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Traumatic Diaphragmatic Hernia in Children: A Case Report

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Abstract

Introduction: Traumatic diaphragmatic hernia is a rare condition in children complicating closed or penetrating trauma to the abdomen and thorax. We report the case of an 11-year-old girl with a traumatic diaphragmatic hernia. **Case Presentation:** An 11-year-old girl was seen in the paediatric surgery department for a thoracolumbar spine deformity and intermittent chest pain. These symptoms occurred after a domestic accident involving a fall from a low wall onto the thoracolumbar spine 5 months previously. The diagnosis was suggested by the presence of a left hemithoracic hydroaera and confirmed by a thoraco-abdominal CT scan. Surgical exploration revealed a linear rupture of the entire left hemi-diaphragm with herniation of the stomach, small intestine, cecum, transverse colon and omentum. We performed a double-layer suture of the diaphragmatic rupture with a non-absorbable suture without edge rejuvenation after the reduction of the hernia. The outcome was favourable with normal postoperative radiographs at one year follow-up. **Conclusion:** Traumatic diaphragmatic hernia, although uncommon and difficult to diagnose, is a condition that is relatively easy to manage surgically, even if it is discovered late. In all cases of trauma to the thoracolumbar spine, regular follow-up and repeat X-rays are necessary if pain persists.

Keywords

Hernia, Diaphragm, Trauma, Child, Case Report

1. Introduction

Traumatic diaphragmatic hernia is a rare clinical entity, particularly in children, complicating closed or penetrating trauma to the abdomen and thorax [1]-[9].

These traumas are responsible for diaphragmatic rupture. There are three phases of traumatic diaphragmatic rupture [3] [5]: initial, latent and obstructive. The initial or acute phase lasts from the time of the accident until the primary lesions have healed. During this period, the urgent treatment of serious associated injuries masks the diaphragmatic rupture. The latency period varies in duration from a few hours, days, months to several years. During this so-called delayed phase, patients may be asymptomatic or present with vague gastrointestinal symptoms due to intermittent obstruction of the herniated organs or cardiorespiratory symptoms due to the mass effect of the herniated viscera in the thoracic cavity. The obstructive phase results from a complication of a long-standing hernia that manifests as obstruction, leading to congestion, strangulation, necrosis or even perforation of the herniated viscera [5] [8]. It most commonly occurs in the left diaphragmatic dome [1] [3] [5] [7] [9]. However, a recent review of the literature has shown that although traumatic diaphragmatic rupture is as common on the right as on the left, it is less obvious clinically as most are missed due to non-specific features [2] [4]. Late presentation results in pulmonary complications, chronic abdominal pain or acute bowel obstruction, which can lead to morbidity and mortality [5]. Treatment is surgical [1]-[9]. Current advances are represented by minimally invasive endoscopic surgery for diagnostic and therapeutic purposes, and further research is needed to provide surgeons with best practice methods to provide optimal treatment for patients [7]. We report a case of diaphragmatic hernia discovered five months after closed trauma to the thoracolumbar spine in an 11-year-old girl. This case report aimed to study the diagnostic and therapeutic aspects of this late clinical entity.

2. Observation

In May 2022, an 11-year-old girl presented to the Paediatric Surgery Department of the University Hospital of Brazzaville with intermittent, poorly systematised thoracic and lumbar pain and thoracolumbar deformity. Her illness began on 2 January 2022 with severe thoracolumbar pain following a domestic accident in which she fell from a low wall and landed on her back. She was taken to a medical centre where, after a normal chest X-ray (**Figure 1**), she was prescribed pain relief without hospitalisation. When the pain worsened, the progressive development of spinal deformity and shortness of breath on exertion rapidly resolved, disrupting the adolescent's schooling, she was referred to us for better management. On admission, the patient was conscious, asthenic and weighed 33 kg for a height of 145 cm. Her heart rate was 80 beats per minute, respiratory rate 20 cycles per minute and pulse oxygen saturation 99% on room air. On pleuropulmonary examination, we noted fairly good thoracic distension, an unperceived vesicular murmur, and hydroauricular sounds in the left lung. The spinal examination revealed a deformity of the thoracolumbar spine without gibbosity (**Figure 2**) and pain on palpation of the lumbar spinous processes with identification of the impact zone, without neurological signs. A standard X-ray of the

Figure 1. Normal frontal chest X-ray.

