



ELSEVIER

Contents lists available at ScienceDirect

Journal of Cardiology Cases

journal homepage: www.elsevier.com/locate/jccase

Case Report

Simultaneous transcatheter aortic valve implantation and off-pump coronary artery bypass grafting for Takayasu arteritis



Kizuku Yamashita (MD), Junjiro Kobayashi (MD, PhD, FJCC)*, Tomoyuki Fujita (MD, PhD), Hiroki Hata (MD, PhD), Yusuke Shimahara (MD), Yuta Kume (MD), Yorihiro Matsumoto (MD)

Department of Cardiovascular Surgery, National Cerebral and Cardiovascular Center, Suita, Osaka, Japan

ARTICLE INFO

Article history:

Received 9 September 2016

Received in revised form 7 December 2016

Accepted 30 December 2016

Keywords:

Takayasu arteritis

Aortic stenosis

Transcatheter aortic valve implantation

Coronary artery bypass grafting

OPCAB

ABSTRACT

We report a patient who underwent simultaneous transcatheter aortic valve implantation and off-pump coronary artery bypass grafting for Takayasu arteritis with diffuse porcelain aorta. The patient was a 59-year-old female with severe aortic stenosis and regurgitation, as well as both coronary ostial stenosis and porcelain aorta. Bilateral internal thoracic arteries were unavailable due to Takayasu arteritis. Therefore, composite radial artery with in-situ gastroepiploic artery was used as graft material. Radial artery was anastomosed to left anterior descending artery and posterior descending artery sequentially. Surgical procedures were successfully accomplished and major perioperative complications did not occur.

<Learning objective: Takayasu arteritis is a rare disease with vasculitis of aorta and its main branches. In addition, it is associated with a low incidence of coronary ostial stenosis and coronary ischemia can be fatal. Porcelain aorta with aortic valve lesion also complicates with Takayasu arteritis and it makes difficult to perform cardiac surgery. The optimal surgical strategy and process for those who combined with coronary ostial stenosis, aortic valve lesion and porcelain aorta remains a subject of debate.>

© 2017 Japanese College of Cardiology. Published by Elsevier Ltd. All rights reserved.

Introduction

Takayasu arteritis is an idiopathic vasculitis mostly found in young Asian females [1]. It occasionally complicates porcelain aorta, coronary artery ostial stenosis, and aortic regurgitation with or without stenosis. Intimal calcification of the aorta affected by Takayasu arteritis often makes aortic procedures or proximal anastomosis of coronary artery bypass grafting (CABG) difficult [1]. In this case, cardiac surgery for severe aortic stenosis (AS) and both coronary ostial stenosis was required. We successfully performed simultaneous operations of transfemoral transcatheter aortic valve implantation (TAVI) and off-pump CABG (OPCAB) using composite radial artery (RA) with in-situ gastroepiploic artery (GEA) without any aortic manipulations.

Case report

A 59-year-old female presented with exertional dyspnea and was referred to our hospital. Oral prednisolone and cyclosporine had been commenced for the treatment of Takayasu arteritis for over two years and tapered (prednisolone 9 mg daily, cyclosporine 75 mg daily at this hospitalization) according to the guidelines [2]. On echocardiography, severe AS [peak jet velocity, 4.9 m/s, mean pressure gradient (mPG), 55 mmHg, aortic valve area (AVA), 0.72 cm²] and regurgitation were noted. The diameters of aortic annulus, Valsalva sinus, sinotubular junction, and ascending aorta were 22, 33, 29, and 30 mm, respectively. Enhanced computed tomography (CT) revealed a circumferential aortic calcification between aortic root and descending aorta that precluded clamping [3], bilateral subclavian artery and internal thoracic artery (ITA) stenosis, whereas no other peripheral vascular lesion was noted (Fig. 1A). Coronary angiogram revealed 75% stenosis of both left and right coronary ostia (Fig. 1B,C). To treat combined aortic valve and coronary lesions, she was referred to the Heart Valve Team in our hospital. Hence, we decided simultaneous transfemoral TAVI and OPCAB procedures because predicted STS score was 12.8% in addition to high possibility of stroke and other morbidities.

* Corresponding author at: Department of Cardiovascular Surgery, National Cerebral and Cardiovascular Center, 5-7-1, Fujishirodai, Suita, Osaka, 565-8565, Japan. Fax: +81 6 6872 7486.

E-mail address: jkobayas@ncvc.go.jp (J. Kobayashi).

