

A Case of Endovascular Treatment of Severe Graft Limb Kinking after Endovascular Abdominal Aortic Aneurysm Repair

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Endovascular aneurysm repair (EVAR) has been recommended as an alternative to open aneurysm repair. The risk of severe perioperative complications is lower than that in open surgical repair; however, late complications are more likely. After EVAR, regular yearly surveillance by duplex ultrasonography or computed tomography is recommended. We report the case of a 67-year-old man with a severely kinked left iliac branch of the stent graft 10 years after EVAR. He had not undergone regular follow-up during the last 4 years. We realigned the endograft kink by percutaneous transluminal angioplasty.

Key Words: Abdominal aortic aneurysm, Endovascular procedures, Angioplasty

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INTRODUCTION

Abdominal aortic aneurysm (AAA) is a pathological abdominal aortic dilation greater than 50% in diameter [1]. As endovascular abdominal aortic aneurysm repair (EVAR) is less invasive and has a lower early mortality rate than open surgery [2], with almost similar long-term survival [3], it is considered effective for the treatment of AAAs, especially in high-risk patients. However, late complications are more likely after EVAR; thus, yearly regular surveillance is recommended.

Stent graft kinking is a complication of EVAR. We report a patient who underwent endovascular repair of an AAA and did not undergo follow-up since 2010. Kinking of the left graft limb was followed by gradual enlargement of the left common iliac artery (CIA).

CASE

A 67-year-old man visited our clinic with a complaint of left leg pain. He was on medications for hypertension. In 2005, he underwent EVAR of an infrarenal AAA at another hospital but did not undergo follow-up since 2010. The computed tomography (CT) performed in 2010 did not reveal any endoleak but revealed an aneurysmal dilatation of both CIA with mild kinking of the left limb stent graft (Fig. 1).

To assess the EVAR graft patency, first, we measured the ankle brachial index (ABI) and performed an angio-CT. The left ABI was significantly decreased to 0.85. Angio-CT revealed that the aneurysm sac was around 7.2 cm and located at the infrarenal area, and that the left CIA was significantly dilated up to 41 mm. No definite signs of endoleak were found at the levels of the main and distal bodies. However, the left iliac branch of the stent graft showed cranial dislodgement into the aneurysm and



Fig. 1. The angio-computed tomography image obtained in 2010 showing the aneurysmal dilatation of both common iliac artery with mild graft kinking of the left limb graft.

significant kinking (Fig. 2).

Based on serial CT images of 2006, 2010, and 2014, we finally confirmed that the left limb stent graft was kinked, followed by gradual enlargement of the left CIA. Therefore, we decided to repair the kinked stent graft with another stent graft.

To prevent further enlargement of the CIA aneurysm, we planned to place an additional limb extension graft from the CIA to the external iliac artery (EIA) with ipsilateral internal iliac artery (IIA) embolization. First, a 0.35-mm hydrophilic curved wire supported with a Judkins right 5-Fr catheter was passed through the kinked stent graft from the left common femoral artery. Then, the hydrophilic wire was exchanged with a super-stiff wire to obtain strong support for stent graft delivery. Next, we advanced the delivery sheath until it crossed the kink site to correct the deformation of the previous stent graft. Finally, we placed a stent graft (Endurant; 16x16x124 mm, Medtronic, Minneapolis, MN, USA) from the aortic bifurcation to the mid-portion of the CIA. After ensuring successful correction of the kinked stent graft, the left IIA was embolized by using eight coils through a microcatheter. Complete embolization of the left IIA was confirmed on angiography. Finally, an additional extension limb stent graft (Endurant, 16x13x95 mm), which covered the length from the left CIA to the EIA, was inserted and post-balloon dilatation was performed. Final angiography showed no endoleak. On day 3, a follow-up CT showed no evidence of endoleak (Fig. 3). The kinking of the original stent graft was significantly improved compared with that on previous CT images.

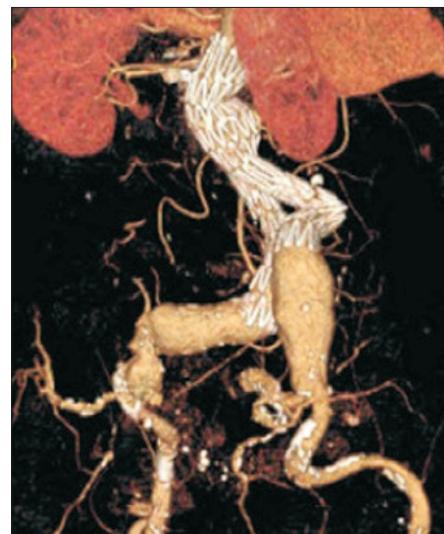


Fig. 2. The angio-computed tomography image obtained in 2014 showing the kinked left limb stent graft. The aneurysm sac located at the infrarenal area is around 7.2 cm. The common iliac artery is dilated up to 41 mm. No definite sign of endoleak is seen at this level.

