Isolated double gastric rupture caused by blunt abdominal trauma in an eighteen months old child: A case report

Roupakias S, Tsikopoulos G, Stefanidis C, Skounis K, Ziotis I
Pediatric Surgery Departement, Hippokration General Hospital of Thessaloniki, Greece

Abstract
We report a case of an isolated double gastric rupture, resulted from blunt abdominal trauma, that we successfully repaired by primary closure. A 18-month-old girl injured in a motorvehicle accident was admitted to our hospital where the plain X-ray and the CT findings revealed the presence of free abdominal air. An immediate performed exploratory laparotomy disclosed two full-thickness ruptures of the stomach (on the greater curvature and the posterior wall). The ruptures were closed primarily by a two-layer closure. Twenty-four hours post-operatively the patient developed delayed shock as a result of chemical peritonitis. On the 8th postoperative day the girl developed septic shock and gastrointestinal bleeding. She underwent a gastroscopy which revealed stress-ulcer, and was treated conservatively in the children intensive care unit of our hospital. She was discharged home on 20th postoperative day. At 3-month follow up, she was doing well with normal growth and eating a regular regimen about her age. Gastric rupture following blunt abdominal trauma is rare, with a reported incidence of 0.02—1.7%. The morbidity and mortality are directly related to the number of associated injuries, the delay in diagnosis and the development of intraabdominal sepsis. In this paper we emphasise the need for early diagnosis and the aggressive surgical treatment as a key to decreasing the mortality and morbidity from this relatively rare injury, especially in this age group of children. Hippokratia 2008; 12 (1): 50-52

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Corresponding author: Tsikopoulos G, 8 Propyleon str, 57010, Thessaloniki, Greece, tel: 2310674461, e-mail: tsikop@yahoo.gr

Trauma is the leading cause of mortality and morbidity in children from ages 1-14 years and results in more deaths and disability than all other childhood diseases combined. Abdominal trauma accounts for 8-10% of all trauma admissions to pediatric hospitals and more than 80% of traumatic abdominal injuries in children result from blunt mechanisms. Penetrating injuries in children are less common and result in 8-12% of the abdominal trauma admissions in most trauma centers. Blunt trauma to the abdomen commonly occurs due to motor vehicle accidents. Other causes are fall from height, seat-belt injuries, and even vigorous resuscitation. Blunt abdominal trauma occurs more commonly in childhood. Following the head and extremities, the abdomen is the third most commonly injured anatomic region in children. The abdominal contents are very susceptible to injuries in children because the abdominal wall is thin, the diaphragm is more horizontal and the ribs are very elastic. Gastrointestinal tract injuries in children may occur by either blunt or penetrating mechanism. The incidence of hollow viscous injuries following blunt abdominal trauma varies from 4 to 15% and especially is present in 3% of pediatric abdominal injuries. Blunt gastric injuries are even rarer occurring in only 0.02—1.7% patients with blunt abdominal trauma. Although some authors find that the incidence is higher in childhood, other reported series failed to demonstrate such a correlation with age. Blunt gastric injuries are uncommon in isolation, being associated with other intra- and extra-abdominal injuries as a rule. Knowing the infrequency of this sort of injury and especially of double rupture, we present our experience of treating an eighteen month old child, who had an isolated double gastric rupture after blunt abdominal trauma in a car accident, without any other intra- or extra-abdominal injury. No similar case for a so young child has been reported in the accessible to us literature.

An 18-month-old girl was referred to our emergency department about half an hour after a vehicle accident, as a rear seat car passenger, conscious and without any other evident of trauma. On physical examination she was haemodynamically stable with blood pressure at 110/60 mmHg and pulse rate 128/min. Her Glasgow coma scale was 13, and her respiratory rate was 28/min with SpO2 95%. Palpation and auscultation of the abdomen was grossly normal. No visible seat belt sign and no other external injury were present. A nasogastric tube was inserted and blood-stained gastric contents were aspirated. An immediate abdominal plain X-ray film followed by a CT revealed free intra-abdominal air (Figure 1) and ascitic fluid in the peritoneal cavity.

Emergency laparotomy revealed extensive peritoneal contamination with recently ingested food and two tears of the stomach (Figure 2a). The first gastric rupture, about 6 cm in length, was located on the middle of the greater curvature (Figure 2b). The damage was detected after the opening of the greater omental sac, which was full of in-
gested food. The second gastric rupture, 2 cm in length, was located on the posterior wall of the upper third of the stomach, parallel to and near the lesser curvature. This minor rupture was found on opening the lesser sac. After copious irrigation, both perforations of the stomach were sutured in two layers. Drain was imposed in the Douglas space.

Twenty-four hours post-operatively the patient developed delayed shock as a result of the chemical peritonitis, which was treated by crystalloid solutions and corticosteroid administration. The 8th postoperative day the girl developed septic shock and gastorrhagia. She underwent a gastroscopy which revealed stress-ulcer, and was treated conservatively in the children intensive care unit of our hospital. She was discharged on 20th postoperative day. At 3-month follow up, she was doing well with normal growth and eating a regular regimen about her age.

