**raumatic diaphragmatic hernia occurs in approximately 4.5% of victims of multiple traumas and is mainly caused by non-penetrating injuries. Only about 1% of these occur bilaterally (6).

Several studies have shown a high incidence of injuries associated with rupture of the left and right hemidiaphragms, especially in the pelvis, spine, central nervous system, and extremities, as well as in intra-abdominal organs (6,14). This fact often hampers the diagnosis of this pathology.

Traumatic right diaphragmatic hernia is infrequent since injury to the right side is more severe than injury to the left side and generally the patient does not reach the hospital alive. Bilateral diaphragmatic hernia is even more severe and rare.

The objective of the present paper is to report the case of a patient, with bilateral diaphragmatic injury, in which laparoscopy was the only method that permitted a sure diagnosis of the lesion.

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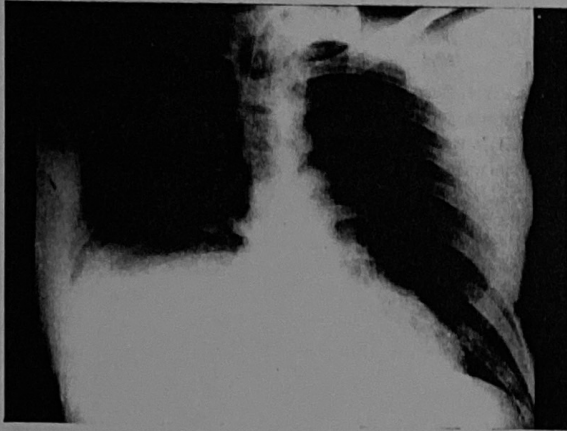
### CASE REPORT

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F.B.S., 33-year old, male, victim of an automobile accident was sent from another service where he presented a picture, of skull and brain trauma, fracture of right femur, and fracture of the pelvis and of the upper limbs. He also presented chest trauma with fracture of costal arches. A diagnostic hypothesis of right hemopneumothorax was raised and 100 ml was drained from the right hemithorax. The patient was then referred to our service, one day after the accident.

When he arrived at the First Aid Clinic of the University Hospital he was hemodynamically stable (150 x 100 mmHg), tachypneic (FR = 28) and in a state of reduced consciousness (Glasgow = 8; RTS = 5.9672; ISS = 27; TRISSCAN = 0.93). Upon examination, the patient presented abdominal flaccidity and absence of air-water sounds. Pulmonary auscultation showed a decreased vesicular murmur in the basal third of the right hemithorax.

A chest X-ray showed elevation of the right diaphragmatic dome (Fig. 1). The patient was removed to the intensive care unit (ICU) where general supportive measures were instituted, including respiratory support. Several



**Fig. 1** - Chest X-ray showing elevation of the right diaphragmatic dome.

auxiliary tests were performed, such as computerized chest tomography, scintigraphy and magnetic nuclear resonance, with inconclusive results.

Without a definite diagnosis, laparoscopy was indicated and revealed the following: absence of fluid in the cavity, normal parietal peritoneum, normal liver and spleen, epiploon near the right subphrenic space, and posterior laceration of the right diaphragmatic dome which extended to the left dome. The conclusion was bilateral traumatic diaphragmatic injury. Laparoscopy permitted the definitive diagnosis of this patient, who was then submitted to median laparotomy. The surgical findings confirmed bilateral diaphragmatic injury associated with partial herniation of the liver. The diaphragmatic lesion was sutured with separate nonabsorbable "U" sutures. The patient had a good course, with an uneventful postoperative period, and was discharged from the hospital in good condition.

## DISCUSSION

Bilateral traumatic diaphragmatic hernia is a rare and serious entity which has been seldom reported in the literature, mainly occurring in males during the 3rd and 4th decades of life. The improved prehospital care and the faster transportation of patients with multiple injuries, as well as the regional decentralization of hospital care has increased the frequency at which these patients reach the hospital alive. In reviews by Hood (9) in 1979 and Sharma (15) in 1989, the incidence of bilateral diaphragmatic hernia was only 1% of the total cases of traumatic diaphragmatic hernia. The course of diaphragmatic hernia usually involves

damage to other organs, especially the spleen, liver, lungs, CNS, and extremities. This is explained by the intensity of injury, which needs to be elevated to generate traumatic diaphragmatic rupture, and this is even more evident in the case of a bilateral rupture. The traumatic indices of the present case confirm this statement.

An early diagnosis may be delayed by the extent of the associated lesions or by a low diagnostic suspicion. Early detection of diaphragmatic rupture is desirable and necessary due to the high mortality caused by herniation of the gastrointestinal segment which may lead to obstruction and necrosis many weeks or even years later. Mortality due to late incarceration is 20% and mortality due to a strangulated hernia is 40 to 57%.

Hepatic scintigraphy, when available, is a highly sensitive method for the diagnosis of right diaphragmatic rupture since it may reveal the presence of the liver inside the thorax, an indirect sign of diaphragmatic injury. In our patient, scintigraphy only suggested hepatic herniation (3,7). Ultrasound may reveal the presence of hepatic parenchyma inside the right hemithorax, but is of low precision for the evaluation of diaphragm integrity, and therefore is of little use for the diagnosis of this pathology (5). Computerized tomography and nuclear magnetic resonance are good diagnostic methods because they can show the presence of the liver or of a gastrointestinal segment inside the thorax (4,8). However, these techniques are not always available, especially when the patient is the victim of trauma. In the present case, both methods failed to disclose the bilateral nature of the injury, only revealing a small hepatic segment inside the right hemithorax.

In a study carried out in Brazil, Ikejiri et al. (10) stated that laparoscopy and thoracoscopy are the two major methods for investigation, both of them easily available to trauma surgeons. Thoracoscopy has proved to be effective during the first 24 hours of trauma, since after this time there is formation of pleural adhesions which hamper the examination and may cause inadvertent damage to the pulmonary parenchyma (11). In the present case, thoracoscopy was not considered because more than 24 hours had elapsed since the accident.

Laparoscopy is considered to be somewhat less effective than thoracoscopy because it does not permit a good visualization of the right diaphragm, but is of enormous diagnostic importance 24 hours after the trauma (1). In the present case, we did not have much difficulty in visualizing the right diaphragmatic lesion (suspected on the basis of the chest X-ray) but we were surprised to find a rupture on the left. Laparoscopy is a rapid and safe procedure which has been well-established in gynecological practice and in

the diagnosis and staging of intra-abdominal pathologies. Using the same principles, laparoscopy surgery has been gaining increasing space in the therapeutic arsenal. In the emergency sector, laparoscopy is an agile method which permits a rapid diagnosis and can prevent unnecessary surgery, especially in penetrating injuries and in closed abdominal traumas (17). Despite the growing use of laparoscopy as a diagnostic method, this procedure is considered to be invasive and, in the present case, we only indicated it after performing noninvasive procedures, following a diaphragmatic hernia algorithm (10).

In patients with traumatic diaphragmatic hernia with no diagnostic confirmation, laparoscopy may be the major diagnostic method since it permits direct visualization of the peritoneal surface of the diaphragm (1).

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