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Delayed Gastric Perforation Following Blunt Abdominal Trauma as a Rare Cause of Secondary Peritonitis in a 34-Year-Old Adult Patient: A Case Report

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Abstract: Gastric perforation (GP) secondary to blunt abdominal trauma is relatively rare clinical entity with a low incidence reported in literature, yet potentially fatal in delayed diagnosis. Isolated GP is frequently associated with delayed presentation due to its anatomical location and imposed a diagnostic challenge. Hence, clinical diagnosis of GP needs high index of clinical suspicion and may need additional imaging to support the clinical diagnosis. In contrast, delay in diagnosis and intervention may lead to significant morbidity and mortality. To the best of our knowledge, this is the first case of its kind to be diagnosed in our setting.

We report here a case of delayed GP detected in a 34-year-old male patient 7-days following blunt abdominal trauma. A primary repair of the perforated stomach with an omental patch was performed. On the 3rd postoperative day, leakage of gastric content was noted through the drain and the laparotomy wound. Re-laparotomy and partial gastrectomy with gastrojejunostomy and Roux-en-Y reconstruction were performed and postoperatively, the patient was shifted to ICU. However, on the 5th postoperative day, the patient developed wound dehiscence and leakage of fecal matter through the wound, and despite best efforts, the patient passed away on the 7th post-operative day.

We recognized that isolated delayed gastric perforation needs a high index of clinical suspicion and prompt management as traumatic hollow visceral injuries, when missed, are a major cause of morbidity and mortality as found in our patient.

Keywords: *Gastric Perforations, Blunt Abdominal Trauma, Tanzania.*

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I. INTRODUCTION

Stomach perforations due to blunt abdominal injury are infrequent in adults, constituting around 0.02–1.7% of all blunt abdominal injuries, usually associated with other intra-abdominal and extra-abdominal injuries with isolated gastric perforations being uncommon [1]. The relative infrequency of gastric perforation is due to protection by the thoracic cage, mobility and vascularity of the stomach [2]. High morbidity and mortality rates have been reportedfor patients with traumatic gastric perforations and have been associated with other associated injuries, delay in diagnosis, severe intra-abdominal infection, sepsis, and recent meal intake [1,2]. In resource poor settings, delay in presentation to the hospital

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and in making the decision to explore the patient because of the lack of skilled man-power, pose a critical challenge [3]. The uncommon occurrence of stomach perforation after blunt force to the abdomen, combined with the often unreliable or negative results from routine imaging and tests, means this injury is almost always discovered only during exploratory laparotomy in surgical settings [2,4]. A high degree of suspicion is required to make a pre-operative diagnosis of gastric perforation; most times the diagnosis is made intra-operatively. Early recognition and prompt surgical treatment of traumatic gastric perforation is of paramount importance if morbidity and mortality associated with traumatic gastric perforation are to be avoided [5]. The extent of injury, timing of diagnosis and surgical interventions are the factors associated with the outcome [3, 5]. Reports link postponed diagnosis and surgical intervention for traumatic gastric perforation to elevated rates of complications and death following surgery [1, 3, 5]. Hollow visceral injuries after a blunt abdominal trauma can have serious consequences if diagnosis is missed or delayed. We report here a case of delayed gastric perforations detected in a 34-year-old male patient 7-days following blunt abdominal trauma.

II. CASE REPORT

A 34-year-old man arrived at our emergency room complaining of intense abdominal pain persisting for 7 days, stemming from blunt trauma sustained during an alleged beating with wooden sticks. He reported having taken a meal just before the accident. Initially, abdominal pain was mild and hence the patient did not present earlier to the hospital. Five days after developing worsening abdominal pain, the patient was attended at a nearby hospital. He had severe generalized abdominal pain which was worse around the umbilicus with constipation three days after the onset of his symptoms. No episodes of loss of consciousness, vomiting (including hematemesis), blood in urine or stool, or inability to void urine were reported. He denied any prior episodes of gastritis, peptic ulcers, diabetes, or hypertension. He was then admitted for two days and given IV fluids and several other medications which he could not recall. As there was no clinical improvement, he was subsequently referred to our hospital for further evaluation and management.

