

CASE REPORT

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Laceration of the Stomach by Blunt Trauma in a Child: A Case of Child Abuse

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ABSTRACT: A case of perforation of the stomach following blunt abdominal trauma is described in a two-year-old boy. The abdominal trauma was the result of a blow to the abdomen by the stepfather. The child had ingested a large meal in the hour preceding the injury. The child died from peritonitis and shock 12 h following the injury. The literature on gastric perforation by blunt trauma is reviewed. Injuries to the stomach from nonpenetrating trauma are quite rare and are most often related to vehicular accidents. Gastric injury in a child presenting with a history of a minor home or play injury should arouse suspicion of more significant and perhaps intentional trauma.

KEYWORDS: pathology and biology, child abuse, injuries, laceration of the stomach

Blunt trauma to the abdomen is common in children. The most frequent significant abdominal injuries from nonpenetrating trauma in children are to the solid organs: the spleen, liver, and kidney in that order [1,2]. Only 11 to 18% of blunt trauma injuries affect the hollow viscera of the gastrointestinal tract [3,4]. Of abdominal injuries resulting from blunt trauma, gastric lesions are quite rare and account for only 0.9 to 1.7% of injuries at all ages [5].

This paper describes a laceration of the stomach in a child resulting from an intentional blow to the abdomen.

Case Report

A two-year-old boy was found dead in bed at 10:45 p.m. According to the stepfather, the child went to bed at 7:00 p.m., without complaint. At noon, the mother had fed the child chop suey and then left for work, leaving the deceased and his three-year-old brother in the care of the stepfather. During the afternoon, the stepfather gave both boys a bath. The deceased had a bowel movement in the tub and the boys were removed from the soiled water.

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To discipline the child, the stepfather said he placed the child across his knees and spanked him on the buttocks with his hand. Over the next few hours, the child complained of some mild abdominal discomfort and was given aspirin. The stepfather stated that at no time did the child appear severely ill.

When the paramedics arrived at the home, in addition to attending the deceased, the three-year-old brother was found to have hot water burns over the left side of the forehead and left wrist. The stepfather explained that these burns resulted from very hot water in the kitchen sink where he had shampooed the child's head.

Autopsy

At autopsy, the child was a well developed two-year-old male wearing a disposable diaper. Several blue contusions were present on the chin, forehead, neck, and left thumb. The abdomen was very markedly distended. Total body X-rays revealed free intraperitoneal air. The peritoneal cavity contained 400 mL of dark brown fluid mixed with undigested chunks of meat, bell pepper, and bean sprouts. There was a transmural laceration of the stomach running horizontally 6 cm along the greater curvature from the fundus into the body. On the lesser curvature was a 3-cm serosal contusion containing a transmural laceration 1.5 cm long (Fig. 1). On opening the stomach, there were 13 mucosal lacerations running parallel to the large transmural laceration along the greater curvature. The longest of these measured 3.5 cm (Fig. 2). A fibrinopurulent exudate was present over the surface of the liver, bowel, and diaphragm.

Microscopically, the stomach showed no evidence of preexisting disease. The lacerations contained hemorrhage in the gastric wall and an early neutrophilic infiltration (Fig. 3). There was early acute peritonitis over the liver and bowel.

The cause of death was attributed to intraperitoneal sepsis and shock resulting from the gastric lacerations. The mechanism of the injury was attributed to blunt trauma to the upper abdomen soon after ingestion of the noon meal. The transmural lacerations and contusion of the serosa indicated that considerable force had been applied to the abdomen. The manner of death was classified as homicide.

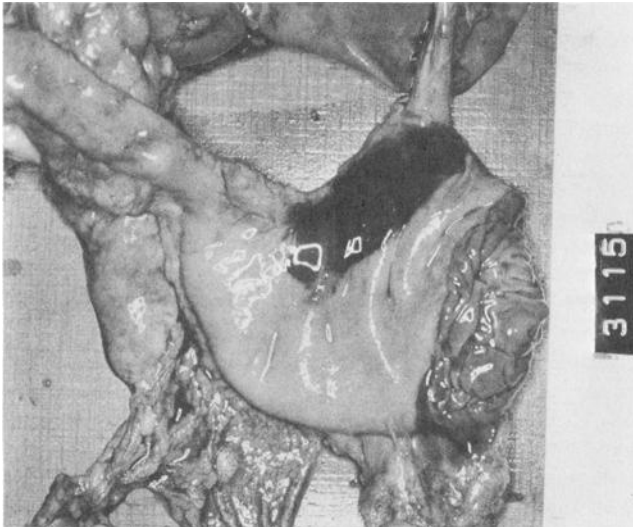


FIG. 1—Stomach demonstrating the large transmural laceration along the greater curvature. The lesser curvature contains contusion and a second area of laceration.

