

Temporary Endovascular Control of a Bleeding Aortoenteric Fistula by Transcatheter Coil Embolization

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A 67-year-old man presented with gastrointestinal bleeding resulting from a fistula between the aortic stump and the fourth part of the duodenum 14 months after an axillobifemoral bypass, graft excision, and aortic stump closure for aortic graft infection. The patient initially refused any attempt at definitive surgical treatment so coil embolization of the aortic stump was performed via a brachial approach. Coil embolization may be a useful adjunct in the management of such difficult problems. This approach may buy time and allow careful planning of a definitive treatment or may serve as a palliative procedure in inoperable patients.

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SECONDARY aortoenteric fistulas are a devastating complication of aortic prosthetic grafting and one of the most challenging problems a vascular surgeon could face. We present an endovascular method of temporary arrest of gastrointestinal bleeding secondary to a fistula between the aortic stump and the duodenum.

CASE REPORT

Our institution does not require institutional review board approval for retrospective case reports. A 67-year-old man presented for emergency treatment with upper gastrointestinal bleeding and rigors. Fourteen months earlier, he had undergone an axillobifemoral bypass, total graft excision, and oversewing of the aortic stump for

aortic graft sepsis. Culture of the excised graft and surrounding tissues developed *Corynebacterium* species sensitive to amoxicillin. As a result, he had been receiving long-term oral antibiotic treatment with amoxicillin throughout this period. To our knowledge, the patient was compliant, as evidenced by the repeat prescription issued by his general practitioner; however, we can not be entirely certain whether he was actually taking his antibiotics regularly. His hemoglobin level on this admission was 4.3 g/dL. He was resuscitated and underwent transfusion. An esophagogastroduodenoscopy showed a deep ulcer crater in the fourth part of the duodenum with stigmata of recent bleeding. Contrast material-enhanced computed tomography (CT) demonstrated an inflammatory mass on the anterior aspect of the aortic stump with the duodenum closely involved (Fig 1). A thin, irregular, contrast material-filled tract between the stump and the duodenum was also seen, suggesting the presence of an aortoenteric fistula. A second aortic procedure would have almost certainly necessitated supraceliac clamping, further excision of the aortic stump to above the renal arteries, and renal revascularization. The risks of such an extensive procedure were discussed with the patient and

his relatives and the patient refused to consider major surgery at this stage. As a result, a decision was made to proceed with selective coil embolization of the aortoenteric fistula tract as a palliative procedure. Under local anesthesia and via the left brachial approach, an aortogram was obtained with use of a 4-F pigtail catheter (Cordis, Miami, FL). This confirmed the presence of an abnormal communication between the aortic stump and the fourth part of the duodenum. The aortic stump was selectively catheterized with use of a 4-F vertebral catheter (Cordis), which passed via the stump abscess into the duodenum (Fig 2a,b). A Spirale embolization coil 6 mm in diameter and 60 mm in length (BALT, Montmorency, France) was placed half in the abscess and half in the aortic stump. A further two 8-mm MReye embolization coils (IMWCE-35-5-8; William Cook Europe, Roden, The Netherlands) were placed in the aortic stump. This resulted in occlusion of the aortic stump below the level of the renal arteries. The procedure was successful and a completion aortogram showed no aortoduodenal communication (Fig 2c). The patient had no further episodes of bleeding and was discharged home 2 days later with a normal hemoglobin level. He was also prescribed continued lifelong suppres-

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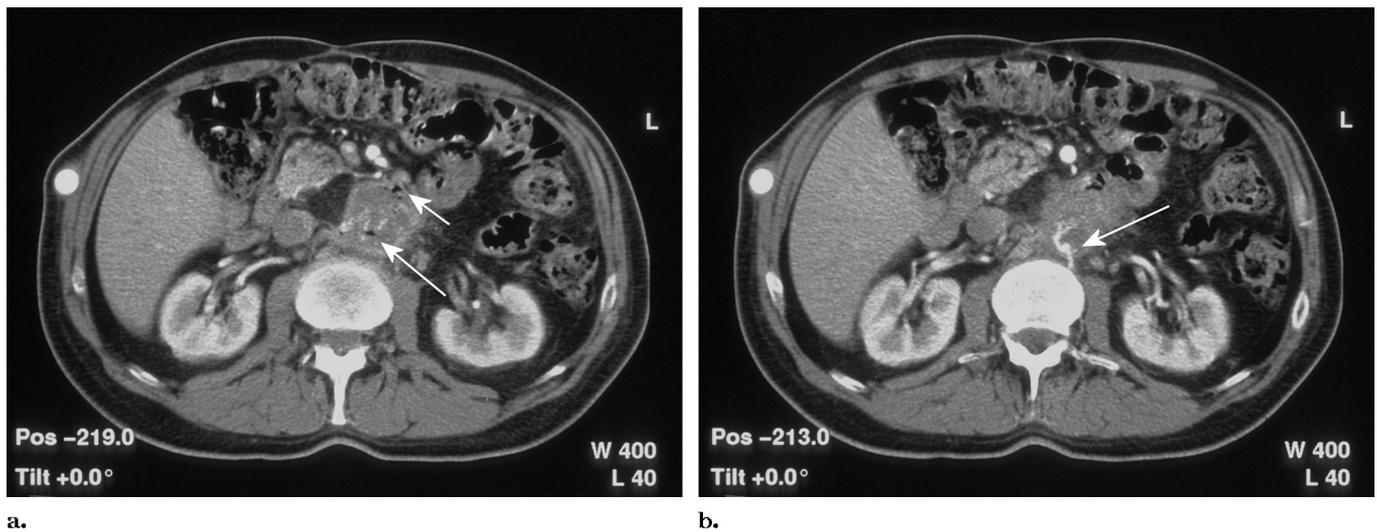


