Aortoduodenal fistula 5 years after endovascular abdominal aortic aneurysm repair with the Ancure stent graft

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We report a case of aortoduodenal fistula 5 years after uncomplicated endovascular abdominal aortic aneurysm repair. The diagnosis was confirmed by abdominal computed tomography scan and esophagogastroduodenoscopy. The patient was successfully treated with primary duodenal repair, removal of the infected graft, in situ placement of a bifurcated graft, and omental interposition. Review of the literature identifies this as one of very few documented aortoduodenal fistulas after endovascular aneurysm repair. Fistulization occurred despite accurate stent graft placement without migration, endoleak, or aortic sac size enlargement on annual postoperative imaging studies. (J Vasc Surg 2007;45:834-6.)

Aortoduodenal fistula is a rare entity. Primary aortoenteric fistula (AEF) has an incidence of 0.04% to 0.07%.[1] Secondary AEF, a fistula that develops after open abdominal aortic aneurysm (AAA) repair, occurs after only 0.36% to 1.6% of cases.[1] Aortoduodenal fistula after endovascular aneurysm repair (EVAR) is exceedingly rare, with only a few other cases reported. We present a patient with aortoduodenal fistula 5 years after successful EVAR.

CASE REPORT

A 76-year-old man underwent uncomplicated EVAR for a 5.7-cm infrarenal AAA. The repair was performed using a 22-mm × 16-mm Ancure (Guidant, Indianapolis, Ind) bifurcated graft. Follow-up computed tomography (CT) scans at 2 months and 14 months after EVAR confirmed shrinkage of the aneurysm sac from 5.6 cm to 5.2 cm. Stabilization of aortic sac size at 5.5 cm was demonstrated on surveillance ultrasound examinations at 26 months and 50 months after EVAR and on a CT scan at 38 months. The stent graft position was excellent, without migration, and there was no evidence of endoleak on any of these five surveillance studies.

Fifty-eight months after repair, abdominal pain, nausea, decreased appetite, and urinary retention developed in the patient 1 week after bilateral pulmonary emboli were diagnosed and treated by full anticoagulation. The patient had not undergone any recent angiographic, endoscopic, or dental procedures. A CT scan of the abdomen and pelvis revealed air around the aortic stent graft (Fig 1). Bloody emesis subsequently developed. An emergency esophagogastroduodenoscopy (EGD) was performed, an AEF was identified, and the patient underwent immediate operation.

At laparotomy, the aortic sac was acutely inflamed. After proximal and distal control was obtained, the aortic aneurysm sac was opened. It was filled with turbid, brown fluid and old clot. The endograft was not bile stained and was not in contact with the fistula. The aortoduodenal fistula was between the third portion of the duodenum and the native aneurysm sac. The proximal fixation hooks were well seated in the aortic neck at least 4.0 cm above the AEF. There was no evidence of stent or hook penetration through the aortic wall. Both distal fixation points and the proximal fixation point of the endograft were well incorporated.

The existing stent graft was explanted, and the aneurysm sac was débrided and copiously irrigated. An in situ 18-mm × 9-mm Dacron graft, without antibiotic impregnation, was placed immediately to limit ischemia time (Fig 2). Next, the duodenal portion of the fistula was repaired primarily in two layers (Fig 3). The greater omentum was interposed between the duodenum and the aortic wall and a drain was placed.

Cultures were obtained and grew *Clostridium perfringens*, *Bacteroides fragilis*, and *Streptococcus* spp at 48 hours. The patient was treated with 17 days of intravenous vancomycin and 14 days of intravenous fluconazole, followed by 13 days of intravenous ertapenem on the advice of two infectious disease consultants after a review of all microbiologic cultures.

The patient's postoperative course was complicated on day 7 by disruption of the right iliac anastomosis requiring ligation of the right common iliac artery. An 8-mm knitted Dacron tube graft was interposed between the right limb of the bifurcated graft and the right common femoral artery. The abdomen was temporarily closed, and a second-look laparotomy was done 2 days later. There was no sign of sepsis, and the abdomen was closed.