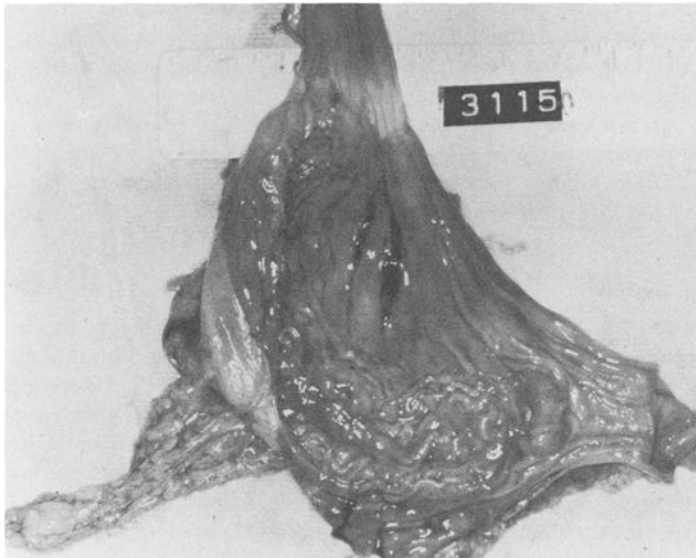


FIG. 2.—Stomach opened along greater curvature to demonstrate several of the 13 mucosal lacerations.

The stepfather, on confrontation with the autopsy findings, admitted to forcefully striking the child in the abdomen with his upraised knee as he swung the child downward upon his lap.

Discussion

The first case of traumatic transection of the stomach was reported by Piancastelli in 1922 [6]. Since then about 70 cases of traumatic gastric laceration have been described in the English literature. When Yajko reviewed the English literature from 1930 to 1975, he found 35 cases of gastric laceration of which 32% were under the age of 16 years [5]. Since 1975, the majority of patients reported with traumatic gastric laceration, 78%, have been in the pediatric age group [4]. Males outnumber females for this injury by two to four times [5].

The increasing incidence of gastric injuries reported in the recent literature appears to be related to the increasing incidence of vehicular accidents. Motor vehicle accidents account for by far the great majority of gastric injuries [7,8]. These injuries may be sustained by either occupants of or pedestrians struck by a vehicle. Bicycles account for a large number of injuries when the rider sustains a blow to the abdomen by striking a fixed impediment. The same mechanism is seen in the motorcyclist who collides with a fixed protruding object [6,9]. Falls account for the next largest number of gastric injuries and these falls are often from a moving vehicle. A few cases of gastric laceration have been reported secondary to vigorous cardiopulmonary resuscitation. These injuries have been found in patients dying from causes unrelated to the gastric injury which was assumed to be the result of ventilatory dilatation of the stomach with air [10].

Apparently only a small number of cases of gastric injury result from physical abuse. In 1977, Siemens and Fulton [10] described a two-year-old girl who was beaten by her mother. On admission 24 h later she was hypotensive, had a rigid distended abdomen, and free intraperitoneal air on X-ray. At surgery, the abdomen contained a large amount of purulent fluid and undigested food. There was a 2-cm laceration of the anterior wall of the stomach which was sutured. The child recovered after re-exploration for subphrenic and pelvic abscesses [10].

By personal communication,³ Dr. Thomas Gilchrist described a 20-month-old male

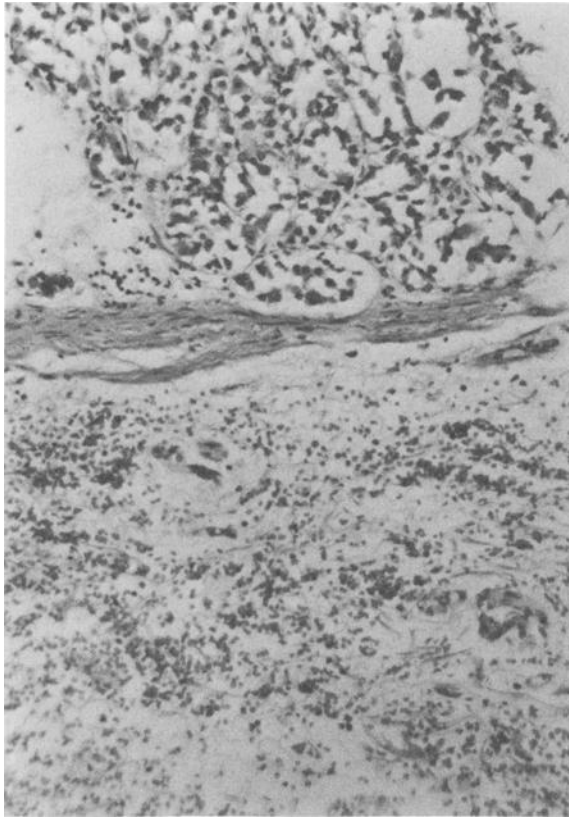


FIG. 3—Photomicrograph of stomach in which hemorrhage and a neutrophilic response are seen at the margin of the transmural laceration. Hematoxylin and eosin $\times 100$ before present reduced size.

struck twice in the abdomen by his stepfather. The child was admitted to the hospital $3\frac{1}{2}$ h later, underwent surgery, and died during the operation. At autopsy, there was a laceration at the junction of the pylorus and duodenum as well as transection of the head of the pancreas and laceration of the mesentery.

