

Coronary Artery Bypass Graft in Porcelain Aorta

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A 48 years old male, with porcelain ascending aorta, and diffuse and severe stenosis of great vessels who underwent coronary artery bypass graft (CABG), and the challenges surgeons may encounter in relation to these patients are discussed along with the review of corresponding literature on this challenging entity in cardiac surgery.

Introduction

Patients with severe calcified ascending aorta (porcelain aorta) present a surgical challenge. They carry a high risk of cerebral as well as systemic embolism during cardiac surgery.¹ Off-pump coronary artery bypass grafting (OPCABG), provides a surgical alternative for these patients.² Every cardiac surgeon may encounter such problem during his or her practice of surgery. It is thus pertinent to review this challenging dilemma. Herein, a case with porcelain ascending aorta is presented and discussed. As left internal mammary artery (LIMA) was diseased, it could not be used for grafting. This was an additional challenge imposed by the present case.

Case report

A 48 years- old smoker male, with history of non insulin dependent diabetes (NIDDM), hyperlipidemia, and hypertension was presented with exertional dyspnea. Positive findings on physical examination included an aortic 3/6 systolic murmur, bruit on both carotid arter-

ies, right brachial blood pressure(BP) 170/63 mmHg, left brachial artery BP100/64 mmHg, and absent left radial pulse. Electrocardiography revealed normal sinus rhythm with right bundle branch block. Echocardiography showed ejection fraction (EF) of about 45-50%, and small size ascending aorta and aortic arch. Coronary angiography was performed which revealed significant stenoses at the origins of Left main, left anterior descending artery(LAD) and right coronary artery (RCA). Also angiography of carotid arteries showed insignificant proximal right internal carotid artery stenosis, and total occlusion of proximal left internal carotid artery. Computerized tomography (CT) angio of aorta and carotid arteries was performed and showed that in addition of above mentioned findings, there were dense calcified plaque at aortic arch, significant stenoses in proximal part of both subclavian arteries, and stenosis at the origin of left vertebral artery. The patient was referred for CABG by cardiologist.

During the operation, we found severe calcification of ascending aorta and arch (Fig.1) so cannulation of aorta was impossible. Ascending aorta dimension was about 1.5-2 cm.

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LIMA was harvested for free graft despite being pulseless, but was not used because it was thick, inflamed and calcified. We used saphenous vein grafts for revascularization of PDA and LAD off-pump. Fortunately a very small area measuring about 0.5x0.5 over RCA was found to lack calcification as shown in Fig.1, we thus anastomosed posterior descending artery(PDA) graft to aortic root in this small area and grafted LAD over PDA graft(composite graft). Obtuse marginal artery (OM) was not graftable. The patient had an uneventful post operative course and the grafts looked patent (Fig.2). Pathologic report of biopsy from the punched portion of aorta showed inflamma-

tion and arteritis. CT angio performed before patient's discharge from hospital, showed multiple stenotic lesions in different parts of large blood vessels originating from aorta.

Discussion

Severely atherosclerotic (porcelain) ascending aorta is associated with increased morbidity and mortality during CABG due to the increased risk of perioperative atheroembolism. Three maneuvers during CABG can cause atheromatous embolism from the diseased ascending aorta. These consist of cannulation of the ascending aorta, cross-clamping, and partial clamping for the construction of the proximal

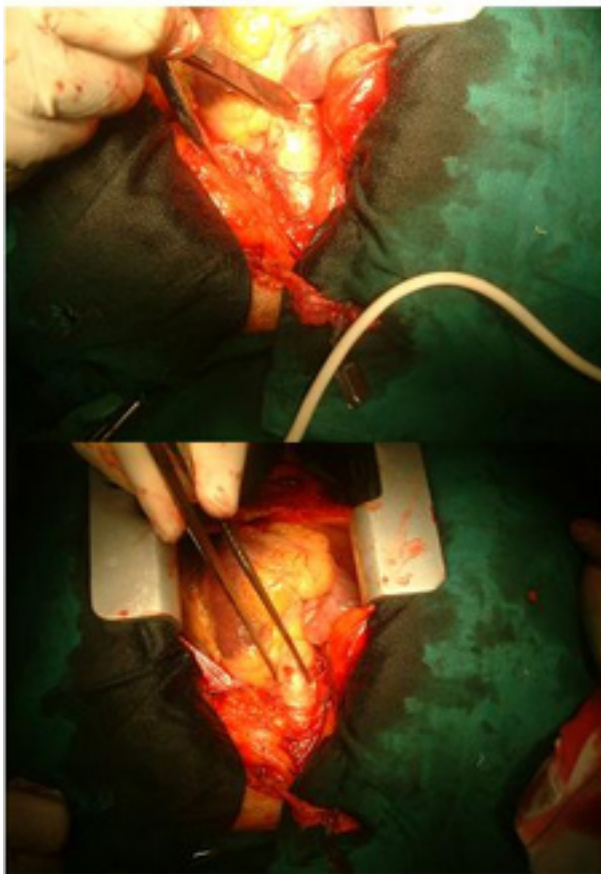


Figure 1: The only graftable area over aortic root (upper), and the rigidity and small diameter of aortic root (lower).

