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Case Report

Isolated gastric perforation following blunt abdominal trauma: A case report ☆,☆☆

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ABSTRACT

Gastric perforation resulting from blunt abdominal trauma is a rare but life-threatening condition, accounting for a small fraction of abdominal injuries in trauma patients. Early identification is crucial due to its nonspecific presentation and diagnostic challenges. We report the case of a 20-year-old male involved in a high-speed motorcycle collision who presented with diffuse abdominal pain and distension. Contrast-enhanced CT imaging revealed pneumoperitoneum and a 4 cm perforation in the anterior gastric antrum, with no associated organ injuries. The patient underwent emergency exploratory laparotomy with primary repair using an omental patch. His postoperative recovery was uneventful, and gastric biopsy results were normal. This case underscores the rarity of isolated gastric perforation in blunt trauma and highlights the pivotal role of CT imaging in diagnosis. It also emphasizes the necessity of prompt surgical intervention to mitigate morbidity and mortality.

Introduction

Gastric rupture following blunt abdominal trauma is a rare but life-threatening injury, accounting for less than 2% of all abdominal trauma cases [1]. The stomach's relative mobility and thoracic protection reduce its vulnerability; however, high-impact trauma, such as motor vehicle collisions and falls, can still cause rupture, most commonly involving the anterior wall or greater curvature [2]. The rarity of this injury, combined with its nonspecific clinical presentation and overlap with other abdominal injuries, often leads to diagnostic delays [3]. Early identification and intervention are critical to preventing severe complications, including peritonitis, sepsis, and multiorgan failure [4]. Advances in AI-assisted imaging have shown promise in improving early detection, potentially reducing diagnostic delays [5]. This case report highlights the diagnostic challenges, the role of imaging, and the importance of prompt surgical management in isolated gastric perforation following blunt trauma.

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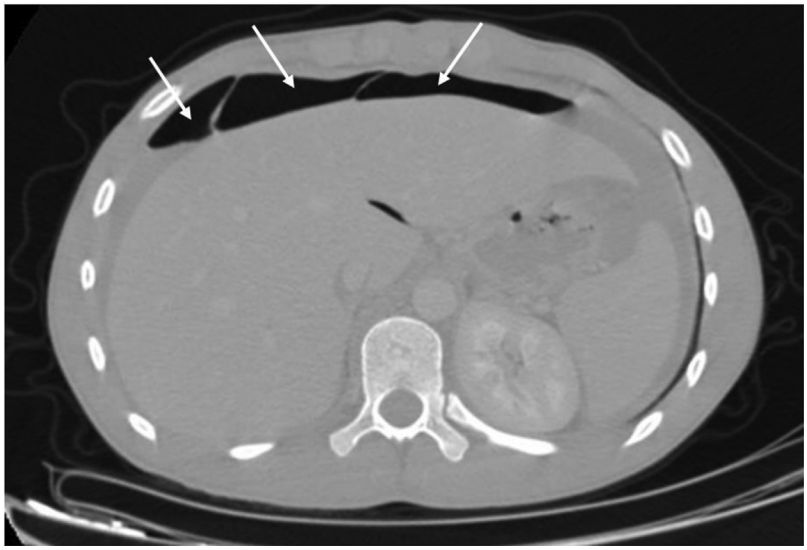

Fig. 1 – Axial noncontrast abdominal CT image demonstrating free intraperitoneal air (white arrows), indicative of gastrointestinal perforation.

Case presentation

A 20-year-old male with no significant medical or surgical history, including no prior gastrointestinal disorders or abdominal trauma, was brought to the emergency department following a high-speed motorcycle collision. He was wearing a helmet and remained conscious, with a Glasgow Coma Scale (GCS) score of 15/15. However, he reported severe diffuse abdominal pain, progressive bloating, and nausea. His family history was unremarkable for gastrointestinal disorders or bleeding tendencies, and he denied smoking, alcohol consumption, or illicit drug use.

