Case Report

Off-pump Coronary Artery Bypass Grafting as Re-do Surgery in Two Cases in Which the Right Gastroepiploic Artery Was Grafted to the Right Coronary Artery

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Transdiaphragmatic off-pump coronary artery bypass grafting (OPCAB) to the right coronary artery, is an effective way to reduce the risks of second bypass surgery as well as the risk of graft injury after coronary artery bypass grafting (CABG). We report two cases of successful OPCAB as re-do surgery in which the right gastroepiploic artery (RGEA) was grafted to the right coronary artery. The first case was a 58-year-old woman, who underwent CABG 10 years ago. OPCAB (RGEA to right coronary artery) was performed since myocardial perfusion scintigraphy revealed ischemia in the inferior wall. The second case was a 67-year-old man who had hypertension, hyperlipidemia, peripheral arterial disease, and was undergoing dialysis (for 6 years). Six years previously, he developed a mycotic aneurysm of the right coronary artery and underwent open-heart surgery. He often had episodes of angina at night or during dialysis, and then developed congestive heart failure and was hospitalized. Since ischemia was considered to be in the inferior wall, the RGEA was grafted to the right coronary artery.

Keywords: coronary artery bypass grafting, re-operation, right gastroepiploic artery, transdiaphragmatic approach, right coronary artery

Introduction

Transdiaphragmatic off-pump coronary artery bypass grafting (OPCAB) to the right coronary artery (RCA) is an effective way to reduce the risks of second bypass surgery as well as the risk of graft injury after coronary artery bypass grafting (CABG). We report two cases of successful OPCAB as second bypass surgery in which the right gastroepiploic artery (RGEA) was grafted to the RCA.

Case 1

A 58-year-old woman underwent CABG (×4) (left internal thoracic artery (LITA) to left anterior descending artery (LAD), saphenous vein great (SVG) to diagonal branch, obtuse marginal branch and atrioventricular branch) 10 years ago. Eight years later, she had chest pain and underwent coronary angiography revealing total occlusion of RCA (#2: # number is American Heart Association classification of coronary artery), 90% stenosis of LAD (#7), total occlusion of Circumflex branch (#13), a patent LITA graft and total occlusion of...
the SVG. Percutaneous coronary intervention at #2 was unsuccessful. Ten years after CABG, percutaneous coronary intervention, at #2 was performed again because of progression of lesions, but was unsuccessful. OPCAB was performed because myocardial perfusion scintigraphy revealed ischemia in the inferior wall.

Surgery: OPCAB (RGEA to #3)

In the supine position, the patient underwent an upper midline incision into the abdominal cavity. The xiphoid process of the sternum was removed. The diaphragm was pulled down, and the pericardium was incised approaching into the pericardial cavity. Pericardial adhesions to the inferior wall of the heart were dissected, and the RCA (#3) was identified. There was good pulsation of the RGEA. The RGEA was harvested from the pylorus through up to two-thirds of the greater curvature of the stomach. Stay sutures were placed on the proximal and peripheral sides of the anastomotic site, and the RGEA was raised through the diaphragm and anastomosed to the RCA (#3).

Postoperative course:
The postoperative course was uneventful. On postoperative day (POD) 16, celiac angiography was performed, and graft patency was confirmed. Then she was discharged from the hospital.

Case 2

A 67-year-old man had hypertension, hyperlipidemia, and peripheral arterial disease and had been undergoing dialysis for 6 years. Six years previously, the patient developed a mycotic aneurysm of the RCA and underwent open heart surgery (removal of the aneurysm of the RCA, ligation of the RCA, and closure of the right atrial fistula).

For the past year, the patient often had episodes of angina at night or during dialysis and developed congestive heart failure and was hospitalized. Although he was discharged from the hospital in remission after receiving drug treatment, he experienced further episodes of angina. The coronary angiography revealed a total occlusion of #3 and #11, while the posterior descending branch (#4 PD) showed collateral circulation from the left anterior descending artery. Since the lesions responsible for ischemia were considered to be in the inferior wall, percutaneous coronary intervention could not be performed. OPCAB was then performed.

Surgery: OPCAB (RGEA to #4 PD)

In the supine position, the patient underwent an upper midline incision into the abdominal cavity. The costal arch was suspended by a Kent-hook to optimize the surgical field. There was good pulsation of the RGEA. The RGEA was harvested with a harmonic scalpel. The diaphragm was incised transversely (by 7–8 cm), and pericardial adhesions were dissected. The #4 PD was identified using a transit time flow-meter X-plore probe (Medi-Stim, Flowmeter, VeriQ: Version 3.0, AS, Norway) and was stabilized using a Guidant Acrobat™ stabilizer (Guidant Corporation, Indianapolis, USA). The RGEA was anastomosed to the #4 PD (Fig. 1).

Postoperative course:
The postoperative course was uneventful. On POD 10, computed tomography of the coronary arteries was performed to evaluate graft patency (Fig. 2). On POD 17, he achieved complete remission and was discharged from the hospital.

Discussion

Transdiaphragmatic OPCAB is an effective method for reducing the risks of second bypass surgery. In case 2, the patient had peripheral arterial disease and had received dialysis for 6 years was at risk (30-day operative mortality rate, 30%; 30-day operative mortality rate plus the rate of having main postoperative complications, 54%: Japan Adult Cardiovascular Surgery Database). Therefore, the transdiaphragmatic approach was selected. On the other hand, the patient of case 1 was at risk of patent graft injury during the second midline sternal incision after CABG. There are many studies demonstrating the efficacy of transdiaphragmatic OPCAB to the RCA in reducing the risk of patent graft injury.

Graft patency rates over the long term (>5 years) after CABG using the RGEA are reported to be 83%–87%. In a follow-up study from 5–17 years, Suma et al. reported that graft patency rates were as high as 87% (108/124). The RGEA is usually used as an in situ graft in a transdiaphragmatic approach because of patency and anatomical location. Takahashi et al. performed OPCAB as second bypass surgery in 10 patients using the GEA to the RCA, and angiographic patency of 100% was achieved. When the RGEA cannot be used in some cases (post-gastrectomy and with arteriosclerosis), bypass surgery using the splenic artery as the inflow source is also considered.
Edwards et al. performed CABG in 1973 using the splenic artery as an in situ graft, and Machiraju et al. and Munakata et al. reported the efficacy of bypass surgery in which the SVG was grafted to the RCA using the splenic artery as the inflow source. Bypass surgery in post-gastrectomy patients using the SVG or the radial artery as a free graft and the gastroduodenal artery as the inflow source has also been reported.

It is difficult in re-do surgery to identify the artery in the anastomotic site. In case 2, after the diaphragm was incised transversely and pericardial adhesions were dissected, the #4 PD was successfully identified using a VeriQ X-plore probe. The pulsating noise could have been low due to the adhesions. This possibility was also suggested by Munakata et al. who identified the artery in the anastomotic site with an ultrasonic flowmeter used in neurosurgery.
Conclusion

We report two patients who successfully underwent OPCAB as re-do surgery in which the RGEA was grafted to the right coronary artery.

References