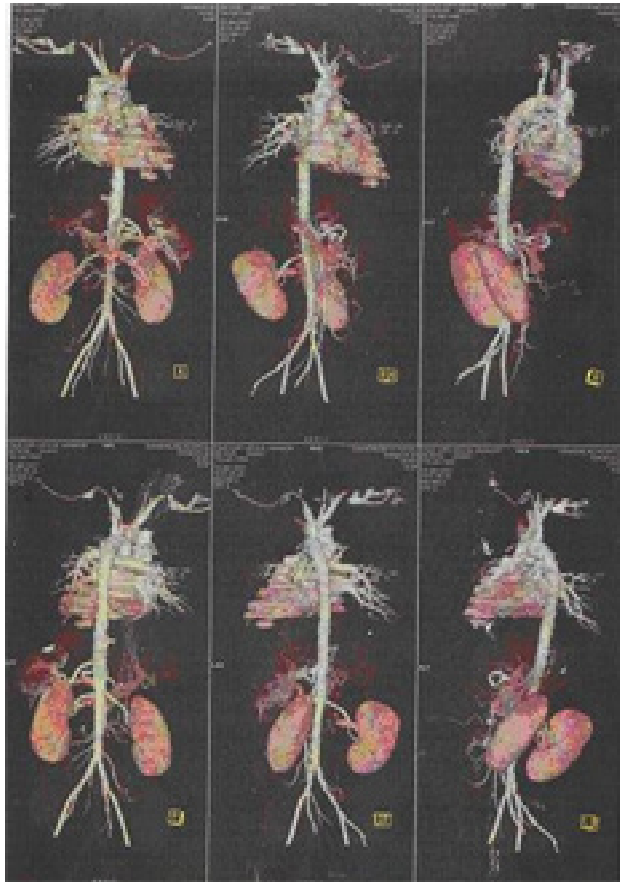


Figure 2: CT angio image of the patient at the time of discharge.

anastomosis.³ CABG using LIMA and greater saphenous vein composite arterial inflow grafts in combination with off-pump beating heart surgery and avoiding cardiopulmonary bypass and clamping the calcified aorta is an effective method to prevent clamp injury and athero-embolisation in these patients.⁴ Ascending aortic atherosclerosis must be suspected in all coronary bypass patients with associated significant carotid, abdominal aortic, and main left coronary artery disease, aortic wall irregularity detected by ascending aortic angiography, adhesions between the ascending aorta and its adventitia, pale appearance of the ascending aorta, and minimal bleeding of an aortic cannulation stab wound. A none-touch technique that avoids any manipulation of the ascending aorta which uses the internal mammary arteries as the sole source of blood supply for coronary bypass is an effective method to prevent aortic clamp injury in patients with severe ascending aortic disease. It is mandatory to consider preoperative angiographic visualization of the ascending aorta of all patients undergoing CABG.⁵

In the present case, off-pump surgery was performed but because of being pulseless, the LIMA could not be used. Fortunately, this problem was solved by finding a small area

above RCA for implanting one graft along with the second graft as composite graft. However, sometimes the problem is not as easy as in the case presented here. In this connection, Uva MS et al. performed their operations using off-pump myocardial revascularization, pump-assisted beating heart revascularization, and proximal saphenous graft anastomosis with an automatic connector.⁶ Leyh RG et al. suggested arterial cannulation of the axillary artery or femoral artery,³ hypothermic fibrillatory arrest for performance of the distal anastomosis, and construction of the proximal anastomosis to the innominate artery or to a disease-free area of the ascending aorta during hypothermic circulatory arrest.⁷ Svensson LG et al. performed endarterectomy for calcified porcelain aorta associated with aortic valve stenosis and believed that endarterectomy of the aorta may be an option in the management of patients with calcification of the aorta.⁸ Some have suggested extra anatomical sites for proximal anastomosis such as the common carotid,⁹ right axillary,¹⁰ right subclavian and innominate arteries.³ Rescigno G et al. successfully used right internal mammary artery as the source of blood inflow for single or sequential venous grafts in 5 elderly patients with eggshell aorta.¹¹

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