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Case report

Gastric rupture following multiple blunt trauma ☆,☆☆

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ABSTRACT

Gastric injury due to trauma is a rare complication that occurs in approximately 0.04%-1.2% of all instances of abdominal trauma. When imaging trauma cases, certain areas can be obscured by several inevitable reasons. Despite its rarity, the high mortality rate of a gastric injury requires an early and accurate diagnosis. We present the case of an 18-year-old male who suffered a gastric rupture of the greater curvature following a road traffic collision before providing a brief review of the literature.

Introduction

Gastric injury following blunt trauma was first described by Yajko in 1975 after he analyzed 35 cases between 1930 and 1973 [1]. Gastric injuries occur in less than 2% of all abdominal trauma cases, although other visceral organ injuries can often be noted [2]. Thus, prognosis in daily practice, by the fact, is often built up based on severity, delayed diagnosis, and other accompanying lesions. Gastric ruptures can occur in any part of the stomach, but the majority of cases appear to affect the anterior wall [3].

An assessment of gastric rupture using plain-film X-rays, ultrasonography, and computed tomography (CT) can highlight the discontinuity of the gastrointestinal wall along with extraluminal free air in the abdomen [4]. Free intraperitoneal air should not be confused with intestinal gas. These equivocal features may occasionally lead to several dilemma situations, particularly where there are lesions that spontaneously

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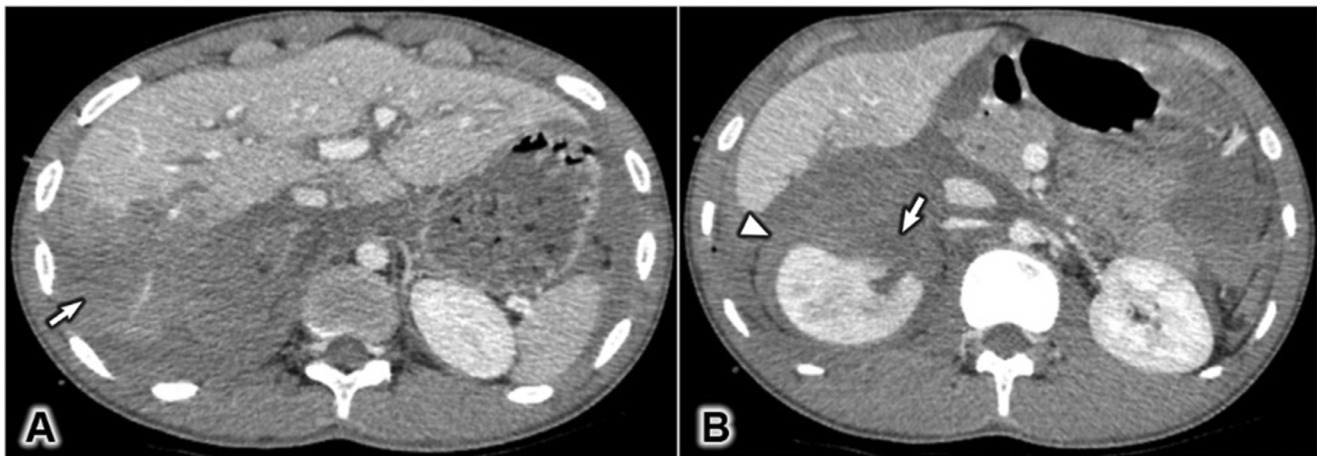

Fig. 1 – *Intraparenchymal hematoma*. (A) An axial CT scan of the abdomen in the portal venous phase showed a large intraparenchymal hematoma in the right hepatic lobe (arrow). (B) An axial view in the portal venous phase contrast-enhanced CT scan shows a renal laceration that does not involve the collecting system of the right kidney (arrow). A large perinephric hematoma surrounds the kidney (arrowhead).

sealed with complex clinical settings. We present a case report of a gastric injury following blunt trauma, which was retrospectively analyzed after surgery had taken place.

Case report

An 18-year-old male was admitted to our emergency department after a motor vehicle accident. No remarkable medical history was documented in his report. The patient complained of having abdominal pain and bloating, particularly in the epigastric and left hypochondrium region. On clinical examination, the patient was fully conscious (a Glasgow Coma Scale score of 15), but traumatic shock was rapidly developing as his heart rate was 100 beats per minute and his blood pressure was 100/50 mm Hg.

Plain-film X-rays were taken, which revealed several fractures of the neck and middle third of the left femur. An abdominal CT scan identified a hemoperitoneum, which corresponded with multiple contusion injuries to the liver, right kidney, and right adrenal gland (Fig. 1). Laboratory tests showed a significant increase in serum aspartate aminotransferase (1946 U/L) and alanine aminotransferase (1681 U/L). Blood in the urine was also detected.

