

Rare and fatal late-term complication of endovascular aneurysm repair: Migration of the endograft into the duodenum

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ABSTRACT

Endovascular aneurysm repair (EVAR) is a treatment method that has become increasingly popular for abdominal aortic aneurysms (AAA) due to its ease of application, reduced hospital stay, and its suitability as an alternative for patients who cannot tolerate open surgery. Although the early outcomes of EVAR are better than those of open surgery, complications such as endoleak, migration, thrombosis or kinking of the endograft limbs, graft infection, and secondary rupture may occur. In this study, we present a patient who underwent EVAR at another institution approximately 10 years earlier and was admitted to our clinic with complaints of deterioration in general condition, fever, and melena. Laboratory examination of 73-year-old man revealed a white blood cell (WBC) count of 17,100, hemoglobin level of 9.5 g/dL, and C-reactive protein (CRP) level of 261 g/L. Computed tomography (CT) revealed thrombosis within the EVAR graft, free air surrounding the graft, fractures in the graft stents, and displacement of the right limb beyond the aorta at the level of the iliac bifurcation. The endograft was observed to have migrated toward the duodenum and formed a fistula. The patient, who presented with sepsis, underwent emergency surgery. Initially, a left axillofemoral bypass was performed to relieve ischemia in the left leg. Subsequently, a laparotomy was performed with the joint participation of the general surgery and cardiovascular surgery departments. Intra-abdominal fecal contamination and rupture of the sigmoid colon were observed. The abdomen was lavaged, the sigmoid colon and rectum were excised, and a colostomy was created. An aortotomy was then performed, and the main body of the graft and its left limb were removed. The duodenum was opened, and the fistulized right limb of the endograft was also removed. No additional vascular intervention was required due to abdominal contamination, adequate collateral circulation in the right leg, likely due to the chronic nature of the process, and the absence of ischemia. The aorta was ligated at the infrarenal level, and the patient, who required high-dose inotropic support, was transferred to the intensive care unit. The patient died in the eighth postoperative hour. To our knowledge, this case represents a rare and unique complication that has not been previously reported in the literature. By presenting this case, we aim to draw attention to the long-term complications of EVAR and emphasize the importance of open surgery in patients with a high life expectancy.

Keywords: Abdominal aortic aneurysm; endovascular aneurysm repair; long-term complication.

INTRODUCTION

Today, approximately 80% of patients indicated for surgery for abdominal aortic aneurysm (AAA) undergo endovascular aneurysm repair (EVAR), while open aneurysm repair (OAR) is preferred in younger patients with a longer life expectancy

and fewer comorbidities. The 30-day mortality is significantly lower with EVAR compared to OAR. However, periodic post-EVAR imaging has reported reintervention rates as high as 18%.^[1]

The most common complication after EVAR, often requiring

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ing reintervention, is endoleak. Other complications include stent migration, endograft infection, limb kinking or occlusion, and endograft collapse. Additionally, ischemia of the extremities, kidneys, intestines, pelvic organs, and spinal cord may occur. Serious complications such as secondary aneurysm rupture have also been reported.^[2] Studies have shown that OAR provides better long-term outcomes in terms of aneurysm-related mortality, reintervention rates, and secondary rupture compared to EVAR.^[3,4] In light of these data, the choice of method for patients undergoing AAA surgery is critically important. In this study, we present a complication that, to our knowledge, has not been previously reported in the literature. The case involves a patient who previously underwent EVAR and subsequently developed thrombosis in the body of the endograft and the iliac limbs, leading to secondary rupture of the right iliac limb. The endograft then became detached, curled, and fistulized into the duodenum, eventually floating within the duodenal lumen.

CASE REPORT

A 73-year-old male patient presented to our hospital with complaints of worsening general condition, melena, fever, and ischemia in the left leg for three days. On admission, the patient had a temperature of 39°C, was tachycardic (130 bpm) and tachypneic (30 breaths/min), and showed a decline in consciousness. Physical examination revealed diffuse abdominal tenderness with guarding. Rectal examination was positive for melena. From the patient's medical history, it was learned that he had undergone EVAR for an AAA at an exter-

nal center 10 years earlier and had been receiving antiplatelet therapy. Laboratory findings were as follows: white blood cell count (WBC) 17,100, hemoglobin 9.5 g/dL, and C-reactive protein (CRP) 261 mg/L. Computed tomography (CT) demonstrated thrombosis of the EVAR graft, free air around the graft, fracture of the graft stents, and the aorta extending outside the graft at the level of the right iliac bifurcation. The graft was located infrarenally and the renal arteries were observed to be patent. It was determined that the endograft had migrated toward the duodenum, forming a fistula, entering the duodenal lumen, and floating within it (Fig. 1).

