Aortic valve replacement and Coronary Artery Bypass Graft in a Patient with Takayasu's Arteritis and Aorcelain Aorta

Mohammadhasan Kalantarmotamedi 1, Omid Assar 2*, Davood Kazemi saleh 2

Abstract

In this case-report, we describe aortic valve replacement and CABG in a 50- year old female patient with Takayasu's disease and severely calcified ascending aorta without cross – clamping the aorta or institution of total circulatory arrest. Intra aortic occlusion technique is explained and the literature is reviewed for different approaches to similar cases.

Introduction

The operative management of the patient with 'porcelain aorta' which requires aortic occlusion and cardiac arrest remains a challenge. A rare case of Takayasu's disease with porcelain aorta that underwent concomitant AVR and CABG with endoclamping of the aorta is described.

Case presentation

A 50–year old female patient admitted to our center and scheduled for aortic valve replacement and CABG.

She was a known case of Takayasu's disease who had undergone right common carotid endarterectomy and right to left carotid bypass graft , three and two months before her current admission at the same center because of bilateral common carotid stenosis and recurrent transient ischemic attacks with hemiparesis of her extremities.

The patient also had a history of hypertension. In physical examination, left radial pulse was not palpable and a diastolic murmur was heard at the left sternal border. Laboratory data was notable for anemia (Hb = 9.2). Chest X-ray revealed diffuse calcification of the thoracic aorta.

Transthoracic and transesophageal echocardiography showed severe aortic insufficiency, left ventricular ejection fraction = 55%, left ventricular end-diastolic diameter = 51mm, aortic annular diameter = 25mm and thickened and calcified ascending aorta with a diameter of 45mm. At chest CT scan. There was severe and homogeneous calcification of the aorta. On cardiac catheterization, left anterior descending artery had a severe proximal stenosis. In the operation, standard median sternotomy was performed. Cannulation as well as cross – clamping of the ascending aorta was avoided due to the presence of 'porcelain aorta'. Cardiopulmonary bypass was established by femoral arterial and right atrial cannulation with moderate hypothermia and intermittent retrograde cold blood cardioplegia for myocardial protection. Near – Infra – red spectroscopy (Invos®, Somanetics) and radial artery pressure were used to monitor effective cerebral perfusion. Tissue oxygenation was maintained above 55%.

The medial aspect of the distal ascending aorta which seemed free of calcification in CT scan images and by palpation was perforated and the tip of a large Foley catheter were introduced through it. The malleable stylet of the retrograde catheter was used as the guide wire for the Foley catheter and by its manipulation, the catheter was directed distally and its balloon was inflated with 50 cc of normal saline in order to achieve effective pressure on the aortic wall and act as an endo-clamp to prevent retrograde blood flow from the aortic arch. (fig.1)

Aortotomy was made as a standard transverse incision, one centimeter above the sinotubular junction.

Jamaran Heart Hospital 1, Research Center for Cardiovascular Diseases 2, Baqiyatallah University of Medical Sciences, Tehran, Iran

The aortic valve was resected and replaced with a no. = 25 Mitroflow pericardial aortic valve by interrupted suturing. Both internal mammary arteries were diffusely sclerotic and occluded, so saphenous vein was harvested and used as a graft to LAD.

The aortotomy was closed with 4-0 Polypropylene sutures. The catheter balloon was then deflated just before completion of the aortic suture and the catheter was removed. The catheter insertion site was used for proximal anastomosis of the vein graft by Heart String.

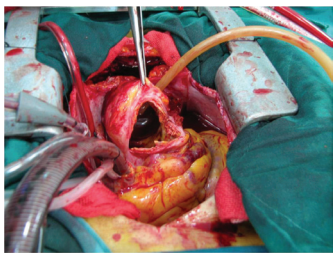

Fig1: Foley catheter balloon inflated within the aorta and used as an endoclamp

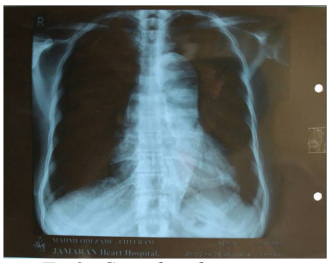

Fig2: Completed proceure

Cardiopulmonary bypass time was 65 minutes. The Patient had an uneventful recovery and was discharged from the hospital on the seventh postoperative day.