Figure 1. Contrast material–enhanced CT scan demonstrates that the aortic graft has been removed and a right axillobifemoral graft is present. **(a)** A contrast material–filled, thin, irregular fistulous tract is seen between the distal end of the aortic stump and the duodenum. Note the presence of gas pockets within the abscess cavity (long arrow) and the duodenum anteriorly (short arrow). **(b)** An enhancing lumbar artery is seen communicating with the aortic stump abscess cavity posteriorly (arrow).

sive oral antibiotic therapy. However, recurrent sepsis dictated change of the antibiotics. To cover gram-positive and gram-negative microorganisms, he was prescribed oral ciprofloxacin and penicillin V based on microbiologic advice. He was readmitted 6 weeks later with further gastrointestinal bleeding. Because he was still refusing definitive surgery, we again proceeded to coil embolization as a temporizing measure so that he could spend Christmas with his family. The procedure was successfully repeated with use of two further coils (Fig 2d). Two weeks later, he experienced a further episode of bleeding. At this point, the patient finally decided to accept the risks of definitive surgery.

A repeat esophagogastroduodenoscopy was performed the day before the operation, which excluded causes of upper gastrointestinal hemorrhage other than the existing aortoenteric fistula. Via a left thoracoabdominal incision and medial visceral rotation, he underwent left aortorenal bypass followed by repair of the aortic stump/duodenal fistula. It was possible to close off the aortic stump while maintaining flow to the renal artery. Postoperatively, he developed progressive multiple organ failure, the main problems being cardiac dysfunction (postoperative myocardial infarction, cardiac failure, ventricular

tachyarrhythmias), renal failure requiring hemodialysis, and respiratory failure (prolonged mechanical ventilation, tracheostomy, methicillin-resistant *Staphylococcus aureus* pneumonia). He died 5 weeks after surgery.

DISCUSSION

Prosthetic graft infection after aortic aneurysm surgery is a life-threatening complication. Treatment options include total graft excision and extraanatomic bypass grafting or in situ replacement of the graft. The former approach has been criticized for its high rate of death, amputation, and disruption of the aortic stump (1). The reported mortality rates range from 25% to 90%, whereas 43% of early deaths and 71% of late deaths are results of aortic stump blowout (1). The risk for stump bleeding or renewed fistula is reported to be in the range of 9%–17% (1). When the latter occurs, repeated aortic surgery can be extremely challenging. It is often necessary to excise the aorta to above the level of the renal arteries followed by renal revascularization either via saphenous vein bypasses originating from the hepatic and splenic arteries or via aortorenal bypasses (2). Many of these patients are critically ill and debilitated by infection, malnutrition, dehydration, and previous surgical

procedures in addition to having chronic cardiac, respiratory, and renal comorbidities (2). When patients are in hemodynamically unstable condition and require an emergent operation, the results are even more dismal (1–3). If surgical therapy is judged impossible because patients are deemed to be too sick to undergo major surgery, a fatal outcome is almost certain.

With the advent of endovascular surgery, less-invasive options became available for the management of the primary and secondary aortoenteric fistulas that obviate massive and difficult open surgery. A review of the literature identified 14 previously reported cases of endovascular repair of aortoenteric fistulas (three primary, 11 secondary) (3–10). Only one patient was treated with percutaneous coil embolization and this involved a primary aortoenteric fistula between a celiac artery aneurysm and the duodenum (3). Aortic stent-graft placement was employed in all remaining patients. In one patient, a primary aortoenteric fistula was treated with the use of n-butyl-2-cyanoacrylate injection followed by an aortic stent-graft placement (4). Although endovascular management of such problems is clearly not definitive, it does serve as a bridge to a more definitive elective repair at a later date with the patient more stable under optimal physiologic