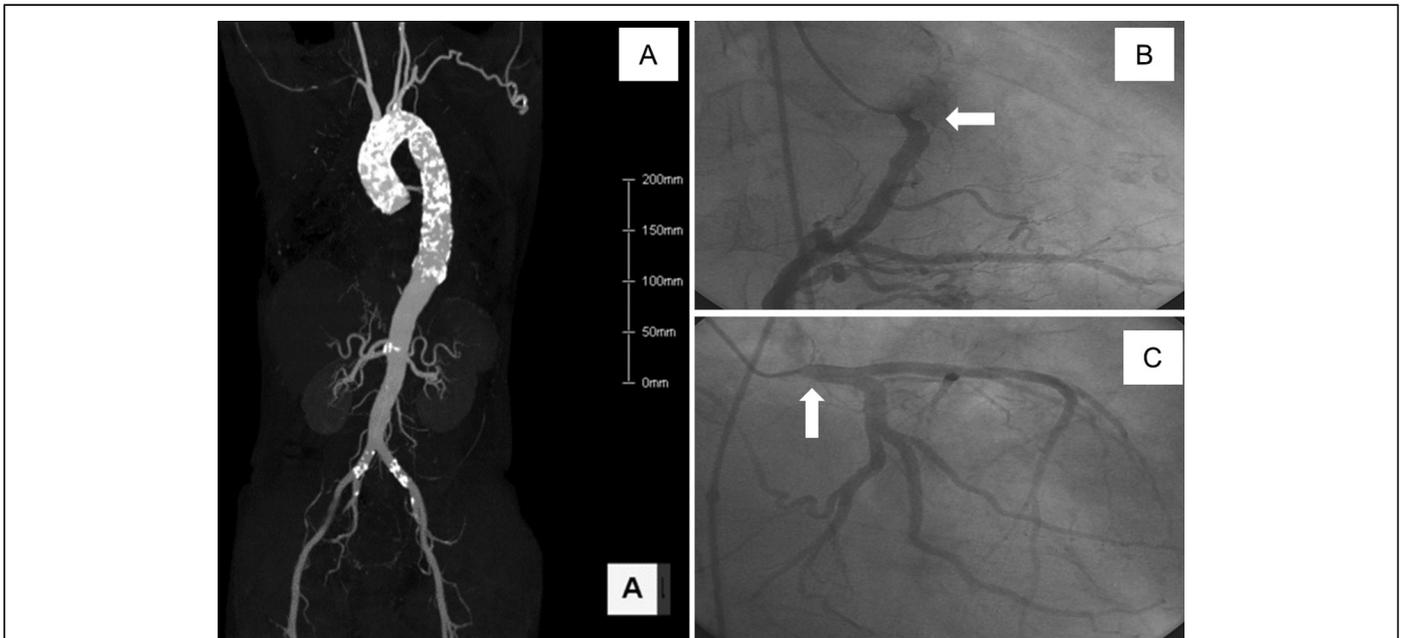


Fig. 1. (A) Preoperative enhanced computed tomography showed the porcelain aorta. (B) Preoperative right coronary selective injection revealed 75% stenosis in the ostium of right coronary artery (arrow). (C) Preoperative left coronary selective injection revealed 75% stenosis in the ostium of left main coronary artery (arrow).

Harvested GEA was passed into pericardial cavity through a tunnel in diaphragm after median sternotomy. In-situ GEA was extended with left RA in side-to-side fashion. Octopus tissue stabilizer (Medtronic Inc., Minneapolis, MN, USA) and CO₂ blower were used during OPCAB to provide a clear surgical field and enabled easier anastomosis of target vessels. First, RA was anastomosed to left anterior descending artery (LAD) in side-to-side fashion. After valvuloplasty of aortic valve with 23 mm balloon, TAVI using 26-mm Edwards SAPIEN XT valve (Edwards Lifesciences, Irvine, CA, USA) by transfemoral approach was performed with rapid ventricular pacing. Finally, Starfish cardiac positioner (Medtronic Inc.) was used to retract the apex anteriorly

and RA was anastomosed to posterior descending artery (PDA) in end-to-side fashion.

Neither arrhythmia nor hemodynamic instability occurred during the operation. Postoperative multidetector CT (MD-CT) revealed patent graft materials (Fig. 2) and transthoracic echocardiography (TTE) showed no paravalvular leakage or stenosis (peak jet velocity, 2.0 m/s, mPG, 6.5 mmHg, AVA, 2.2 cm²). Postoperative MD-CT revealed a slightly stenotic portion of the radial arterial graft after RA-LAD anastomosis in spite of the good forward flow (50 ml/min) using transit-time flow meter during OPCAB. Although perioperative myocardial ischemia was not confirmed, vasospasm of RA might have occurred [4]. Therefore,

