

EARLY EXPERIENCE WITH BILATERAL INTERNAL MAMMARY ARTERY GRAFTING

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SUMMARY

We carried out first bilateral internal mammary artery grafting in March 93 and ever since the number of patients receiving bilateral internal mammary artery grafts has constantly grown. This study is a review of first 10 patients who were operated between March 93 to August 95. Age ranged from 35-47 and the median age was 45 years. Only young males with good LV function were selected and all insulin dependent diabetes were excluded. All the operations were elective in nature. All patients received additional saphenous vein grafts. 3 patients had sequential LIMA grafts constructed between diagonal and LAD. There was no mortality and 8 patients made uneventful recovery. One patient developed perioperative MI and required balloon pump support, and two required reopening. None of the patients required inotropic support. No sternal wound problems occurred. In conclusion bilateral internal mammary artery grafting does not increase surgical risk and wound infection is not a problem if diabetics are excluded.

INTRODUCTION

The internal mammary artery (IMA) has been established as the preferred conduit for myocardial revascularisation. Its early patency exceeds that of vein grafts and long term patency remains high, in contrast to vein grafts which are subject to late closure as a result of progressive atherosclerosis.^{1,2,3} This superior long term patency is reflected in improvement in long term survival, decrease in the rate of reoperation and improvement in event free survival and cardiac related morbidity.^{4,5}

To further enhance the results of myocardial revascularisation, both IMAs have been used in an attempt to bypass multiple vessels with this conduit.⁶ Technical maneuvers to maximize IMA length enabling it to reach more distal branches of RCA and circumflex artery; have been described,⁷ and free RIMA has been shown to have excellent long term patency.^{8,9}

No adverse effect on mortality and morbidity have resulted from the use of one IMA graft.^{10,11} Surgeons, however, are concerned that the longer, more complicated and technically demanding procedure of bilateral IMA grafting may have an adverse effect on surgical morbidity and mortality. The present study attempts to address these concerns.

MATERIAL AND METHODS

During the period March 93 and August 95 a total of 10 patients were selected for bilateral IMA grafting. Age ranged from 36-47 and the median age was 45. Criteria for selection for bilateral IMA grafting were young age, male gender and good LV function. Moreover, insulin dependent diabetics were not considered for bilateral internal mammary artery grafting. Patients were operated by the senior author at PIC and NICVD during the period mentioned

above. All the operations were elective in nature. All the patients received vein grafts in addition to IMA.

Technique

The same technique was used for all patients. Skin was prepared by Hibiscrub and Povidone iodine. Diathermy use was restricted to a minimum. CPB was established by a single two stage cavoatrial venous and aortic cannulation at 28°C. Flow was maintained at 2.4 L/min/m.² LV was vented through the aortic root needle. Myocardial protection was achieved with cold crystalloid cardioplegia of St. Thomas type, which was infused antegrade in all cases.

Both IMAs were harvested by mobilizing from the 5th intercostal space to their origin from the subclavian artery. The intercostal branches were controlled with hemoclip and care was taken to clip the first intercostal branch. All pericardial, pleural and thymic branches were carefully diathermised. During the takedown of IMA pleural space was regularly entered. LIMA was brought through a slit in pericardial edge at the base of the heart, so that it would not kink by the expanding lung. Moreover it was laid parallel to the phrenic nerve.

In 7 patients free RIMA was used. The RIMA was never routed through the transverse sinus. The destination of the free RIMA is given in Table-I. The sternum was closed with 8 wires of number 5 steel. LIMA was targeted to LAD in 8 patients. Out of these 8, 3 received sequential LIMA grafting to diagonal and LAD. In the remaining two patients LIMA was anastomosed to diagonal and Cx marginal each.

RIMA was used as in situ 3 and free grafts 7. In situ RIMA was diverted to RCA, LAD and PDA in one instance each.

Study Protocol

All patients had postoperative ECG and cardiac enzyme assay performed in the ICU. Any fresh Q wave in the ECG and CK-MB > 50 iu/L was taken as evidence of perioperative MI.

All the patients were submitted to ETT within 60 days of operation. 2 patients agreed to have angiography which was done during the same time scale.

RESULTS

Mortality = Nil

8 patients had uneventful recovery.

Perioperative Myocardial Infarction

One patient had ST elevation in anterolateral leads. He required IABP support in the ICU on the day of surgery. Patient stabilized. Cardiac enzymes were normal. Echocardiography later on showed no fresh wall motion abnormalities.

Reopening for excessive mediastinal bleeding was necessitated in 2 patients. In one patient, bleeding was from the RIMA bed, and in another no bleeding point was found, but a large hematoma was present over the PA and the free RIMA graft.

