

Detection of an aortoenteric fistula in a patient with intermittent bleeding

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SUMMARY

Background A 57-year-old male with an aortobifemoral bypass graft presented to a gastroenterology clinic with a 3-month history of intermittent hematemesis, melena and fever. The patient had received antibiotic therapy 2 months before for the same symptoms; however, following brief regression (~3 weeks) the symptoms had returned.

Investigations Physical examination; analysis of full blood count; measurement of erythrocyte sedimentation rate, C-reactive protein levels, liver enzymes, electrolytes, renal function, serum cholesterol and serum triglyceride; HIV serology; blood, sputum, urine and stool culture analysis; performance of esophagogastroduodenoscopy, colonoscopy, abdominal ultrasonography and multidetector CT scanning.

Diagnosis Aortoenteric fistula with an inflammatory mass surrounding the aortobifemoral bypass graft.

Management Laparotomy with removal of the aortobifemoral bypass graft, performance of an extra-anatomic right axillofemoral bypass graft and an extra-anatomic right-left femorofemoral bypass graft.

KEYWORDS aortobifemoral bypass graft, aortoenteric fistula, extra-anatomic bypass, intermittent bleeding, multidetector CT

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Competing interests

The authors declared no competing interests.

THE CASE

A 57-year-old man with a 7-year-old woven Dacron® (Invista Inc, Wilmington, DE) aortobifemoral bypass graft presented to a gastroenterology clinic with a 3-month history of intermittent hematemesis, melena and fever.

The patient had been admitted to another center with these symptoms 2 months before presentation to the gastroenterology clinic. At the previous center, esophagogastroduodenoscopy (EGD) and colonoscopy had been performed and the results had been unremarkable. A CT scan of the patient, however, demonstrated perigraft soft tissue thickening. In addition, the patient had an elevated serum C-reactive protein level (12 mg/l; normal range 0–5 mg/l) and an elevated erythrocyte sedimentation rate (ESR; 60 mm/h; normal range 0–20 mm/h). The patient was hospitalized and antibiotic treatment was initiated. The patient's symptoms regressed and 2 weeks later he was discharged from the center; however, a week after discharge he developed hematochesia. Repeat EGD and colonoscopy were performed at the center, the results of which were normal. The patient was, therefore, referred to the gastroenterology clinic for further investigation.

The patient appeared pale and fatigued on admission to the gastroenterology clinic. His vital signs were as follows: blood pressure 90/60 mmHg, heart rate 110 beats/min and body temperature 37°C. On physical examination the patient's intestinal sounds were slightly audible, there was tenderness in his epigastrium, and digital rectal examination was unremarkable. Laboratory investigations revealed that the patient had hypochromic anemia—a low hemoglobin level (9.7 g/l; normal range 13.6–17.2 g/l)

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and a low mean corpuscular volume (76.8 fl; normal range 80.7–95.5 fl). In addition, his ESR and serum C-reactive protein level were elevated to 50 mm/h and 15 mg/l, respectively. The patient's biochemical parameters (including liver enzymes, electrolytes, renal function measurements, serum cholesterol and serum triglyceride) were within normal ranges. His HIV serology was negative, and the findings of blood, sputum, urine and stool cultures were also negative.

Abdominal ultrasonography images of the patient showed an aortic graft from the renal artery to the iliac artery bifurcation and dilated intestinal loops that were filled with fluid. EGD revealed that the patient had a spotty hyperemic antrum without signs of bleeding; other parts of his stomach and duodenum, including the third part of the duodenum, were normal. Multidetector CT (MDCT) was performed with 90 ml of contrast medium (Visipaque®; GE Healthcare, Oslo, Norway), which was administered through the patient's right antecubital vein at a rate of 3 ml/s; no oral contrast medium was used. Postcontrast axial MDCT sections of the patient revealed perigraft soft tissue thickening, adjacent bowel wall thickening, and a fistula with the proximal part of the fistula tract filled with contrast medium (Figure 1). Midsagittal multiplanar reconstruction of the MDCT images confirmed the presence of a fistula between the patient's aorta and the third part of his duodenum (Figure 2). On the basis of these findings, the patient was diagnosed with an aortoenteric fistula 3 days after his admission to the clinic.