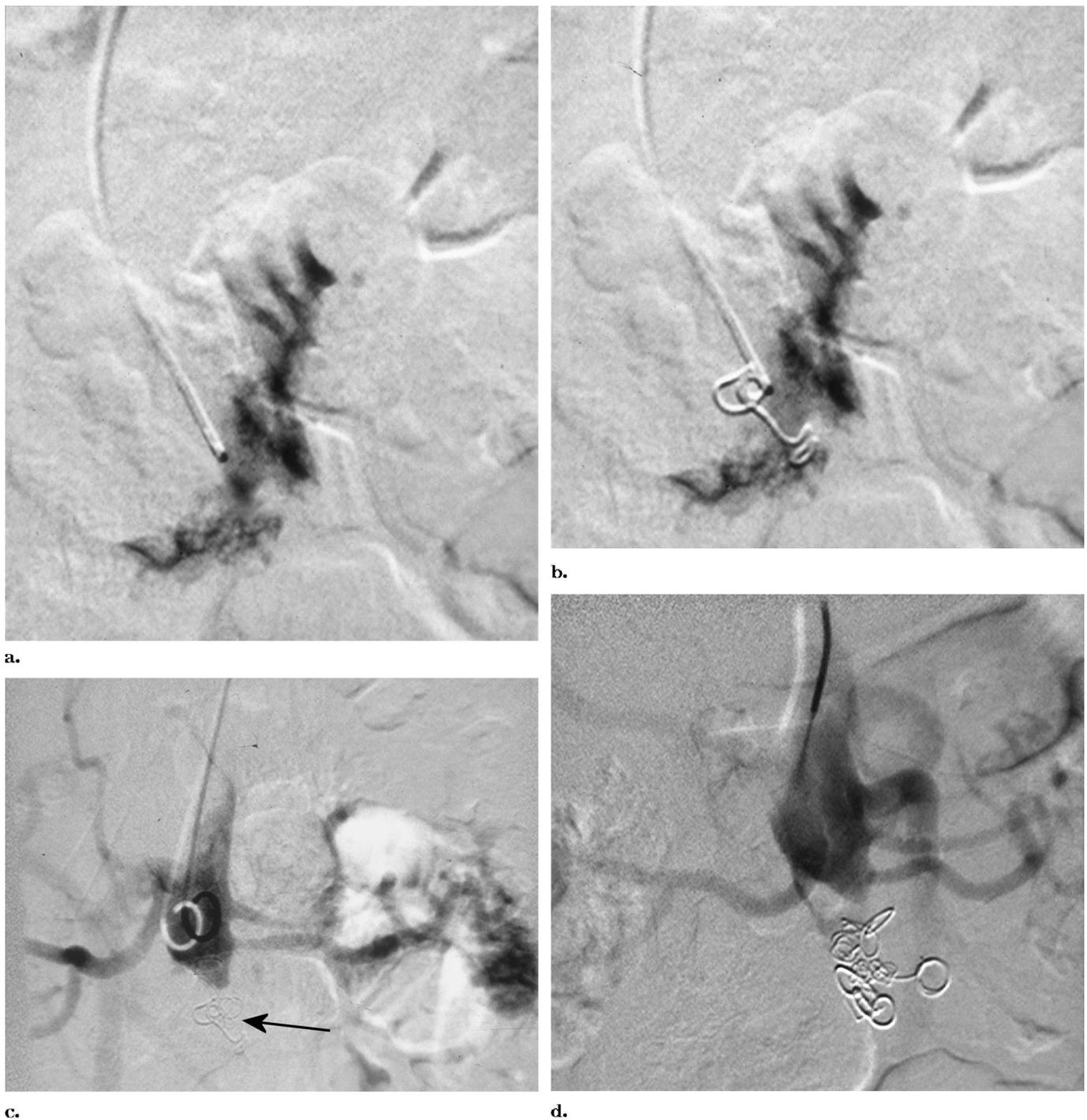


Figure 2. (a) Aortogram with the catheter placed in the fistulous tract. Contrast material is seen within the duodenum. (b) Thrombogenic coils are being placed in the distal aortic stump at the origin of the fistula and its associated abscess cavity just behind the duodenum. (c) Completion angiogram of the coiled aortic stump and aortoduodenal fistula (black arrow) shows no extravasation of contrast material. (d) In a second embolization procedure 6 weeks later, two further coils have been delivered, after which no aortoduodenal communication can be seen.

