

Successful hybrid repair for ruptured abdominal aortic aneurysm caused by type IIIa endoleak resulting from a disconnected contralateral limb

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ABSTRACT

The occurrence of a type IIIa endoleak after endovascular aortic repair is a rare, but crucial, complication leading to rupture. Treatment of a ruptured abdominal aortic aneurysm caused by a type IIIa endoleak can sometimes be challenging. We have reported the case of a 78-year-old man who had presented with a ruptured abdominal aortic aneurysm caused by a type IIIa endoleak resulting from disconnection of a contralateral limb. The patient underwent hybrid repair using manual reconnection of the limbs with laparotomy and an endovascular technique, including balloon occlusion of the infrarenal aorta and new contralateral limb deployment. We found this hybrid repair to be an effective and minimally invasive procedure when total endovascular repair would have been difficult. (J Vasc Surg Cases Innov Tech 2022;8:417-20.)

Keywords: Abdominal aortic aneurysm; Disconnected stent graft limb; Endoleak; Endovascular aneurysm repair; Rupture

Endoleak can be a crucial complication leading to rupture after endovascular aortic repair (EVAR). The definition of a type III endoleak, based on the Society for Vascular Surgery reporting standards, is leakage between the endograft components or fabric disruption. A type IIIa endoleak involves a disconnection between the main body and the contralateral limb or disconnection of the iliac limb from the ipsilateral distal extension or the proximal cuff from the main body.¹ In the present report, we have described the case of hybrid repair using combined laparotomy and an endovascular technique to treat a ruptured abdominal aortic aneurysm (AAA) caused by a type IIIa endoleak resulting from disconnection of a left contralateral limb from the limb of the main body. The patient provided written informed consent for the report of his case details and imaging studies.

CASE REPORT

A 78-year-old man with a history of hypertension, dyslipidemia, chronic kidney disease, and pacemaker implantation who had

undergone EVAR using a Zenith endovascular graft (Cook Medical Inc, Bloomington, IN) at another institution 9 years previously had presented to the emergency department of our hospital with acute abdominal pain. The patient's blood pressure was 86/56 mm Hg, his respiratory rate was 30 breaths/min, and his heart rate was 120 beats/min on arrival to the emergency department. He was intubated shortly after his arrival. Pulselessness and pallor in the left lower extremity were also significant. Contrast-enhanced computed tomography showed a large retroperitoneal hematoma surrounding an AAA (maximum diameter, 73 mm) and disconnection of the left contralateral limb from the main body limb. A part of the aneurysm was enhanced by contrast medium, indicating the presence of a type IIIa endoleak (Fig 1). His hemodynamic state was becoming unstable in the emergency department. Therefore, a 4F sheath was percutaneously inserted via the right femoral artery. The aortic balloon was inserted during the interventional procedure room in the usual sterile manner. A pigtail catheter was passed into the descending aorta via the 4F sheath under fluoroscopic guidance. A stiff guidewire was passed into the descending aorta via the 4F sheath, and the sheath was then replaced with a 12F DrySeal flex introducer sheath (W.L. Gore & Associates, Flagstaff, AZ). A Reliant stent graft balloon catheter (Medtronic, Santa Rosa, CA) was inflated in the main body of the stent graft via the right femoral artery through the DrySeal sheath for aortic occlusion before he was transported to the operating room. He was placed in the supine position, and median laparotomy was performed, during which the blood pressure increased from 68/49 mm Hg to 168/88 mm Hg. A moderate amount of hemorrhagic ascites and retroperitoneal hematoma was found. After the aneurysm had been minimally incised without exposure of either the other side of the aorta or the common iliac arteries, the disconnected left contralateral limb, which had originated from the limb of the main body, was found inside the aneurysm. We found no evidence

