Case Report

Total Occlusion of Abdominal Aortic Endograft Successfully Treated with Axillofemoral Bypass

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We report a case of total occlusion of a Zenith bifurcated stent graft 16 months after implantation. A 72-year-old man was admitted to our hospital complaining of bilateral lower extremity numbness, followed by severe rest pain 4 h after sudden onset of symptoms. Computed tomography showed total occlusion of the endograft at the mid-portion of the main body. He underwent left axillofemoral bypass using a reinforced polytetrafluoroethylene T-shaped graft, leading to resolution of symptoms 7 h after onset. Axillofemoral bypass successfully relieved acute lower extremity ischemia caused by total occlusion of the abdominal aortic endograft.

Keywords: abdominal aortic endograft, total occlusion, axillofemoral bypass

Introduction

Endovascular aneurysm repair (EVAR) has become a standard therapy for abdominal aortic aneurysm on account of its benefits, including minimal invasiveness and quick recovery. However, device-related complications can occur in the mid to late postoperative period and some patients need to undergo re-intervention. Endograft occlusion, a serious late complication following EVAR, has been reported to have an incidence ranging from 1.1% to 7.1%.1-9 Typically, endograft limb occlusion occurs unilaterally. If endograft occlusion occurs acutely in the bilateral limb or the main body of the endograft, its pathological condition may be similar to that of acute occlusion of the abdominal aorta, a life-threatening disease associated with high morbidity and mortality. Here we report a case of abdominal aortic endograft total occlusion that was successfully managed with axillofemoral bypass; in addition, we discuss the treatment strategies for this critical situation.

Case Report

A 72-year-old man was admitted to an emergency department of a district hospital, complaining of sudden bilateral lower extremity numbness and severe rest pain. At the age of 62, he had undergone mechanical valve replacement for aortic valve stenosis and permanent pacemaker insertion for sick sinus syndrome at the same hospital. Sixteen months ago, he had undergone abdominal aortic endograft implantation for infrarenal abdominal aortic aneurysm at a different hospital. Preoperative computed tomography (CT) showed the maximum aneurysm diameter of 62 mm, the neck angulation of 77°, and the terminal aorta diameter of 21 mm (Fig. 1). A Zenith endovascular graft (Cook Inc., Bloomington, Indiana) was implanted through the right femoral approach. The procedure was performed successfully and the postoperative course was uneventful. A postoperative CT showed the neck angulation of 56° and the terminal aorta diameter of 21 mm (Fig. 1). Preoperative CT showed the neck angulation of 56° and the terminal aorta diameter of 21 mm (Fig. 1). The patient was discharged from the hospital with no endoleak. Subsequently, he had been regularly followed-up for anticoagulation therapy at a local hospital. He had not experienced intermittent claudication previously.

On further examination at the district hospital, a CT showed an abdominal endograft implanted from below the orifice of the renal arteries to the bilateral common iliac arteries with complete occlusion at the mid-portion of the main body (Fig. 2). The neck angulation was 54°, and the terminal aorta diameter of 21 mm (Fig. 2). Preoperative echocardiography showed that there was no obvious thrombus in the left atrium and the left ventricle, and around the mechanical aortic valve. A diagnosis of acute endograft occlusion was made. The patient was transferred to our hospital 4 h after the onset of symptoms for
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emergency treatment. On physical examination, his arterial blood pressure was 180/84 mmHg and the bilateral femoral arteries were not palpable. The lower extremities were cyanotic and cold. Concomitantly, the patient complained of severe rest pain in the gluteal area and lower extremities. Although paralysis did not develop, sensory perception of numbness was observed. Laboratory tests showed an increased white blood cell count of 11900/µL. The level of serum creatine kinase was not elevated (161 IU/dL) and international normalized ratio of prothrombin time (PT-INR) was not prolonged (1.17). He was immediately taken to the operating room.

The patient was placed in the supine position. Under general anesthesia, balloon embolectomy was performed from the bilateral common femoral arteries. On both sides, a 4-Fr balloon catheter was passed distally and a massive clot was removed from the superficial femoral artery and profunda femoris, leading to restoration of normal retrograde flow. Next, a 5-Fr balloon catheter was inserted proximally toward the iliac arteries; however, the balloon catheter did not pass through the limbs of the endograft. We did not use the guidewire for passing through the occluded endograft. Complete removal of the clot failed, as a result, antegrade normal flow did not resume in both common femoral arteries. Thus, left axilllobifemoral artery bypass was performed using an 8-mm reinforced polytetrafluoroethylene T-shaped graft. Thereafter, perfusion to the bilateral lower extremities successfully resumed 7 h after the onset of symptoms, without hyperkalemia after reperfusion. The operation time was 225 min.