The patient was subsequently discharged to home 5 weeks later in stable condition on therapy with oral antibiotics. The patient is doing well 13 months after discharge. He is currently taking a suppression dose of oral clindamycin.

DISCUSSION

Aortoenteric fistula after EVAR is a rare complication. To our knowledge, 10 cases have been previously described. Two of the reported cases were associated with graft migration and kinking that led to fistula formation.[2,3] Another report described breakdown of the graft material with development of a type III endoleak leading to fistulization.[4] One fistula was noted in a patient who had a persistent inflammatory periaortic mass after EVAR for

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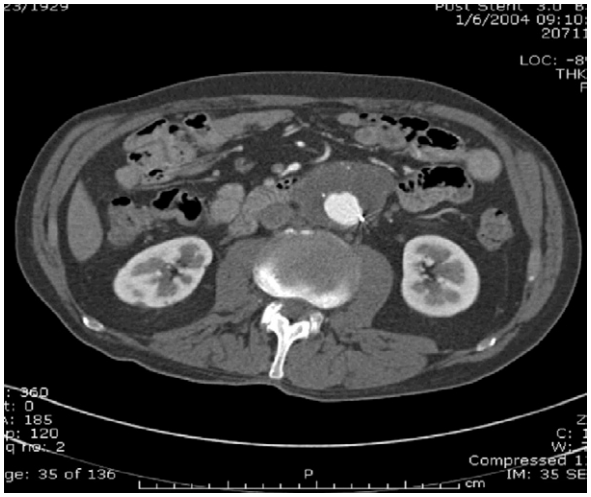

Fig 1. Abdominal computed tomography reveals copious air around the aortic stent graft within the aneurysm sac.

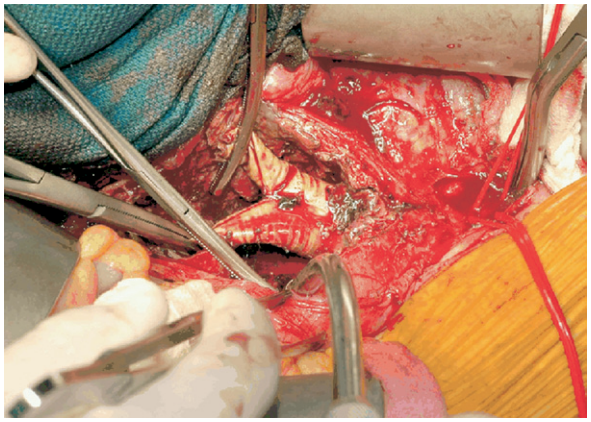

Fig 2. Operative photograph of aortic stent graft explantation from aortic sac. The proximal and distal fixation points were well incorporated but did not prevent relatively easy removal of the stent graft. (Patient's head is to the right.)

inflammatory AAA.[5] One report documented a persistent type I endoleak after EVAR before fistulization occurred.[6] One case was described in a patient with active Crohn's disease; fistulization may have resulted from a segment of involved intestine.[7] Finally, two cases were included in a large review of EVAR complications, but no information about the patients or other details were listed.[8] Only two other AEFs have been reported without any antecedent complications after EVAR (Table).[9,10]

The aortoduodenal fistula in our case was not associated with an endoleak, graft migration, or increase in aortic sac size during 5-year surveillance postoperatively. Even after careful retrospective review of the five surveillance studies, there was no evidence of endoleak or graft abnormalities.