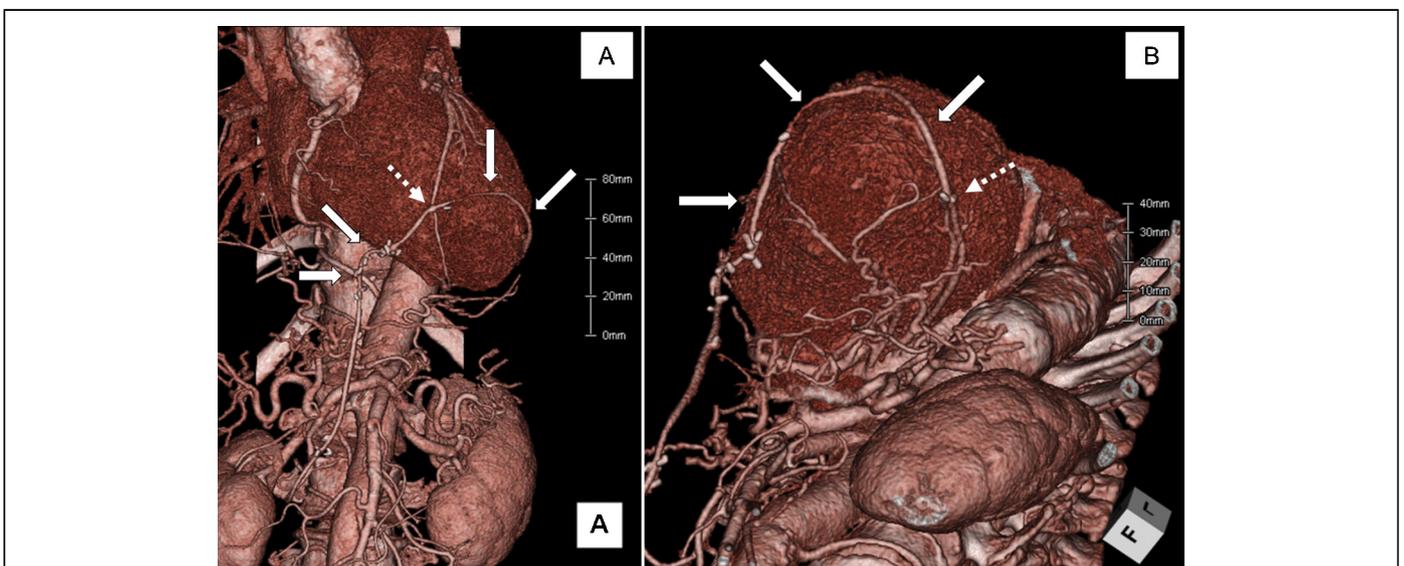


Fig. 2. Postoperative multidetector computed tomography showed patent graft materials of I composite graft with in-situ gastroepiploic artery and radial artery (arrows). Single dotted arrow indicates radial artery to left anterior descending artery anastomosis (A) and the other single dotted arrow indicates radial artery to posterior descending artery anastomosis (B). (A, anterior side; B, inferior side).

antispasmodic agents were intensified after the MD-CT graft evaluation. The postoperative course was uneventful and the patient was discharged on postoperative day 15. Five months after the operation, follow-up TTE showed no paravalvular leakage and aortic root dilatation.

Discussion

The presence of coronary ostial stenosis implicates a possibility of the lethal cause in Takayasu arteritis [1]. Aortic stenosis with heart failure and coronary ostial stenosis are definite indications for surgery in the guidelines [5]. Therefore, simultaneous operations for AS and coronary artery disease were indicated in this patient. However, conventional aortic valve replacement with CABG under cardiopulmonary bypass and cardiac arrest was difficult because of the porcelain aorta.

This case presentation demonstrated three major points. First, OPCAB using in-situ GEA was able to revascularize right and left coronary arteries like in-situ ITA without aortic manipulations [6]. This procedure may reduce perioperative morbidity in patients with Takayasu arteritis who have porcelain aorta. We have previously reported aorta no-touch technique to avoid early morbidity and mortality from neurologic events [7]. In the presence of subclavian artery stenosis, GEA was the only versatile graft for aorta no-touch OPCAB. As seen in this 59-year-old patient, arterial grafting is mandatory to avoid reoperation for graft stenosis in the future. Because this patient had only moderate coronary artery stenosis, we may have to follow the flow competition of in-situ GEA. Although early graft patency was satisfactory on MD-CT, long-term graft patency was not as good as ITA in previous studies.

Second, the order of procedures is crucial to avoid intraoperative complications. Anastomosis of RA to LAD lesion was the first procedure to prevent ischemia of LAD lesion and enabled the heart to tolerate rapid ventricular pacing which may induce coronary artery ischemia during TAVI. Prosthetic valve deployment was the next procedure after RA to LAD anastomosis. Lastly, we could lift up the apex without any difficulties for OPCAB after relief of aortic valve lesion and anastomose the residual coronary lesion (RA to PDA in this case).

