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Bentall Procedure with Concomitant Coronary-Coronary Bypass for Right Coronary Artery Stenosis: A Case Report

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Abstract

Introduction: Aortic surgery has made much progress recently. Yet the combination of aortic surgery and coronary artery bypass grafting has remained a major issue for the surgeons.
Patient and Observation: Herein, we present a case of severe aortic insufficiency with aortic aneurysm concomitant with single coronary artery disease on the right coronary artery. The patient underwent Bentall procedure for the correction of severe AI and aortic aneurysm. Subsequently, due to the lack of proper site for proximal anastomosis of the saphenous vein graft on the ascending aorta, we decided to perform coronary-coronary artery bypass for the right coronary artery lesion instead of conventional implantation of saphenous vein graft on the ascending aorta.
Conclusions: Coronary-coronary artery bypass could be performed safely for special conditions like porcelain aorta and when the ascending aorta is not suitable for the proximal saphenous vein graft.

Keywords: Aortic Aneurysm, Aortic Insufficiency, Cardiac Surgery, Coronary-Coronary Artery Bypass

1. Introduction

Routine coronary artery bypass grafting (CABG) is performed through distal anastomosis of a bypass conduit on the target site of the coronary artery and proximal anastomosis on the aorta. In rare cases like calcified aorta (porcelain aorta) or other conditions without proper proximal site, other options are available including the insertion of proximal site on innominate artery or the use of composite graft (1-3). One of the options in such conditions is the use of coronary-coronary bypass for avoiding the manipulation of the ascending aorta (1, 2). This report presents a case of severe aortic insufficiency (AI) with aortic aneurysm which was a candidate for Bentall procedure. The coronary angiography findings of the case also indicated significant stenosis on the right coronary (RCA) and posterior descending arteries (PDA).

2. Patient and Observation

We present the case of a 63-year-old woman diagnosed with aortic aneurysm and sever AI with concomitant coronary artery disease (CAD). The patient, who was in functional class III, suffered from chest pain and exertional dyspnea. In echocardiography examination, the patient had severe aortic valve insufficiency with dilatation of ascending aorta. The aortic root and ascending aorta to proximal of aortic arch had diameters of 6 and 5.5 cm, respectively. However, the rest of aorta had a normal size. Although the patient was a candidate for Bentall procedure, due to her age, a coronary angiography was performed in order to evaluate the epicardial coronary arteries. Whereas no significant stenosis was observed in the left coronary artery including left anterior descending and left circumflex artery, the RCA and PDA had severe stenosis in the mid part (Figure 1).

In the operating room, after opening the pericardium and administrating heparin, dilation of the aortic root and ascending aorta was noticed. In addition, severe cardiomegaly and left ventricular hypertrophy was seen, which were caused by the chronic aortic valve insufficiency with distal ascending aortic cannulation and right atrium for venous drainage. Subsequently, cardiopulmonary bypass was initiated and after full mobilization of the entire length of ascending aorta and separating the aorta from pulmonary artery, aortic clamp was accomplished and cardiac arrest was induced with hypothermia. Then, the cardiopelegia infusion was given directly into coronary ostia.

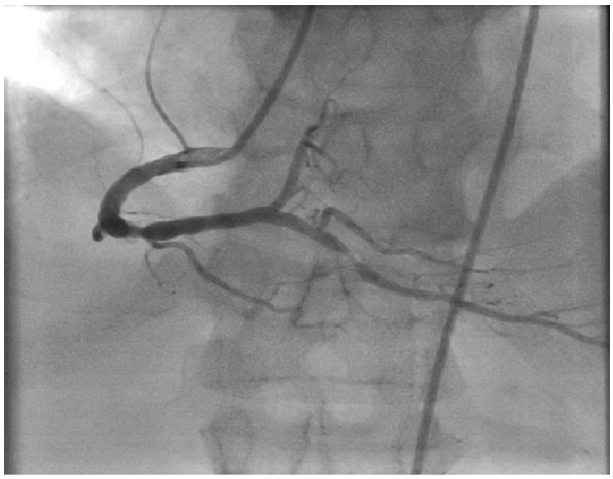

Figure 1. Sever Stenosis of PDA

When evaluating the aortic valve, severe aortic leaflet deformity with malcoaptation was noticed. The Bentall procedure was implemented, using the inclusion technique. After the excision of aortic leaflet, a composite graft (23 mm) was used for replacing the aortic valve. Then, the implantation of prosthesis in aortic position was performed through continuous suture technique. Subsequently, both coronary arteries were reimplanted in the composite graft. Distal anastomosis of the composite graft to the remaining aorta was performed at the later stages of the procedure (Figure 2).

Due to PDA stenosis, the bypass conduit was constructed between proximal and distal sites of stenosis. This uncommon type of bypass is used in especial cases like calcified aorta or any condition with dissected aorta (Figure 3).

