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LIMA RIMA Y – TOTAL ARTERIAL REVASCULARIZATION: OUR STUDY

Surgery

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ABSTRACT

Total arterial revascularization using off-pump coronary bypass and aortic no touch technique with BITA graft is safe and effective, with low complication rate and mortality among patient. Adding to its superiority to vein conduits, arteries allow high degree of versatility and long-term patency with minimizing need for reintervention especially in young patients and patients with atherosclerotic and porcelain aorta. Despite growing evidence of improved survival only minority of surgeons are using it, due to fear of deep sternal wound infection and learning curve associated with it. Here we will discuss experience in our centre, techniques and associated complications associated with use of BITA graft for total arterial revascularization.

KEYWORDS

Total Arterial Revascularization, Bita Graft.

Introduction

Internal thoracic artery (ITA) grafts are associated with better outcome than with saphenous vein grafts in CABG[1,2]. LIMA graft is considered the best graft for bypassing the LAD coronary artery[3,4]. Use of the RIMA, in place of the LIMA, may also produce the same results[5,6]. Tector et al.[7], Barra et al.[8], and Kamath et al.[9] described sequential anastomoses, BIMA anastomoses, the free graft technique, and reimplantation of the RIMA as a free graft into the LIMA in situ to compose Y graft. Excellent late clinical results were reported by Tector et al.[7], Tatoulis et al.[10] and Lytle et al.[11]. This procedure provides additional length to reach a distal coronary artery branch, such as the posterior descending branch of the right coronary artery or PLV. This technique is gaining popularity than CABG with cardiopulmonary bypass (CPB) because it was associated with less complications. We used bilateral internal mammary artery (BIMA) Y graft with OPCABG for the selected patients. It entail the following benefits: total arterial revascularization, no interaction with the aorta thus avoiding cerebral apoplexy and fewer complications associated with major organs. In this paper, we summarize our experience with off-pump coronary artery bypass surgery using BIMA Y graft.

Methods

Clinical data - From July 2014 to May 2018, we completed 56 (29 male and 27 female patients) CABG surgeries using a BIMA Y configuration graft to achieve total arterial myocardial revascularization. During these procedures, we considered the following two conditions: (1) young patients; and (2) aortic or carotid artery involvement was present. Most patients in our institute undergo CABG with LIMA + SVG and few selected patients received the BIMA Y graft.

Surgical technique - The semi-skeletonization method of the BIMA harvesting technique was employed[12]. IMA exposure was achieved with a IMA retractor, and the IMA was dissected via electrocautery and hemoclips from the chest wall along with a narrow pedicle of surrounding tissue. The LIMA was harvested first and dissected from the origin to the distal region of bifurcation. The RIMA was then dissected in a similar manner. After heparinization, the RIMA was removed as a free graft. The LIMA was divided at the last bifurcation. The IMA pedicle was left with accompanying veins and little fat. Proximal end of the RIMA was anastomosed with a continuous 8-0 polypropylene suture to LIMA. The BIMA was comprised of a Y configuration graft, with the LIMA serving as the short limb of the Y graft and the RIMA serving as the long branch. The length of the RIMA made it possible to graft as far as the lateral circumflex or posterior descending arteries.

Off-pump technique - All off-pump coronary artery bypass surgeries were performed by the same surgeon. To stabilize ventricular wall movement, suction-type mechanical stabilizer (Octopus; Medtronic) was used. To obtain a bloodless operative field, the small bulldog clamp temporarily occluded the coronary flow, and a warm diluted papaverine (1mg/ml) solution flush was used. Critical LAD branch in almost all patients was first revascularized with the LIMA in an end-to-side fashion to provide a backup to the less critical area. Sequential anastomoses of the diagonal and circumflex branches were then performed in a side-to-side perpendicular (diamond) fashion using the RIMA. The posterior descending or distal right coronary artery graft was performed last using the distal end of the RIMA as an end-to-side anastomosis in parallel. All anastomoses were performed with a single continuous 7-0 polypropylene suture. Cardiac enzyme analyses and electrocadiograms were performed on all patients immediately post-operatively and at day one and two. A surgical review was done one month post-operatively, and routine follow-up was maintained.