Third, transfemoral TAVI in patients with AS and porcelain aorta was an effective procedure to avoid aortic manipulation to reduce neurological complications. Although combined transaortic TAVI with OPCAB have been reported [8,9], it was impossible to perform in this case because of the porcelain aorta. Although transapical approach is an effective procedure with apical elevation by Lima stitch, frailty of left ventricular muscle should be considered because of long-standing steroid use. Transsubclavian approach is not available due to bilateral subclavian artery stenosis.

Dilated lesions as aortic root dilation are recognized in Takayasu arteritis. In this patient, aortic root dilation was well controlled by

preoperative immunosuppressant medications [2]. Immunosuppressive treatment of Takayasu arteritis is essential to maintain remission and prevent the development of aortic annular dilatation, which may cause paravalvular leak or device migration in the future. Follow-up echocardiography is crucial because of unclear long-term results after TAVI and the possibility of aortic root dilatation. Therefore, follow-up echocardiography in this case will be conducted every 6 months.

Conflict of interest

The authors declare that there is no conflict of interest.

Acknowledgment

This case was presented at 25th World Society of Cardio-Thoracic Surgeons annual meeting and exhibition at Edinburgh, Scotland in 2015.

References

- [1] Endo M, Tomizawa Y, Nishida H, Aomi S, Nakazawa M, Tsurumi Y, Kawana M, Kasanuki H. Angiographic findings and surgical treatments of coronary artery involvement in Takayasu arteritis. *J Thorac Cardiovasc Surg* 2003;125:570–7.
- [2] Hiratzka LF, Bakris GL, Beckman JA, Bersin RM, Carr VF, Casey Jr DE, Eagle KA, Hermann LK, Isselbacher EM, Kazerooni EA, Kouchoukos NT, Lytle BW, Milewicz DM, Reich DL, Sen S, et al. 2010 ACCF/AHA/AATS/ACR/ASA/SCA/SCAI/SIR/STS/SVM Guidelines for the diagnosis and management of patients with thoracic aortic disease. A report of the American College of Cardiology Foundation/American Heart Association Task Force on Practice Guidelines, American Association for Thoracic Surgery, American College of Radiology, American Stroke Association, Society of Cardiovascular Anesthesiologists, Society for Cardiovascular Angiography and Interventions, Society of Interventional Radiology, Society of Thoracic Surgeons, and Society for Vascular Medicine. *J Am Coll Cardiol* 2010;55:e27–129.
- [3] LeMaire SA. Individualized treatment strategies for patients with aortic valve disease and porcelain aorta. *J Thorac Cardiovasc Surg* 2015;149:134–6.
- [4] Mussa S, Choudhary BP, Taggart DP. Radial artery conduits for coronary artery bypass grafting: current perspective. *J Thorac Cardiovasc Surg* 2005;129:250–3.
- [5] Nishimura RA, Otto CM, Bonow RO, Carabello BA, Erwin 3rd JP, Guyton RA, O’Gara PT, Ruiz CE, Skubas NJ, Sorajja P, Sundt 3rd TM, Thomas JD, Anderson JL, Halperin JL, Albert NM, et al. 2014 AHA/ACC Guideline for the management of patients with valvular heart disease a report of the American College of Cardiology/American Heart Association task force on practice guidelines. *Circulation* 2014;129:e521–643.
- [6] Kim KB, Kang CH, Chang WI, Lim C, Kim JH, Ham BM, Kim YL. Off-pump coronary artery bypass with complete avoidance of aortic manipulation. *Ann Thorac Surg* 2002;74:S1377–82.
- [7] Kobayashi J, Tagusari O, Bando K, Niwaya K, Nakajima H, Ishida M, Fukushima S, Kitamura S. Total arterial off-pump coronary revascularization with only internal thoracic artery and composite radial artery grafts. *Heart Surg Forum* 2002;6:30–7.
- [8] Wiegerinck EM, Cocchieri R, Baan Jr J, de Mol BA. Hybrid coronary artery bypass grafting and transaortic transcatheter aortic valve implantation. *J Thorac Cardiovasc Surg* 2013;145:600–2.
- [9] Kobayashi J, Shimahara Y, Fujita T, Kanzaki H, Amaki M, Hata H, Kume Y, Yamashita K, Okada A. Early results of simultaneous transaortic transcatheter aortic valve implantation and total arterial off-pump coronary artery revascularization in high-risk patients. *Circ J* 2016;80:1946–50.