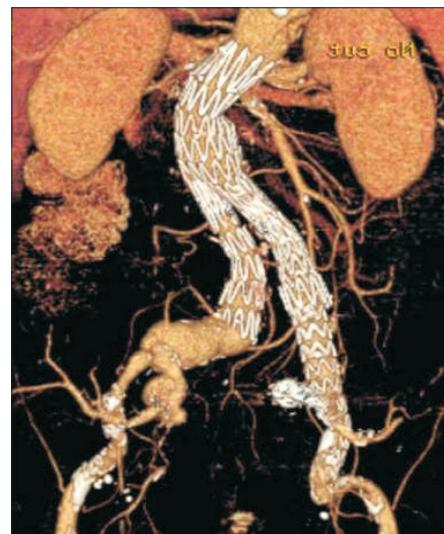


Fig. 3. Follow-up angio-computed tomography image showing significant improvement of kinking after repair with additional stent grafts.

DISCUSSION

Kinking of the aortic stent graft may cause endoleak and possible graft rupture [4]. The reported incidence of graft kinking within a mean follow-up of 22 month is 3.7% [5]. Stent graft kinking can result in flow restriction, lumen stenosis causing graft thrombosis, and occlusion. A study showed a 7.1% occlusion rate [6] in patients who had no stent reinforcement [7].

No definite theory can explain the formation of graft kinking, but several mechanisms of kinking have been postulated. The first mechanism is the “accordion effect.” The shortening of the endovascular stent graft after release is followed by re-expansion of the stent itself to its natural length as a result the gradual distortion of the stent [8]. After EVAR, the vessel remodeling effect on the stent graft leads to kinking with an associated risk of endovascular stent graft occlusion [9]. Migration of the stent graft at the level of the proximal or distal fixation has also been reported as the cause of such geometric distortion. Rhythmic pulsations cause longitudinal stress in the stent graft, resulting in change in stent shape [10]. The period of implantation and type of endovascular stent-graft have been correlated in the presence of kinking. Vangaurd endovascular stent-graft (Boston Scientific, Oakland, CA, USA) endovascular stent-grafts were associated with higher risk of kinking compared with other types of stent-graft [5].

Although the incidence of severe complication after

EVAR is relatively low, severe kinking could result in loss of limb function. Endoleak sometimes cannot be corrected by endovascular treatment and requires surgical treatment. In this case, native vessel remodeling after EVAR, especially the gradual enlargement of the CIA, caused graft dislodgement, which finally led to a significant graft limb kinking. If the stent in the present patient had been monitored regularly as graft kinking progressed, the stent kinking could have been easily corrected before the onset of a claudication symptom. For this reason, lifelong surveillance and appropriate reintervention are essential after EVAR.

In conclusion, our case shows the importance of long-term regular follow-up after EVAR for early detection of stent graft complications, including morphological change, decreased flow, and luminal stenosis. An additional stent graft with IIA embolization could be a good treatment option for endograft kinking by aneurysmal dilatation of the CIA or the EIA.

REFERENCES

- 1) Johnston KW, Rutherford RB, Tilson MD, Shah DM, Hollier L, Stanley JC. Suggested standards for reporting on arterial aneurysms. Subcommittee on Reporting Standards for Arterial Aneurysms, Ad Hoc Committee on Reporting Standards, Society for Vascular Surgery and North American Chapter, International Society for Cardiovascular Surgery. *J Vasc Surg* 1991;13:452-458.
- 2) Liakishev AA. Comparison of endovascular aneurysm repair with open repair in patients with abdominal aortic aneurysm, 30-day operative mortality results: randomised controlled trial. Results of the EVAR 1 trial. *Kardiologiiia* 2004;44:90.
- 3) United Kingdom EVAR Trial Investigators, Greenhalgh RM, Brown LC, Powell JT, Thompson SG, Epstein D, et al. Endovascular versus open repair of abdominal aortic aneurysm. *N Engl J Med* 2010;362:1863-1871.
- 4) Krämer SC, Seifarth H, Pamler R, Fleiter T, Görich J. Geometric changes in aortic endografts over a 2-year observation period. *J Endovasc Ther* 2001;8:34-38.
- 5) Fransen GA, Desgranges P, Laheij RJ, Harris PL, Becquemin JP; EUROSTAR Collaborators. Frequency, predictive factors, and consequences of stent-graft kink following endovascular AAA repair. *J Endovasc Ther* 2003;10:913-918.
- 6) Ilyas S, Shaida N, Thakor AS, Winterbottom A, Cousins C. Endovascular aneurysm repair (EVAR) follow-up imaging: the assessment and treatment of common postoperative complications. *Clin Radiol* 2015;70: 183-196.
- 7) Sivamurthy N, Schneider DB, Reilly LM, Rapp JH, Skovobogatyy H, Chuter TA. Adjunctive primary stenting of Zenith endograft limbs during endovascular abdominal aortic aneurysm repair: implications for limb patency. *J Vasc Surg* 2006;43:662-670.
- 8) White GH, May J, Waugh R, Harris JP, Chaufour X, Yu W, et al. Shortening of endografts during deployment in endovascular AAA repair. *J Endovasc Surg* 1999;6:4-10.
- 9) Harris P, Brennan J, Martin J, Gould D, Bakran A, Gilling-Smith G, et al. Longitudinal aneurysm shrinkage following endovascular aortic aneurysm repair: a source of intermediate and late complications. *J Endovasc Surg* 1999; 6:11-16.
- 10) Umscheid T, Stelter WJ. Time-related alterations in shape, position, and structure of self-expanding, modular aortic stent-grafts: a 4-year single-center follow-up. *J Endovasc Surg* 1999;6:17-32.