The patient was operated on immediately after MDCT was performed, and laparotomy confirmed the presence of an inflammatory mass surrounding the aortobifemoral graft. The inflammatory mass was removed, and an adhesion was observed between the aortobifemoral graft and the duodenal wall that was hyperemic and edematous. The duodenum and aortobifemoral graft were separated and a defect in the graft wall was observed. The aorta was clamped over the graft, the infected aortobifemoral graft was removed, and the free side of aorta was sewn into a stump. The defect in the duodenum wall was oversewn and extra-anatomic right axillofemoral bypass graft surgery and extra-anatomic right-left femorofemoral bypass graft surgery were performed. During the postoperative period the patient was free from symptoms and without signs of gastrointestinal bleeding. At



Figure 1 Multidetector CT scan of the case patient. The image shows perigraft soft tissue thickening (closed arrowhead), adjacent bowel wall thickening (open arrowhead) and the proximal part of the aortoenteric fistula tract filled with contrast medium (arrow) in the postcontrast axial CT sections.

follow-up 3 months later, the patient was still free from symptoms and doing well. His full blood count, ESR and C-reactive protein level were within normal limits, and on physical examination, distal pulses of the lower extremity were normal. The surgery did not cause any adverse events.

DISCUSSION OF DIAGNOSIS

Complications after abdominal aortic graft surgery include perigraft abscess formation, pseudoaneurysm, lymphocystic hematoma and aortoenteric fistula. The incidence of aortic graft infection is not high (0.4–3.1%), but it remains one of the most challenging problems in aortic graft surgery.¹ Aortoenteric fistula is a severe but rare complication (prevalence 0.4–1.4%) of aortic graft surgery that is usually caused by graft infection. Aortoenteric fistulas can be observed in all segments of the gastrointestinal tract; however, 75% are located in the duodenum, especially in the third part, and the affected part is generally proximal to the aortic graft.^{2,3} The time between surgery and fistula formulation can range from a couple of days to 20 years, but fistula formulation is usually observed within 3–5 years of aortic graft surgery.³

The main symptom of aortoenteric fistula is gastrointestinal bleeding. Classical herald bleeding occurs before a massive bleed in 20–100% of patients with aortoenteric fistula.² Bleeding can, however, be intermittent and in small amounts

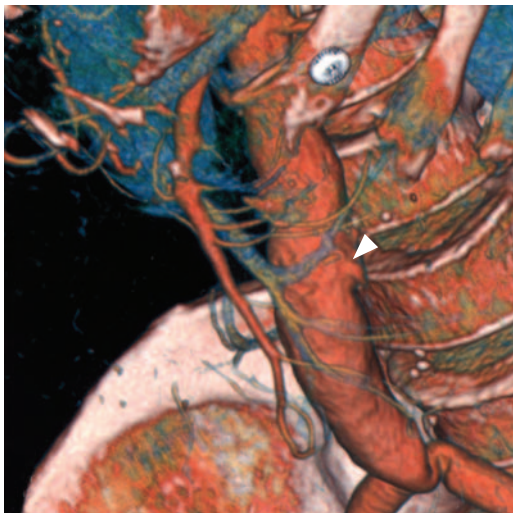


Figure 2 Midsagittal multiplanar reconstruction of the multidetector CT images of the case patient. The image shows the proximal part of the fistula tract filled with contrast medium between the aorta and third part of the duodenum (arrowhead).

in some patients. The case patient developed an aortoenteric fistula 7 years after surgery (slightly over the average time) and his gastrointestinal bleeding was intermittent as occurs in a minority of patients with the condition.

