ED QUICK QUIZ
WHAT IS THE DIAGNOSIS?

BACKGROUND

A 76-year-old man presents to the emergency department with sudden-onset abdominal pain of 4 hours duration. The pain is present in the upper abdomen, centred in the epigastrium, and described as deep and burning. The patient has a medical history of coronary artery disease and hypertension. He also reports having "indigestion," which caused pain similar to today's episode in his upper abdomen. In the past, food did not relieve this symptom.

On physical examination, the patient is pale and in obvious discomfort. His heart rate is 122 beats per minute, and his blood pressure is 110/65 mm Hg. Cardiovascular and respiratory findings are unremarkable, but he has tenderness in the epigastric region of his abdomen. His stool is brown and FOB positive. Hyperactive bowel sounds are heard on auscultation. Laboratory investigations show a mild anaemia with haemoglobin concentration of 12.7 g/dL and urea and creatinine values of 17.1 mmol/L and 106 µmol/L, respectively.

What is the diagnosis?

HINT: Look at the bowel wall
Pneumoperitoneum from duodenal ulcer perforation

Clear definition of both the inner and outer wall of the bowel and the free air under the diaphragm demonstrate pneumoperitoneum. The term pneumoperitoneum refers to air in the peritoneal cavity. The differential diagnosis of pneumoperitoneum includes iatrogenic causes (eg, peritoneal dialysis, abdominal surgery including laparoscopy and laparotomy, after which pneumoperitoneum can persist for 3-6 days or up to 28 days), blunt or penetrating trauma, perforation of hollow viscera (eg, gastric ulcer, duodenal ulcer [as in this patient]), pneumatosis intestinalis or pneumatosis coli, vaginal insufflation, and gas from the mediastinum (eg, from barotrauma).

Although many patients with perforated peptic ulcer disease initially present with severe abdominal pain with epigastric tenderness and classic signs of peritonitis, patients who are elderly or immunocompromised and patients with altered mental status may have only minimal signs and symptoms. In one study of patients >60 years with perforated ulcer, only 70% had abdominal pain (Hilton, 2001). Other patients reported symptoms including dyspepsia, anorexia, nausea, and vomiting. Severe abdominal pain was present only in 16% of patients. About 6% of patients have no abdominal findings. In most cases of perforation from ulcer disease, gastric and duodenal content (ie, bile, ingested food, swallowed bacteria) leak into the peritoneum, resulting in peritonitis and increasing the risk of infection and abscess formation. In addition to sepsis, subsequent third-spacing of fluid into the peritoneal cavity due to the peritonitis can lead to hypotension and shock.

Upright chest or left lateral decubitus radiographs can depict as little as 1-2 mL of gas under the diaphragm or lateral margin of the liver, especially if strict positioning techniques are used. Therefore, these studies should be the first diagnostic modalities used. Supine abdominal radiographs are generally of limited value in diagnosing pneumoperitoneum. CT is highly sensitive in depicting pneumoperitoneum and has the added benefit of assisting the clinician in identifying the underlying aetiology in many patients.

Numerous signs are described for diagnosing pneumoperitoneum on plain radiographs. One of the best known, the Rigler sign (double-wall or bas-relief sign), is visualization of the outer surface of the wall of a bowel loop due to free air in the peritoneal cavity. This air provides negative contrast and intraluminal gas that outlines the internal wall. The cupola sign (inverted cup-shaped configuration) is an arcuate lucency overlying the lower thoracic spine and projecting caudad to the heart (air outlines the inferior surface of the diaphragm). The umbilical ligaments and urachus, and particularly the falciform ligament, are sometimes identified as linear radiopaque structures in the presence of free air.

Another common sign is a collection of gas in the right upper quadrant adjacent to the liver lying mainly in the subhepatic space and in the hepatorenal fossa, which is visible as an oval or triangular gas shadow not in obvious continuity with the rest of the bowel. The collection is usually present in the medial aspect of the right upper quadrant, with a superomedial to inferolateral orientation.

The football sign is visualization of the entire peritoneal cavity as an oval gas shadow with the vertically oriented falciform ligament representing the seam of an American football. This sign is most often seen in the paediatric patient.

Nonsurgical management of a perforated ulcer is associated with prohibitive morbidity and mortality rates, especially in high-risk groups, such as immunocompromised patients and the elderly. Surgical management is generally indicated. Initial management includes gastric decompression with a nasogastric tube, pain control, intravenous hydration, and administration of broad-spectrum antibiotics. Closure with a piece of
omentum (Graham patch) or truncal vagotomy with pyloroplasty (by incorporating the perforation) are 2 common approaches to the surgical management of perforated duodenal ulcer. The patient in this case underwent omental patch repair of his duodenal perforation.