

Porcelain Aorta in Coronary Artery Bypass Graft Operations: An Alternative Approach

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ABSTRACT

Porcelain aorta represents a serious condition for coronary artery bypass graft operations. Here we describe a simple technique to avoid any aortic manipulation during an off-pump coronary artery bypass graft procedure. The right internal thoracic artery is used as the source of blood inflow for single or sequential venous grafts. We have used this technique with good results in 5 elderly patients with eggshell aorta.

INTRODUCTION

The finding of a porcelain aorta represents a troublesome condition during cardiac surgical procedures. In cases of coronary artery bypass operations, an effective solution is represented by the off-pump coronary artery bypass (OPCAB) approach, which avoids aortic cannulation and cross-clamping [Accola 1993]. Moreover, the use of arterial grafts eliminates the need for implanting venous conduits on the ascending aorta. However, elderly patients often are very frail with complex coronary artery disease, thus making complete arterial revascularization an additional risk, especially if the procedure is to be performed off-pump. We present here a simple method that allows the use of the saphenous vein for coronary artery bypass graft (CABG) operations without the need to manipulate the aorta or its major branches. This method uses the proximal portion of the right internal thoracic artery (ITA) as the source of blood inflow for venous conduits.

MATERIALS AND METHODS

Five elderly patients (mean age, 73 ± 2 years) were referred for the CABG procedure (all patients had unstable angina). Two patients had chronic renal insufficiency (preoperative creatinine levels >2.5 mg/100 mL), and in 2 cases

significant carotid artery stenoses were present. One patient had chronic lymphatic leukemia. OPCAB procedures were scheduled for all 5 patients. The Octopus II (Medtronic, Grand Rapids, MI, USA) was used as a heart stabilizer, and an intracoronary shunt was inserted in each coronary artery to preserve flow during the anastomosis. After opening the pericardium, we discovered a completely calcified aorta, which precluded any aortic clamping. At this point, the left ITA was anastomosed to the anterior descending coronary artery. The proximal portion of the right ITA (10-12 cm) was harvested. This conduit was anastomosed end to end to the venous graft by means of a polypropylene (Prolene) 7-0 suture (Ethicon, Brussels, Belgium) (Figure 1). The ends of both conduits were obliquely cut at angles of 60° and 45° for the ITA and venous grafts, respectively. The oblique cuts allowed us to correct the mismatch between the 2 grafts. Afterward, the distal portion of the venous graft was anastomosed in an end-to-side fashion by means of a continuous Prolene 7-0 suture to a diagonal branch in 2 cases, to the second marginal branch in 1 case, and to the left posterior descending artery in 1 case. In the last patient, a sequential graft was constructed in which the vein was anastomosed side to side to the first obtuse marginal artery and end to side to the posterior descending artery (Figure 2).

RESULTS

In our series, no significant electrocardiographic changes or hemodynamic problems were recorded. The postoperative course was uneventful in all patients. Before the patient was discharged from the hospital, a Doppler ultrasound control analysis of both ITAs was performed and showed excellent diastolic flow for all patients (Figure 3).

DISCUSSION

Aortic manipulation is the source of subclinical cerebral emboli, even in patients with an apparently normal aortic wall [Barbut 1994]. When significant plaques are present or when the ascending aorta is completely calcified (porcelain aorta), its clamping is formally contraindicated. The development of OPCAB surgery has allowed the surgeon to avoid aortic cannulation and cross-clamping; moreover, by using pedicled arterial conduits, the surgeon can accomplish a "no touch" approach. Arterial grafts may allow complete

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Figure 1. The right internal thoracic artery is anastomosed to the venous graft in an end-to-end fashion.

myocardial revascularizations, and double ITAs, Y grafts with both ITAs or the radial artery, sequential ITA grafts, the use of the right gastroepiploic artery, and so on are the most popular solutions to these cases [Hirose 2000]. However, all of these techniques are challenging and appear troublesome to carry out in patients with several extracardiac risk factors. In elderly patients, we believe that a straightforward procedure should be the surgeon's primary concern. This consideration means that the anastomosis of a well-functioning left internal mammary artery to the left anterior descending coronary artery represents the main goal of the operation. Any additional anastomosis on this conduit may jeopardize this primary goal. Otherwise, the use of multiple arterial grafts increases the risk of postoperative complications, which can be extremely dangerous in older patients. Our solution allows

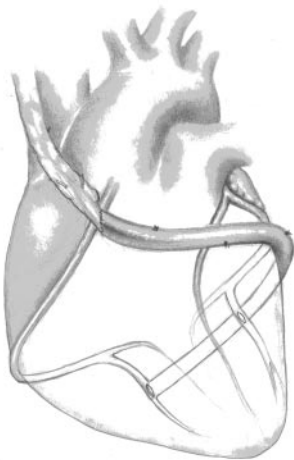


Figure 2. The venous conduit is anastomosed side to side to the first obtuse marginal artery and end to side to the posterior descending artery to create a sequential graft.

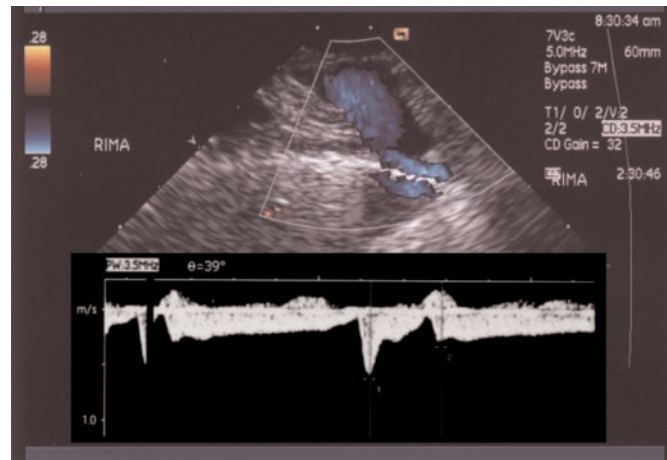


Figure 3. Doppler ultrasound control analysis of both internal thoracic arteries shows a good diastolic flow.

a completely no-touch approach, coupled with the technical ease and feasibility of using venous grafts. Harvesting the proximal segment of the right ITA is rapidly done, sternal vascularization is partly preserved, and the caliber of the proximal ITA is large enough for the artery to be safely anastomosed to the vein. Furthermore, the oblique anastomosis allows the surgeon to minimize the mismatch between the 2 vessels.

For OPCAB revascularization procedures of greater complexity, the right ITA can effectively supply a sequential venous graft. Moreover, this composite graft can easily be controlled by means of Doppler ultrasound assessment during the early and late postoperative period.

New stapling devices are becoming available that allow the anastomosis of venous grafts to the ascending aorta without the need of aortic cross-clamping [Werker 1997]. These devices represent an effective solution when a calcified aorta is found; however, there are a few patients in whom even a small segment of "soft" aorta is hard to find. The composite graft we have described here may be the best option in these cases.

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