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Case Report

Traumatic rupture of duodenal diverticulum-clinical case in catastrophe setting

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ABSTRACT

Duodenal diverticula are anatomical outpouchings of the gastrointestinal tract, with a prevalence of up to 27% in individuals over 50 years old. While often asymptomatic, complications such as diverticulitis, obstruction, and perforation can occur. Traumatic rupture of a duodenal diverticulum is extremely rare, with only a few cases documented in the literature. We report the case of a 64-year-old female involved in a major traffic accident with multiple injuries. Initially stable, she later developed abdominal tenderness and hypotension, prompting a CT scan that revealed pneumoperitoneum without significant hemoperitoneum. Surgical exploration revealed a ruptured duodenal diverticulum, which was treated with diverticulectomy and omentoplasty. Blunt abdominal trauma typically affects the liver, spleen, and retroperitoneal organs, while isolated duodenal injuries remain rare. Mechanisms for duodenal rupture, particularly in the context of seatbelt use, include sudden intra-abdominal pressure increases during deceleration. Imaging, particularly CT, plays a crucial role in the early detection of such injuries, although resource limitations during mass casualty events may delay its use. Surgical management remains the definitive treatment, and early intervention is essential in unstable patients. Traumatic rupture of a duodenal diverticulum is an uncommon yet life-threatening event. Early suspicion, timely imaging, and surgical intervention are key to successful outcomes. Continuous reassessment is crucial, as trauma-related injuries may present later in the clinical course.

Keywords: Duodenal diverticulum, Traumatic rupture, Blunt abdominal trauma, Seatbelt injury, Pneumoperitoneum, Diverticulectomy

INTRODUCTION

Diverticula are outpouchings of hollow viscera that can form in organs such as the bladder, heart, and various segments of the gastrointestinal (GI) tract, with the colon being the most common site, followed by the duodenum.[1,2]

Duodenal diverticula are common anatomical anomalies, with a prevalence ranging from 10% to 27% in individuals over 50 years of age, and their incidence increases with age. There is no significant sex predilection. Most duodenal diverticula are located in the second portion of the duodenum, typically on the mesenteric border.[1,3]

Although only 5-10% of duodenal diverticula become symptomatic, when they do, patients may experience nausea, vomiting, pain, bleeding, or steatorrhea.[4] As seen with diverticula in other regions, such as the sigmoid colon, complications can arise, including acute diverticulitis, obstruction, and perforation. Unlike lower GI tract diverticula, obstruction in patients with duodenal diverticula typically manifests with vomiting but without abdominal distension. In some cases, obstruction can lead to biliary stasis and ascending cholangitis.[2,3,5]

Perforation is among the rarest but most life-threatening complications of duodenal diverticula.[6] According to a review by Thorson et al perforation is primarily caused by diverticulitis-69%, followed by lithiasis-10%, iatrogenic injury, ulceration-10%, foreign body ingestion-2%, and trauma, which accounts for only 4%. Traumatic rupture is exceedingly rare, with only 12 documented cases in the literature.

This case report details the management of a rare traumatic duodenal diverticulum rupture, underscoring the importance of clinical reassessment in catastrophic settings.

CASE REPORT

A 64-year-old female tourist was involved in a major traffic accident, which resulted in a total of 56 casualties and the activation of the local disaster response plan. The patient was wearing a seatbelt and was extricated from the scene by emergency services. She was transported to the emergency department with full spinal immobilization.

On arrival, the patient was confused, with a Glasgow coma scale (GCS) score of 14. Her vital signs were stable, but she complained of pain in her elbow.

Physical examination revealed an elbow deformity consistent with dislocation, in addition to multiple facial, forearm, and right-hand lacerations requiring suture repair. Neurological examination was unremarkable, and there were no signs of internal bleeding. Due to the high volume of casualties, an E-FAST (extended focused assessment with sonography for trauma) was not performed.

Initial laboratory investigations demonstrated leukocytosis with neutrophilia, hemoglobin at 10.7 g/dL, and normal liver enzymes. Amylase and lipase levels were not measured.

Imaging studies, conducted according to hospital trauma protocols, revealed fractures of C1 and C2 with rotatory subluxation, as well as fractures of the first and second right ribs.

After receiving initial treatment, the patient was placed under observation in the emergency department.

Approximately four hours after admission, the patient's condition deteriorated, with a drop in GCS, hypotension, and signs of prostration. Upon reassessment abdominal tenderness was noted.

After stabilization, an urgent CT scan revealed pneumoperitoneum predominantly on the right side, without significant hemoperitoneum. There were no notable retroperitoneal or thoracic abnormalities. The CT findings are shown in Figure 1.