RESULTS

The age range of the patients was 45–72 years, with the average age being 58.49 ± 14 years. Of the 56 patients, Triple-vessel lesions were present in 49 (87.5%) patients, left main trunk lesions in 29 (51.78%) patients, and double-vessel disease in 7 (12.5%) patients. A total of 219 distal anastomoses were made in all 56 patients, with an average of 3.9 ± 1.1 bypasses performed for each patient. No one received supplemental vein graft.

Table 1. Patients data.

VARIABLES	n (no. of cases)
Age	45 – 72 (average – 58.49)
Gender – Male/ Female	44/ 12
HTN	34 (60.71%)
DM	37 (66.07%)
Tripple- vessel disease	49 (87.5%)
Double – vessel disease	7 (12.5%)
Left Main Disease	29 (51.78%)
Post – op - Stroke	0
Sternal wound infection	4 (7.1%)
Peri – operative IABP	5 (8.9%)
Post -op angina	3 (5.35%)
30 days Mortality	2 (3.57%)

At the same time, 31 (55.3%) cases underwent coronary artery endarterectomy. No perioperative deaths occurred however 2 (3.5%) post-op deaths were present within 30days of surgery. A total of 5 (8.9%) cases underwent Intra-Aortic Balloon Pump. one (1.7%) cases needed reentry for bleeding. 4 (7.1%) patients developed wound problems (including two diabetic patients). No case had cerebral vascular accident. All patients were successfully discharged from the hospital. 3 patients presented with angina at one month follow-up visit. Cardiology angiography was not performed because of economic reasons and concern about iatrogenic injury of the LIMA.

DISCUSSION

Since bilateral internal thoracic artery (BITA) grafting to coronary arteries provide the best long term survival and lowest rates of reintervention, many surgeons are opting for it. Patients undergoing

CABG with BIMAs have been well known to have long-term results that are superior to those found with only the LIMA13,14. The RIMA was histologically identical to the LIMA and might even show similar long-term patency rates. The length of the semi-skeletonized RIMA in the Asian population is approximately 15–20 cm if harvested from the first rib to the bifurcation region. This technique has been previously shown to be associated with good early clinical and angiographic results when performed without a cardiopulmonary bypass[15,16].

Concern that diabetes may lead to an increased risk of deep sternal wound infection has limited the use of both IMAs in diabetic and non-diabetic patients[17,18]. Although the use of BIMA is considered a risk factor for sternal infection, this risk appears to be attenuated by skeletonized IMA mobilization[18]. In our series, we dissected the BIMA using the narrow pedicle IMA first and then resected the endothoracic fascia using the semi- skeletonization technique[19]. In our study, 4 patients suffered from a wound event and deep sternal infection, including two who suffered from diabetes, which was slightly more than other CABG patients without the BIMA Y graft in our department.

When all target vessels in triple-vessel disease were bypassed with composite ITA graft, major concern was that the single attached LITA would not be able to supply enough blood to the myocardium causing life-threatening hypoperfusion syndrome[20] however, reports show that hypoperfusion was rare, and total revascularization using composite graft provided 2.3 fold increase in reserve of blood flow to coronary vascular bed through the grafts[21].

CONCLUSION

There is a learning curve associated with performing the technique. OPCABG combined with the aorta no-touch technique has been accepted as an effective procedure to avoid neurologic and aortic complications and to reduce operative risks. It is considered as the strategy of choice in patient with diffusely atherosclerotic or porcelain aorta. In conclusion, the total arterial off-pump coronary bypass grafting using a BIMA Y graft could be successfully performed by skillful cardiac surgeons. It is associated with low in-hospital mortality and low complication rates.

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