The patient subsequently underwent surgery for a type-2 open fracture of the left femur. However, as his abdominal symptoms were worsening, the previously obtain abdominal CT scan was reevaluated by both radiologist and surgeon. This time, an abnormal 24 × 40 mm air-fluid collection adjacent to the greater curvature of the stomach was noted, which was originally misdiagnosed as gastrointestinal contents (Fig. 2A). In the coronal plane, the integrity of the gastric wall was shown to be disrupted on the greater curvature side, which connected with the collection of air and fluid mentioned above (Fig. 2B). An emergency laparoscopy was performed, which revealed 1500 mL of intra-abdominal blood, a 4-cm laceration on the greater curvature of the stomach (Fig. 3), and hepatic contusions involving the VI, VII, and VIII Couinaud segments. According to the operative report, the Witzel jejunostomy was approached for the gastric rupture, while 2 drains were placed under the liver and in the Douglas cavity. Other contusion injuries were managed by conservative treatment and the patient's post-operative recovery was uneventful.

Discussion

Gastric rupture following blunt trauma is a medical emergency, although doctors are often confronted with several ambiguous symptoms in the clinical setting. Acute hypogastric pain will likely be a factor for the majority of patients and any delay in diagnosis will undoubtedly lead to increased postoperative complications. Several studies have suggested intra-abdominal abscesses were the most common problem after gastric rupture surgery, with incidences of up to 24% [5].

A recent study by Ueda showed that the average age of patients suffering traumatic gastric injuries was 40.1. Additionally, the male/female ratio was 17:4, and 22 of the 26 cases studied in this research were caused by road traffic collisions [6]. Gastric injuries can occur in any part of the stomach, and ruptures can also occur at more than 1 site, although rarely. For example, among the 66 patients studied by Nanji and Mock, only 2 had ruptures at multiple sites [7].

In a study by Aboobakar et al. [3], 40% of ruptures were located in the anterior wall, with 23% in the greater curvature, 15% in the lesser curvature, and 15% in the posterior wall. In our case study, the injury was located in the greater curvature adjacent to the antrum.

Plain-film abdominal X-rays, abdominal ultrasound, and CT are the primary modalities used in traumatic assessments of the abdomen. On plain-film X-rays, signs that may indicate gastric injury include subdiaphragmatic free gas and the Rigler sign [8].

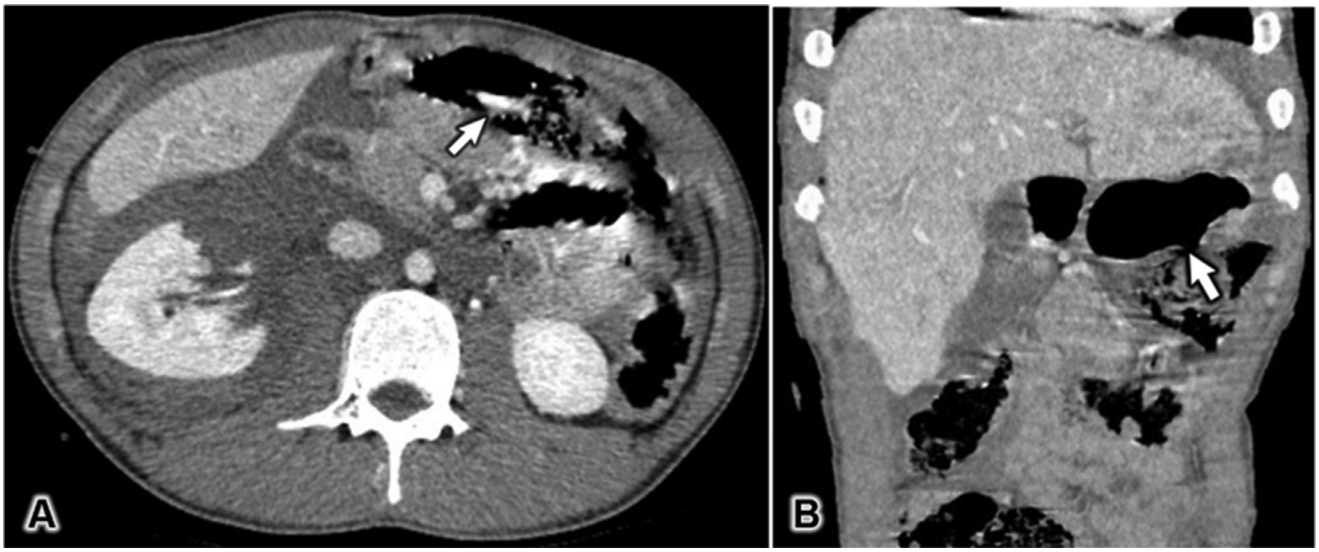

Fig. 2 – *Pneumoperitoneum*. (A) An axial image from the abdominal CT scan in the portal venous phase demonstrates free intraperitoneal air (arrow). (B) A coronal image from the post-contrast hepatic venous phase shows a discontinuity of the stomach wall and a connection with the free air (arrow), suggesting that this is the location of the rupture.

