

Thrombosis of the Left Anterior Descending Artery Due to Compression from Giant Pseudoaneurysm Late After a Bentall Operation

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ABSTRACT *Background:* A postoperative pseudoaneurysm may develop and gradually expand in the mediastinal space even late following Bentall operation for aortic root replacement, particularly in patients with dissection of the aorta. *Methods:* A very large (148 mm) pseudoaneurysm originating of the right coronary ostium suture line was observed in a patient admitted with unstable angina 6 years after Bentall procedure for type A aortic dissection. Angiograms showed reduced flow in the right coronary and thrombotic subocclusion of the left anterior descending (LAD) coronary artery due to extrinsic compression from the expanding mediastinal mass. *Results:* Reoperation was performed during femoro-femoral cardiopulmonary bypass and brief period of circulatory arrest to clamp the tubular graft. After closure of the detected right coronary ostium in the tubular graft double bypass, grafting to the right coronary and LAD arteries was required. Postoperative course was uneventful. *Conclusions:* Close long-term follow-up after a Bentall procedure is required to minimize the risk of developing a large pseudoaneurysmal mass, in particular, after dissection of the aorta. doi: 10.1111/j.1540-8191.2006.00206.x (*J Card Surg* 2006;21:195-197)

In 1968, Bentall and De Bono described a technique for replacement of the aortic valve and ascending aorta with reimplantation of the coronary arteries ostia on a tubular aortic graft.¹ Since then, modifications have been proposed in particular to reduce the incidence of postoperative complications at coronary ostia anastomoses sites.² We report occurrence of a giant pseudoaneurysm at the site of the right coronary ostium anastomoses in a young patient with Marfan syndrome 6 years after a Bentall operation for acute type A dissection. This caused complete detachment of the right coronary ostium and thrombotic subocclusion of the left anterior descending (LAD) artery from compression by the pseudoaneurysmal mass.

CASE REPORT

A 34-year-old man with Marfan syndrome was admitted to our unit with symptoms of unstable angina and electrocardiographic ST segment elevation in leads V₃-V₄, 6 years after a Bentall operation for acute type A dissection of the aorta. Serum troponin I level at admission was 6 ng/mL. Coronary and ascending aorta

angiograms showed extravascular leakage of the contrast agent in a pseudoaneurysmal cavity approximately at the level of the right coronary artery (RCA) ostium anastomoses. The coronary artery was not visualized. A left coronary angiogram showed proximal subocclusion of the LAD coronary artery (Fig. 1). A transesophageal echocardiogram confirmed the presence of a large pseudoaneurysm in the anterior mediastinal space, causing compression on the tubular aortic graft, and a depressed left ventricular function with 35% ejection fraction (Fig. 2). A pseudoaneurysmal diameter of 148 mm was measured at computerized tomography (Fig. 3).

SURGICAL TECHNIQUE

After Heparin administration, a femoro-femoral cardiopulmonary bypass (CPB) was instituted and the patient cooled down to 30°C of esophageal temperature. Median sternotomy was then performed and adhesions were dissected. The left internal mammary artery (LIMA) and a segment of the distal left saphenous vein were harvested. The pseudoaneurysm was occupying almost entirely the anterior middle and upper mediastinal space; it was isolated as possible, CPB was briefly suspended with the patient in Trendelenburg position and the pseudoaneurysmal wall incised. The tubular

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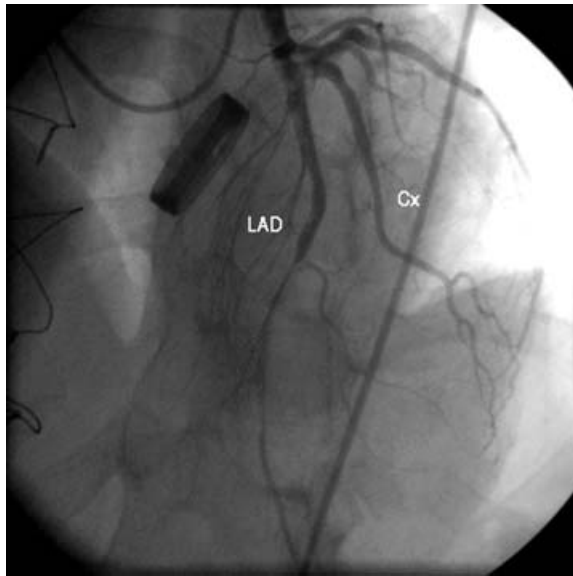


Figure 1. Coronary artery angiogram of the left coronary system with thrombotic LAD lumen.

aortic graft could then be visualized, cross-clamped distally, and CPB restarted, rewarming the patient to 34°C of temperature. On inspection, evidence of a large extravascular leak was found at site of the previous RCA ostium anastomosis, causing almost complete detachment of the vessel from a corresponding large hole (2 cm × 1.5 cm) in the tubular prosthesis. Cardiac arrest was induced by administration of tepid blood cardioplegia directly into the right coronary ostium and through the graft opening for the RCA anastomosis into the left coronary ostium. Administration of cardioplegia was repeated every 20 minutes during cross-clamp time. The RCA ostium could not be reattached to the graft, due to the damaged aortic wall surrounding the ostium; therefore, the corresponding opening in the graft was closed by means of a Dacron patch and a 4-0 polypropylene