Informed consent was obtained for the scientific publication of this case, with assurance that the patient's personal information would remain confidential.

The patient, who was in a state of sepsis, first underwent a left axillofemoral bypass to address ischemia in the left lower extremity. Subsequently, the patient was taken for emergency abdominal surgery with the simultaneous participation of the cardiovascular surgery and general surgery teams. A median laparotomy was performed, and abdominal exploration revealed a rupture in the sigmoid colon with fecal contamination. After irrigation, the sigmoid colon and rectum were resected, and a colostomy was created. The aorta was freed, and a cross-clamp was placed inferior to the renal arteries. An aortotomy was performed, and the endograft was found to be completely thrombosed and infected. The main body and left limb of the endograft were removed. An aortoduodenal fistula was present at the distal aorta, at the level of

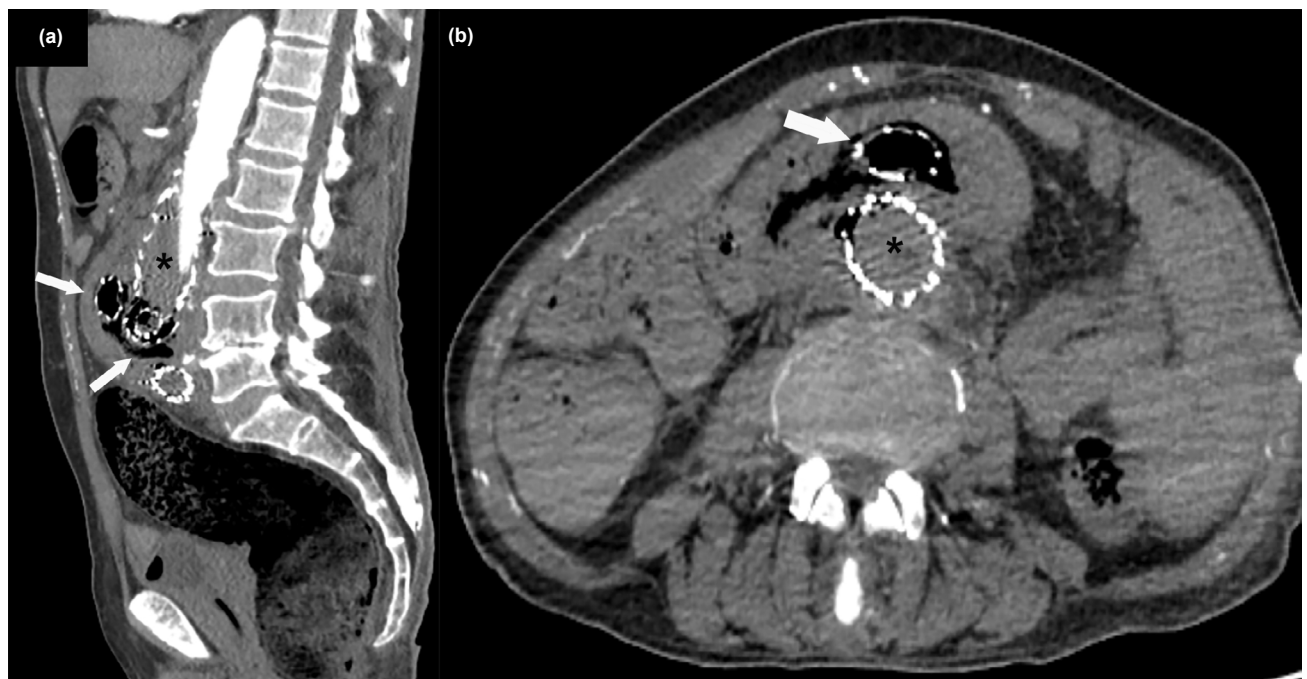


Figure 1. Sagittal (a) and axial (b) computed tomography (CT) angiography images obtained at the level of the duodenum and aorta show the aortic endograft filled with air and coursing into the duodenal lumen (white arrows in a and b). Note the total occlusion of the aorta at the level of the stomach (black asterisks in a and b).