The most common diagnostic procedures for aortoenteric fistula are EGD, conventional CT and angiography. EGD should be performed initially to evaluate the third part of the duodenum to detect whether there is extrinsic compression of the lumen and to exclude other possible reasons for gastrointestinal bleeding including vascular ectasias, small bowel neoplastic lesions, hemobilia and small intestinal diverticula. In order to make an exact diagnosis of aortoenteric fistula on EGD, the fistula or the graft must be visible. Unfortunately, fewer than 40% of patients with an aortoenteric fistula have signs of bleeding on EGD.^{2,3} In patients without signs of bleeding on EGD, push enteroscopy, a recently developed technique for examination of the small bowel beyond the duodenum, can have high diagnostic yield.⁴

Angiography is of limited use in the diagnosis of aortoenteric fistula, especially if bleeding is slow. This modality can, however, be used to make a diagnosis if the bleeding rate observed is at least 0.5 ml/min.⁵ Angiography cannot be used to detect an aortoenteric fistula in a patient with intermittent bleeding who is in a nonbleeding

interval and, therefore, this modality was not used to assess the case patient. As a result of the limitations listed, the sensitivity of angiography in detecting aortoenteric fistula is only 20%.³

Conventional CT can highlight the complications of aortic graft surgery early on and it is, therefore, recommended that CT is performed during postoperative follow-up.⁶ Features of CT images of aortoenteric fistula that are almost always associated with graft infection are perigraft or intraluminal gas, perigraft fluid, perigraft soft tissue thickening, adjacent bowel wall thickening, disruption of aneurysmal wrap, and pseudoaneurysm. Perigraft contrast medium extravasation is a sign of aortoenteric fistula, but in patients with a slow bleeding rate this finding cannot be detected by conventional CT.⁷ Although conventional CT (performed at the other center) detected perigraft soft tissue thickening in the case patient, CT scans failed to detect that he had an aortoenteric fistula, presumably because he had a slow bleeding rate or was in a nonbleeding episode. Neither endoscopic nor radiological procedures alone provide sufficient evidence for a diagnosis of aortoenteric fistula; preoperative diagnosis is still very difficult and an exact diagnosis can be made in only approximately 30% of patients.⁸

MDCT is a quick noninvasive procedure that provides excellent image quality and enables volume-rendered image reconstruction, which facilitates the production of more-useful images. MDCT is particularly useful for the diagnosis of aortoenteric fistula when the patient's bleeding rate is slow and when detection of the proximal part of the fistula tract might be enough for diagnosis, as was the case for the patient described in this study. Six cases of aortoenteric fistula detected by the use of MDCT have been described in the literature (Table 1).^{9–12} In all except two of these cases, blood in the stomach was detected by EGD, and MDCT scans showed leakage of blood into the duodenum. The remaining two cases had a visible aortic graft on endoscopic examination. The case patient had neither signs of bleeding nor a visible aortic graft on EGD. Despite these negative findings, MDCT was performed at an early stage and the patient was referred for surgery under elective conditions, which is associated with better survival outcomes than emergent surgery.

Magnetic resonance angiography is a new technique and a safe alternative to conventional angiography. The modality has recently been

Table 1 Summary of six cases of aortoenteric fistula detected by multidetector CT.

