Endovascular aneurysm repair using the periscope graft technique for thoracic aortic anastomotic pseudoaneurysm

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Abstract

Replacement of an artificial graft in a redo lateral thoracotomy is extremely difficult with a high risk of lung injury. Endovascular intervention may be an ideal option in such conditions, as in the following case. A 75-year old man with a history of coronary artery bypass graft surgery developed a proximal anastomotic pseudoaneurysm 1 year after undergoing artificial proximal descending aorta replacement surgery. Thoracic endovascular aneurysm repair was performed successfully using the periscope graft technique to preserve the flow into the left subclavian artery from the distal side of the aortic stent graft. Since the patient had coronary artery bypass grafting, debranching of the left subclavian artery was considered too risky. Using the periscope graft technique, the pseudoaneurysm was successfully repaired preserving the left subclavian artery patency, thus obviating a side-to-side subclavian artery crossover bypass.

Keywords: Redo • Periscope graft • Endovascular aneurysm repair • Pseudoaneurysm

INTRODUCTION

Anastomotic pseudoaneurysm is a serious complication after thoracic aneurysm surgery, affecting ~3% of patients undergoing artificial graft implantation. Treatment for anastomotic pseudoaneurysms involves the replacement of an artificial graft through a redo lateral thoracotomy, which is extremely difficult because of adhesion, with a high risk of lung injury in up to 30% of the cases [1]. Thoracic endovascular aneurysm repair (TEVAR) is a reasonable option to avoid a redo thoracotomy, but it has risks of occluding the major branches from the aorta. By inserting a stent in the major branch with its free-end placed distal to the aortic stent graft (periscope graft technique), the patency can be preserved. We treated a 60-mm anastomotic pseudoaneurysm proximal to the descending aorta replacement, using the periscope graft technique.

CLINICAL SUMMARY

A 75-year old man complaining of chest discomfort was admitted to our hospital. His medical history included coronary artery bypass grafting (CABG) 8 years earlier (Fig. 1A), replacement of the proximal descending aorta with an artificial graft 1 year earlier, poorly controlled hypertension, diabetes mellitus and cerebral infarction. Computed tomography (CT) revealed an enlarging 60-mm aortic pseudoaneurysm at a proximal side of the vascular prosthesis replacement site (Fig. 1B and C).

At the time of replacement with an artificial proximal descending aorta 1 year earlier, the distal aortic arch could not be sufficiently dissected because of severe adhesion on the proximal side. As a result, damage and occlusion at the origin of the left subclavian artery were suspected, and a vascular bypass was added to the left subclavian artery using a 28-mm tube graft with one branch reimplanted in the descending aorta with the aim of preserving the patent left internal thoracic artery-anterior descending branch (LITA-LAD) bypass during anastomosis.

Taking into consideration the history of cerebral infarction and the low level of respiratory function, as well as the risk of redo lateral thoracotomy, TEVAR was selected as the surgical method [1]. Obstruction of the origin of the left subclavian artery to secure 20 mm for a proximal landing zone and deployment of the device from Zone 2 may cause an occlusion because of the short distance to the left subclavian artery. Therefore, a Talent device was selected from among the shortest commercial devices available in Japan.

Use of the periscope graft technique was required to preserve the collateral left subclavian artery bypass graft so that the device could obstruct the bypass graft entrance to the left subclavian artery, based on measurement of the treatment length after angiography. Therefore, a protective catheter for the bypass graft was inserted from the left femoral artery to the left subclavian artery. Since entry of the bypass graft to the left subclavian artery on the distal side is obstructed when deployment is performed from Zone 2, the periscope graft technique with an E-Luminexx vascular stent was used.

The kissing balloon technique was performed to avoid collapse of the periscope stent (Fig. 2A). For a type 2 endoleak from the left subclavian artery, coil embolization was performed and surgery was completed with no endoleak, and the bypass...
graft was patent via the periscope graft (Fig. 2B). The post-operative course was uneventful, and the patient was discharged on Day 14.

DISCUSSION

Replacement of an artificial graft in a redo lateral thoracotomy for thoracic aortic aneurysm is highly invasive and difficult because of adhesion, with a high risk of lung injury [1]. TEVAR is beginning to be used to reduce invasiveness and post-operative complications compared with conventional open surgeries [2, 3]. Several reports have shown the technical feasibility and therapeutic potential of TEVAR in redo cases. In TEVAR, it is important to prevent endoleaks for exclusion of an aneurysm. Thus, it is common to secure blood flow by adding a distal bypass to the debranching technique to secure a landing zone.

Debranching with the chimney technique is used in TEVAR to Zone 0, and it is performed on the proximal side of the stent graft in many cases. However, TEVAR is rarely performed with the periscope graft technique for preservation of a branch on the distal side of a stent graft, as in our case, and there have been few reports on such cases [4, 5].

Nevertheless, although a supraclavicular left carotid-subclavian bypass and a side-to-side subclavian artery crossover bypass

Figure 1: (A) 3DCT after CABG shows a patent left internal thoracic artery-anterior descending branch. (B and C) CT performed before TEVAR shows a non-uniform anastomotic pseudoaneurysm in the distal arch. Asterisk denotes the bypass graft from a 28-mm tube graft with one branch (J-Graft woven-graft, Japan Lifeline Co., Ltd., Tokyo, Japan) to the left subclavian artery. Black arrow denotes a 60-mm aortic pseudoaneurysm at a proximal anastomotic site.

Figure 2: (A) The kissing balloon technique with a Talent device TF3636C114XJ (Talent™ Thoracic Stent Graft; Medtronic, Minneapolis, MN, USA) and an E-Luminexx vascular stent (10 × 80 mm) (C.R. Bard, Inc., Tempe, AZ, USA) using a 46-mm reliant stent graft balloon (Medtronic) and a Fox Cross PTA catheter (9 × 40 mm) (Abbott, Abbott Park, IL, USA), respectively. Asterisk denotes the protective catheter for the bypass graft to the left subclavian artery and periscope graft (E-Luminexx). (B) CT after TEVAR shows that there is no endoleak and that flow to the left subclavian artery has been established via the chimney stent.
were not performed, TEVAR with the periscope graft technique was completed without complications.

In this case with a high risk of lung complications, favourable results were obtained from TEVAR with the periscope graft technique, which was selected because of suspected obstruction of the patent LITA-LAD bypass graft after CABG. The patient was discharged from hospital with no complications. Thus, TEVAR with the periscope graft technique in this patient was a bailout option in a life-threatening redo case.

In conclusion, since surgical invasion is extremely high in cases requiring reoperation, risk evaluation and careful determination of the therapeutic strategy are important. TEVAR with the periscope graft technique is safe and has low invasiveness, because the flexibility of the landing zone is high with appropriate anatomic conditions.

Conflict of interest: none declared.

REFERENCES