On examination, he had superficial abrasions over the epigastrium and left hypochondrium, measuring approximately 3 cm in diameter, without active bleeding. His abdomen was distended, diffusely tender, and exhibited guarding and rebound tenderness, with absent bowel sounds, raising suspicion for intra-abdominal injury. Initial vital signs were stable, with a blood pressure of 120/80 mmHg, heart rate of 90 beats per minute, respiratory rate of 18 breaths per minute, and oxygen saturation of 98% on room air.

Laboratory tests showed a hemoglobin level of 15.5 g/dL (normal: 13.5-17.5 g/dL), leukocytosis with a white blood cell count of 16,500/μL (normal: 4000-11,000/μL), and an elevated C-reactive protein (CRP) level of 40 mg/L (normal: <5 mg/L), consistent with an acute inflammatory response secondary to perforation. Serum amylase and lipase were within normal limits, ruling out pancreatic injury, and liver and renal function tests were unremarkable.

Contrast-enhanced abdominal CT revealed free intraperitoneal air (pneumoperitoneum) (Fig. 1), a 4 cm full-thickness defect in the anterior wall of the gastric antrum communicating with the peritoneal cavity (Fig. 2), and a large intraperitoneal fluid collection consistent with digestive content leakage (Fig. 3). No evidence of hepatic, splenic, pancreatic, or intestinal injury was observed.

An emergency midline exploratory laparotomy under general anesthesia revealed extensive intraperitoneal contamination with digestive fluid and fibrinous membranes. A full-thickness 4 cm perforation was identified in the anterior gastric antrum (Fig. 4), with edematous and inflamed surrounding mucosa. No concurrent injuries to the liver, spleen, pancreas, intestines, or major vessels were detected. The perforation was repaired using interrupted Monocryl 3/0 sutures in 2 layers, reinforced with an omental patch to reduce the risk of leakage (Fig. 5). A Valsalva maneuver confirmed the integrity of the repair. The peritoneal cavity was thoroughly irrigated with warm normal saline, and 2 Jackson-Pratt drains were placed—1 in the subhepatic space and the other in the Douglas pouch. The abdominal wall was closed in layers using Vicryl sutures for the fascia and skin staples.

Postoperatively, the patient was admitted to the intensive care unit (ICU) for close monitoring and received intravenous fluid resuscitation with isotonic crystalloids, broad-spectrum intravenous antibiotics (piperacillin-tazobactam), and analgesia with intravenous paracetamol and opioids as needed. Nasogastric decompression was maintained for 48 hours. By postoperative day 4, bowel function returned, allowing progression to a clear liquid diet, followed by soft foods on day 6. Drains were removed on day 7 after minimal output. Histopathological analysis of the gastric biopsy revealed no signs of malignancy, gastritis, or Helicobacter pylori infection. The patient recovered uneventfully and was discharged on postoperative day 8 with normal alimentation and bowel transit. At a 2-week follow-up, he remained asymptomatic.

Discussion

Gastric rupture following blunt abdominal trauma is an uncommon but serious injury, accounting for only 0.04% to 1.7% of all blunt trauma cases [1]. This injury typically results from

Fig. 2 – Axial contrast-enhanced CT (portal venous phase) showing a discontinuity in the anterior gastric wall (white arrow) with direct communication to free air, confirming gastric perforation.

