

Small bowel perforation: an unusual presentation for child abuse

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Hollow viscus perforation due to inflicted blunt abdominal injury is uncommon. Diagnosis is frequently delayed because of inaccurate or absent history, nonspecific or delayed physical findings or both, and laboratory tests with low sensitivity. Computed tomographic scanning of the abdomen is the best diagnostic test available. A high index of suspicion is essential to diagnose visceral perforation early, as significant morbidity and mortality results from diagnostic delay.

(Key words: bowel perforation, abdominal trauma, child abuse, computed tomography)

Abdominal visceral perforation has been reported in 1% to 8% of children hospitalized for blunt abdominal trauma.¹⁻³ Major abdominal trauma is responsible for most of these cases. The authors report a case of duodenal perforation attributable to child abuse and review the mechanisms of injury, diagnostic evaluation, and treatment of abdominal visceral rupture.

Report of case

A 12-month-old girl presented to the emergency department with multiple emeses of 8 hours' duration and a decrease in activity for 1 hour before presentation. No history of fever, diarrhea, previous surgery, or trauma was identified. The child was alert and had a rectal temperature of 102°F, heart rate of 120 beats/min, and blood pressure of 120/57 mm Hg. Pertinent physical examination findings included dry mucous membranes,

sunken eyes, hypoactive bowel sounds, and a fullness in the epigastric region. A 2 cm × 2 cm yellow to light brown ecchymosis was seen to the right of the umbilicus. Several 1 cm × 1 cm reddish brown ecchymoses on the right lower abdomen and a single 1 cm × 2 cm area of similar discoloration near the spinous process of L1 were identified. On the bases of the bruising and the fullness in the epigastric region, an abdominal injury was suspected.

A nasogastric tube was placed, and aspiration of gastric contents was negative for blood. A normal saline solution fluid bolus (20 mL/kg) was administered intravenously. An obstructive series was obtained and revealed no free air. Laboratory tests were pending on admission. The patient was admitted with a provisional diagnosis of possible occult abdominal trauma and mild dehydration. Abnormal laboratory results included the following: blood urea nitrogen, 21; amylase, 208; serum glutamic-oxaloacetic transaminase, 513; serum glutamic-pyruvic transaminase, 933; and peripheral white blood cell count of 17.5 with segmented neutrophils 57 and band forms 22. Results of urinalysis were normal, and hematocrit and electrolyte values were normal.

The patient was monitored with seri-

al abdominal examinations and during the next 6 hours had progressive abdominal tenderness, right upper quadrant guarding, and generalized rebound tenderness. A computed tomographic (CT) scan of the abdomen with oral meglumine diatrizoate (Gastrografin) contrast revealed a duodenal hematoma with perforation. During laparotomy, a complete transection of the duodenum was repaired with an end-to-end anastomosis. The child was treated with supportive care and parenteral antibiotics. She recovered completely and was discharged 5 days later. On further questioning, the infant's mother's boyfriend admitted striking the child once in the abdomen when the child would not stop crying 2 days before admission.

Discussion

Hollow viscus perforation occurs in up to 8% of children hospitalized for blunt abdominal trauma.¹⁻³ Bowel perforation may result from shearing forces produced by sudden deceleration tearing the bowel at the antimesenteric border close to its point of attachment to the posterior abdominal wall.^{3,4} This may occur with lap belt injuries in children involved in motor vehicle accidents or in falls from a height.³ Perforation may also be caused by sudden bursting of the bowel when fluid-filled loops are subjected to sudden increases in intraluminal pressure from an extrinsic blow or compression of a loop against the vertebral column.^{1-3,5} This injury may result from a kick or a punch.

