CHIRURGIE THORACIQUE / THORACIC SURGERY

TRAUMATIC DIAPHRAGMATIC RUPTURE IN A SMALL CHILD

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Abstract
Traumatic diaphragmatic rupture (TDR) is very rare injury in children. It is usually caused by blunt trauma and its diagnosis often missed or delayed because of the not evident specific clinical signs. We present a case of left traumatic diaphragmatic rupture, in a 3-year-old boy following a recent blunt abdomino-thoracic trauma due to household accident. Findings on physical examination and on plain chest film raise diagnostic suspicion. After resuscitation measures, diaphragmatic repair was performed via exploratory thoracotomy. Immediate operative suites were simple and the child has being discharged from hospital at J8 postoperative.

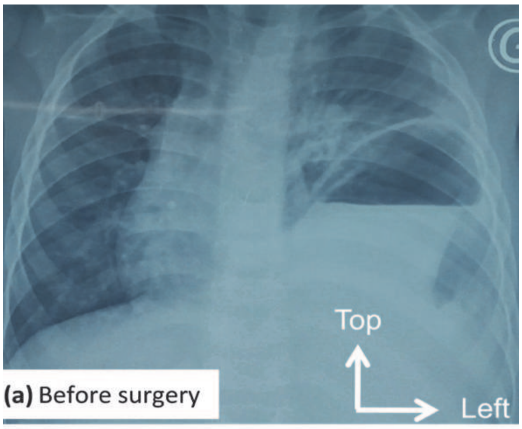
Introduction

Traumatic diaphragmatic rupture (TDR) is an un-common injury in children[1]. Prevalence is 0.5-1.8 case/year[2-6]. It is usually caused by blunt trauma[7]. Its diagnosis often missed or delayed because of the severity of other associated injuries[5,8] or because of the not evident specific clinical signs[9-10].

Case report

We present a case of left traumatic diaphragmatic rupture, in a 3-year-old child following a recent blunt abdomino-thoracic trauma due to household accident. The child was hit by a three-wheeled motorcycle that was maneuvering a reverse gear in the vehicle garage at home. The rear wheel is passed in the abdomen of the little boy. The child immediately shed feces without gastrointestinal bleeding. He is evacuated to our unit before 6 hours.

The physical examination findings such as 1) respiratory distress, 2) bowel obstruction signs, 3) left abdomino-thoracic contusion, 4) "hollow belly" aspect but flexible and painless, 5) air-fluid sound in left hemithorax and then, elevated hemidiaphragm, and air-fluid level in left hemithorax on plain chest film have raised the diagnosis suspicion. After resuscitation measures, exploratory thoracotomy was performed. At the thorax opening, we found a hernia, in the thorax, of the stomach containing the nasogastric tube, the transverse colon with the large epiploon and the left lobe of the liver without visible visceral lesions. The reintegration of the hernia viscera allows to highlight a 12 cm transverse diaphragmatic rupture with regular net margins extending from the left hemicoupole to the diaphragmatic centrum tendinosum with a traumatic opening of the pericardium about 3 cm long, suggesting the tip of the heart. We performed to: 1) a diaphragmatic repair by interrupted full-thickness nonabsorbable 0 sutures reinforced by an overlock, 2) A pleural toilet, 3) Intra-pericardial aspiration with the respect of the pericardial breach. The chest was closed on 2 chest drains put in suction. Immediate operative suites were simple and the child has being discharged from hospital at J8 postoperative



(a level occupying the left haemithorax and an elevated left hemidiaphragm,
(b) : After diaphragmatic repair showing a return of the lung and the diaphragm to their anatomical position.

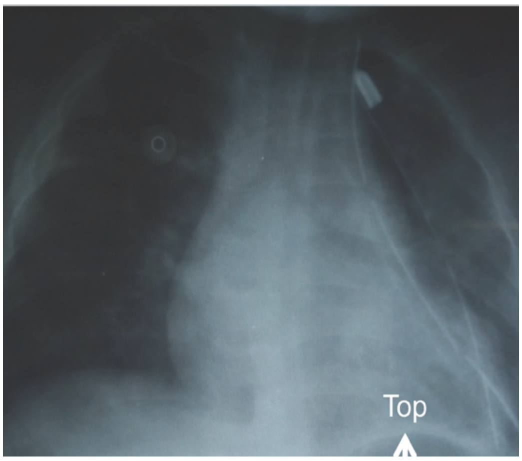
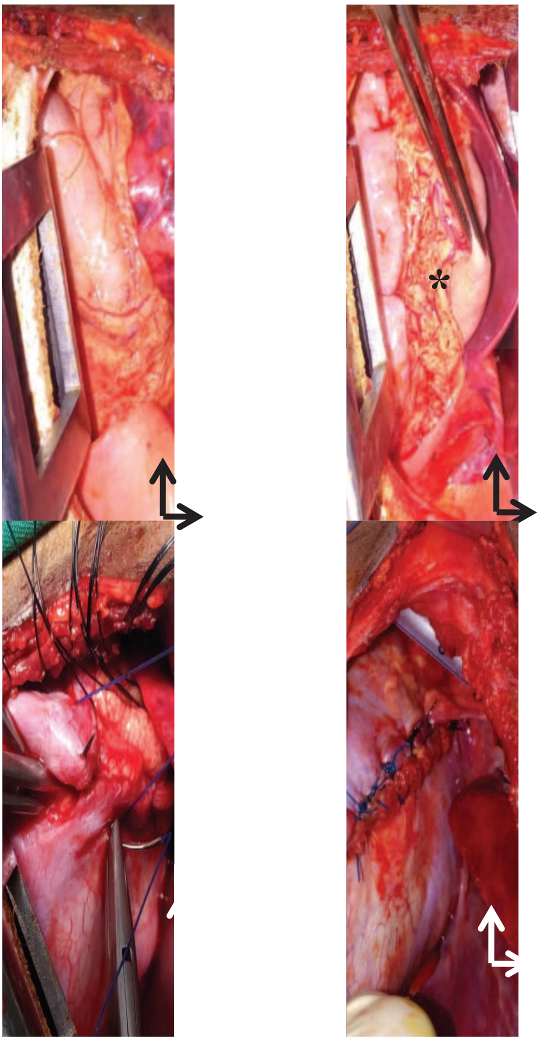


