Primary aortoduodenal fistula as a cause of rapidly progressing hypovolaemic shock

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Section: Abdominal imaging
Area of Interest: Gastrointestinal tract Abdomen
Procedure: Education
Imaging Technique: CT-Angiography
Imaging Technique: CT
Special Focus: Fistula Blood Acute Case Type: Clinical Cases
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Patient: 85 years, male

Clinical History:
A 85-year-old man, without significant medical history, presented with anal red blood loss. No clear gastro-intestinal bleeding source could be identified on endoscopy nor on CT. Two hours later, he had massive haematemesis and signs of hypovolaemic shock. New endoscopy demonstrated blood in the stomach but no clear bleeding source.

Imaging Findings:
A computed tomography (CT) examination showed an abdominal aortic aneurysm of 6 cm diameter. Furthermore a connection was demonstrated between the aorta and the third part of the duodenum, with massive active contrast extravasation into the duodenum in the direction of the stomach (Fig. 1). The stomach was distended due to the large amount of blood being pumped into it (Fig. 2). CT images in the arterial phase also showed signs of hypovolaemic shock. The inferior vena cava was collapsed due to loss of circulating blood volume. Delayed and diminished enhancement of abdominal organs like the kidneys and the spleen, due to vasoconstriction, could also be depicted (Fig. 3).

Discussion:
An aortoenteric fistula is a direct communication between the aorta and the bowel. The duodenum is involved in 60% of cases. The other parts of the gastrointestinal tract can also be involved [1]. Secondary fistulas are a complication of aortic reconstructive surgery and have an annual incidence of 0.6% [2]. Primary fistulas, in which the native aorta is involved, are even rarer [3]. Most frequent aortic causes are atherosclerotic abdominal aortic aneurysm [3] and penetrating atherosclerotic aortic ulcers [4]. Other aortic causes include aortitis or collagen vascular disease [5]. Intestinal causes include penetrating peptic ulcer, penetrating gastro-intestinal malignancy, appendicitis, diverticulitis and even foreign bodies [1, 4, 6]. A classical clinical triad exists: GI bleeding, abdominal pain and a pulsatile abdominal mass. However, this triad is only found in 11% of cases [7]. Usually, a massive gastrointestinal haemorrhage secondary to an aortoenteric fistula is preceded by small, self-limiting bleeding episodes, called ‘herald bleeds’ [8]. Contrast extravasation into the GI tract on a contrast-enhanced CT is a very specific sign, but is very rare (11%) [9]. Mostly CT only demonstrates non-specific signs, such as ectopic bowel gas within or adjacent to the aortic lumen (56%) [9]. However, this may also be seen in infectious aortitis. Other non-specific findings include effacement of the periaortic fat plane, periaortic free fluid and soft tissue thickening. These
findings are very frequently seen but also show a considerable overlap with other entities like aortitis, mycotic aneurysm and retroperitoneal fibrosis. This stresses the importance of correlating the imaging findings with the clinical presentation.
Conventional angiography is not very sensitive since only patients with an intermittent or low flow rate into the fistula make it to the angiography table [9].
Endoscopy only reveals 26-62.5% of aortoenteric fistulas [7] but can exclude other causes of GI bleeding. Without urgent intervention, the mortality approaches 100%. Treatment consists of open surgery or an endovascular procedure, the latter being associated with a lower complication rate [10]. Despite treatment, mortality rates still reach up to 90%.

Conclusion:
In patients with gastrointestinal haemorrhage and an inconclusive endoscopy, CT is the diagnostic modality of choice. Contrast extravasation from the aorta into the bowel is highly specific for aortoenteric fistula but rarely seen. Non-specific signs such as ectopic periaortic gas should alert the radiologist of the possibility of a primary aortoenteric fistula. Patient survival largely depends on prompt diagnosis and treatment.

Differential Diagnosis List: Primary aortoduodenal fistula, Ruptured abdominal aortic aneurysm, Bleeding duodenal ulcer

Final Diagnosis: Primary aortoduodenal fistula

References:
Description: Contrast-enhanced CT in the early arterial phase: partially thrombosed abdominal aortic aneurysm with calcifications in the wall (arrowheads). An active contrast extravasation (arrow) into the horizontal segment of the duodenum (stars) can be depicted. Origin: Department of Radiology, Antwerp University Hospital, Edegem, Belgium.
**Description:** Coronal Maximum Intensity Projection (MIP) reformation more clearly demonstrating the active contrast 'jet' (arrows) from the abdominal aortic aneurysm (arrowheads) into the duodenum in the direction of the stomach. **Origin:** Department of Radiology, Antwerp University Hospital, Edegem, Belgium.
**Figure 2**

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**Description:** Contrast-enhanced CT of the abdomen in the early arterial phase shows a distended, blood-filled stomach (star) and contrast in the duodenum (arrowhead). **Origin:** Department of Radiology, Antwerp University Hospital, Edegem, Belgium.

*b*

**Description:** The presence of high-density contrast in the antrum of the stomach in the portal venous phase (b) indicates active filling of the stomach with blood coming from the duodenum (arrowhead). **Origin:** Department of Radiology, Antwerp University Hospital, Edegem, Belgium.
Figure 3

Description: Contrast-enhanced CT in the arterial phase demonstrates signs of hypovolaemic shock: collapse of the inferior vena cava (arrow) and delayed and diminished enhancement of abdominal organs like the kidneys and the spleen (stars). Origin: Department of Radiology, Antwerp University Hospital, Edegem, Belgium.