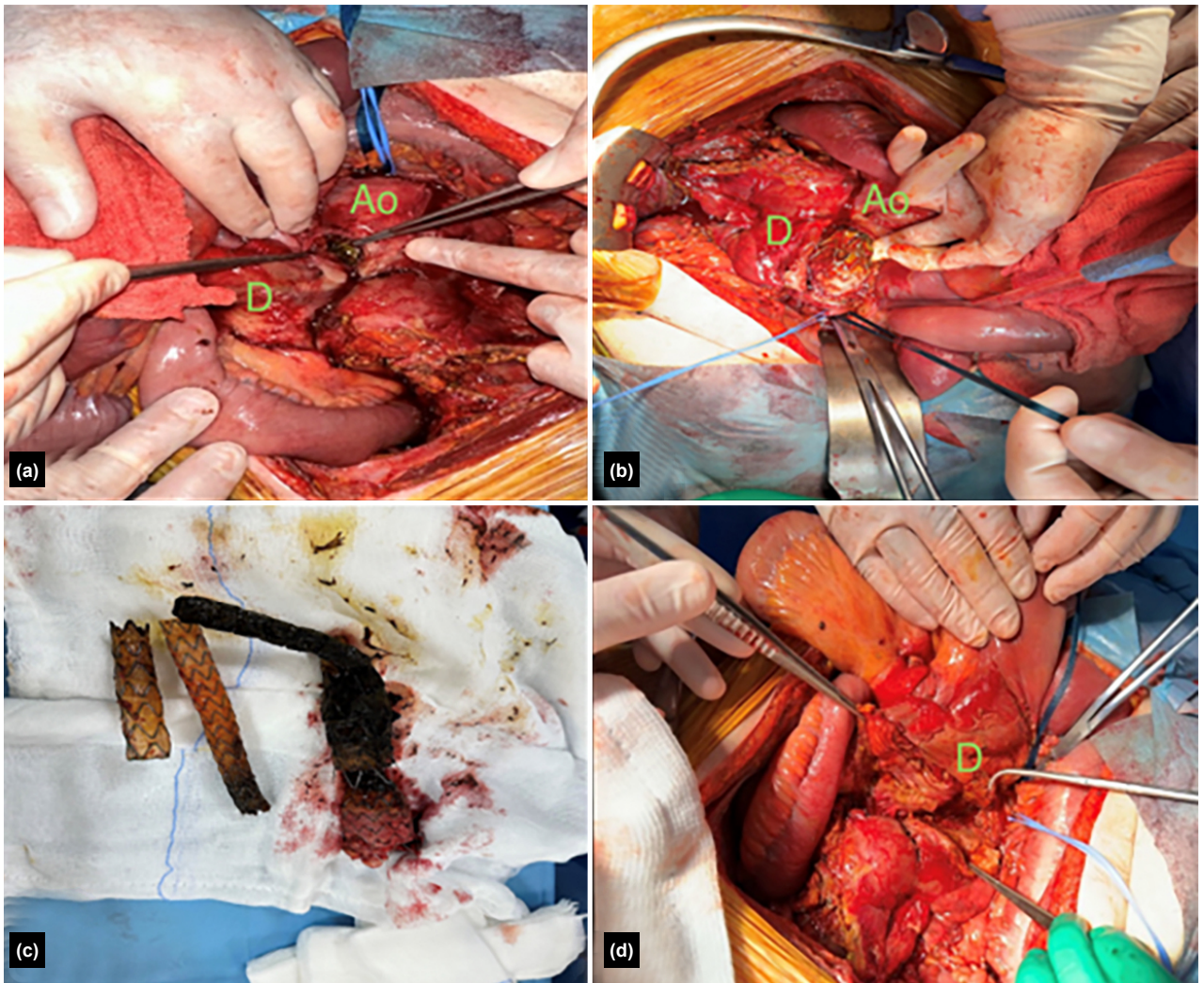


Figure 2. Intraoperative photographs show a fistula between the aorta and duodenum (**a and b**). Postoperative view of the extracted endograft (**c**). Direct visualization of the duodenal lumen (**d**). Ao refers to the aorta, and D refers to the duodenum.