conditions, rather than emergent surgery in the setting of hemorrhagic shock, acute renal insufficiency, and myocardial ischemia (3–10). Alterna-

tively, this could serve as a palliative measure in patients deemed unfit to withstand major open surgery or those who refuse surgery. These interven-

tions may be combined with the administration of long-term antibiotics and adjunctive maneuvers, such as percutaneous drainage of an infected

collection and proximal bowel diversion (3). Percutaneous drainage was considered in this patient, but it was believed that this would have been a high-risk procedure, first, because the inflammatory mass was relatively inaccessible, second, because there was the risk of aggravating gastrointestinal bleeding even further and transforming a relatively stable situation into an unstable one, and third, because there were no clinical signs of overt sepsis. For these reasons, and given the patient's reluctance, we decided against percutaneous drainage. Had the patient developed signs of sepsis, percutaneous or open drainage and continuous or intermittent irrigation with antibiotics could have been an option. Given the patient's initial refusal to consider definitive surgery, the plan was to obtain a follow-up CT scan at some stage to monitor the inflammatory mass. However, in the meantime, the patient changed his mind and decided to proceed with surgery. As a result, no follow-up imaging was performed. Perhaps percutaneous drainage would have been easier if the mass was larger at this point in time. When the patient accepted to undergo surgery, we proceeded without placement of drainage catheters and irrigation with antibiotics. In the past, we have employed this technique in conjunction with definitive surgery (11). However, we have abandoned this after two patients developed severe retroperitoneal candidiasis, perhaps as a result of fungal overgrowth after eradication of the original infecting organism and the prolonged presence of a foreign body. Nevertheless, we accept that other centers have found it beneficial (12). Proximal bowel diversion to contain the infection was also considered after cessation of bleeding but we decided against this because there were no clinical signs of uncontrolled sepsis and because of the patient's refusal.

This case illustrates a unique clinical scenario with no other endovascular options available. Placing thrombogenic coils into the fistula tract is only a temporary measure of controlling gastrointestinal bleeding, and, because of persistent infection, it eliminates neither the likelihood of fistula recurrence nor the risk of a fatal aortic stump blowout. Nevertheless, the procedure has the advantage that it can be

easily repeated at a later date if necessary in the event of further bleeding. There are also potential complications, such as misplacement of the coil and renal or visceral embolization. Another limitation of the procedure is failure to completely thrombose the fistula tract, particularly when it is large. Perhaps, the chances of complete tract thrombosis could be enhanced by the use of n-butyl 2-cyanoacrylate in addition to coils, as seen in a case of a high-output aortocaval fistula (4,13). Although others have reported good results (4,13), we have no experience with this agent and we did not consider this option at the time of the treatment or during the recurrent bleeding episodes. Embolization materials such as glue, detachable balloons, or vascular plugs could have all been used, alone or in combination, to occlude the fistulous tract. It should be stressed that the technique described herein does not apply in cases of catastrophic gastrointestinal blood loss. In the presence of rapid bleeding and hypovolemic shock and/or when the aortoenteric communication is large, coils are unlikely to stop or slow down the bleeding. Faced with such a problem, temporary control of the hemorrhage could be achieved with an aortic balloon occlusion catheter introduced via the brachial route and inflated in the descending thoracic aorta (14,15). This would allow time for simultaneous resuscitation and surgical control of the bleeding. Finally, a "wind-sock" device or an aortic occluder placed in the aortic stump could have been an alternative option; however, no such reports exist in the literature to our knowledge.

The persistent infection of the aortic stump leading to recurrent aortoenteric fistula is a difficult problem. Coil embolization can offer some short-term benefit by delaying operation for hours or days to allow for resuscitation and planning of the procedure, but not weeks. Coils only promote thrombosis; they do not provide a durable and effective barrier to hemorrhage from the aorta, as evidenced by the recurrent bleeding in this case, nor do they help with the underlying infection. The ideal plan in this patient would have been temporary control of the gastrointestinal bleeding, stabilization and optimization, followed by definitive elective surgical repair of the

recurrent fistula. However, no additional therapy was initially employed because he refused surgery. Additionally, one could argue that the second time the patient had a bleeding episode, another embolization technique should have been considered, given that the original coils lasted only 6 weeks. We and the patient were aware that embolization without definitive surgery was only a temporizing measure. Although we believe that the durability of coil-induced thrombosis was mainly dependent on the presence of underlying infection and, less so, the choice of embolization material, it may be that employing another embolization technique the second time, perhaps could have resulted in a longer bleeding-free interval. One might also argue that, ultimately, the procedure was not useful for the patient. Revision aortic surgery for the second time, in particular when involving a thoracoabdominal approach, is a high-risk procedure even in the elective setting. Whether there would have been a different outcome had the patient been operated on soon after the first embolization procedure is therefore impossible to predict.

Transcatheter coil embolization of a bleeding fistula between the aortic stump and the duodenum appears to be a useful adjunct in the management of such difficult problems. This endovascular method may buy time and allow careful planning of a more definitive treatment in an optimized patient in hemodynamically stable condition and/or may serve as a palliative procedure in inoperable patients or those who refuse surgery.

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