On arrival at the emergency department, this patient was evaluated according to the advanced trauma life support algorithm. He was fully conscious with Glasgow coma score of 15/15, dehydrated, pale, afebrile. His vital signs were blood pressure 102/54 mmHg, respiratory rate 20 breaths per minute and temperature of 37.4^0C, and SPO_2 was 96% on room air. The abdomen was moderately distended, diffusely tender with guarding and rigidity. Multiple bruises and abrasions were evident over the anterior chest wall and epigastrium. Bowel sounds were low-pitched. The digital rectal examination was normal. Other systemic examinations were essentially normal.

A provisional diagnosis of perforation peritonitis secondary to visceral injury was made. Routine laboratory investigations revealed Hemoglobin of 6.6 g/dl and urinalysis was normal. Full blood picture showed leukocytosis with predominance of neutrophils. Serum electrolytes revealed hypokalemia of 2.2 mmol/l (normal range in blood is 3.5-5.0 mmol/l).

The stool Ag test for *H. pylori* which was taken from the stools on a gloved figure after DRE revealed negative results. The plain abdominal x-ray in the erect position was diagnostic of hollow visceral perforation with air under the right hemi-diaphragm (Figure 1). Abdominal ultrasound scan was suggestive of free fluid in the abdomen (images could not be preserved). An urgent abdominal CT-scan was indicated but it was not done due to patient's hemodynamic instability.

Therefore, the patient was quickly taken into operating room for emergency laparotomy after rapid and adequate fluid resuscitation. Nasogastric tube and urethral catheter were also inserted. Pre-op intravenous broad-spectrum antibiotics and analgesics were administered.

Intra-operatively the patient was found to have two large, full thickness gastric perforations. The first gastric perforation was 3 × 4 cm along the lesser curvature (Figure 2), along with a second 4 × 2 cm perforation in the prepyloric region extending to the duodenum in the anterior wall (Figure 3). The peritoneal cavity contained numerous undigested food particles, along with approximately 4 liters of foul-smelling gastric contents. There were no other associated intra-abdominal injuries.

After copious peritoneal lavage, we primarily closed both gastric perforations in two layers: an inner layer using 2-0 Vicryl and an outer layer with 2-0 silk. This was followed by omentopexy. The drain was inserted and the abdomen closed. Due to low blood pressure and low oxygen saturation postoperatively, the patient was sent to the Intensive Care Unit (ICU) where he was managed with fluid resuscitation, restriction of oral intake, broad-spectrum antibiotics and adequate pain management without any ionotropic support. Within twenty-four hours post-operatively the patient was found to be hemodynamically stable. However, on the 3rd postoperative day, we noticed yellowish greenish materials leaking through the drain and the laparotomy wound. The patient was resuscitated and prepared for re-laparotomy. Findings at surgery included gross peritoneal contamination with yellowish greenish fluid mixed with undigested food particles, small part of the left lobe of the liver and the whole gall bladder were necrotic and there was a missed full thickness posterior gastric perforation measuring 3 cm × 2cm. The previously repaired perforations were found intact. The repair of posterior gastric perforation was difficult as the gastric wall was so friable and therefore partial gastrectomy with gastrojejunostomy and Roux-en-Y reconstruction, cholecystectomy and the hepatic necrotectomy were performed. A thorough peritoneal lavage was done. Abdominal drain was kept in peritoneal cavity and the abdomen closed in layers. The patient was taken to ICU for close monitoring and resuscitation. He was managed with intravenous fluids, restriction of oral intake, broad-spectrum antibiotics, adequate pain management and total parenteral nutrition (TPN). However, on the 5th postoperative day, the patient developed wound dehiscence and leakage of fecal

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matter through the wound. He was then managed aggressively with fluid resuscitation, broad-spectrum antibiotics and he was given TPN. On the 7th postoperative day, despite best efforts done, the patient passed away.

III. DISCUSSION

Since it was first described in 1922 [6], only a few cases of gastric perforations secondary to a blunt abdominal trauma have been reported in literature, and this is mainly because it is a very rare disease entity, occurring with an incidence of 0.02% to 1.7% of all abdominal trauma [1]. The rarity of gastric perforation following blunt abdominal trauma is due to several factors that include the protective anatomy afforded by the thoracic cage, the relative mobility of the stomach and gastric wall thickness [1]. However, there are three mechanisms that may be attributed to gastric perforations because of blunt abdominal trauma. Key mechanisms likely include external compression spiking intra-abdominal pressure, rapid deceleration generating shear forces, and crushing of abdominal contents between the front wall and vertebral column [7]. Several factors have been described which increase the risk of stomach perforation, the most studied being a history of full stomach or recent food and a high-velocity trauma to the left side of the body [1]. Patients in these scenarios often eat a large meal beforehand, as a full, distended stomach becomes less flexible and more vulnerable to rupture from blunt trauma [3,7]. Our patient presented with severe abdominal pain after sustaining blunt abdominal trauma caused by assault by a group of people. According to her statement, he had just finished eating when the crash occurred; hence, her stomach was distended, which is one of the risk factors for stomach injury following blunt abdominal trauma [7].