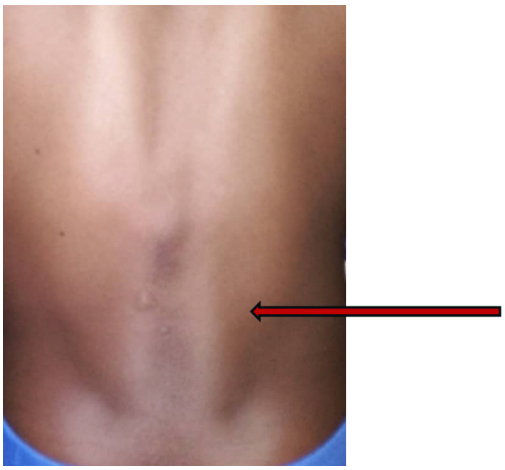

Figure 2. Patient back view: the arrow points the impact zone with deformity of the lumbar spine.

thoracolumbar spine showed an elevation of the left diaphragmatic dome with intrathoracic hydroaera and wedging of the L2, L3 and L4 vertebrae (**Figure 3**). A thoraco-abdominal CT scan confirmed the diagnosis of a rupture of the left diaphragmatic hemidome with the presence of intra-thoracic abdominal viscera (**Figure 4**) and clarified the severity of the trauma by demonstrating fusion of the listeles of the vertebral bodies from L2 to L5. The patient was referred for surgery after a standard pre-operative assessment at 8months post-trauma due to several family and hospital problems. The patient was admitted to hospital 12 days before surgery for worsening chest and abdominal pain, which was managed with intravenous analgesics and strict bed rest. Surgery was performed under general anaesthesia with orotracheal intubation, in the supine position with a log to elevate the diaphragm, a nasogastric tube and urinary catheter in place. A median supraumbilical laparotomy was performed. Exploration revealed a complete linear left diaphragmatic rupture with smooth edges (**Figure 5**). The procedure consisted of reintegrating the herniated viscera and suturing the rupture in two planes with a non-absorbable suture without redressing the

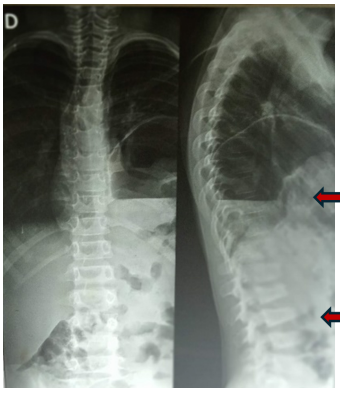

Figure 3. Standard radiographs of the thoracolumbar spine: The first arrow points a ascension of the left diaphragmatic dome with hydroaeric level indicating the presence of hollow organs; The second arrow points the wedge-shaped vertebrae L2, L3, L4.

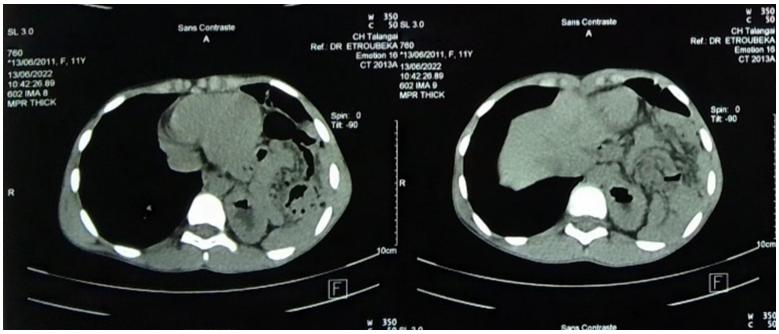

Figure 4. CT scan without injection (thoracic floor): A hernia of the abdominal viscera that takes up almost the whole of the left lung.

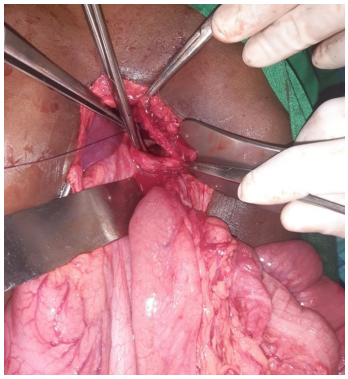

Figure 5. Diaphragmatic breach after hernia reduction.

edges (**Figure 6**). The herniated viscera were the transverse colon, cecum, small intestine (purple, rapidly re-coloured), stomach and omentum. The postoperative course was uncomplicated. The patient was discharged on the fifth postoperative day. Postoperative radiographs (second day, one month, three months and one year) were normal (**Figure 7**). The spinal deformity was managed by the Physical Medicine and Rehabilitation Department with physiotherapy and a lumbar brace. She was able to return to school in October 2022.