The patient underwent successful primary duodenal repair, removal of the infected graft, in situ replacement

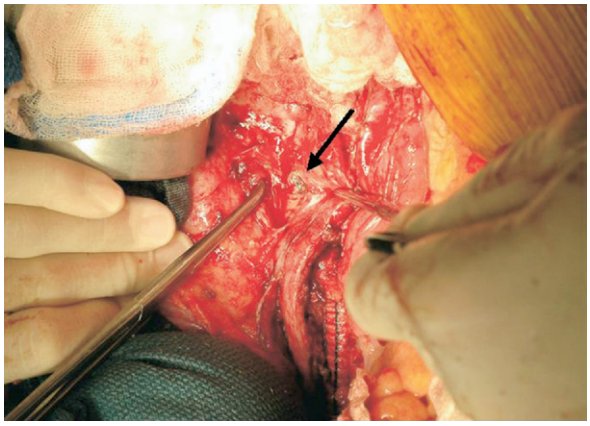

Fig 3. Operative photograph of the fistula between the third portion of the duodenum (surgical clamp tip is within the fistula, surrounded by duodenal mucosa) and the aneurysm sac *(black arrow)*. The site of the fistula was 4 cm below the proximal stent graft fixation point and did not involve fixation hooks or the metallic stent.

with a Dacron bifurcated graft, and omental interposition. Three of the previously reported 10 cases were managed with intestinal repair, endograft explantation, and extra-anatomic bypass, and four were managed with in situ aortic grafting. One was managed with intravenous antibiotics alone.[7] The treatment for two patients was not described. Perioperative mortality for these technically challenging cases occurred in four (40%) of 10 patients.

AEF is a difficult problem to diagnose and treat. The preoperative diagnosis is challenging. CT scan is only 33% to 80% sensitive for AEF, and EGD may confirm the diagnosis but does not eliminate it if no fistula is seen. The primary reason for performing EGD is to exclude other causes of upper gastrointestinal bleeding. Physicians must rely on history and physical examination findings in addition to diagnostic tests to establish the diagnosis.

Controversy also exists about optimal treatment for these patients. Traditional teaching recommends explantation of the infected graft and extra-anatomic bypass. More recent studies suggest that patients can be treated with in situ grafting using prosthetic graft material, resulting in better 5-year patency and a greater limb salvage rate.[11,12]

The risk of AEF after EVAR is theoretically less than after open AAA repair. AEF after open repair has an incidence of up to 1.6%.[1] EVAR leaves no exposed suture lines, and because the aortic wall is not exposed or opened, the retroperitoneal tissue remains intact, which leaves undisturbed, viable tissue between the aorta and the duodenum. Suggested causes of AEF after EVAR include persistent endoleak with associated increase in aortic sac size. Graft migration, graft erosion, or adjacent organ injury from protruding fixation hooks or metallic stents may also be involved in the development of AEF. Other conditions such as inflammatory AAA or Crohn's disease may increase the risk of AEF after EVAR. No evidence was found of stent

Table. Clinical data for 11 patients with aortoenteric fistula after endovascular aneurysm repair

Patient	*Reference*	*Age*	*EVAR device*	*AEF site*	*Time after EVAR (mos)*	*Vascular reconstruction*	*Outcomes*
1	Norgren et al,[4] 1998	70	Stentor*	Duodenum	18	Aortobiiliac	Alive @ 6 mos
2	Hausegger et al,[3] 1999	52	Vanguard†	Duodenum	20	Aortobiiliac	Alive @ 6 mos
3	d'Othée et al,[2] 2000	62	Stentor	Duodenum	22	Axillobifemoral	Alive @ 3.5 yrs
4	Makar et al,[7] 2000	70	Zenith‡	Duodenum	5	Antibiotic therapy only	Died
5	Ohki et al,[8] 2001	?	?	Duodenum	9	?	Died
6	Ohki et al,[8] 2001	?	?	Duodenum	30	None	Died
7	Parry et al,[5] 2001	61	AneuRx§	Duodenum	6	Aortobiiliac	Alive @ 7 mos
8	Kar et al,[9] 2002	76	AneuRx	Duodenum	23	Aortobiiliac	Alive @ 1 yr
9	Abou-Zamzam et al,[6] 2003	67	Ancure	Ileum	11	Axillobifemoral	Alive @ 4 mos
10	French et al,[10] 2004	68	Zenith	Duodenum	18	Axillobifemoral	Died 6 days post-op
11	Present case	76	Ancure	Duodenum	58	In situ aortobiiliac graft	Alive @ 13 mos

EVAR, Endovascular aneurysm repair; *AEF,* aortoenteric fistula.
*Minimal Invasive Technology, La Ciotat, France.
†Boston Scientific Corp, Natick, Mass.
‡Cook Inc, Bloomington, Ind.
§Medtronic, Minneapolis, Minn.

graft erosion or penetration by fixation hooks as the cause of the AEF in our patient. The most likely cause was persistent aneurysm sac endotension in the absence of a demonstrable endoleak. This resulted in a primary AEF without direct involvement of the endograft.

