Duodenal perforation: a diagnostic pitfall in non-accidental injury

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Duodenal perforation is a rare, life threatening injury associated with non-accidental blunt abdominal trauma. Diagnostic delay is common, as the true history is concealed and signs may be minimal. Double contrast computed tomography is the most sensitive investigation to confirm clinical suspicion. We report three cases, all with other features typical of non-accidental injury.

In the UK each year, 1 in 1000 children are severely physically abused, and at least 1 in 10 000 die from their injuries. Blunt abdominal trauma may inflict severe injury that is not immediately apparent. We report three cases of duodenal perforation following blunt non-accidental trauma to highlight the difficulties in diagnosis.

CASE 1
A 9 month old girl presented with a week’s history of diarrhoea and vomiting. She was pale and dehydrated, with facial and lumbar bruising. The parents were unable to account for her injuries, blaming an older sibling; their full extent only became apparent subsequently. An hour after arrival, she developed abdominal distension. x Ray examination revealed free intraperitoneal gas, a recent fracture of the 11th rib (without callus), and an older fracture of the 10th (with abundant callus). Cranial computed tomography (CT) scan was normal; enhanced CT of the abdomen confirmed free peritoneal gas and fluid, anterior displacement of the superior mesenteric vessels, and a posterior perfusion defect of the spleen (fig 1). Laparotomy revealed a complete rupture of the third part of the duodenum, requiring excision of necrotic tissue and end to end anastomosis. The histological features were in keeping with an injury at least 48 hours old, indicating that the perpetrator had access to the child a day or more before presentation, thus opening up the field of enquiry.

CASE 2
A 20 month old boy presented with a three day history of vomiting and abdominal pain. He was emaciated, tachycardic, and hypotensive. There was bruising over the face and trunk, and the abdomen was distended with absent bowel sounds. Chest x ray examination showed an old fracture of the left clavicle; abdominal x ray examination showed distended bowel loops. An ultrasound scan showed a small volume of free fluid and a possible subcapsular hepatic haematoma. Cranial CT was unremarkable. When questioned, the father attributed the injuries to falling out of bed onto a carpeted floor. The boy had previously been investigated for failure to thrive; the family were known to social services. He was admitted and initially improved with conservative management. However, by 48 hours, he had developed a pyrexia and abdominal guarding. Laparotomy revealed peritonitis with a 5 mm perforation of the third part of the duodenum, which was repaired. The skeletal survey showed an undisplaced spiral fracture through the left femur.

CASE 3
A 26 month old boy presented with a history of a generalised convulsion, lethargy, and vomiting. There was no history of trauma. On arrival, he appeared irritable and post-ictal, and had a swollen left knee. By the following morning, he was pyrexial with bile stained vomiting and a distended, tender, silent abdomen. Abdominal x ray examination showed patchy free gas, and ultrasound extensive loculated peritoneal fluid. Laparotomy revealed an 80% transection of the third part of the duodenum, which was repaired. Subsequent CT brain was normal, and it was determined that he had been investigated elsewhere two months previously for a metaphyseal fracture of the left femur.

DISCUSSION
Blunt abdominal trauma is the second commonest cause of death in abused children. The mobility of the small intestine is protective, but the fixed retroperitoneal course of the duodenum renders it vulnerable; the commonest visceral injury is intramural haematoma of the duodenum or proximal jejunum following direct compression against the vertebral column. Perforation or disruption may occur at the time of injury, or later secondary to tissue necrosis. The posterior position of the duodenum within the abdomen implies that...
significant force is required to disrupt it, increasing the likelihood of injury to neighbouring organs. Case 1 had additional injury to the spleen and a retroperitoneal haematoma; case 2 had a small mesenteric haematoma; none had evidence of injury to the pancreas. The forces required to cause intestinal injury are great, and a clear history of a dramatic event should be forthcoming from the carers to account for it, for example, a road traffic accident. Doubt should be cast on the validity of any story where only a minor or moderate mechanism for the injury is given.

Diagnosing duodenal perforation is notoriously difficult. In non-accidental injury the history is misleading and the true mechanism concealed, as shown by these three cases. The clinical signs of retroperitoneal injury may be limited, and overshadowed by other injuries. Clinical findings such as abdominal pain or tenderness may be subtle or delayed, and a high index of suspicion is required. When examining children with abdominal symptoms, with unusual or contradictory histories, particularly when there has been a delay seeking medical help, the possibility of non-accidental injury must be considered. Associated injuries are present in up to 65%, including cutaneous bruising, intra-ocular haemorrhages, and multiple fractures of varying ages. All three cases described here had bony injury typical of physical abuse.

Conventional investigations may add little to the evaluation. A raised amylase may indicate duodenal perforation or pancreatic damage. The serum amylase was measured in the second case and was normal. An intraperitoneal rupture of the duodenum may show the typical features of free intraperitoneal gas, but was not apparent in our second case. Retroperitoneal duodenal perforation is frequently difficult to diagnose using conventional radiology. The most sensitive method of detecting occult retroperitoneal trauma is CT scan with intravenous and oral contrast, and this should be performed whenever the diagnosis is suspected if there is no clear indication for laparotomy. CT scanning also allows other injuries to be identified. However, findings are often subtle, and the diagnosis may still be missed, requiring continued clinical review in suspicious cases.

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