The postoperative course was complicated by acute kidney injury caused by rhabdomyolysis. The serum creatinine level was elevated to 2.6 mg/dL on postoperative day (POD) 4; however, urine output was maintained through administration of diuretics. The elevated serum creatinine level decreased thereafter without renal replacement therapy. Reconstructive three-dimensional CT scan performed 1 week after the operation showed a thrombosed abdominal endograft and a patent axillobifemoral bypass graft (Fig. 3). The patient complained of severe rest pain in the lower extremities during the early postoperative period. Ischemic muscle damage was restored to the level of cane walking. On POD 23, the patient was transferred to the previous hospital for further rehabilitation. The patient was alive and well at 6-month follow-up.

**Discussion**

Endograft occlusion is a serious late complication of EVAR. We observed one case of unilateral limb occlusion of a Zenith bifurcated stent graft among a total of 187 EVAR cases at Saitama Red Cross Hospital and Saitama Medical Center, Jichi Medical University, between January 2008 and
December 2013. In most cases, endograft occlusion occurs in the unilateral endograft limb. Compared with unilateral limb occlusion, bilateral limb occlusion is relatively uncommon, with a reported incidence ranging from 0% to 0.6% and accounting for 0% to 15% of endograft occlusion cases. Total occlusion of the main body of the bifurcated stent graft is a rare condition and no previous studies have been reported on its detailed therapeutic process.

More than 90% of endograft occlusions occur within the first year after EVAR, typically within the first 3 months. The most common clinical presentation of endograft occlusion is acute limb ischemia, including numbness, sensory loss, rest pain, and loss of motor function. The reported incidence of acute limb ischemia is 50%-68%. Endograft occlusion can present with chronic claudication without rest pain in 30%-50% of patients or may become evident during follow-up imaging study in 17%-20% of patients. This patient experienced acute endograft occlusion 16 months postoperatively without any prodromal symptoms. Recent study reported that endograft morphology can be changed chronologically after implantation. The late morphological change might be related to the occurrence of endograft occlusion. In addition, PT-INR was not prolonged at the time of admission in spite of anticoagulation therapy. Although preoperative echocardiography did not show an obvious thrombus, there is a possibility that a thrombus caused by inadequate anticoagulation therapy might have occluded the main body of the endograft. Previously, several technical and anatomical factors have been reported to provoke endograft limb occlusion following EVAR. These include smaller limb diameter, kinking of endograft, extension of the graft limb to the external iliac artery, severe tortuosity of the iliac arteries, and narrow aortic bifurcation. CT imaging data in this patient suggested that limb kinking in the terminal abdominal aorta may have induced narrowing of the endograft limb lumen, leading to main body occlusion of the endograft.

There are some variations in the incidence of limb occlusion among commercially available endovascular devices. Second- or third-generation endografts have been reported to have lower incidences of graft occlusion than first-generation endografts. Notably, Gore Excluder endoprosthesis (W.L. Gore & Associates, Flagstaff, Arizona), one of the currently available third-generation endografts, has been reported to more suitable for complex iliac anatomy, with a limb occlusion incidence of 0%-1.4%, which is lower than that of Zenith stent graft (4.8%-5.5%) or Endurant endograft (Medtronic Inc, Minneapolis, Minnesota) (3.4%).

Treatment modalities for endograft limb occlusion are determined by the area and length of thrombosis, pattern of disease progression, clinical presentation, and severity of leg ischemia. In cases of acute limb occlusion, urgent revascularization is mandatory. Particularly, acute bilateral limb occlusion, which clinically resembles acute abdominal aortic occlusion, requires prompt diagnosis and emergency surgical intervention. Percutaneous treatments include thrombolytics with or without additional stent placement. Open surgical repair procedures include embolectomy with or without endograft replacement, anatomic bypass, and extra-anatomic bypass, such as femorofemoral crossover bypass and axillofemoral bypass. If remnant thrombus is expected to remain in an endograft after successful thrombectomy, additional endograft insertion would have been a preferable treatment option to reestablish the anatomic blood route. We initially tried to open embolectomy; however, the clot in the endograft limbs could not be removed. Therefore, we selected extra-anatomic axillo-bifemoral bypass to achieve prompt perfusion to the ischemic legs of the critically ill patient because 5:30 h had already passed from the onset of symptoms to entrance into the operating room. Although axillofemoral bypass can be a treatment option for chronic bilateral limb occlusion, it is mainly used for limb salvage and has inferior late survival for aortoiliac occlusive disease. Therefore, careful CT examination will be needed to prevent late occlusion and other adverse events during the outpatient follow-up period.

**Conclusion**

We experienced an extremely rare case of acute total occlusion of the main body of a Zenith bifurcated stent graft 16 months after implantation. Prompt revascularization using axillofemoral bypass successfully relieved profound lower extremity ischemia. Although careful follow-up is
needed, axillobifemoral bypass may be an effective treatment for patients with critical ischemia caused by acute bilateral limb occlusion or main body total occlusion.

**Disclosure Statement**

The authors have no conflict of interest to disclose.

**References**