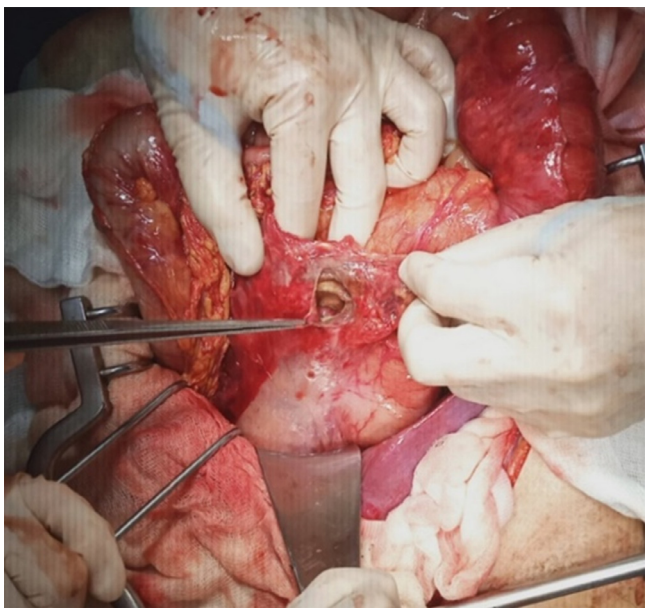

Fig. 3 – *Intraoperative findings*. A 4-cm hole in the greater curvature of the stomach was identified during the laparotomy, which was consistent with the CT findings.

Ultrasound can provide a good assessment of any free intraperitoneal fluid, particularly when the patient is hemodynamically unstable, although it is rarely used in cases of severe pneumoperitoneum. The gold standard for assessing gastric rupture is an abdominal CT scan as it can show discontinuities in the stomach wall and any free gas bubbles. Clinical signs supporting this diagnosis include focal thickening, abnormal enhancement of the gastric wall, fatty infiltration, and surrounding abscesses [9–13]. Additionally, any discontinuity in the bowel wall might be demonstrated as a hypodense line perpendicular to the bowel wall, representing the site of injury [14]. However, this sign is less commonly detected than pneumoperitoneum (in less than 50% of patients with gastrointestinal injury) [9,10,14]. We hypothesize that the main reason for this is that most ruptures are small in size. Abdominal CT is unequivocally superior to other imaging modalities in gastric injury evaluation, with an 82%-90% level of accuracy when diagnosing gastric injuries [10,14,15].

The likelihood of gastric laceration accompanied by involving injuries has been shown in numerous studies. Of the 14 patients with gastric ruptures studied by Shinkawa et al. [2], 8 patients had combined abdomino-thoracic injuries, 4 patients had brain injuries, and 8 patients had limb fractures; just 5 patients had intra-abdominal lesions with no accompanying injuries. In solid organ injuries associated with gastric injury, the liver was injured most frequently (36%) followed by the pancreas and spleen (29%). However, reports in this field are sometimes conflicting. For example, Ueda showed that most patients with gastric lesions had no other complications; only ten of the 26 cases studied had other organ injuries, with the spleen the most commonly affected (4/26) [6].

Our findings are in line with those of Shinkawa et al. The post-contrast abdominal CT scan in our case study showed a grade IV liver injury, a grade II right kidney injury (according to AAST 2018), and a right adrenal gland injury with a fracture of the left femoral neck. As multiple unavoidable drawbacks in general, we believe that considerable effort should be devoted to giving an accurate diagnosis, particularly during multiple trauma situations—as, for example, the gastric rupture was initially overlooked. Therefore, clinical vigilance is imperative as an abdominal CT might fail to detect bowel injuries in 13% of cases [16].

When a gastric injury is suspected, surgery should be performed promptly. There was evidence of bias against the de-

lay in surgery. The mortality of patients who were operated on within 8 hours was 2%. However, this increased significantly to 9% in patients who underwent surgery after 16-24 hours and reached 30% in patients whose surgery was delayed for more than 24 hours [17]. Overall mortality rates for gastric injury can range from 0 to 66% [1,3,18].

Conclusion

Although traumatic gastric injuries are rare, this study shows that dangerous complications can be largely avoided if there is no delay in diagnosis. CT offers unprecedented imaging capabilities compared with the other imaging modalities in providing a definite diagnosis. Signs of discontinuity in the gastric wall are strongly indicative of a gastric injury but are present in less than 50% of cases. Therefore, accurately determining indirectly suggestive signs are essential for maximizing the chances of an accurate diagnosis.

Ethical statement

Appropriate written informed consent was obtained for the publication of this case report and accompanying images.

Author contributions

Nguyen DH, Nguyen DH, and Nguyen MD contributed equally to this article as co-first authors. All authors have read the manuscript and agree to the contents.

Patient consent

Informed consent for patient information to be published in this article was obtained.

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