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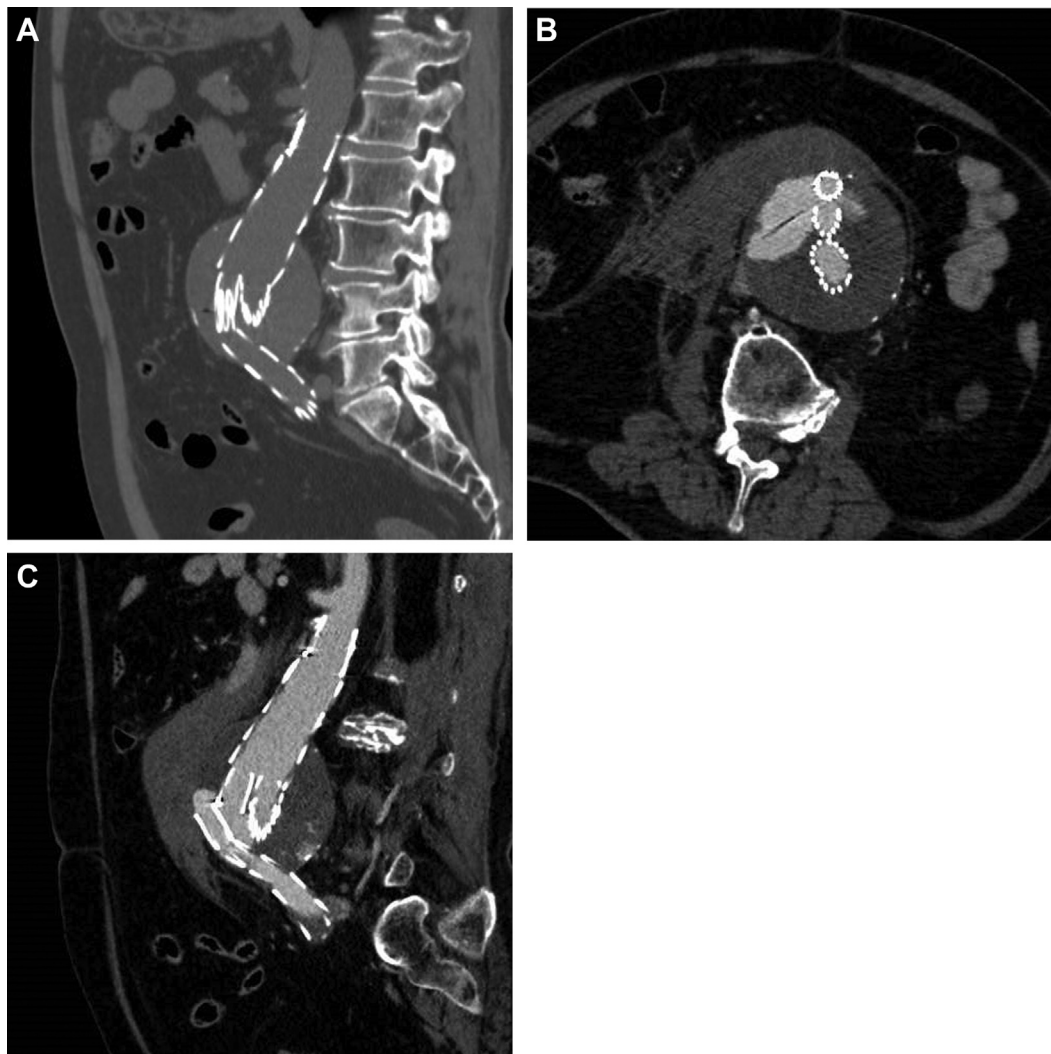


Fig 1. **A**, Computed tomography scan from 6 years before the current presentation, after endovascular aortic repair, showing that only one half of the first stent of the contralateral limb had overlapped with high angulation formed where the line of the main body had crossed the line of the contralateral limb. **B**, Contrast-enhanced computed tomography scan showing a major endoleak, a large retroperitoneal hematoma, and three parts of the stent graft limbs. **C**, Contrast-enhanced computed tomography scan with sagittal section showing disconnected stent graft limb.

of a type I or II endoleak, with bleeding controlled after entering the sac. Fresh thrombus was found inside the left contralateral limb. Blood back flow from the left contralateral limb after removal of the thrombus was noted. Manual reconnection of the main body limb and disconnected limb with ~10 mm of overlap was performed after the left contralateral limb had been clamped (Fig 2). After reconnection of the left limbs, the Reliant stent graft balloon catheter (Medtronic) was deflated, and the clamping of the left contralateral limb was released. This portion of the procedure required ~30 minutes from the abdominal incision to deflation of the aortic occlusion balloon. No fabric defect of the left limb that could have resulted in a type IIIb endoleak was found. Next, the left common femoral artery was exposed. An 8F sheath was inserted into the left

common femoral artery. A stiff guidewire was passed into the descending aorta via the 8F sheath, and the sheath was then exchanged for a 14F DrySeal Flex Sheath (W.L. Gore & Associates). Next, an Excluder contralateral limb (W.L. Gore & Associates) was deployed over 5 mm inside the main body to the old left contralateral limb to prevent the recurrence of a type IIIa endoleak. Completion angiography showed no evidence of an endoleak (Fig 3). Open abdominal management was performed to prevent postoperative abdominal compartment syndrome, and the patient was transferred to the intensive care unit in a stable condition. Abdominal closure was performed on postoperative day (POD) 2. The patient was extubated on POD 4 and transferred to the general ward on POD 9. Contrast-enhanced computed tomography angiography on POD 11 showed no

