

# Gastric Perforation: A Case Report of an Unusual Complication of Rib Fracture due to Blunt Abdominal Trauma

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## ABSTRACT

Blunt abdominal trauma is far more common than penetrating injuries, but gastric perforation is more frequently associated with penetrating abdominal trauma. Rib fractures due to blunt trauma usually cause solid organ injury. Blunt gastric perforations are rare, accounting for <2% of all blunt abdominal injuries. Among all hollow viscus injuries, gastric perforation is associated with the highest mortality, which increases proportionately to time in operative intervention. Clinical vigilance and early intervention are mandatory for improved prognosis. The authors, herein, present a case of a 36-year male with a history of blunt abdominal trauma due to a fall resulting in a left lower rib fracture complicated by posterior gastric perforation, which required a high index of suspicion for diagnosis due to concurrent injuries and its timely diagnosis and the management led to uneventful recovery of the patient.

**Key Words:** *Blunt abdominal trauma, Gastric perforation, Rib fracture.*

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## INTRODUCTION

Blunt abdominal trauma commonly leads to solid organ injuries, liver (26.4%) being the most commonly affected followed by spleen (20.7%).<sup>1</sup> Incidence of hollow viscus injuries following blunt abdominal trauma ranges from 4-15%, whereas blunt gastric perforations are even rarer (0.02-1.7%).<sup>2</sup> Rib fractures are frequently seen in blunt trauma (40%) and are often accompanied by intrathoracic and intraabdominal solid organ injuries. The rarity of gastric perforation due to blunt abdominal trauma, along with inconsistent diagnostic yield from routine investigations, leads to its recognition at laparotomy. The authors report here a rare case of blunt abdominal trauma resulting in rib fracture leading to splenic injury as well as gastric perforation.

## CASE REPORT

A 36-year male, a construction worker by profession, presented in the accidents and emergency department with a history of fall from approximately 6 feet high and landed on steel rebars two hours ago.

The patient was evaluated according to the Advanced Trauma Life Support (ATLS) algorithm. The patient was conscious with a Glasgow Coma Scale (GCS) of 15/15; the airway was permeable and respiratory physical examination was normal. He was normotensive but presented with tachycardia and complained of generalised abdominal pain. Abdominal inspection revealed a 4×3 cm bruise and swelling at the left lower anterior chest wall (Figure 1). On palpation, the abdomen was firm, non-distended, and tender over the left hypochondrium with a tender palpable swelling, whereas bowel sounds were audible. Subcutaneous emphysema was palpable at the left costal margin.

Laboratory tests revealed haemoglobin (Hb) of 13.5 g/dL and a white blood cell (WBC) count of  $18.2 \times 10^9/L$  with a normal coagulation profile. Chest x-ray confirmed the subcutaneous emphysema and revealed a fractured 10<sup>th</sup> rib on the left side with no pneumohaemothorax or free air under the diaphragm. A focused assessment with sonography in trauma (FAST) examination showed mild free fluid in the abdominal cavity. Contrast-enhanced computed tomography (CECT) of chest and abdomen revealed haemoperitoneum, fracture of the left 10<sup>th</sup> rib laterally, indistinct posterior wall of the fundus of stomach and wall of lesser curvature with adjacent large haematoma, herniation of small bowel through a defect in the left anterior abdominal wall, associated with a recognisable bulge under the skin with small haematoma and surgical emphysema, and disruption of splenic echotexture with hypoechoic regions representing splenic haematoma (Figure 2).

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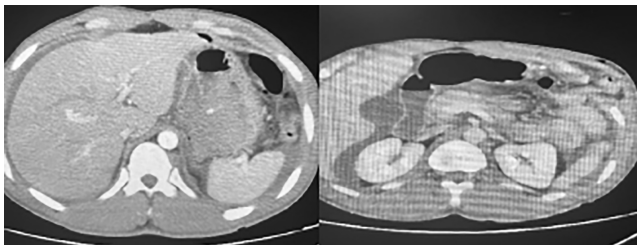
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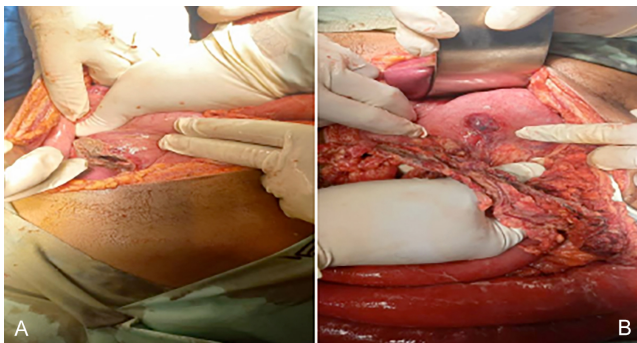
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**Figure 1: Bruises and bulges in the left hypochondrium.**



**Figure 2: Contrast-enhanced computed tomography of abdomen demonstrating multiple injuries**



**Figure 3: (A) Intraoperative findings of perforation of the posterior wall of stomach. (B) Partial-thickness anterior wall perforation.**



**Figure 4: 5<sup>th</sup> Postoperative day wound infection drained adequately.**

An exploratory laparotomy was performed finding gross contamination of the abdominal cavity with serohaemorrhagic fluid and undigested food particles. A transverse full-thickness laceration measuring 3×2 cm was noted in the posterior wall of the stomach and a longitudinal 2×2 cm partial-thickness laceration involving the serosa was noted in the anterior wall of the stomach (Figure 3 A, B). A 4×4 cm defect in the left-upper anterior abdominal wall with herniating small bowel loops was noted. A subcapsular haematoma of the spleen was also noted with no active bleeding. No other associated abdominal injury was noted. The abdominal cavity was washed with copious amounts of normal saline. The gastric perforation was primarily repaired in two layers and the anterior serosal laceration was repaired primarily in a single layer. The abdomen was closed after placing drains in the left subphrenic and pelvic space.