None of the patient required inotropic support. One patient developed severe pneumonia which led to bronchopleural fistula. He ultimately recovered. Superficial wound infection developed in one patient. No sternal dehiscence or deep seated sternal infection was seen.

TABLE - I

FREE RIMA	Cx MARGINAL	RAMUS	PDA	TOTAL
FREE RIMA	5	1	1	7

DISCUSSION

The IMA graft has an early patency rate exceeding that of vein grafts.^{1,2} The difference in patency increases with time as the vein grafts became stenotic and occluded as a result progressive vein atherosclerosis from which IMA seems to be largely immune. Currently vein graft failure is a major angiographic indication for reoperation and it is increasingly recognized that stenotic vein grafts were associated with disastrous clinical histories. The IMA has the further advantage of not accelerating progression of atherosclerosis in the native circulation as rapidly as the vein grafts.¹²

The clinical advantages of the superior long term patency of the IMA graft are demonstrated in improvement in long term survival, and incidence of reoperation, reoperation-free survival and hospitalization for cardiac events.^{4,5}

If the long term salutary effects of myocardial revascularisation are to be sustained, it is essential that the conduit maintains its patency. Attention has therefore focused to the IMAs in an attempt to bypass maximum number of vessels with a conduit demonstrated to have excellent long term patency. No increased mortality and morbidity from using one IMA has been described in large series of patients.^{3,4,5} This does not increase the risk of complications.⁶ The incidence of perioperative MI is not increased which lend support to the ability of IMA to provide blood flow sufficient to meet myocardial oxygen demand, as previously demonstrated by Schmidt and associates.¹⁵

Cosgrove has further demonstrated that pleural space opening (even when both were entered) did not increase respiratory complications.⁶

It has also been shown that additional dissection associated with mobilization of

both IMAs does not lead to more reopening although requirement for transfusion are marginally increased. This is in agreement with previously reported findings that red cell mass and age were the best predictors of necessity for, and the amount of transfusion in patients undergoing myocardial revascularisation. The duration of the operation and the number of grafts were not predictors of transfusion requirement.¹⁵

Of greatest concern in the use of IMA graft is the possibility of sternal wound infection. It was Culliford¹⁶ who reported that bilateral IMA grafting results in 8.5% incidence of sternal wound infection as compared to 2.3% when LIMA was used. This led to fear among surgeons that dissection of both IMAs would devascularise the sternum and increase the number of wound complications. However,, the study of Cosgrove incriminated diabetes and advanced age as the only significant factors for sternal wound complications. Type of conduit and gender did not achieve statistical significance. Special consideration should be given to diabetic and elderly patients before bilateral IMA grafting.⁶

The patency of RIMA as a bypass graft compared favorably with LIMA. Lower patencies of both IMAs are observed when coronary arteries other than LAD were the target vassals. Use of RIMA as a free graft (or its passage through the transverse sinus) does not appear to jeopardize graft patency.⁹

Our results support continued use of RIMA in selected patients, and several technical aspects of revascularisation should be emphasized. First we prefer to use LIMA as a bypass graft to LAD whenever possible. Although RIMA can reach LAD in most patients and has good patency to this vessel, LIMA allows more flexibility in bypass of the distal LAD, and less vulnerable to injury if reoperation is necessary.

We have used free RIMAs in most of our patients. In situ RIMA has been used to bypass LAD and CRA in one patient each. Only in one patient we have used in situ RIMA to bypass PDA. Riviera et al advocate bypass of RCA with RIMA and believe that the graft can extend beyond the acute margin of the heart.¹⁷ However, we find that the length of in situ RIMA is often insufficient for optimal site of anastomosis to the RCA. PDA and continuation of RCA beyond PDA (which are usually recipient sites for grafts in patients with distal RCA disease), are difficult to reach with in situ RIMA, and the necessary length of the graft is easily underestimated when the heart is decompressed during cardiopulmonary bypass and cardioplegic arrest.

We prefer to use RIMA for bypass of proximal lesions in the intermediate branch of left coronary artery, or for obtuse marginal branches. Orszulack has proposed that these grafts can be routed through the transverse sinus or RIMA can be used as a free graft. We have not used the transverse sinus route for in situ RIMA but instead have relied on free RIMAs.

CONCLUSION

Bilateral internal mammary artery grafting does not increase surgical mortality, however, it does increase surgical morbidity to a small degree. This procedure is especially warranted in young patients, in an attempt to improve long term results of myocardial revascularisation. The problem of sternotomy wound infection can be obviated if insulin dependent diabetics are excluded.

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