Endovascular stent-grafting for traumatic aortic aneurysms with the use of a fenestrated stent-graft

Taijiro Sueda, MD,^a Kazumasa Orihashi, MD,^a Masanabu Watari, MD,^a Kenji Okada, MD,^a Osamu Ishii, MD,^a and Akira Naito, MD,^b Hiroshima, Japan

Endovascular stent-grafting is becoming common as a new method for repairing an aneurysm of the descending aorta.¹ In most cases, a stent-graft is indicated for a dissecting aortic aneurysm² in the descending aorta. We devised a fenestrated stent-graft in which a U-shaped fenestration was made at the greater curvature of the graft and prevented obstruction of the left subclavian artery. Here, we describe a case of traumatic aortic aneurysm in the proximal descending aorta that was managed with a fenestrated stent-graft.

Clinical Summary

The patient was a 74-year-old man. While driving, he had a traffic accident and received a blunt injury to the thorax. After admission to the emergency room, he was found to have a hemothorax and fractured ribs on the left side. A contrast-enhanced computed tomographic (CT) scan revealed a traumatic aortic aneurysm in the proximal descending aorta (Figure 1, *a*). After receiving vasodilating therapy, he was transferred to our hospital for radical therapy. An aortic angiogram showed a pseudoaneurysm 5 × 5 × 4 cm in size in the lesser curvature of the proximal descending aorta (Figure 2, *a*). The aneurysm was situated in the proximal descending aorta just below the ductus arteriosum. The aortic wall was smooth and the iliac arteries were not curved. Therefore, endovascular stent-grafting was indicated in this case. A thin-walled woven Dacron vascular graft (Ube Industries, Ltd, Tokyo, Japan, porosity 350 mL) with a diameter of 26 mm was fabricated. The steel Z-shaped stent was made with a steel guide wire (0.2 mm in diameter), covered with the vascular graft, and fixed to the graft wall with multiple interrupted sutures. The proximal greater curvature of the stent-graft was trimmed and fenestrated to make a U-shaped window 2 cm in width and 3 cm in depth. We put radiopaque markers around the fenestrated window to show the orientation of the window. The stent-graft was introduced into a sheath catheter 18F in diameter. The right femoral artery was exposed and a small aortotomy was performed on the anterior wall of the femoral artery. The sheath catheter was then inserted into the lumen of the descending aorta beyond the left subclavian artery. The proximal end of the stent-graft was placed to the aortic arch and the fenestrated window of the stent-graft was directed toward the left subclavian artery. While the proximal end of the stent-graft was delivered into the aorta and the fenestrated window expanded partially, the direction of the fenestrated window was adjusted by rotating the sheath catheter under radiofluoroscopy. Then, the whole stent-graft was delivered into the aorta and the stent-graft was dilated with a balloon catheter. A contrast-enhanced CT scan showed total elimination of the pseudoaneurysm in the proximal descending thoracic aorta (Figure 1, *b*). Postoperative aortography revealed that the traumatic pseudoaneurysm was completely closed by the endovascular stent-graft coverage and the left subclavian artery was not obstructed (Figure 2, *b*). There was no serious complication after the endovascular stent-grafting procedure. The patient was discharged from the hospital 20 days after endovascular stent-grafting.

From the First Department of Surgery^a and the Department of Radiology,^b Hiroshima University School of Medicine, Hiroshima, Japan.

Received for publication Oct 19, 2000; accepted for publication Nov 14, 2000.

Address for reprints: Taijiro Sueda, MD, Professor, Department of Surgery, Hiroshima University School of Medicine, 1-2-3 Minami-ku, Hiroshima, 734-8551, Japan (E-mail: sueda@mc.ai.med.hiroshima.u.ac.jp).

J Thorac Cardiovasc Surg 2001;122:144-6

Copyright © 2001 by The American Association for Thoracic Surgery

0022-5223/2001 \$35.00 + 0 12/54/113016

doi:10.1067/mtc.2001.113016

Figure 1. Preoperative and postoperative CT scan appearances. Preoperative contrast-enhanced CT scan revealed a traumatic aortic aneurysm in the proximal descending aorta (a). Postoperative contrast-enhanced CT after stent-graft deployment confirmed absence of aneurysm filling (b).

Figure 2. Preoperative and postoperative digital subtraction angiography. Preoperative aortic angiogram showed a saccular pseudoaneurysm 5 × 5 × 4 cm in size in the lesser curvature of the proximal descending aorta (a). Postoperative aortography revealed that the traumatic pseudoaneurysm was completely closed by the endovascular stent-graft coverage and the left subclavian artery was not obstructed by the fenestrated stent-graft (b).

Discussion

Endovascular stent-grafting for aneurysms of the descending thoracic aorta is less invasive than the standard prosthetic replacement. Dake and associates¹ reported the feasibility of endovascular stent-grafting for aneurysms of the descending thoracic aorta via a catheter inserted from the femoral artery. They also applied stent-grafting in the treatment of aortic dissections² with obliteration of the true lumen. However, this method can only be applied to descending thoracic aor-

tic aneurysms. If the proximal end of the stent-graft is inserted into the aortic arch, obstruction of the left subclavian artery occurs frequently and leads to cerebral infarction. Inadequate insertion of the stent-graft into the distal arch aorta results in fetal endoleakage.³ Most traumatic aneurysms arise in the lesser curvature of the aortic arch below the ductus arteriosus, and deep insertion of the stent-graft into the aortic arch can easily obstruct the left subclavian artery. Accordingly, we used an endovascular stent-graft with a fenestrated

window. A fenestrated stent-graft has a U-shaped window in the greater curvature of the graft, which is made by cutting the proximal end of the stent-graft. The fenestrated window of the graft, which was directed toward the left subclavian artery, prevented obstruction of the orifice of the left subclavian artery despite deep insertion of the stent-graft into the aortic arch. We put radiopaque markers around the fenestrated window to show the orientation of the window with radiofluoroscopy. This alternative method has several advantages: no risk of obstruction of the left subclavian artery, a lower possibility of endoluminal leakage from the proximal end of the stent-graft, and a much shorter operative time. In addition, we can construct this stent-graft more easily than the branched stent-graft.⁴

References

1. Dake MD, Miller DC, Semb CP, Mitchell RS, Walker PJ, Liddell RP. Transluminal placement of endovascular stent-grafts for the treatment of descending thoracic aortic aneurysms. *N Engl J Med*. 1994;331:1729-34.
2. Slonim MD, Nyman U, Semb CP, Miller CD, Mitchell RS, Dake MD. Aortic dissection: percutaneous management of ischemic complications with endovascular stents and balloon fenestration. *J Vasc Surg*. 1996;23:241-53.
3. Mitchell RS, Dake MD, Semb CP, Fogarty TJ, Zarins CK, Liddell RP, et al. Endovascular stent-graft repair of thoracic aneurysms. *J Thorac Cardiovasc Surg*. 1996;111:1054-62.
4. Inoue K, Sato M, Iwase T, Yoshida Y, Tanaka T, Tamaki S, et al. Clinical endovascular placement of branched graft for type B aortic dissection. *J Thorac Cardiovasc Surg*. 1996;112:1111-3.

Targeted

The Journal of Thoracic and Cardiovascular Surgery gives you two tables of contents.

The condensed table of contents tells you at a glance what topics and authors are presented each month. The expanded table of contents gives you a brief abstract of each article. You select only those articles of most interest to you for further reading.