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Post-traumatic duodenal perforation in a 15-year-old adolescent: Case report

Souha Qarouach[1,2]*; Loubna Aqqaoui[1,2]; Chaima Riadi[1,2]; Hidaya Zitan[1,2]; Houda Oubejja[1,2]; Fouad Ettayebi[1,2]

[1]Pediatric Surgical Emergency Department, Rabat Children's Hospital, Morocco.

[2]Faculty of Medicine and Pharmacy, Mohamed V University, Rabat, Morocco.

***Corresponding Author:** Souha Qarouach
Pediatric Surgical Emergency Department, Rabat Children's Hospital, Morocco.
Email: Souha.qarouach@gmail.com

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Abstract

Duodenal injuries by blunt abdominal trauma in children are rare. They are often missed because of the retroperitoneal position of the duodenum. Their diagnosis and treatment remain a challenge. We report the case of a 15-year-old adolescent suffering a blunt abdominal trauma due to a kick of horse. On the physical examination, the patient was hemodynamically stable, with generalized abdominal pain. An abdominal CT scan found a pneumoperitoneum, suspicious of perforation of the gastrointestinal tract. An exploratory laparotomy confirmed an isolated duodenal perforation. A simple suture of the duodenal perforation was performed. The postoperative course was uneventful. In this article, we discuss the diagnostic difficulties, the importance of CT scan and the therapeutic strategy.

Keywords: Duodenal perforation; Pneumoperitoneum; Case report; Blunt trauma.

Introduction

Abdominal trauma in children is a common reason for consultation in pediatric emergency departments, often occurring in road traffic accidents and sports injuries. Duodenal injuries are rare, accounting for 0.2% to 3.7% of all exploratory laparotomies for abdominal trauma, and are often associated with injuries to adjacent organs [1]. Early diagnosis of a duodenal injury remains a challenge due to its retroperitoneal location, which leads to delayed management and, consequently, a high rate of morbidity and mortality [2,3]. We report a case of abdominal blunt with duodenal perforation due to a horse kick without any associated lesions.

Case presentation

A 15-year-old boy arrived at the emergency department after being kicked in the right upper abdomen by a horse. Despite the trauma, he was in stable condition, although he complained of vague and diffuse abdominal pain that wasn't clearly localized. On clinical examination, his vital signs were normal he was alert, with stable blood pressure and heart rate, and showed no signs of confusion or altered consciousness. His abdomen was soft but tender throughout, and peri-umbilical abrasions were noted on the skin (Figure 1).

Initial laboratory investigations were performed (Table1).

Table 1: Initial laboratory findings.

Parameter	Patient's value	Reference range
Hemoglobin (Hb)	11.7 g/dL	11.0 – 15.1 g/dL
White Blood Cell Count (WBC)	9600 /µL	3500 – 9300 /µL
Amylase	27 U/L	40 – 125 U/L

A contrast-enhanced CT scan of the abdomen was performed, which revealed the presence of free air in the peritoneal cavity (Figure 2), raising concern for a hollow viscus perforation.

The decision was made to proceed with emergency surgery. A midline laparotomy was performed, revealing free peritoneal

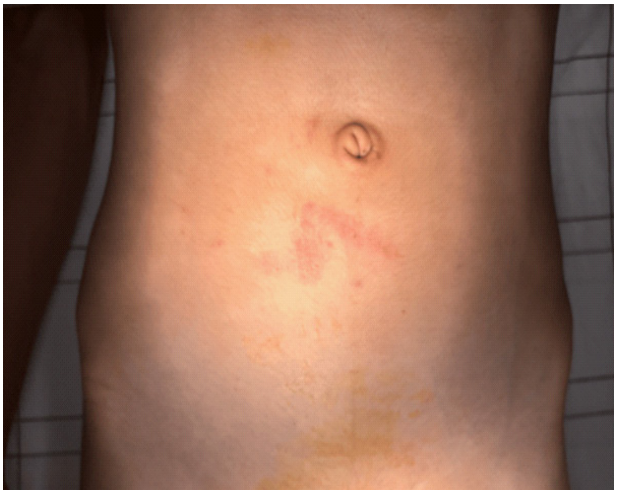

Figure 1: Post-traumatic peri-umbilical dermabrasion.

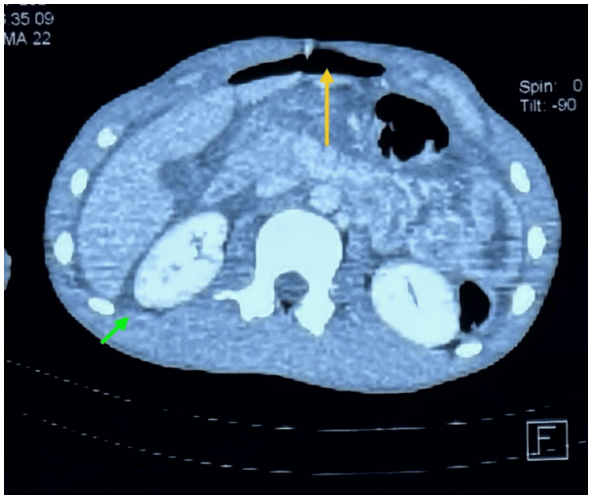

Figure 2: Axial CT scan of abdomen showing pneumoperitoneum (yellow arrow) and intra-peritoneal fluid collection (green arrow).