Discussion

In blunt trauma there are three different mechanisms that causing distinct patterns of injury to gastrointestinal organs. First is a crush injury that occurs when an organ is compressed violently against the spine. Burst injury occurs when rapid compressive forces are applied to a filled and distended hollow viscous, without direct mechanical compression. And finally shear injury caused by rapid acceleration-deceleration of an organ at one point of fixation. In young children, the intestine is not fully attached within the peritoneal cavity, potentially making it more vulnerable to injury due to sudden deceleration and/or abdominal compression. Blunt injuries to the stomach are relatively infrequent and occur when a compressive force causes a burst injury in a patient with a full stomach. The stomach has very strong walls and these are not torn by blunt trauma unless it is very severe or the stomach is full, or both. Other protected factors are the anatomical position of the stomach and his high degree of mobility.

Blunt gastric rupture can occur in any portion of the stomach and usually occurs as a single lesion, which is commonly debrided and repaired by primary closure. The anterior gastric wall is the most common site of rupture, followed by the greater curvature, the lesser curvature and the posterior wall. A full stomach usually ruptures at the greater curvature with a blowout or stellate configuration. However, the greater curvature is the site most often affected in the paediatric age group. Apart from these injuries, total rupture of the gastro-oesophageal junction, complete circular avulsion of the stomach from the duodenum, and rupture of both gastric walls have been reported due to blunt abdominal trauma and were associated with a solid organ injury. In the literature only one case of isolated gastric rupture of both walls reported in a 13 years old boy and an isolated double rupture of the posterior wall in a 14 years old.

Figure 1. The abdominal CT findings revealed free intra-abdominal air.

Figure 2. (A) Two full-thickness ruptures in the stomach (on the greater curvature and the posterior wall), (B) The first gastric rupture, about 6 cm in length, was located on the middle of the greater curvature.
Gastric rupture is well known for its association with injuries of adjacent organs: liver, pancreas and spleen\textsuperscript{17}. Associated solid-organ injury, lung injury and pneumothorax have been reported in 83\%\textsuperscript{18} to 93\%\textsuperscript{17} of cases. Gastric rupture is often associated with injury to the extremities\textsuperscript{17}. In our case there was no other organ injury.

When rupture occurs with a full stomach, massive peritoneal contamination results\textsuperscript{16}. The majority of patients either present in shock or develop hypotension shortly after arrival\textsuperscript{16}, as a result of blood loss from associated injuries\textsuperscript{16}. Although the blood loss from the rupture itself is generally insufficient to induce shock, patients may become hemodynamically unstable as a result of the chemical peritonitis induced by the spillage of gastric acid\textsuperscript{16,20}. Sings and symptoms of an acute abdomen are almost invariably present\textsuperscript{16}.

Gastric perforation following blunt abdominal trauma requires prompt diagnosis\textsuperscript{21}. Free intraperitoneal air on plain abdomen and chest x-ray films is seen only 16-66\% of the cases\textsuperscript{19,20}. CT may be also helpful in establishing an early diagnosis thereby decreasing the period of peritoneal contamination, sepsis and shock\textsuperscript{20} and is more useful for visualization of intra-abdominal free air\textsuperscript{16}. It can also reveal associated solid-organ injuries. The CT findings which are suggestive of gastric rupture are free subdiaphragmatic air, visualization of an “outlined” falci form ligament, intraperitoneal nasogastric tube location, and intraperitoneal fluid-fluid layer\textsuperscript{21}.

Repair of the stomach with two-layer sutting is the treatment of choice for blunt injury-associated gastric rupture\textsuperscript{22}. The air test is useful for assessing of the integrity of the repair and searching for any untreated perforation\textsuperscript{11}. Thorough and adequate peritoneal lavage and drainage are also necessary\textsuperscript{11}.

Gastrointestinal injury from blunt abdominal trauma in children carries a high mortality, usually from associated intraabdominal or extrabdominal injuries\textsuperscript{24}. The mortality has been reported to range from 0-66\%\textsuperscript{19}. It is mostly related to associated injuries, septica complications and, less frequently, to fatal shock\textsuperscript{7}. The majority of complications related to gastric rupture is septic in nature\textsuperscript{18}, and relate directly to massive intraperitoneal contamination\textsuperscript{16}. The most common complication is intraabdominal abscess formation but gastric fistulae may also occur\textsuperscript{11}. In our case our patient developed postoperatively septic shock with an incident of stress-ulcer gastrorrhagia.

In conclusion, we encountered a case of an 18-month old child with an isolated double gastric rupture resulting from blunt abdominal trauma in a car accident and successfully managed surgically by primary closure. Although gastric rupture usually occurs as a single lesion in the stomach, surgeons should be aware of the possibility of multiple ruptures. Preoperative CT study was effective for a prompt diagnosis and treatment. Copious intraperitoneal irrigation and drainage are essential for the patient’s survival.

References

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