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Off-Pump Coronary Artery Bypass Grafting in a High-Risk Dextrocardia Patient: A Case Report

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ABSTRACT

We present an interesting but high-risk case of an obese male patient aged 56 years with dextrocardia and a left diaphragmatic hernia. Anterior myocardial infarction was diagnosed in 1994, and the patient later presented with a history of unstable angina. The diagnosis for this chronic smoker was triple-vessel disease, impaired left ventricular function, chronic renal failure, chronic bronchitis, impaired lung function, pulmonary hypertension, hypertension, diabetes, and chronic active gastritis (EuroSCORE of 10). The patient underwent successful off-pump coronary artery bypass grafting with 3 saphenous vein grafts to the left anterior descending, obtuse marginal, and right posterior descending arteries. He was discharged home 8 days later.

INTRODUCTION

Off-pump coronary artery bypass grafting (OPCABG) has been an acceptable approach for coronary revascularization, particularly in high-risk cases. So far, there has been 1 published report of OPCABG carried out in a dextrocardia patient [Tabry 2001]. We present an interesting case of OPCABG in a high-risk dextrocardia patient with a EuroSCORE of 10.

CASE REPORT

The patient was a 56-year-old Malay man who had incidentally received a diagnosis of situs solitus dextrocardia and left diaphragmatic hernia in 1980. He was a chronic smoker who presented to the cardiologist with symptoms of unstable angina. He was in New York Heart Association (NYHA) functional class 3. He also had other comorbid problems, including chronic renal failure, chronic bronchitis, hypertension, diabetes, and gastritis. His chest radiograph showed a situs solitus dextrocardia and left diaphragmatic hernia (Figure).

Coronary angiographic results showed severe triple-vessel disease and impaired left ventricular function (left ventricular ejection fraction [LVEF], 37%). The patient's baseline serum creatinine level ranged between 210 µmol/L and 230 µmol/L, forced expiratory volume in 1 second was 1.1 L (41.5% of predicted), forced vital capacity was 1.3 L (44% of predicted), and the mean pulmonary artery pressure was 47 mm Hg. A transthoracic echocardiogram showed an LVEF of 40%, a left ventricular end-diastolic dimension of 4.8 cm, situs solitus dextrocardia, and anteroseptal hypokinesia. The patient's calculated risk stratification using the EuroSCORE model was 10.0, which gave a mortality rate of more than 20% [EuroSCORE 2004]. Although the patient was given the option to have a combined surgery, the patient and his relatives consented only to the urgent coronary surgery and refused to have the left diaphragmatic hernia repaired at the same time. In fact, the patient refused to have the hernia repaired at all because it had not given him any problem since 1980.

During anesthetic induction, continuous cardiac output monitoring and an intravenous milrinone infusion were started. With the patient under general anesthesia, a standard midline sternotomy was carried out, and an elective OPCABG operation was performed with the Octopus 3 stabilizer, the Starfish heart positioner, and intracoronary shunts (Medtronic, Minneapolis, MN, USA). The activated clotting time of 440 seconds was reached with a heparin dose of 150 U/kg body weight and was maintained between 350 seconds and 400 seconds. Hemodynamic stability during the operation was ensured with a regimen of inotropic drugs and warm fluid. Three saphenous vein grafts were made to the left anterior descending (LAD) (1.5 mm), the obtuse marginal (OM) (1.5 mm), and the right posterior descending (RPDA) (2.0 mm) arterial vessels.

The heart, in a situs solitus dextrocardia position, was partially rotated, with the apex pointing to the right. The LAD vessel was directly visible in the middle of the operating field and was grafted easily without manipulating the heart position. The OM vessel was just visible laterally to the left, and the RPDA vessel was positioned posteriorly to the right, hence its difficult exposure. The Octopus 3 stabilizer was positioned on the Octobase sternal retractor (Medtronic) and used in the usual way, with the suction pads oriented parallel to the arteries. The Starfish was positioned

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Dextrocardia with a left diaphragmatic hernia.