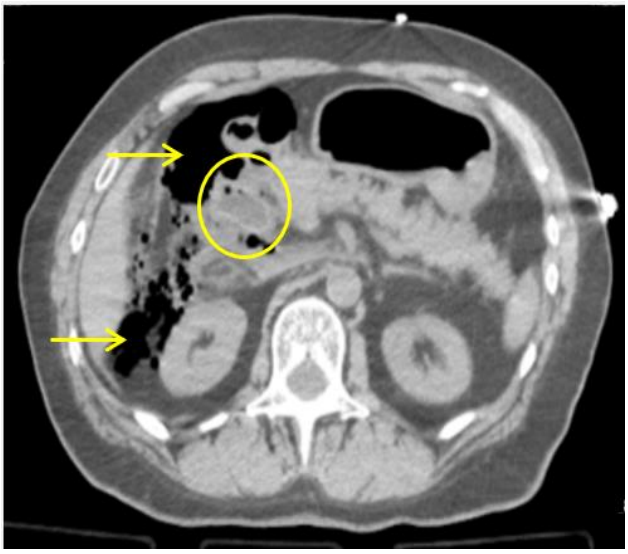

Figure 1: Abdominal CT scan.
Arrows-pneumoperitoneum and circle-ruptured duodenal diverticulum.

Surgical intervention

Surgical exploration was indicated.

A median laparotomy was performed, revealing no signs of hepatic or splenic injury.

A Kocher maneuver was carried out, identifying multiple diverticula at the mesenteric border of the jejunum and a complete rupture of a diverticulum located in the second portion of the duodenum.

The diverticulum was excised using mechanical suturing device, followed by invagination of the suture site and reinforcement with omentoplasty.

Surgical findings are illustrated in Figure 2.

Postoperative course

Following the procedure, the patient was admitted to the intensive care unit and initiated on broad-spectrum antibiotic therapy and vasopressor support.

During her hospitalization superficial infection at the surgical site and facial wounds were noted.

On the seventh postoperative day, after stabilization and no longer requiring vasopressors, she was transferred back to her home country via air ambulance.

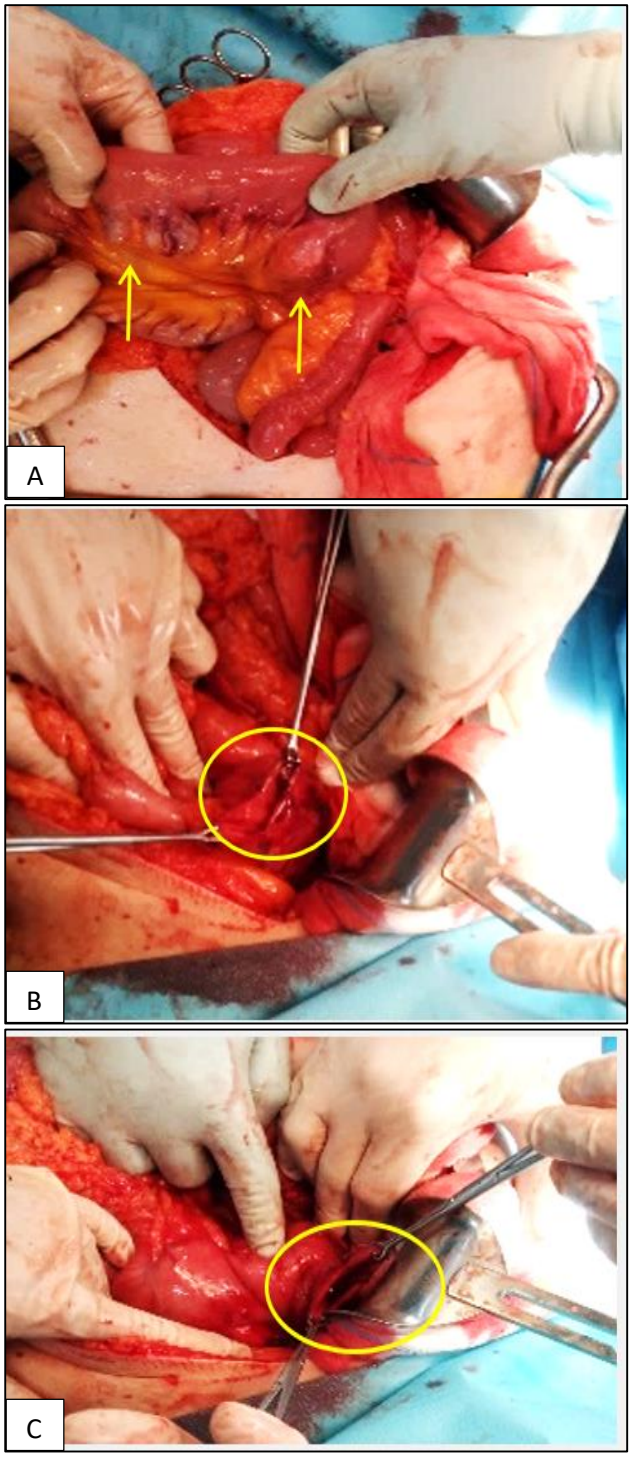

Figure 2 (A-C): Intra-operative findings.
Arrows-multiple jejunal diverticula and circles-ruptured duodenal diverticulum.