After the completion of the procedure and return to a normal sinus rhythm, the patient was weaned from the cardiopulmonary bypass. Thereby, the inclusion technique was completed by sewing the aortic aneurysm above the composite graft. After this stage, no significant hemorrhage was observed and sternum closure was performed routinely. The patient had an uneventful postoperative course. Based on the echocardiographic findings, the prosthetic aortic valve had good hemodynamics and no evidence of paravalvular leak was detected. The patient was discharged eight days after the surgery and she was in good health status during the 6-month follow-up.

3. Discussion

Aortic aneurysm is a degenerative disease whose prevalence increases with aging. Aortic aneurysm refers to

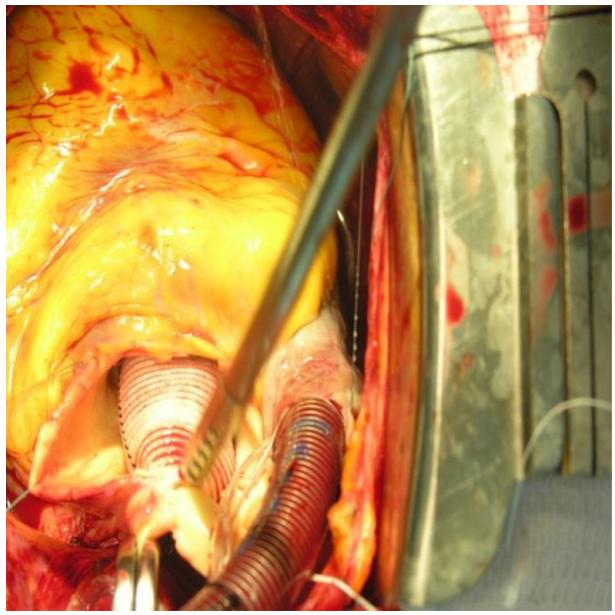

Figure 2. Bentall Procedure Using Composite Graft

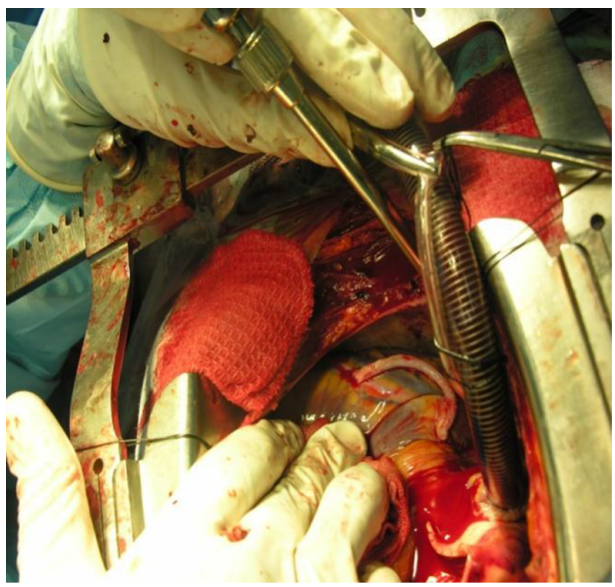

Figure 3. Coronary-Coronary Artery Bypass

the localized aortic dilation with a diameter at least 50% greater than the normal diameter (4-6). Aneurysm can be classified into two types, namely true and false. Whereas the true aneurysm involves all the layers of the aortic wall (adventitia, media, intima), the false one involves only the outer layer and it is contained by the adventitia. Although

the true aneurysm has many etiologies, the most common type of it is the degenerative aneurysm caused by loss of elastic tissue in the aortic wall resulting from the inflammatory process, increased proteolysis and elastolysis, and the deficiency of collagen and elastin content (4). Aortic enlargement can be seen on any site of the thoracic aorta; however, the most common site is the ascending aorta (5, 6). The dilation of the aortic root and the sinus of Valsalva frequently lead to secondary aortic valve regurgitation. Other less common etiologies of thoracic aortic aneurysm are post-traumatic, inflammatory, infected, mechanical, and anastomosis types (4).

There are different imaging techniques for the diagnosis of aortic aneurysm including simple chest X-ray, computed tomography (CT) angiography, and magnetic resonance imaging. CT is the most common non-invasive diagnostic test, which provides essential information about the exact size, location, and extension of aortic aneurysm. In addition, this test can show any aortic flap, sign of aortic dissection, and false aneurysm (5, 7). For the patients older than 40 years, the coronary angiography should be performed for the evaluation of the coronary artery tree to rule out the CADs, especially the transesophageal echocardiography is used as an accurate diagnostic imaging.

Depending on the size, location, and presence or absence of aortic valve insufficiency, different procedures should be performed. These procedures are aortoplasty and replacement of ascending aorta with tube graft; however, in cases with valve incompetency and root dilation, the Bentall procedure should be performed. The presence of CAD with concomitant aortic aneurysm is reported in 10% - 15% of the studies (1, 2, 7).

