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## Lesson of the week

# Delayed presentation of handlebar injuries in children

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**Initial assessment of children with abdominal trauma from bicycle handlebars may provide false reassurances**

Accidents represent the largest single cause of death in childhood. Although head injuries are the major cause of mortality and morbidity after bicycle accidents in children, abdominal injuries are not uncommon. Bicycle accidents account for 5-14% of blunt abdominal trauma in children.<sup>1-3</sup> In general, injuries to the spleen, liver, or kidneys are readily evident soon after the accident; however, injuries to the bowel and pancreas often present late and result in greater morbidity.

## Case reports

### Case 1

An 11 year old boy fell off his bicycle and sustained a handlebar injury to his upper abdomen. He attended his general practitioner on the same day because of abdominal pain and vomiting, which was treated with an antiemetic drug. For the next 18 days the boy had vomiting, anorexia, weight loss, and increased epigastric pain. He was then referred to the local surgical unit for assessment.

Examination showed that he was anxious and pale, with a tender epigastrium and a palpable mass in his upper abdomen. His white blood count was  $12.9 \times 10^9/l$  and his serum amylase concentration was 2850 U/l. A diagnosis of traumatic pancreatitis was made and the boy was transferred to the regional paediatric surgical centre.

An ultrasound scan showed a large pancreatic pseudocyst (4.9 cm in diameter) lying between the body of the pancreas and the stomach. The boy was initially treated conservatively with total parenteral nutrition. However, over the next seven days his serum amylase concentration remained high and serial ultrasound scans showed an enlarging pseudocyst. Contrast enhanced computed tomography of the abdomen

confirmed that the boy had a pancreatic pseudocyst measuring 11 cm $\times$ 8 cm $\times$ 7 cm. Endoscopic retrograde pancreatography showed complete disruption of the pancreatic duct at the junction of the head and body of the pancreas. Distal pancreatectomy was undertaken in cooperation with the hepatobiliary surgeons, and a drain was inserted into the lesser sac. The boy made steady progress and was discharged home 10 days after surgery with the drain in situ. One week later he was reviewed in outpatients; his symptoms had resolved and his drain was removed.

### Case 2

A 10 year old boy presented to his local, out of hours general practitioner service with abdominal pain and vomiting two hours after sustaining blunt abdominal trauma from his bicycle handlebars. Examination showed that he had an abrasion to the left of his umbilicus with no evidence of any peritonism (figure), and he was therefore discharged home.

The boy's abdominal pain and vomiting worsened over the next 36 hours and he was therefore referred to the local surgical unit. During examination he was noted to be dehydrated and tachycardic. He had generalised abdominal tenderness and peritonism. Plain radiographs of his chest and abdomen suggested free air in the right upper quadrant. Initial blood tests showed a neutrophilia of  $18.2 \times 10^9/l$  and a raised urea concentration of 10.1 mmol/l, but his serum amylase value was normal. Some free fluid was noted on abdominal ultrasonography, but no solid organ injury was seen.

The boy was transferred to the regional paediatric surgical centre. Contrast enhanced computed tomography of his abdomen confirmed free air and fluid within the peritoneal cavity. There was dilatation and thickening of his proximal small intestine but no free

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Abdominal abrasion in a 10 year old boy with handlebar injury

retroperitoneal gas. The boy had a laparotomy and this showed complete transection of his jejunum 20 cm from the duodenojejunal flexure. He underwent a limited segmental resection with primary anastomosis, and thorough peritoneal lavage was carried out. The boy was treated with a course of intravenous antibiotics and given a short period of total parenteral nutrition. He made a steady recovery and was well enough to return home 12 days after surgery.

## Discussion

The common abdominal injuries after blunt trauma are those to the spleen, liver, and kidneys.<sup>3-4</sup> These are usually evident on presentation because the associated blood loss results in signs of shock and the blood causes irritation of the peritoneum, resulting in signs of peritonism.

Perforation of the gastrointestinal tract is reported in 4-9% of patients who present at hospital with blunt abdominal trauma.<sup>2-6</sup> While most of these injuries are a result of motor vehicle accidents, bicycle handlebar injuries have been reported to account for 14-20% of cases.<sup>4-5</sup> Diagnosis is often delayed because there is usually no associated major blood loss. The small intestine is the most common site of perforation, and peritonism may not be evident initially because the content of the small bowel is of a neutral pH, low bacterial density, and low enzymatic activity. Studies have reported that only 38-54% of cases had signs of peritonism at presentation.<sup>2-6</sup> A plain radiograph is also unreliable in diagnosis as there is no pneumoperitoneum in 54-85% of cases<sup>2-6</sup>; this is because the small bowel contains little air, unlike the stomach or colon, in which perforation more often results in appreciable pneumoperitoneum.

Bicycle accidents are by far the most common cause of pancreatic injuries in children, accounting for 42-75% of cases.<sup>9-10</sup> Unlike the situation in adults, the injury is an isolated one in 62-73% of paediatric cases.<sup>9-10</sup> Diagnosis may also be delayed as there is usually no major blood loss. Injuries range from minor contusions or lacerations to major ductal injuries and transections that result in the formation of pseudocysts. Patients with major injuries characteristically have a persistently high serum amylase concentration.<sup>11</sup>

In 5 to 9 year olds, cycling is the major single activity, apart from playing, which results in injuries.<sup>12</sup> Cycling accounts for 48% of injuries to children on public roads.<sup>12</sup> Bicycle accidents in which there is a history of trauma from the handlebars are particularly

associated with severe abdominal injuries as the force of impact is applied via the small cross sectional area of the end of the handlebars.<sup>1-13</sup> A study of 813 children who presented to hospital with bicycle related injuries found that life threatening intra-abdominal injuries occurred in 10 of 21 children who had sustained handlebar trauma.<sup>1</sup> There is often discordance between the apparently minor circumstances of these accidents and the seriousness of the injuries sustained.

Because the initial clinical and radiological signs are often misleading, general practitioners and casualty staff need to have a high index of suspicion when first assessing children who have sustained trauma from bicycle handlebars. Abdominal ultrasonography can be a useful non-invasive investigation in these children. It may show free peritoneal fluid without concomitant solid organ injury in cases of gastrointestinal tract perforations,<sup>8</sup> and it may detect specific anatomic lesions of the pancreas.<sup>14</sup> However, ultrasound findings may be normal in the early period after the trauma and intra-abdominal injury cannot therefore be excluded in all cases.<sup>8-11</sup> Frequently repeated clinical examination remains the most important tool for early diagnosis; we recommend a period of observation for all children who have symptoms after such an injury, and review by a senior doctor before discharge.

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