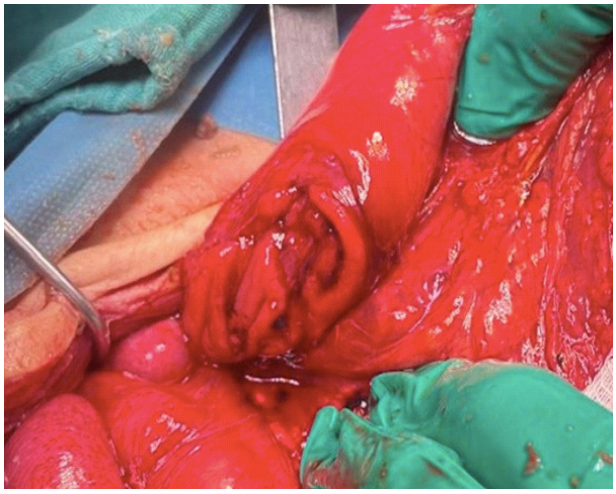

Figure 3 Single laceration of the first part of the duodenum.

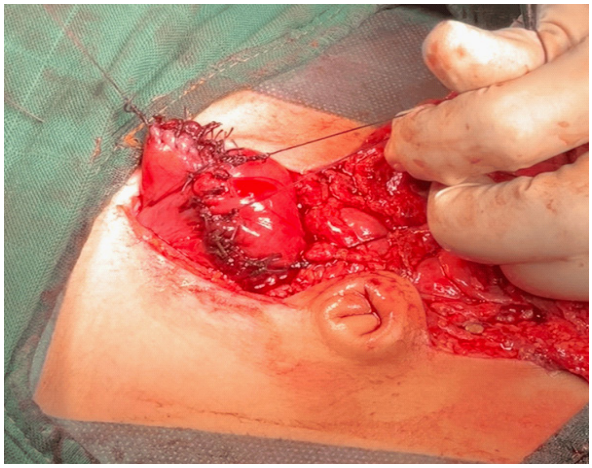

Figure 4: Duodenal double-layer closure with vicryl 3-0 suture.

fluid and a perforation in the first part of the duodenum (D1), consistent with a Grade 3 injury on the AAST scale (Figure 3).

The perforation was repaired with a two-layer primary closure using 3-0 Vicryl sutures (Figure 4). A nasoenteric feeding tube and a Redon drain were placed near the repair site for postoperative management.

By the fifth postoperative day, the patient had resumed oral intake without difficulty and showed no signs of abdominal discomfort. At his six-month follow-up, he remained symptom-free and in good overall health.

Discussion

In children, blunt trauma sadly remains one of the most frequent causes of death. Solid organ injury and bowel perforation are the most common. Gastrointestinal injury after blunt abdominal trauma is less than 1% and duodenal injury accounts for 17% to 30% of the cases [4]. Duodenal injury is difficult to diagnose because most of the duodenum is retroperitoneal. This leads to a delay in diagnosis, a greater percentage of complications, and a higher rate of death. These injuries usually involve the retroperitoneal portion of the duodenum and account for a small percentage of abdominal trauma [2-5].

The mechanism of injury in blunt duodenal trauma may influence operative management. Duodenal injuries often happen when a strong force hits the upper part of the abdomen, pushing the duodenum back against the spine. This type of trauma is commonly seen in car accidents such as when a child's abdomen strikes the steering wheel or from something as everyday as falling onto a bicycle handlebar. These scenarios are particularly frequent in children, who are more vulnerable to such impacts.Blunt duodenal injuries may also occur by a direct acceleration deceleration force to the duodenum, such as in a fall from a high building. In the current case, the horse kick was similar to a steering wheel injury, resulting in a deceleration force to the right upper abdomen [6,7].

According to the Duodenal Organ Injury Scale (American Association for the Surgery of Trauma Organ Injury Scaling Committee) [8], an injury graded as a Grade III injury represents a complete transection of the third part of duodenum. This type of injury is believed to account for <25% of duodenal injuries in the pediatric population [9,10].

In line with this classification, our patient sustained a Grade III duodenal injury, involving a tear that affected between half and the entire circumference of the duodenum's first segment (D1). As the duodenum is located retroperitoneally, the symptoms are generally nonspecific, and the diagnosis is often delayed. This underpins the role of abdomen computed tomography (CT), considered as the reference imaging modality [11]. CT scan has a sensitivity of 86% and a specificity of 88% in detecting hollow viscus injuries in blunt abdominal trauma cases, compared to 53% and 69% achieved with clinical examination [12]. If pneumoperitoneum, bowel wall pneumatosis, or free fluid are visible in the absence of injury to a solid organ, intestinal perforation is suspected [2]. There is no consensus regarding treatment. The surgical approach depends on the size of the lesion of the duodenum and the associated organ injuries (pancreatic, biliary, or other intra-abdominal injury) [13]. Primary repair with or without pylorus exclusion is the current recommendation for most duodenal injuries. However, in complex injuries, the usual management is pylorus exclusion with gastrojejunostomy or pancreaticoduodenectomy [14,15]. Siboni et al. reported that primary repair alone does not increase morbidity or mortality and may even decrease the length of hospital stay [16].

Santos et al. reported that mortality in cases of duodenal trauma ranges from 5.3% to 30%, with higher rates observed when injuries to the pancreas or common bile duct are also present. However, the most critical factor influencing mortality is the delay in diagnosis and surgical intervention. Based on injury severity, the highest mortality rate was seen in Grade 4 injuries (58.8%), followed by Grades 1, 2, and 3, with rates of 8.3%, 18.7%, and 27.6%, respectively [2,3].

Conclusion

Isolated posttraumatic duodenal perforation is a rare entity and the preoperative diagnosis can be challenging. Abdominal CT scanning plays an important role in the early detection and management. Although there is no consensus regarding the optimal surgical technique, primary repair can lead to good outcomes in selected patients.

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