Blunt abdominal trauma-induced gastric perforations can occur at any gastric location. The anterior wall is most frequent (40%), followed by the greater curvature (23%), lesser curvature (15%), and posterior wall (15%) [4]. In our patient anterior wall, lesser curvature and posterior wall were the most common sites noted. The posterior wall was initially missed in the first laparotomy due to severe adhesion.

Concomitant visceral injuries are frequent in blunt abdominal trauma with gastric perforation; isolated gastric perforation occurs infrequently. Splenic injury is the most common associated injury, followed by thoracic injury [1,2]. In this case, no other intra-abdominal organs were involved, likely attributable to the fully distended stomach absorbing the bulk of the compressive forces.

Gastric perforation following blunt abdominal trauma requires prompt diagnosis [8]. However, the preoperative diagnosis may be difficult as many physical signs for gastric perforation are non-specific. High index of suspicion is required when dealing with patients with gastric perforation following blunt abdominal trauma and may need additional imaging to support the clinical diagnosis [5]. The presence of gas under the right hemi-diaphragm on plain abdominal erect X-ray is diagnostic of perforation in only 16-66% of the cases [1]. As of our case, plain abdominal x-ray in erect view showed gas under the right hemi-diaphragm which indicates gastro-intestinal perforation. Abdominal ultrasonography proves valuable in hemodynamically unstable patients for detecting intra-abdominal free fluid, which strongly indicates hemoperitoneum and warrants immediate laparotomy [9]. This was the case in our study, and it was an indication that the patient needed an urgent laparotomy.

In the hemodynamically stable patient, the diagnostic imaging of choice is a CT scan of the abdomen which can lead to early diagnosis of gastric perforation, and is accurate in detecting associated bowel, vascular, or solid organ injury prior to surgery [10]. Abdominal CT scan was deferred due to the patient's instability, with ongoing resuscitation efforts.

The initial management of delayed traumatic gastric perforation follows the principles of care of critically ill surgical patients. Once patient is well resuscitated, it should be followed by operative management [1, 11]. Operative management of gastric perforation includes rapid and direct access to the entire peritoneal cavity through an extended midline incision. The entire stomach should be examined carefully as perforations are most likely to be missed at some parts of the stomach such as the gastro-esophageal junction, the greater curvature at the omental attachments, the lesser curvature at the gastro hepatic ligament, and the posterior wall of stomach [11]. The type of repair depends on the size of perforation and site of perforation. Primary two-layer inverting repair with omental patching (omentoplasty) and intraoperative air leak testing continue to be the standard treatment for gastric perforation. Some authors recommend adequate debridement of the margins of the laceration and postoperative gastric decompression. Adequate peritoneal lavage, debridement and repair with a 2-layer closure followed by peritoneal drainage is the treatment of choice for blunt gastric perforation [3, 11]. Our patients had undergone primary two-layer repair of gastric perforation followed by omentoplasty. However, in this patient, the perforation on the posterior wall of stomach was missed during the initial surgery due to gross contamination. This necessitated re-laparotomy due to leakage of yellowish greenish material mixed with undigested food particles through the drain and through the laparotomy wound.

Gastric perforation following blunt abdominal trauma carries the highest risk of morbidity and mortality among all hollow visceral injuries [3]. Studies have shown that the time to surgical intervention corelates with increased morbidity and mortality of the patient [1, 3, 8]. Most complications encountered following gastric perforation are septic in nature because of the massive intra-peritoneal contamination that ensues after rupture of a distended stomach and usually account for the late mortality [8, 9]. It is to be noted that the fed patient with distended stomach has a neutral gastric pH that predisposes to a greater bacterial load with more infective complications [12]. The most common complications are intra-abdominal abscess, gastric fistula formation, and wound infection [3, 5]. The overall mortality rate associated with gastric perforation is reported to range from 0-66% [8, 9]. The high morbidity and mortality associated with this injury are related to the delay in diagnosis, presence of associated

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injuries and development of complications [1,2]. Having a high index of suspicion, making a near diagnosis, performing adequate debridement and repair, and aggressively treating any complications are key to survival in patients that have sustained these injuries and associated complications [5].