In the classic form of CABG, a segment of prepared conduit is constructed between the coronary artery distal to lesion and ascending aorta as a proximal site. Nevertheless, in rare conditions, other types of CABG should be employed due to technical challenges mostly for proximal anastomosis on aorta. One of the options in this condition is coronary artery bypass that is usually used in the right coronary system. The first coronary-coronary artery bypass was performed in 1987 on a patient with porcelain aorta, the results of which were satisfactory (1, 2, 8, 9). The conduits that are used for coronary-coronary artery bypass are left internal mammary artery, saphenous vein graft, and radial artery (10). Most of the studies showed satisfactory short- and long-term outcomes of coronary-coronary bypass procedure. In selected cases, the common indications for this type of revascularization are: severe calcification of the ascending aorta (porcelain aorta), stenosis of the subclavian artery, or the short length of conduit for reaching to the ascending aorta (3, 11, 12). Some studies demonstrated that coronary-coronary bypass leads to the same level of blood flow to myocardium as does the classic CABG (13).

3.1. Conclusion

Coronary-coronary artery bypass could be performed safely with satisfactory outcomes for special conditions like porcelain aorta and in case of lack of suitable site for the insertion of the conduit.

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Footnote

Conflicts of Interest: The authors of the current study declare no conflicts of interest.

References

1. Freitas AC, Saporito WF, Donelli LA, Breda JR, Machado LN, Horiuti L, et al. Right coronary bypass grafting with coronary-coronary venous bypass graft. *Rev Bras Cir Cardiovasc.* 2009;**24**(3):401–3. [PubMed: 20011890].
2. Barboso G, Rusticali F. Proximal internal mammary in situ graft and distal coronary-coronary graft. *Tex Heart Inst J.* 2000;**27**(1):70–1. [PubMed: 10830636].
3. Moeinipour A, Amouzeshi A, Hoseinikhah H. Coronary artery bypass surgery in coronary artery disease concomitant with porcelain aorta: Great challenge for cardiac surgeon. Official quarterly publication of the iranian heart association; .
4. Hagan PG, Nienaber CA, Isselbacher EM, Bruckman D, Karavite DJ, Russman PL, et al. The International Registry of Acute Aortic Dissection (IRAD): new insights into an old disease. *JAMA.* 2000;**283**(7):897–903. [PubMed: 10685714].
5. Trimarchi S, Nienaber CA, Rampoldi V, Myrmel T, Suzuki T, Mehta RH, et al. Contemporary results of surgery in acute type A aortic dissection: The International Registry of Acute Aortic Dissection experience. *J Thorac Cardiovasc Surg.* 2005;**129**(1):112–22. doi: 10.1016/j.jtcvs.2004.09.005. [PubMed: 15632832].
6. Coady MA, Davies RR, Roberts M, Goldstein LJ, Rogalski MJ, Rizzo JA, et al. Familial patterns of thoracic aortic aneurysms. *Arch Surg.* 1999;**134**(4):361–7. [PubMed: 10199307].
7. Moeinipour A, Fathi M, Sepehri Shamloo A, Amini S, Hoseinikhah H, Kianinejad A. Mediastinal packing for intractable coagulopathy in acute aortic dissection (types 1 and 2 debakey): A life-saving technique report of experiences. *Case Rep Crit Care.* 2015;**2015**.
8. Korkmaz AA, Onan B, Tamtekin B, Oral K, Aytekin V, Bakay C. Right coronary revascularization by coronary-coronary bypass with a segment of internal thoracic artery. *Tex Heart Inst J.* 2007;**34**(2):170–4. [PubMed: 10830636].
9. Nomura F, Ohno T. In situ coronary-coronary bypass grafting for a huge left coronary aneurysm. *Ann Thorac Cardiovasc Surg.* 2014;**20 Suppl**:622–4. doi: 10.5761/atcs.cr.13-00101. [PubMed: 23995349].

10. Omay O, Ozker E, Indelen C, Suzer K. Revascularization of left anterior descending (LAD) artery with in situ left internal thoracic artery (LITA) and coronary-coronary free LITA grafts: 12-year patency. *J Card Surg.* 2008;**23**(6):722–4. doi: 10.1111/j.1540-8191.2008.00643.x. [PubMed: 19017000].
11. Nezic D, Knezevic A, Cirkovic M, Jovic M, Mangovski L, Milojevic P. [In situ pedicle graft and coronary-coronary bypass grafting using internal thoracic artery in management of multiple lesions of the left anterior descending coronary artery]. *Med Pregl.* 2004;**57**(11-12):601–4. [PubMed: 16107010].
12. Nezic D, Knezevic A, Borovic S, Cirkovic M, Milojevic P. Coronary-coronary free internal thoracic artery graft on a single, distal, left anterior descending artery lesion. *J Thorac Cardiovasc Surg.* 2004;**127**(5):1517–8. doi: 10.1016/j.jtcvs.2003.11.022. [PubMed: 15116019].
13. Nezic D, Knezevic A, Cirkovic M, Vukovic P, Jovic M. Perfect angiographic patency of the arterial coronary-coronary conduit five years following surgery. *Thorac Cardiovasc Surg.* 2009;**57**(5):307–8. doi: 10.1055/s-2008-1039208. [PubMed: 19629896].