The patient was admitted in the general ward with restriction of oral intake, fluid resuscitation, and adequate pain management, and was administered 2g cefoperazone-sulbactam intravenously for 10 days. Splenic injury was managed conservatively with strict vital and abdominal girth monitoring and limited mobilisation. Postoperative wound infection improved with drainage and aseptic dressings (Figure 4). The patient was able to resume oral intake on the 5<sup>th</sup> postoperative day and was eventually discharged on the 10<sup>th</sup> day.

## DISCUSSION

Rib fractures usually cause surgical emphysema and pneumothorax, but rare cases of mediastinal emphysema and pneumopericardium have also been reported.<sup>3,4</sup> In blunt trauma, fractures of the lower ribs often result in solid organ injuries, particularly to the liver and spleen, and more rarely, a fractured rib fragment can cause intra-abdominal hollow viscus injury. To our knowledge, three similar cases have been reported, and in two of them, fractured rib fragments had penetrated the diaphragm and caused gastric perforation without involving solid organ injury.<sup>5</sup> In contrast, this case showed no diaphragmatic injury, with the fractured rib fragment directly penetrating the posterior wall of the stomach. Aboobakar *et al.* reported a case of anterior gastric perforation associated with left rib fractures, but no accompanying splenic injury.<sup>2</sup>

The rarity of gastric injury in such cases is likely due to the stomach's protective anatomical position, thick muscular wall, and relative mobility. Blunt abdominal trauma most commonly results in solid organ injury, and when the gastrointestinal tract is involved, the proximal jejunum is the most commonly affected structure, followed by the duodenum and ascending colon at the ileocaecal valve region.<sup>6</sup>

The most common sites of gastric perforation following blunt trauma are the anterior wall, followed by the greater curvature, lesser curvature, and posterior wall.<sup>7</sup> In this case, the

posterior wall of the stomach, the least likely site, was involved. During surgery, exploration of the posterior wall is obligatory in every instance. The posterior wall injury can be explained by the fact that when the stomach is fully distended,<sup>8</sup> the greater curvature rotates around the longitudinal axis of the stomach, making it more forward and upward, thereby predisposing the posterior wall to injury. Furthermore, gastric injuries usually present as a single lesion, whereas in this case, the trauma caused both an anterior serosal tear and a posterior full-thickness laceration.

Signs and symptoms of acute abdomen in gastric perforation following blunt trauma are typically due to chemical peritonitis, and the patient is often haemodynamically stable because isolated gastric perforation does not cause significant blood loss. This patient had an associated splenic injury, which led to blood loss and subsequent class I shock. However, prompt management maintained the patient's normotension. A high index of suspicion is required for early diagnosis, even if there is no free air on the plain chest or abdominal radiographs, as free air is seen in only 16-66% of cases on plain x-rays. Therefore, there should be a low threshold for performing computed tomography when there is diagnostic doubt.<sup>9</sup> Typically, moderate amounts of free air are present on an erect chest x-ray in the case of gastric perforation, but in this case, the perforation was on the posterior wall of the stomach, obscured by haematoma, and no free air was appreciated. An urgent CT scan with intravenous contrast was, therefore, performed to delineate the hollow viscus injuries.

Surgical management of such cases depends on the grade of injury, as described by the American Association for the Surgery of Trauma. Grade I-III injuries are managed with single- or two-layer primary closure, whereas grade IV-V injuries involve devascularisation and tissue loss of the stomach, requiring sub-total or total gastrectomy depending on the area of the stomach wall involved. Laparoscopic omental patching is also being performed and has shown comparable results to open surgery, with less postoperative discomfort and infection.<sup>10,11</sup>

Gastric injury is a rare complication of rib fractures, but it should always be considered in cases of lower left rib fractures following blunt abdominal trauma. A thorough clinical examination and investigation, along with a high index of suspicion, are essential for accurate diagnosis and timely intervention, which can greatly reduce the mortality and morbidity associated with blunt gastric injuries.<sup>12</sup> The operating surgeon must be vigilant in exploring all intra-abdominal organs during laparotomy for any injury that may have been missed on imaging, as imaging investigations can sometimes be falsely reassuring.

#### PATIENT'S CONSENT:

Written informed consent was obtained from the patient for the publication of this case report and accompanying images.

#### COMPETING INTEREST

The authors declared no conflict of interest.

#### AUTHORS' CONTRIBUTION:

TA: Concept, design of the work, and critical revision.

TS: Acquisition, analysis, interpretation of the data, and drafting of the final report.

FE: Acquisition, drafting of the work, and critical revision.

RN: Acquisition, analysis, and drafting of the work.

All authors approved the final version of the manuscript to be published.

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