at the apex of the heart or lateral to it, where it had the best suction capacity and optimum performance. The Starfish could not be placed in any other positions because of the large amount of epicardial fat that prevented effective suction. The Starfish facilitated the OM and RPDA vessel exposures and minimized hemodynamic instability, especially with the dilated and impaired heart. For the OM exposure, the Starfish was easily maneuvered and rotated the heart toward the right for anastomosis. For the RPDA exposure, the heart was held out of the pericardial sac by the Starfish, with the apex pointing toward the ceiling and slightly to the left and with care taken not to compromise the right ventricular outflow. For the RPDA anastomosis, we found it easier to operate from the opposite side. The cardiac index was well maintained during the OM and RPDA anastomoses. A proximal coronary sling was used prior to the arteriotomy and insertion of the coronary shunt. We have never used any distal coronary sling. We use coronary shunts in all OPCABG cases with subtotal coronary occlusion, and our experience suggests that the shunts do help to minimize coronary blood loss, hemodynamic instability, and conversion rate. The distal anastomoses were sutured prior to the proximal anastomoses with continuous 7-0 polypropylene suture (Prolene; Ethicon, Somerville, NJ, USA). The proximal anastomoses were sutured with 6-0 Prolene and a Satinsky aortic tangential (side-biting) clamp. The LAD and OM grafts were routed along the left side, and the RPDA graft was routed along the right side toward the aorta. The left internal mammary artery was harvested; however, it was too small with poor flow and hence was not used. We left both pleural spaces unopened to minimize respiratory morbidity. Urine output and serum creatinine level were satisfactory and almost unchanged during and after surgery. The patient was extubated in the cardiac intensive care unit approximately 3 hours after surgery. With a total blood loss volume after surgery of approximately 220 mL, the patient did not require blood product transfusion. No intra-aortic balloon pump or renal dialysis was required postoperatively. The patient's stay in the intensive care unit was less than 24 hours. Cardiac arrhythmia, ischemia, or infarction was not encountered. Oral ticlopidine treatment was restarted together with the patient's other essential medications, including subcutaneous injections of low molecular weight heparin. Postoperative recovery was uneventful, and the patient was discharged home on postoperative day 8. Currently, 16 months after his operation, the patient is still in NYHA functional class 1 and is angina free. The postoperative echocardiogram showed an LVEF improvement of 48.6%.

DISCUSSION

The first case of dextrocardia was reported by Fabricius in 1606. Dextrocardia with situs solitus is less common than situs inversus. So far, only 1 case of OPCABG performed in a dextrocardia patient has been reported worldwide [Tabry 2001]. To the authors' knowledge, the present case is the first in the world of OPCABG performed in a high-risk (EuroSCORE of 10.0) dextrocardia patient. Many centers around the world have shown OPCABG to be a safe and suitable approach for coronary revascularization and have demonstrated excellent outcomes, particularly in high-risk cases [Ascione 1999, Bittner 2002, Riha 2002]. That OPCABG helped to minimize blood loss in this patient with myocardial, renal, pulmonary, and metabolic morbidity was not surprising at all.

The introduction of modern OPCABG devices, the Octopus 3 and the Starfish in particular, has transformed the surgical technique dramatically, making it safer and easier to carry out even a complex procedure in a high-risk dextrocardia patient with a left diaphragmatic hernia. We did not use the Octopus 3 and Starfish any differently than in other OPCABG cases, apart from the different orientation of the device on the Octobase sternal retractor relative to the patient's coronary vessels. In this situs solitus case, the exposures of the LAD and OM vessels were straightforward in practice because the heart had partially rotated to the right, hence exposing the LAD vessel directly in the middle of the surgical field and the OM vessel just lateral to it. In fact, the LAD anastomosis was performed without the use of the Starfish. On the other hand, the RPDA exposure was the most challenging, with a difficulty similar to that of exposing the distal branch of the left circumflex vessel in a patient with a normally oriented heart. An operating table maneuver was also used to enable good exposure of the RPDA as well as to optimize intravascular volume control.

Using the Octopus 3 requires no special tricks of coronary stabilization in OPCABG. The coronary vessels were stabilized in the best possible way, with the suction pads placed parallel to the coronaries, with the heel of the stabilizer placed either proximal or distal to the arteriotomy. We prefer to place the heel of the stabilizer distal to the arteriotomy

because it allows placement of our proximal coronary sling. As for the use of the Starfish, we prefer to use it at the apex of the heart, and in this case we easily maneuvered the dilated heart into various positions to expose the coronary vessels adequately while minimizing hemodynamic insult as much as possible. We find the routine use of cardiac output monitoring for dilated and impaired hearts to be very helpful. There have been previous normal cases in which the Starfish was used at the midcardiac angle near the acute marginal artery region to expose the RPDA vessel. In the present case, however, we did not use the technique because of the large amount of epicardial fat that prevented effective suction by the Starfish. Opening the pleura does help in some cases, but we did manage to avoid it in this case to minimize postoperative respiratory morbidity. The left diaphragmatic hernia did not pose any special problem during the operation. That the patient refused to undergo a combined procedure to repair the hernia was another good reason for not opening the left pleura, in case the patient changes his mind in the future. We have always preferred to do the distal anastomoses first, because it is much easier to measure the length of the vein graft. We find the routine use of the coronary shunt in subtotal occlusion cases to be very useful. To avoid distal coronary damage, we have never used a distal coronary sling. We chose to use vein grafts rather than arterial grafts because of (1) a small internal mammary artery with poor flow, (2) the patient's large heart, and (3) the high-risk and urgent nature of the operation. The possibility of graft thrombosis from using less heparin might have posed a problem, particularly in this high-risk OPCABG case. Hence, we preferred to start the patient on antiplatelet therapy and subcutaneous injections of low molecular weight heparin as soon as there was no evidence of active bleeding postoperatively.

CONCLUSION

OPCABG can be safely performed in a high-risk dextrocardia patient. We found the Medtronic Starfish heart positioner to be very versatile and useful in this case.

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