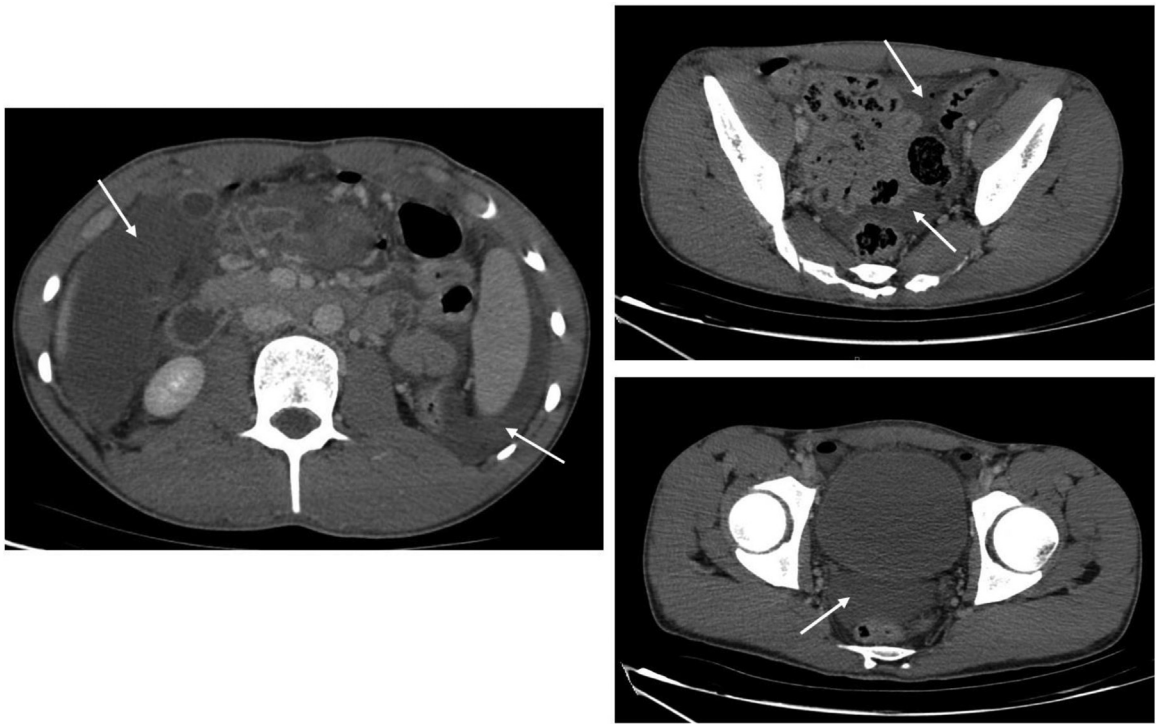

Fig. 3 – Axial contrast-enhanced CT (portal venous phase) demonstrating pneumoperitoneum and a large intraperitoneal fluid collection (white arrows), consistent with perforated viscus.

high-impact events such as motor vehicle accidents, falls, or physical assaults. Despite the stomach's relative mobility and protection by the thoracic cage, significant external forces can lead to rupture, particularly in areas like the anterior wall and greater curvature [2]. A sudden increase in intra-abdominal pressure, especially when the stomach is full, increases the risk of rupture [6]. High-speed trauma can generate shear forces between adjacent structures, leading to organ rupture [7]. In our case, the patient's high-speed motorcycle collision likely caused a sudden increase in intra-abdominal pressure, resulting in an isolated 4 cm perforation of the gastric antrum.

CT imaging plays a pivotal role in diagnosing gastric perforations. In our case, contrast-enhanced CT of the abdomen and pelvis revealed pneumoperitoneum, a large intraperitoneal fluid collection, and a 4 cm defect in the anterior gastric wall, consistent with gastric perforation. While CT

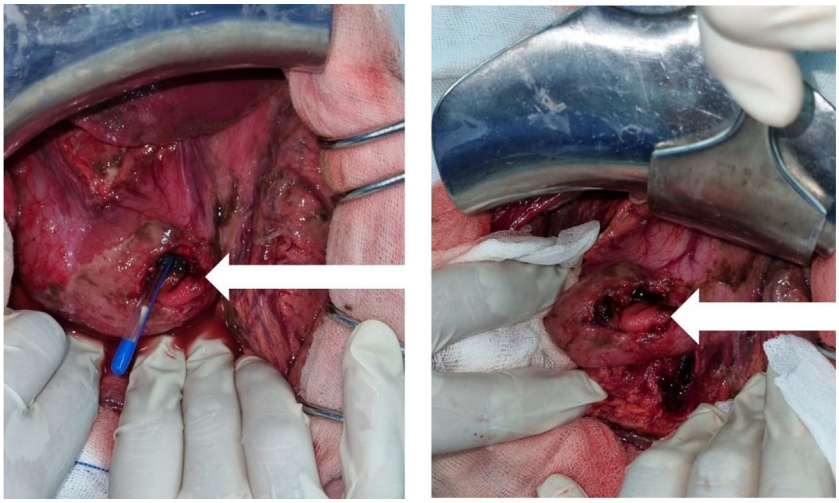

Fig. 4 – Intraoperative photograph revealing a 4 cm full-thickness perforation in the anterior gastric antrum (white arrows), correlating with CT findings.

