Case report

Aortic insufficiency produced by stent-graft displacement

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Abstract

The following case report describes an unusual example of aortic valve damage caused by iatrogenic stent-graft rupture (disconnection of the proximal uncovered part of a stent-graft) during delivery of a proximal extension, resulting in the displacement of a stent-graft wire to the aortic root. The wire was extracted under cardiopulmonary bypass, using circulatory arrest, and the damaged aortic valve replaced by a mechanical valve.

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1. Introduction

Endovascular repair of thoracic aneurysms by a stent-graft (SG) is an accepted alternative to surgery. However, the durability of SG repair is questionable. The first generation ‘home made’ SGs, tubular with stainless steel wires, were problematic. Second generation stent-grafts, conical with nitinol wires, are more successful [1,2]. Fracturing of the metallic wire, suture breakage, or graft perforation is already well documented [3]. The following describes a case of structural failure in a previously implanted SG, and displacement of a metallic wire from this first-generation SG during the introduction of the new SG, with subsequent laceration of the aortic valve, leading to acute aortic insufficiency.

2. Case report

In 2001, a 32-year-old man suffered multiple injuries in an accident, with traumatic aortic rupture, located just below the origin of the left subclavian artery on the aortic arch concavity (Fig. 1a). It was immediately repaired using a SG (Ella Dacron Z-stent, Hradec Kralove, Czech Republic). He was re-admitted in January 2005 for pseudoaneurysm in the aortic arch, proximal to the graft. The primary aim of surgery was to add another SG (Gore Excluder, WL Gore, Flagstaff, AZ, USA) into the aortic arch after transposition of epiaortic vessels. The operation was performed via a midline sternotomy, using a reversed bifurcated prosthesis 14/7 (Albugraft, Edwards Lifesciences, Switzerland). The common arm was connected to the ascending aorta, the separate arms to the brachiophalic trunk and left carotid artery. Though the delivery of SG via left femoral artery was successful, it involved a very difficult manipulation, leading to the displacement of the metallic covered neck of the existing SG into the aortic root. An attempt to extract the wire under medically controlled heart arrest using Adenosine (Adenocor, Sanofi-Synthelabo) without cardiopulmonary bypass was unsuccessful, with heavy blood loss and borderline hemodynamic stability. The peroperative transesophageal echocardiography (TEE) showed only mild aortic regurgitation (AR) (1/4) and the wire was not visible outside the aorta. It was decided to terminate the operation, stabilize the patient and prepare him for percutaneous extraction of the wire. On day 8, deterioration of hemodynamic stability was noted. The TEE showed increased severe AR (grade 3/4). A CT scan showed the disconnected neck of the first SG in the aortic root (Fig. 1b). The planned percutaneous extraction was abandoned, amid concern about further damage to the aortic valve, and the patient referred to cardiac surgery.

A midline resternotomy was performed. Opening of the thorax revealed the ascending aorta perforated by metallic wire 4 cm above the aortic valve, though no evidence of bleeding was found (Fig. 2a). The ascending aorta beneath the central branch of the bifurcation prosthesis (regular aortic canula 24F, Medtronic, Minneapolis, MN, USA) and right atrium (double stage canula 34/48, Medtronic) were canulated and the patient cooled to 25 °C. During 3 min of circulatory arrest, the aorta was opened, the stent extracted.
and aortic valve reviewed, showing a small laceration on the free margin of the non-coronary cusp (Fig. 2b and c). It was decided to replace the valve by a mechanical one (St. Jude Medical Inc., Minneapolis, MN, USA) after clamping the aorta.

During circulatory arrest, no cerebral protection other than lowering the body temperature was used. The second postoperative stage was uneventful and the patient discharged in a good condition after 6 days. At 3 months he...
remained stable, with good artificial valve function and no evidence of endoleak in the aortic arch.

Summary of events:
- 2001: car accident followed by SG implantation into distal aortic arch (partly covering the left subclavian orifice)
- January 26, 2005: endoleak-stenting of whole aortic arch with surgical transposition of epiaortic vessels in one operation. Complications described above
- February 3, 2005: increase of AR to grade 3/4 (severe), deterioration of patient leading to second operation (wire extraction, AVR)

3. Discussion

The first question is which intervention to use. The use of SG instead of regular surgery is preferred in elderly and very sick patients. Where there is acute aortic transection in patients suffering from polytrauma, the method chosen requires consideration. A possible danger is bleeding during full heparinization; therefore, less invasive SG placement was chosen in the above case. Second generation SGs have shown improved results in endovascular treatment of thoracic aortic aneurysms, and dissections. In the above case, endoleak was the primary reason for reintervention. Stent fragment dislocation while implanting a new SG is a rare complication. In the case described, the reason for complete release of the proximal ‘neck’ was the manipulation of the guiding wires and delivery system in the aortic arch. Displacement of a fragment of wire to the aortic root and damage of the aortic valve has never before been documented.

The second point is why the wire was not extracted during the same procedure. First, the option of cardiopulmonary bypass was unavailable. Second, the patient was unstable due to severe bleeding. During reoperation, the impossibility of applying an aortic clamp necessitated total circulatory arrest for a short time to extract the wire. The aortic clamp was then applied, the aortic valve reviewed and replacement was chosen for the patient’s safety.

4. Conclusion

Structural failure of a previously implanted stent-graft has to be considered before planning further implantation and the SG carefully evaluated before inserting a new device.

References