Dr. Halbert Fillinger described by personal communication⁴ a six-month-old male who sustained a blow to the abdomen by an adult. This child presented with vomiting and shock, underwent surgery, and died 27 h following the injury. The stomach contained a laceration of the posterior wall.

Several cases of gastric perforation have been reported as spontaneous rupture of the stomach. These cases are almost exclusively confined to infants during the first two weeks of life and are related to congenital defects of the stomach, gavage, peptic ulcer, septicemia, hypoxia, oxygen therapy, and birth trauma [11]. These cases do not occur de novo and are erroneously labeled as spontaneous. There is a report of the 25-year-old woman who sustained a small anterior wall tear of the stomach after a mild exercise session of ten push-ups [8]. Such a case might be considered spontaneous in view of the mild exertion involved in producing the injury.

³T. F. Gilchrist, personal communication, State of Alabama, Department of Forensic Sciences, Montgomery, AL, 1982.

⁴H. Fillinger, personal communication, Office of the Medical Examiner, Philadelphia, PA, 1982.

Blunt abdominal trauma to a hollow organ is most likely to occur at a relatively fixed point. The most frequent site of injury to a hollow organ is in the vicinity of the duodenojejunal flexure near the ligament of Treitz [2,3]. Factors that may account for the rarity of gastric injuries among the hollow organs probably include its high degree of mobility, relatively protected location, thick wall, and usual state of emptiness [5].

The mechanism postulated to account for blunt trauma injuries of the stomach suggests compression of the stomach between the abdominal wall and the vertebral column by a blow causing a sharp rapid increase in pressure over a limited area. Such a force is frequently of a deceleration type as occurs in a vehicular accident or a fall [12]. A full stomach intensifies this type of pressure effect and is particularly susceptible to blunt trauma [10,13]. The mechanism in the full stomach is analogous to an inflated balloon in which compression causes expansion until the wall tears. Experimentally in animals, gastric laceration by compressive force has been found to occur first in the seromuscular coat followed by tears in the mucosa and submucosa [5]. In our case, multiple tears were present in the mucosa in addition to the transmural lacerations, perhaps indicative that rupture may begin in the mucosa. Tan reported a 17-year-old boy who was kicked in the abdomen while playing football and sustained two linear mucosal lacerations of the stomach [14].

Certain anatomical features of the abdomen of the young child that differ from those of the adult may account for the preponderance of abdominal injuries in children reported in the recent literature. The prominent abdomen with its widely flared costal margins of the child offers less protection than the lower rib cage of the adult. The abdominal musculature of the child is poorly developed and provides little protection from a blow. Finally, the child has a more narrow anterior-posterior dimension than the adult [1].

Lacerations of the stomach from blunt trauma may occur in any part of the stomach but are most common on the anterior wall and greater curvature followed in frequency by the lesser curvature [5,9]. Blunt trauma can result in a variety of pathological lesions of the stomach. The least severe degree of injury is edema and hemorrhage of the mucosal surface without disruption of the continuity of the wall. Occasionally blunt trauma will produce occlusion of the epiploic vessels leading to ischemia of the gastric wall and delayed rupture [13]. The most common injury is a transmural laceration along a longitudinal or vertical axis. With injuries of great force, there may be complete transection of the entire circumference [12].

Gastric injuries from blunt trauma are often associated with other intraabdominal injuries. Splenic injury is the most commonly associated injury as might be anticipated from its location adjacent to the stomach. In both children and adults, pancreatic injury is frequently associated with gastric injury, and in children bowel and liver injuries are frequent [4]. Of injuries outside the abdomen, orthopedic trauma commonly accompanies gastric injury. Head injury is the most common cause of death in patients with gastric injuries who die of an associated injury [10,12]. The distribution of injuries associated with gastric injury are those injuries anticipated from the type of trauma that most frequently account for gastric trauma, vehicular accidents, and falls.

The mortality of gastric lacerations is presently about 11% but earlier reports were much higher in the range of 40 to 66% [4,9]. Both morbidity and mortality are considerably affected by the frequency of associated serious injuries. The isolated gastric laceration is a serious threat to life because of the peritoneal soiling. Even with early surgical intervention, there is risk of persistent infection requiring subsequent surgery. Delay in diagnosis and surgery increases both morbidity and mortality.

Conclusion

The present case illustrates an injury sustained by a child from an intentional blow to the abdomen. While gastric laceration is a rare injury, it is one that results only from significant

force to the abdomen. Most gastric trauma results from vehicular accidents or falls and is often accompanied by associated injuries, especially fractures and head injury. A child presenting with gastric injury with vague historical documentation or with a history of a minor home accident should arouse suspicion of more significant and perhaps intentional trauma. It is unlikely that the type of blow necessary to produce a gastric laceration could occur without the parent being aware of the incident or of the seriousness of the condition of the child following the trauma.

Acknowledgments

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