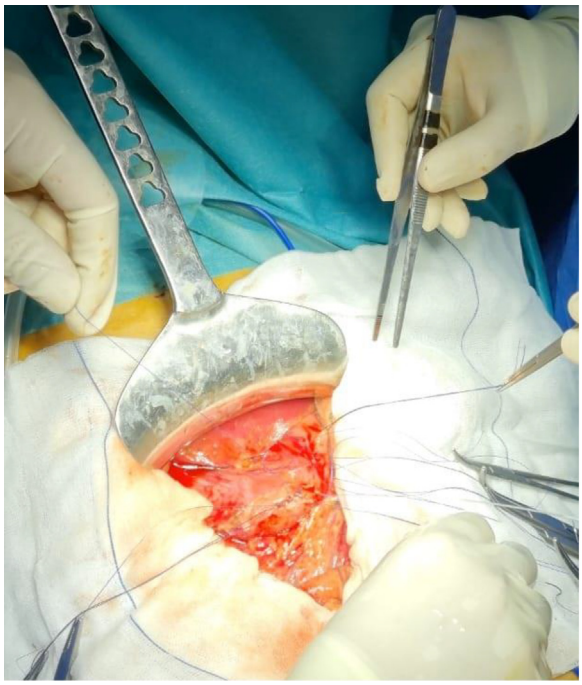

Fig. 5 – Intraoperative image showing the gastric perforation repaired with interrupted Monocryl 3/0 sutures.

is highly sensitive for detecting key features such as pneumoperitoneum, free fluid, and gastric wall discontinuities, its diagnostic accuracy may be limited in cases with small perforations or overlapping injuries [3]. Specific CT findings in gastric perforation include thickening of the gastric wall, focal discontinuity, and free air adjacent to the stomach [8]. Multidetector CT with oral contrast can enhance detection by improving visualization of gastric wall integrity and associated leakage [9]. The use of water-soluble oral contrast in CT imaging can further enhance the detection of gastric perforations by highlighting leakage sites, particularly in cases with subtle findings.

AI-assisted algorithms enhance detection of subtle findings, such as micro-perforations and small pneumoperitoneum, improving diagnostic accuracy. Machine learning models trained on large trauma datasets have demonstrated increased sensitivity in detecting gastrointestinal perforations, particularly in polytrauma patients [10]. Recent studies have shown that AI algorithms, such as deep learning models, can improve the detection of pneumoperitoneum and subtle gastric wall defects, reducing diagnostic delays in trauma patients. As AI technology continues to evolve, its integration into emergency radiology workflows may facilitate faster and more reliable identification of gastric injuries, ultimately improving patient outcomes [11].

Delayed diagnosis and treatment of gastric perforation are associated with significantly higher morbidity and mortality. Mortality increases from 2% with surgery within 8 hours to 30% if delayed beyond 24 hours, underscoring the need for early intervention [12]. In our case, prompt surgical intervention with primary repair and omental patch placement ensured an uneventful recovery. Most gastric ruptures can be treated with primary repair using a 2-layer closure technique to ensure proper hemostasis. However, cases with extensive tissue loss or multiple ruptures may require gastrectomy and reconstruction [13].

Conclusion

Gastric rupture due to blunt abdominal trauma is a rare but life-threatening condition that requires prompt diagnosis and intervention. This case highlights the critical role of CT imaging in identifying pneumoperitoneum and gastric wall defects, enabling timely surgical management. Early intervention, as demonstrated in this patient, is essential for prevent-

ing complications such as peritonitis and sepsis. Radiologists play a key role in trauma assessment, and AI-assisted CT analysis may further enhance early detection, reducing delays and improving outcomes. Continued advancements in imaging and trauma care remain essential for optimizing outcomes in patients with this rare injury.

Declaration of generative AI and AI-assisted technologies in the writing process

During the preparation of this work, the author(s) used OpenAI's ChatGPT to assist in translating content. After using this tool, the author(s) reviewed and edited the content as needed and take(s) full responsibility for the content of the publication.

Patient consent

Informed consent was obtained from the patient.

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