Figure 1: Chest X-ray of a patient with left sided traumatic diaphragmatic rupture.



thoracotomy
(a) : Omentum is viewed in left pleural cavity under the left lung. **(b)** : Transverse colon (*),omentum (**) , stomach containing the nasogastric ube (***) and left lobe of the liver (****) were viewed in left pleural cavity. **(c)** and **(d) :** After viscera hernia reintegration, traumatic diaphragmatic upture was repaired by interrupted full-thickness sutures.

Discussion

The diaphragm is a musculotendinous, dome-shaped structure dividing the thoracic and abdominal cavities[3].The first traumatic diaphragmatic hernia was described a in 1541 by Sennertus [11]. A diaphragmatic rupture occurs in most often when during a blunt trauma, a lateral impact distort the chest wall and shearing the diaphragm or a direct frontal impact cause a sudden increase in intra-abdominal pressure[12]. The left abdomino-thoracic impact found in this case report was conform to this mechanism. The diaphragm most frequently tears at the jonction of the muscular and the centrum tendinosum[13]. This explains why diaphragmatic rupture in this case report, was a transverse diaphragmatic rupture extending from the left hemicoupole to the centrum tendinosum. Injuries to the left hemidiaphragm occur three times more frequently than to the right side following blunt trauma[9]. This is because, unlike the right hemidiaphragm congenitally stronger and partially protected by the liver, the left hemidiaphragm lack a visceral protection against intraabdominal hyperpressure[9,14]. This case we report was were left-sided. According to the time of presentation, diaphragmatic rupture can be classified in three clinical phases follow the onset of traumatic diaphragmatic injury: acute, latent, and obstructive phases[15,16]. According to Carter et al, the acute phase extends from the time of injury to 14 days afterward. If the patient survives, the second or interval phase is entered. This interval phase extends until the third stage, which is the phase of obstruction or strangulation[6]. This case we report was admited in the acute phase. It is well known that diagnosis of traumatic diaphragmatic rupture remains difficult because it is often associated with other visceral injuries that may mask the clinical or radiological signs[18]. This was not the case of this litle boy whose diagnosis was easy and fast based on clinical signs and chest x-ray without the need for a chest CT scan. This ease of diagnosis was due to the absence of associated visceral lesions and to acute evolution. According to literature, laparotomy is the favoured surgical approach to acute diaphragmatic rupture, because approximately 50% of patients with blunt diaphragmatic injuries have other intra-abdominal pathologies and thoracotomy is commonly employed to repair chronic ruptures[3]. However, the thoracotomy used to repair the left and acute diaphragmatic rupture in this patient was a deliberate choice of the surgical team in the absence of clinical suspicion of abdominal visceral lesions. This thoracotomy allowed us to discover a tear of the pericardium and to pose a pleural drain allowing to evacuate the pleural effusion caused by the intra-thoracic hernia of the abdominal viscera but also to evacuate a possible pericardial effusion by the pericardial-pleural window left in place. The most common viscera to herniate is the stomach and colon on the left side and the liver on the right side[19]. However, in this case reported, in addition to the stomach and the transverse colon with the large epiploon, the left lobe of the liver had also herniated in the thorax because of the large size of the diaphragmatic rupture extended to the centrum tendinosum. The preferred method of closure of the diaphragmatic defect is by interrupted full-thickness nonabsorbable 0 or no. 1 sutures[15]. In the acute stage Mesh or prosthetic repair is rarely needed but may be useful for a delayed repair[5]. In this case that we report, we performed a diaphragmatic repair by interrupted full-thickness nonabsorbable 0 sutures reinforced by an overlock. For isolated traumatic diaphragmatic rupture repaired adequately, complications are rare[15]. This has been the case in our patient whose follow-up has been simple.

Conclusion

Early diagnosis and prompt therapy of traumatic diaphragmatic rupture, are the conditions of a low morbidity and mortality rates in children.

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