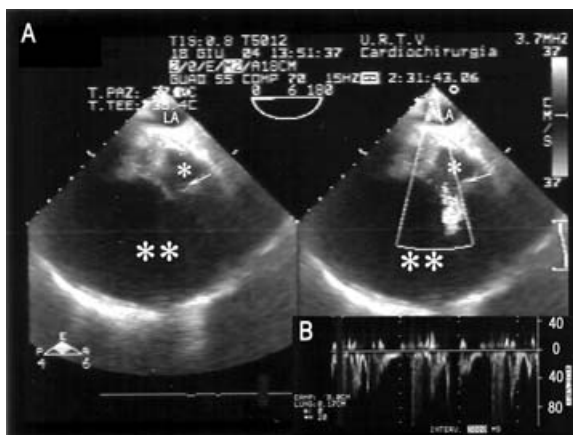


Figure 2. Transesophageal echocardiogram and Doppler pulse wave show the true lumen (*) and pseudoaneurysm cavity (**) with low-velocity flow through the opening in the prosthesis for the RCA implantation (→).



Figure 3. CT scanning showing the true lumen (*) and pseudoaneurysm cavity (**) with maximum diameter of 14.8 cm.

running suture. The RCA ostium was also closed with a 4-0 polypropylene running suture and the saphenous vein graft was anastomosed end-to-side to the proximal RCA segment. Thereafter, the LAD was incised distally and partially organized thrombotic material was removed from the proximal vessel lumen by insertion of a 3-mm Fogarty type catheter through the incision; an end-to-side LIMA to the LAD anastomosis was then performed. Finally, the cross-clamp was removed, the proximal end of the vein graft anastomosed end-to-side to the tubular prosthesis, and the patient was weaned from CPB. A postoperative angiogram showed normal shape of the aortic tubular graft, competitive blood flow in the LAD both from the previous anastomosis to the tubular graft and from the LIMA, and a patent vein graft to the RCA. Postoperative follow-up was uneventful and the patient was discharged after 8 days.

DISCUSSION

The Bentall-De Bono operation is a well-recognized surgical procedure for aortic root and valve replacement, with good early and late results. Patients with Marfan syndrome or patients undergoing aortic root replacement for acute type A dissection, however, present higher risk of postoperative complications, in particular of pseudoaneurysm formation at anastomoses sites. Both suture line tension and friability of the aortic wall may contribute to occurrence of that complication. Kouchoukos et al.³ reported in 1986 a high incidence of pseudoaneurysm formation in patients operated upon with the "inclusion technique," possibly due to excessive tension in aortic and/or coronary ostia anastomoses after tight wrapping of the native aneurysmal aortic wall and bleeding in the space around the tubular graft. Later on, excision of the coronary ostia buttons and direct reattachment of the ostia to corresponding holes in the tubular graft, namely the "button technique," has given excellent results.³ Nevertheless, the risk of damage or high tension in coronary ostia anastomoses remains, in particular, in patients presenting a wide gap between the

aneurysmal wall and the prosthetic graft, or when mobilization of the coronary ostia is not adequate, as in redo operations.⁴ Recently, a new tubular prosthesis (Gelweave Valsalva, Sulzer Vascutek, Renfrewshire, Scotland) has been introduced presenting a pseudosinususes of Valsalva design with increased proximal diameter of the graft at level of the aortic root, which may help reducing the gap to the native coronary ostia and facilitate fashioning of the anastomoses with minimal tension.⁵

If a large pseudoaneurysm develops in the anterior mediastinal space, it usually adheres to the under face of the sternum, increasing the risk of chest reopening; in that case, as in our patient, instituting a femoro-femoral CPB before opening of the sternum reduces blood pressure and pseudoaneurysm wall tension, facilitating a safer sternotomy and dissection of adhesions; moreover, body temperature can be preventively lower to avoid hypoxic damage of tissues in case of hypotension following accidental penetration into the pseudoaneurysmal cavity.

Of note, as showed in this patient, a large pseudoaneurysm could lead to myocardial ischemia, causing compression on the LAD and, eventually, thrombotic occlusion of the vessel; removal of the thrombotic material could be blindly attempted intraoperatively by introduction of a Fogarty type catheter through the incision in the distal coronary artery. Anyway, additional coronary bypass grafting was performed, in case of persistent occlusion of the vessel. Also, reattachment of the right coronary ostium to the tubular graft was not possible in this patient, due to the damaged and friable appearance of the aortic wall surrounding the ostium and the large gap between the ostium and the tubular graft; we preferred, therefore, to suture the RCA

ostium and perform an additional saphenous vein bypass to the proximal segment of the coronary artery.

In conclusion, pseudoaneurysm formation is still possible at distance from aortic root replacement, in particular, in patients with a friable aortic wall structure, as after acute dissection of the aorta or in Marfan syndrome. Compression from a large pseudoaneurysmal mass on the coronary arteries and/or extravascular leakage at coronary ostia anastomoses sites may compromise myocardial vascularization, causing clinical signs of ischemic heart disease. Close follow-up of high-risk patients by echo and X-ray scanning may hopefully provide early detection of that complication, prompting surgical correction before formation of a large mediastinal mass.

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