Study	Age, sex	Previous aortic surgery	Herald bleeding	EGD findings	Precontrast MDCT findings	Postcontrast MDCT findings	Surgical findings	Outcome
Perks <i>et al.</i> (2004) ⁹	82, M	5-year-old, end-to-end, woven Dacron® (Invista Inc, Wilmington, DE) graft	No	Blood and hematoma within the stomach and duodenum. Source of bleeding not identified	NR	Jet flow of contrast medium from the aorta into the third part of the duodenum	Died before surgery	Death
Perks <i>et al.</i> (2004) ⁹	74, M	8-week-old, end-to-end, woven Dacron® graft	No	Duodenitis and fundal hematoma but no active bleeding	Perigraft gas, heterogeneous perigraft collection and duodenal hematoma	Contrast medium extravasation from the aorta into a perigraft collection and the third part of the duodenum	Aortoenteric fistula with a large inflammatory mass surrounding the graft	Death
Perks <i>et al.</i> (2004) ⁹	63, M	8-year-old, woven Dacron® end-to-side aortobifemoral and right femoral-popliteal bypass graft	No	Visible graft through a large duodenal ulcer with associated hematoma	Graft protruding into duodenum	Perigraft soft tissue thickening of 8 mm	Active bleeding into the duodenum through a hole over the anterior aspect of the graft	Death
Roos <i>et al.</i> (2002) ¹⁰	69, M	13-year-old aortobifemoral Y-graft	Yes, 3 weeks before manifest bleeding	Fresh blood in the whole duodenum. Source of bleeding not identified	NR	Aortoenteric fistula and contrast medium flow into the duodenum	Surgery was not performed. An endovascular stent was placed	Still in follow-up
Kayani <i>et al.</i> (2005) ¹¹	80, M	10-year-old abdominal aortic aneurysm repair	No	Fresh blood in the stomach. Source of bleeding not identified	NR	Aortoenteric fistula and contrast medium flow into the duodenum	Died before surgery	Death
Yoshimoto <i>et al.</i> (2005) ¹²	64, F	9-year-old abdominal aortic aneurysm repair	No	Visible prosthetic graft in the third part of the duodenum	NR	An adhesion was observed between the duodenal lumen and the aortic prosthesis	NR	Still in follow-up
Present case	57, M	7-year-old aortobifemoral bypass graft	Yes, 3 months before manifest bleeding	Antral gastritis. Source of bleeding not identified	NR	Perigraft soft tissue thickening, adjacent bowel wall thickening and filling of the proximal part of the fistula tract with contrast medium between the aorta and the third part of the duodenum	Aortoenteric fistula with an inflammatory mass surrounding the aortobifemoral graft	Still in follow-up

Abbreviations: EGD, esophagogastroduodenoscopy; F, female; M, male; MDCT, multidetector CT; NR, not reported.

advocated for the diagnosis of aortoenteric fistula, particularly in patients with renal failure or other contraindications to iodinated contrast material.¹³

TREATMENT AND MANAGEMENT

Aortoenteric fistula is a rare cause of severe gastrointestinal bleeding and might be primary (arising from aortic aneurysm) or secondary to aortic graft surgery. The condition is an uncommon but potentially catastrophic complication of this type of surgery. In patients with

aortoenteric fistula, gastrointestinal blood loss is often rapid and can lead to death by exsanguination. Urgent surgery was the only appropriate treatment option for aortoenteric fistula before endovascular stent placement procedures became possible. Endovascular stent placement can also be used as a temporary measure before definitive surgery is performed, especially in patients who cannot tolerate emergent surgery.

New surgical techniques, including strict hemostasis (the aorta can be clamped over the suprarenal and supraceliac arteries for hemostasis

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during surgery), covering the suture lines with retroperitoneal tissue and peritoneum, and the use of antibiotics and nonabsorbable sutures, might reduce aortoenteric fistula formation. Extra-anatomic axillofemoral bypass, or in rare cases thoracofemoral bypass, can be performed to obtain optimum distal perfusion during surgical repair. Extra-anatomic bypass can be performed before graft removal to control bleeding in patients who are hemodynamically stable. In the case patient, as the aim was to control bleeding, the infected graft was removed before both extra-anatomic bypasses were performed. In patients with aortoenteric fistula, prompt diagnosis and expedient surgical repair is essential for survival.¹⁴

CONCLUSIONS

This case highlights that all patients with a medical history of aortic aneurysm or aortic graft surgery should be presumed to have aortoenteric fistula if they present with gastrointestinal bleeding and/or fever of unknown origin. The three-dimensional multiplanar image reformatting capability of MDCT makes this modality a quick and noninvasive method for detecting fistula and evaluating adjacent organs. MDCT is generally used in patients with active bleeding; however, this case illustrates that MDCT can be used to detect aortoenteric fistula in patients with intermittent bleeding. If aortoenteric fistula is suspected, MDCT should be performed as soon as possible.

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