Time between EVAR and diagnosis of AEF has been variable. The previously reported cases occurred from 4 to 30 months after EVAR. Our case occurred 58 months after EVAR, which is by far the longest postoperative interval reported. The significance of this is unclear but does emphasize the continued need for surveillance after EVAR. The true incidence of AEF after EVAR has yet to be defined owing to the lack of comprehensive long-term data. With our case and the 10 previous reports, it is clear that AEF must remain in the differential diagnosis of any patient who presents with upper gastrointestinal bleeding and abdominal pain after EVAR. These cases present a formidable surgical challenge with significant perioperative morbidity and mortality.

REFERENCES

1. Busuttil SJ, Goldstone J. Diagnosis and management of aortoenteric fistulas. Sem Vasc Surg 2001;14:302-11.
2. d'Othée BJ, Soula P, Otal P, Cahill M, Joffre F, Cérène A, et al. Aortoduodenal fistula after endovascular stent-graft of an abdominal aortic aneurysm. J Vasc Surg 2000;31:190-5.
3. Hausegger KA, Tiesenhausen K, Karaic R, Tauss J, Koch G. Aortoduodenal fistula: a late complication of intraluminal exclusion of an infrarenal aortic aneurysm. J Vasc Interv Radiol 1999;10:747-50.
4. Norgren L, Jernby B, Engellau L. Aortoenteric fistula caused by a ruptured stent-graft: a case report. J Endovasc Surg 1998;5:269-72.
5. Parry DJ, Waterworth A, Kessel D, Robertson I, Berridge DC, Scott DJ. Endovascular repair of an inflammatory abdominal aortic aneurysm complicated by aortoduodenal fistulation with an unusual presentation. J Vasc Surg 2001;33:874-9.
6. Abou-Zamzam AM, Bianchi C, Mazraany W, Teruya TH, Hopewell J, Vannix RS, et al. Aortoenteric fistula development following endovascular abdominal aortic aneurysm repair: a case report. Ann Vasc Surg 2003;17:119-22.
7. Makar R, Reid J, Pherwani AD, Johnston LC, Hannon RJ, Lee B, et al. Aorto-enteric fistula following endovascular repair of abdominal aortic aneurysm. Eur J Vasc Endovasc Surg 2000;20:588-90.
8. Ohki T, Veith FJ, Shaw P, Lipsitz E, Suggs WD, Wain RA, et al. Increasing incidence of midterm and long-term complications after endovascular graft repair of abdominal aortic aneurysms: a note of caution based on a 9-year experience. Ann Surg 2001;234:323-35.
9. Kar B, Dougherty K, Reul GJ, Krajcer Z. Aortic stent-graft infection due to a presumed aortoenteric fistula. J Endovasc Ther 2002;9:901-6.
10. French JR, Simring DV, Merrett N, Thursby P. Aorto-enteric fistula following endoluminal abdominal aortic aneurysm repair. ANZ J Surg 2004;74:397-9.
11. Oderich GS, Bower TC, Cherry KJ Jr, Panneton JM, Sullivan TM, Noel AA, et al. Evolution from axillofemoral to in situ prosthetic reconstruction for the treatment of aortic graft infections at a single center. J Vasc Surg 2006;43:1166-74.
12. Young RM, Cherry KJ Jr, Davis PM, Gloviczki P, Bower TC, Panneton JM, et al. The results of in situ prosthetic replacement for infected aortic grafts. Am J Surg 1999;178:136-40.

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