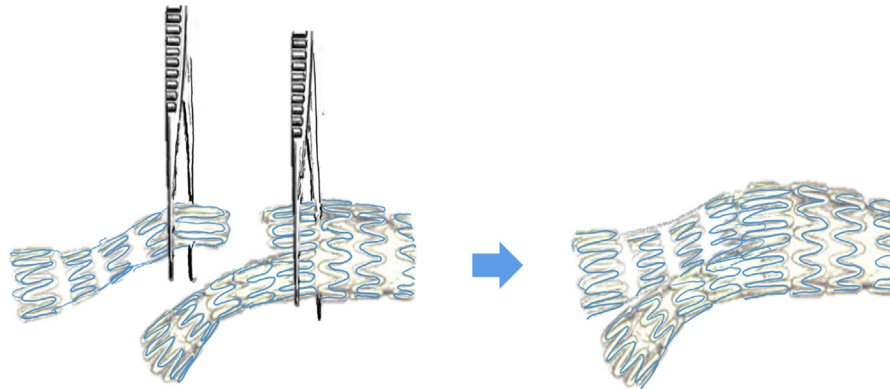


Fig 2. The disconnected stent graft limb was manually reconnected to the limb of the main body.



Fig 3. Completion angiography showing no evidence of an endoleak or stent graft occlusion.



Fig 4. Three-dimensional computed tomography angiography on postoperative day (POD) 11 showing no migration or disconnection of the left contralateral limb.

evidence of an endoleak or migration of the stent grafts (Fig 4). The patient was discharged without any complications on POD 37.

DISCUSSION

When an AAA is anatomically suitable, EVAR is considered a safe treatment often used for unruptured AAAs, especially in elderly patients. However, endoleaks can occur and will lead to enlargement or rupture of an AAA. Zoethout et al² reported that the total endoleak

rate for elective EVAR was 17%. Type III endoleaks are uncommon, with an incidence ranging from 2.1% to 4.5%.³⁻⁵ The main cause of a type IIIa endoleak is inadequate attachment of the overlaps at the junction between components.⁶ In the present case, we suspected that disconnection of the components of the limb had occurred because of the high angulation formed where the line of the main body crossed the line of the contralateral limb. Several procedures for repair of type IIIa endoleaks have previously been reported.⁶⁻⁸

We initially considered total endovascular repair. However, we considered total endovascular repair to be difficult because of the positional relationship between the gate of the main body and the contralateral limb, in addition to the small working space in the aneurysm sac. We, therefore, selected hybrid repair to ensure a

quick repair. Some advantages are associated with our hybrid repair. The use of this procedure will allow for faster repair of a ruptured AAA and restore lower limb ischemia than total open or endovascular repair. In addition, high intra-abdominal pressure will be more quickly relieved than with total endovascular repair. The use of laparotomy can decrease intra-abdominal pressure and help stabilize the hemodynamic state, especially in the case of a ruptured AAA with a large retroperitoneal hematoma, such as in the present patient. Bellamkonda and Chaar⁸ reported a graft interposition technique between the main body and detached limb as an alternative to open reconstruction. The graft interposition technique also seems useful but requires a longer aortic clamp time than our hybrid repair procedure. Furthermore, because our procedure did not necessitate suprarenal or celiac aortic clamping, the risk of visceral ischemia was decreased. In addition, a minimal incision of the retroperitoneum and aneurysm reduced the bleeding compared with total open repair.

Our hybrid repair approach involves manual reconnection of the limb of the main body and the disconnected contralateral limb via laparotomy with infrarenal aortic balloon occlusion and additional new contralateral limb deployment via an endovascular technique. We considered this technique to be the ideal approach in the present case.

CONCLUSIONS

Hybrid repair using manual reconnection of the limbs via laparotomy and an endovascular technique involving balloon occlusion of the infrarenal aorta and additional

new contralateral limb deployment for the treatment of a ruptured AAA caused by a type IIIa endoleak resulting from disconnection of a contralateral limb was found to be an effective and minimally invasive procedure when the use of total endovascular repair would have been difficult.

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