the right iliac bifurcation. The duodenum was opened, and the right limb of the endograft, extending upward within the lumen, was removed. It was determined that the ampulla of Vater was intact and that a Whipple procedure was not necessary; therefore, the duodenum was primarily repaired (Fig. 2). Since there was no distal ischemia in the right lower extremity and the abdomen was heavily infected, we avoided placing an additional vascular graft and ligated the aorta at the infrarenal level. The patient was admitted to the intensive care unit with high inotropic support. Unfortunately, the patient, who remained in septic shock, died 8 hours after surgery.

DISCUSSION

An abdominal aortic aneurysm can be defined as a pathological dilation of the aorta. It is a serious health problem affecting 4.8% of the population (6.0% in men and 1.6% in women) and may result in death due to the risk of rupture. It is most

commonly observed in individuals aged 65-74 years.^[5] Although the clinical presentation is generally silent, symptoms related to compression of surrounding organs and distal embolization may also occur. In cases of rupture, more dramatic findings such as abdominal or back pain, abdominal swelling, pallor, agitation, and hemodynamic shock may develop. Intervention is recommended for men with an abdominal aortic diameter ≥ 55 mm and for women with ≥ 50 mm.^[6]

Currently, approximately 80% of patients undergoing intervention for AAA are treated with EVAR, while OAR is performed less frequently.^[1] The main reason for this is that early survival outcomes are better in patients treated with EVAR. Antoniou et al.^[4] reported that the 30-day mortality rate was 1.2% for EVAR and 3.1% for OAR, concluding that EVAR is superior to OAR in terms of 30-day mortality. EVAR has many advantages, such as being less invasive than OAR, allowing early mobilization, reducing the duration of hospital stay, being feasible under sedation without the need for gen-

eral anesthesia, and causing less postoperative pain. These advantages make EVAR a good treatment alternative for patients at high risk for open surgery. In the high-risk group of ruptured AAAs, approximately 80% of women and about 70% of men die.^[1] Therefore, EVAR should be considered the primary approach in the treatment of ruptured AAAs.^[1,6] The Management of Abdominal Aorto-iliac Aneurysms guidelines published by the European Society for Vascular Surgery (ESVS) in 2024 recommend an endovascular approach as the first-line treatment option for patients with AAA rupture and suitable anatomy (Class I, Level of Evidence A).

Unfortunately, the early advantages of EVAR do not necessarily translate into favorable long-term outcomes. Complications such as endoleak, endograft migration, endograft infection, endograft collapse, limb kinking or occlusion, and secondary aneurysm rupture negatively affect the long-term results of EVAR. Among these complications, the most common one is endoleak, which is also the condition that most frequently requires reintervention. Compared to OAR, long-term mortality rates, reintervention rates, and secondary rupture rates are significantly higher after EVAR. In other words, EVAR may become disadvantageous in the long term for the treatment of AAA. Therefore, when deciding on the procedure for elective AAA surgery, the patient's age and accompanying comorbidities should be the primary considerations. In a meta-analysis by Ben Li et al.,^[3] at 5-9 years of follow-up, all-cause mortality was significantly higher in EVAR patients (27.3% vs. 24.7%), while reintervention rates were 17.6% versus 14.9%, and secondary rupture rates were 2.0% versus 0.6%. Current ESVS guidelines also recommend OAR for elective AAA treatment in patients with long life expectancy and low comorbidity (Class IIa, Level of Evidence B).^[6]

Aortoenteric fistula after EVAR is a rare but fatal complication. Erosion caused by the endograft in the aortic wall has been reported as the most common mechanism for fistula development. Inflammation in the aneurysmal aortic wall after EVAR and primary infection of the endograft are other important causes of aortoenteric fistula. In some cases, however, a distinct etiological mechanism cannot be identified. Patients generally present with abdominal or back pain, nausea, vomiting, and gastrointestinal (GI) bleeding. Sometimes atypical findings such as fever, weight loss, or septic shock may also be present.^[7] We believe that the aortoduodenal fistula in this case developed due to graft thrombosis and migration, followed by infection. Because the graft was thrombosed from the main body, the patient did not experience massive GI bleeding; instead, melena was present and the septic condition was predominant.