Most hollow viscus injuries are associated with a major traumatic event. In the absence of confirmed abdominal trauma, the possibility of child abuse must be considered with the detection of a perforated viscus. Visceral injury is noted in 8% of children sustaining accidental blunt abdominal trauma vs 65% of abused children with blunt abdominal trauma.⁶ Overall, 65% of bowel perforations occur within 100 cm from the ligament of Treitz⁷; however, the exact location of visceral perforation differs with the mechanism of injury. The duodenum, jejunum, and duodenojejunal junction are the most common sites of perforation when associated with abuse, while accidentally

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injured patients tend to have more diverse injuries, including gastric and jejunoileal perforations, mesenteric avulsions, and solid organ injuries.^{3,6}

The mean age of children with abdominal injuries caused by abuse is 2 years^{2,5,6} in contrast to the mean age of 5.5 years in children with accidental or motor vehicle-related abdominal injuries.² Most visceral injuries due to child abuse occur in boys.^{2,3,5,7}

Diagnosis of hollow viscus injury is often difficult. History is helpful in that mechanism of injury should alert the physician to search for evidence of visceral perforation. However, in child abuse, often the history is inaccurate and the presentation may be delayed. Initial dramatic physical findings of hemorrhage and peritonitis may not be present, and more common nonspecific findings of abdominal pain, tenderness, and hypoactive bowels may be noted.^{1,3,7} Frequent abdominal examinations should be performed, and careful observation should continue for at least 48 to 72 hours to aid in the detection of visceral rupture due to blunt abdominal trauma.²

Results of initial laboratory analysis of electrolytes, amylase, hematocrit, and leukocyte count may be normal and, therefore, may not be helpful in early detection of intestinal rupture in children.^{1,2} Peritoneal irritation with progressive leukocytosis and fever may develop over 1 to 2 days, necessitating continued analysis.

Radiographic imaging has limited value in the diagnosis of visceral injuries. Plain radiographs of the abdomen that are positive for intraperitoneal fluid, extraluminal air, ileus, and scoliosis are noted initially in less than 40% of abdominal trauma patients.^{1,2,8} Magnetic resonance imaging is not commonly used in the evaluation of these injuries.

However, CT scans of the abdomen have been useful in detecting both solid viscus and hollow viscera injuries. Computed tomography can identify the presence, type, and magnitude of injury, visualize all intra-abdominal and retroperitoneal organs and structures, and help predict the need for operative repair.⁸ Use of contrast material is controversial; however, several studies have found it useful

in identifying extravasation of enteric contents, bowel wall thickening, free peritoneal fluid, free air, and hematomas from nonopacified bowel loops.^{8,9} Use of contrast material for stomach and bowel opacification during CT has been found to be safe in the assessment of abdominal trauma.⁹ A CT scan is indicated if the patient has any three of the following clinical criteria: abdominal distention, absent bowel sounds, blood in the nasogastric tube, abdominal abrasions or contusions, gross hematuria, lap belt injury, assault/abuse as mechanism of injury, abdominal tenderness, or a trauma score less than 12.¹ Computed tomography may not detect all intestinal perforations when performed during the initial evaluation for suspected injury and should be repeated in 48 to 72 hours, if clinically indicated.¹

Definitive management of visceral perforations is surgery. Peritonitis, hypotension unresponsive to fluid replacement, and CT evidence of perforation indicate the need for surgical intervention.

Morbidity and mortality following small bowel trauma in children are affected by the injury itself, the rapidity with which it is diagnosed and treated, and the number and severity of associated injuries. The mortality rate of visceral perforation due to accidental causes (for example, motor vehicle accidents) is 16% to 20%⁴ vs 30% to 50% when perforation is caused by child abuse.^{4,5} Early diagnosis is the most significant factor in limiting mortality. Children with significant delays in presentation (due to child abuse) often present in shock or have complications characterized by peritonitis, hemorrhage, and death.^{2,5-7}

With physical abuse of children in the United States now occurring in epidemic proportions, it is imperative that victims be recognized and evaluated for potential abdominal injury. A detailed history, meticulous examination (including rectal examination), and awareness of the social situation will help to detect hollow viscus injury. Serial abdominal examinations in an alert patient, along with serial laboratory and radiographic evaluations including abdominal CT scanning, are the most reliable means to iden-

tify intestinal injury in children. All physicians who care for acutely ill or injured children must consider nonaccidental trauma in children who present with vomiting and abdominal pain.

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