Discussion

It has been reported that approximately 2% of patients referred for cardiac surgery and one – third of patients older than 80 years have significant atherosclerosis of the ascending aorta. One – fifth of these Patients will have the extreme (Porcelain aorta) Subtype. Extensive Calcification of the ascending aorta is a very unusual finding in younger population and often results from vasculitis. Takayasu's disease is a large vessel vasculitis, involving the aorta and its major branches, which predominantly affects young women. Initially a granulomatous aortitis leads to intimal thickening, inflammation of vasa vasarum and medial necrosis and progresses at variable rates to a sclerotic stage with fibrosis and calcification, which in 13-44% of cases results in annular dilatation and aortic regurgitation. [1]

Aneurysmal degeneration occurs in only 15% of the patients. The coronary arteries are affected in less than 10% of cases. [2] Hypertension as a result of renal artery stenosis or aortic coarctation is the most common manifestation and is present in as many as 80% of affected individuals.

The operative management of the patient with 'porcelain aorta' who requires aortic occlusion and cardiac arrest remains a challenge. Clamping of a calcified aorta predisposes to cerebral embolism, aortic rupture and laceration of the diseased aorta with increased risk of perioperative stroke, neurobehavioral changes and death.

The risk of stroke is dependent on the presence, location (with increased likelihood of middle and lateral segments) and extent of disease. [1]

Different strategies have been developed to address this problem, including institution of a period of circulatory arrest which has an inherent risk of adverse neurologic sequelae and endoclamping of the aorta with single or double arterial cannulation. Various catheters have been used for intraaortic occlusion including Foley catheter, Pruitt aortic occlusion catheter and Heartport endoclamp. [1-3]

Cosgrove [4] and Earth, et al [5] first described the use of Foley catheter for this purpose. Easy availability of Foley catheter makes it an attractive choice but it has been suggested that it is relatively soft and its placement and exact positioning in the ascending aorta is difficult. As it was noted, we used the malleable stylet of the retrograde catheter as the guidewire of the Foley catheter and had no problem for its placement and positioning.

The site at catheter insertion can be determined by several methods like transesophageal echocardiography, epiaortic ultrasonography, IVUS and CT scan or MRI.

It is more likely that the medial part of the aorta will be free of calcium in comparison to the anterior and lateral parts. [1] We chose the medial aspect of the distal ascending aorta for catheter insertion site, judged by CT images and palpation.

The intra aortic occlusion technique described above can be used as an alternative to profound hypothermia and total circulatory arrest for aortic valve replacement in patients with a calcified aorta (caused either by atherosclerosis as in the elderly patients or vasculitis) not suitable for cross – clamping.

References:

1. Athanasiou T, Kumar P, Afhrafian H, et al. Aortic valve replacement in a patient with Takayasu's disease without cross – clamping the calcified ascending aorta. Asian cardiovasc Thorac Ann 2004; 12:376-378
2. Liddicoat JR, Doty JR, Stuart RS. Management of the atherosclerotic ascending aorta with endoaortic occlusion. Ann Thorac Surg 1998; 65: 1133-1135
3. Ooi A, Lyenger S, Langley SM, Haw MP. Endovascular clamping of porcelain aorta in aortic valve surgery using Foley catheter. Heart Lung Circ 2006; 15(3): 194-6
4. Cosgrove DM. Management of the Calcified aorta. Ann Thorac Surg 1983; 36: 718-719
5. Earth HG, Stoney WS. Balloon catheter occlusion of the ascending aorta. Ann Thorac Surg 1984; 35: 560-561