The case we present was lost due to this rare and fatal complication that developed in the long term. Reflecting on this case, the question of whether the decision for the index AAA

intervention would have been more appropriate in favor of OAR inevitably arose. Although there is no definitive answer to this question, we recognize the need for a much more detailed, meticulous, and comprehensive evaluation when deciding which intervention to apply in similar cases. We believe that, compared with the previous decade, greater consideration should be given to OAR and its long-term advantages.

In conclusion, the preference for EVAR in patients with long life expectancy who are also suitable candidates for OAR may lead to an increase in long-term complications. To reduce such complications, patient selection should be performed meticulously and the most appropriate method should be chosen for each patient. In particular, centers with extensive experience in open surgery should consider OAR over EVAR in patient groups with long life expectancy. By presenting this rare and fatal EVAR complication, we hope to contribute to decision-making in the treatment of AAA.

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OLGU SUNUMU - ÖZ

**Endovasküler anevrizma onarımının nadir ve ölümcül geç dönem komplikasyonu:
Endogreftin duodenuma göçü**

Endovasküler anevrizma onarımı (EVAR), uygulama kolaylığı, hastanede kalış süresinin kısılması ve açık cerrahiye tolere edemeyen hastalar için iyi bir alternatif olması nedeniyle abdominal aort anevrizmaları (AAA) için giderek popülerlik kazanan bir tedavi yöntemidir. EVAR'ın erken dönem sonuçları açık cerrahiye göre daha iyi olmakla birlikte, endoleak, migrasyon, endogreft uzuvlarında tromboz/kıvrılma, greft enfeksiyonu ve sekonder rüptür gibi komplikasyonlar görülebilir. Bu çalışmada, yaklaşık 10 yıl önce başka bir kurumda EVAR uygulanan ve genel durumunda bozulma, ateş ve melena şikayetleriyle kliniğimize başvuran bir hastayı sunuyoruz. 73 yaşında erkek hastanın laboratuvar incelemesinde beyaz kan hücresi (WBC) sayısı 17100, hemoglobin düzeyi 9.5 g/dL ve C-reaktif protein (CRP) düzeyi 261 g/L olarak bulundu. Bilgisayarlı tomografi (BT), EVAR greftinde tromboz, greft etrafında serbest hava, greft stentlerinde kırıklar ve sağ bacağın iliak bifurkasyon seviyesinde aortun dışına yer değiştirdiğini gösterdi. Endogreftin duodenuma doğru göç ettiği ve fistüleştigi görüldü. Sepsis ile başvuran hasta acil ameliyata alındı. İlk olarak sol bacadaki iskemiye gidermek için sol aksillofemoral baypas yapıldı. Daha sonra genel cerrahi ve kalp damar cerrahisi bölümlerinin ortak katılımıyla laparotomi yapıldı. Karın içi fekal kontaminasyon ve sigmoid kolon rüptürü görüldü. Karın yıkandı, sigmoid kolon ve rektum eksize edildi ve kolostomi oluşturuldu. Daha sonra aortotomi yapılarak greftin ana gövdesi ve sol bacağı çıkarıldı. Duodenum açıldı ve fistüle olmuş sağ bacak endogrefti de çıkarıldı. Karın içi kontaminasyon, sağ bacadaki muhtemelen kronik sürece bağlı yeterli kollateral dolaşım ve iskemi olmaması nedeniyle ek vasküler girişime gerek duyulmadı. Aort infrarenal seviyede bağlandı ve hasta yüksek inotropik destek alarak yoğun bakım ünitesine alındı. Hasta, postoperatif 8. saatte kaybedildi. Bilgilerimize göre, literatürde daha önce bildirilmemiş bu nadir ve benzersiz olguyu sunmamızın amacı, EVAR'ın uzun dönem komplikasyonlarına dikkat çekmek ve yüksek yaşam beklentisi olan hastalarda açık cerrahinin önemini vurgulamaktır.

Anahtar sözcükler: Abdominal aort anevrizması; endovascular anevrizma onarımı; uzun dönem komplikasyon.

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