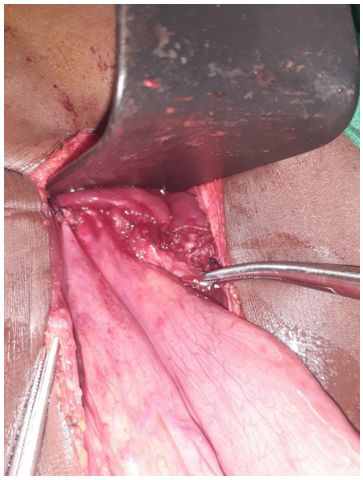

Figure 6. Suturing the breach without re-dressing of the edges after reduction of the hernia.

Figure 7. Postoperative radiograph (day two): Left diaphragmatic cupola in normal position and good digestive aeration.

3. Discussion

Traumatic lesions of the diaphragm are a rare type of trauma in children. According to Marzona [8], the prevalence of these lesions in childhood trauma is 0.07%. Traumatic lesions of the diaphragm are often clinically occult and can be difficult to detect. An unrecognised traumatic rupture of the diaphragm can have dangerous long-term consequences due to herniation of the viscera into the chest cavity, causing respiratory distress and possibly strangulation of the herniated organs [3] [5]. There are two types of trauma, direct penetrating trauma and indirect blunt trauma to the thoraco-abdominal region with trauma to the diaphragm [1] [2] [3]. The main aetiology is closed abdominal trauma due to car accidents, falls or crush injuries [1] [2] [3] [4] [8]. We present the first documented case from our department, detected at 5 months, compared to 4 years for the case reported by Njem [5]. The aetiology was thoracolumbar trauma caused by a fall from a low wall, landing on the lumbar spine (L2 - L5).

Left-sided involvement is most commonly reported in most series [1] [3] [5] [7] [9], but some authors report an almost equal incidence of right-sided involvement due to the non-specificity of the symptoms [2] [4]. In our case, the diaphragmatic rupture was left-sided with herniation of the stomach, small intestine, cecum and transverse colon. Diagnosis is easily made by imaging [1]-[9] with standard chest X-ray and thoracoabdominal CT scan, which allows analysis of associated lesions and herniated abdominal organs. Treatment is always surgical. The abdominal approach is the preferred route for emergent lesions, and the abdominal approach is appropriate for post-trauma lesions of the left dome. The thoracic approach is justified for lesions of the right dome [1] [2] [3] [4] [5] [8]. Edge-to-edge suturing of the edges of the rupture is the rule. In our experience the approach was a median supraumbilical laparotomy with suture of the edges in 2 planes. The postoperative course was uncomplicated and the follow-up at 15 months was favourable. Traumatic diaphragmatic hernia, which is difficult to diagnose, is easy to manage surgically, except in the context of serious complications such as strangulation and perforation of the herniated viscera. Appropriate management of closed thoracoabdominal trauma by emergency services would significantly reduce the incidence of morbidity and mortality from traumatic diaphragmatic hernia.

4. Conclusion

Diaphragmatic hernia is rare in children. The main cause is the increasing number of road accidents and more violent play accidents. Ruptures of the left diaphragm are always clearly predominant. In the latent phase of diaphragmatic hernia, specific symptoms appear several months or even years after the trauma. The standard chest X-ray is the basic examination for rapid diagnosis, confirmed by computed tomography. Laparoscopy is a highly reliable diagnostic tool and allows therapeutic procedures to be carried out. A recognised diaphragmatic rupture is an indication for surgery as soon as the diagnosis is made, if there are no other priorities. The risk is volvulus of an ascending organ, which has a poor prognosis.

Authors' Contributions

All the authors contributed to the conduct of this research work; they read and approved the final version of the manuscript.

Informed Parental Consent

We certify that the child's parents have been informed and have given their consent to the publication of this case report.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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