IV. CONCLUSION

We present a case of blunt abdominal trauma-induced gastric perforation, where mortality resulted from delayed diagnosis and surgery, compounded by septic complications from intraperitoneal contamination. Prognostic factors include injury severity, presentation timing, a distended stomach, and concomitant injuries. Optimal outcomes hinge on a high index of suspicion, prompt diagnosis, thorough debridement and repair, and aggressive management of complications in blunt abdominal trauma-induced gastric perforation. Investigating for hollow organ injuries, ruling in or out their perforations, using simple X-ray imaging and abdominal USS after a blunt abdominal trauma is critically important, particularly in primary healthcare settings.

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- *Authors' Contribution*

RTM prepared and wrote the manuscript; IEM revised the manuscript with some additional comments. BPM, IOR and MYM provided care to the patient and guidance during writing and revision of the manuscript. All of the authors agreed with the final draft of this manuscript.

- *Ethical Considerations*

The permission to publish this case study was obtained from University of Dodoma in March 2025.

- *Consent*

Informed consent for use of patient's personal data was sought from the relative.

- *Funding*

This case study received no funding during its development.

- *Conflict of Interest*

None declared by the authors.

ABBREVIATIONS

- CT – Computed Tomography
- DRE – Digital Rectal Examination
- GP – Gastric perforation
- ICU – Intensive Care Unit
- TPN – Total Parenteral Nutrition

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FIGURES

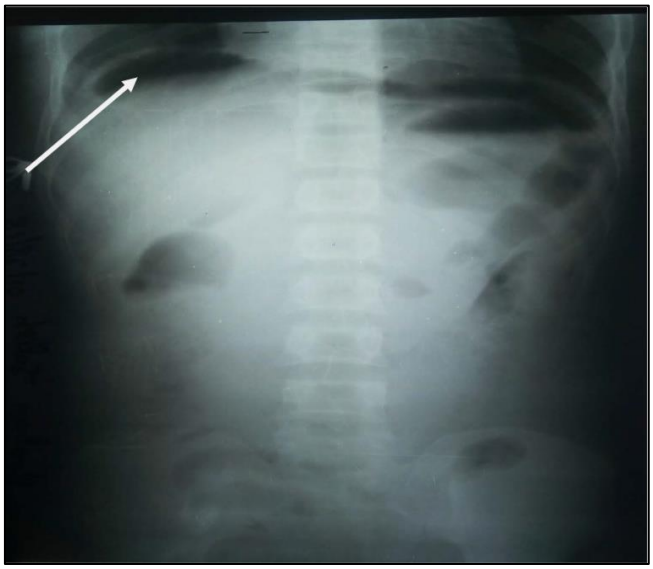

Fig 1 Plain Erect Abdominal X-Ray Showing Collection of Air Under the Right Diaphragm (Arrow)

Fig 2 Intra-Abdominal Finding Showing Gastric Perforation in the Lesser Curvature of the Stomach

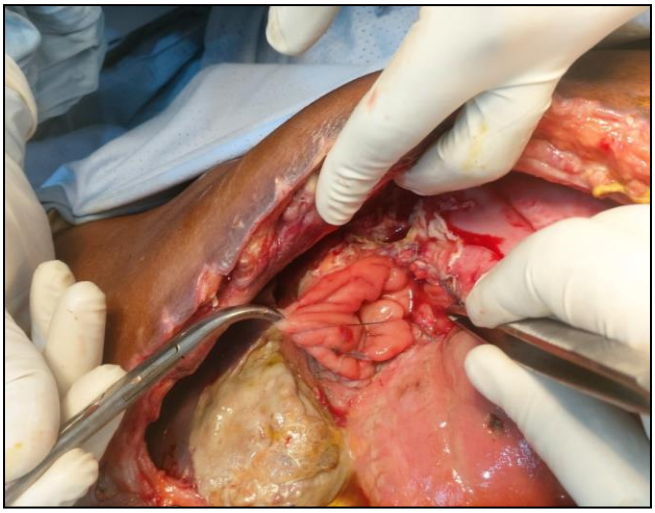

Fig 3 Intra-Abdominal Finding Showing Gastric Perforation in the Anterior Wall of the Stomach