DISCUSSION

Blunt abdominal trauma most frequently involves the liver, spleen, and retroperitoneal structures such as the kidneys.[6] Deceleration forces can also result in small bowel injuries. However, physical examination for these injuries is often nonspecific, requiring a high index of suspicion, as symptoms may manifest hours to days after the initial trauma.[7]

The mechanisms leading to isolated duodenal injuries remain unclear. One hypothesis is that sudden deceleration causes compression of the duodenal arch against the second and third lumbar vertebrae.[2] In this patient's case, it is believed that the seatbelt led to a rapid increase in intra-abdominal pressure, resulting in strangulation of the duodenal arch between the seatbelt straps, as shown in Figure 3.[1] Of note, this traffic accident resulted in 56 victims and 31 fatalities, none of whom were wearing seatbelts.

Duodenal injuries may present with subtle clinical and laboratory findings. Leukocytosis and elevated pancreatic enzymes can occur, although these findings are nonspecific, they can raise suspicion of duodenal perforation.[1,8] In this patient, amylase and lipase were not measured, as they are not included in the initial trauma evaluation protocol.

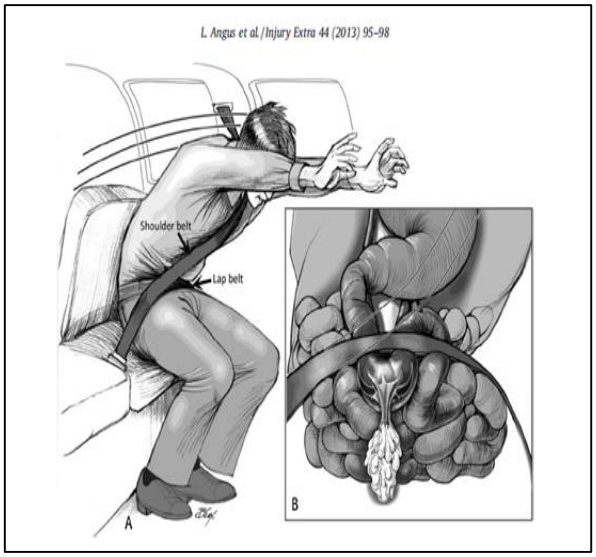

Figure 3: Possible mechanism of duodenal diverticulum rupture. Closed loop obstruction due to the straps of the seatbelt. Sudden increase of abdominal pressure causing an explosive rush of air into the blind pouch of the diverticulum.

CT imaging remains a valuable tool in the trauma setting, as it can detect small amounts of free fluid or pneumoperitoneum, along with other possible and more common traumatic injuries.[9] However, CT is not universally available in all hospitals, and its use can be resource-intensive and time-consuming, especially in mass casualty situations. In this case, the CT scan was essential in confirming the diagnosis, but its application may not always be feasible during disaster management.

E-FAST is a rapid, bedside tool to 'rule in' intra-abdominal injuries, though it may not reliably detect retroperitoneal injuries in the early stages.[10] Unfortunately, it was not performed in this patient due to the high volume of casualties.

Surgical intervention remains the definitive treatment for duodenal diverticulum rupture. The most common approach involves diverticulectomy with mechanical or manual suturing and retroperitoneal drainage.[2,3] Although omentoplasty is sometimes performed to reinforce the suture line, there is no substantial evidence to support its routine use. In cases where the injury involves the ampulla, more extensive resections, such as a duodenostomy or a Whipple procedure, may be necessary. In selected cases, conservative medical management may be considered as a stand-alone treatment.[2,8]

CONCLUSION

Traumatic rupture of a duodenal diverticulum is an extremely rare complication, requiring a high level of clinical suspicion for timely diagnosis, given its nonspecific symptoms. Prompt imaging should not be delayed, particularly in patients presenting with multiple injuries, as it aids in early detection. Surgical intervention remains the gold standard treatment and should be prioritized in unstable patients without waiting for further diagnostic studies. Continuous and systematic reassessment is crucial in acute trauma management, as certain injuries may only become apparent later in the course of care.

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