

Coronary Revascularization Using Bilateral Internal Mammary Artery— Experience At The Punjab Institute Of Cardiology*

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Summary:

Three hundred and eightyfour patients were operated from September, 1991, to November 30, 1993. We used single IMA's on 303 patients, Bilateral IMA's on 30 patients and Bilateral IMA with Right Gastro-Epiploic Arterial grafts on one patient. We compared early and late results on these three groups. Group I - Patients with Vein Grafts only, Group II - Patients with Single IMA Grafts, Group III - Patients with Bilateral IMA. Early results did not show much difference between these three groups as far as complications were concerned except, that there was more blood consumption in Bilateral IMA group, i.e. 300 ml, 550 ml and 700 ml respectively for the three groups. As far as late results are concerned, none of the Bilateral IMA patients was re-admitted for recurrence of Angina or any other complications.

Introduction:

As it is a well-established fact that arterial grafts are better than vein grafts, single (Left) IMA graft is routinely used at almost every centre in the world because of its longer potency. Left IMA is easy to use mostly onto LAD system. Very few surgeons are using the Right IMA routinely. Ischaemic heart disease is very common in Pakistan and patients present at a very young age as compared to the West. Because of long-term potency of the IMA, we should consider using Bilateral IMA on as many patients as possible. Saphenous vein grafts have limited long term potency and as many as 15 ~ 20% vein grafts block off after one year of operation.

Methods:

All 384 patients who underwent the CABG operation were studied in Punjab Institute of

Cardiology, Lahore, from September, 1991 to the end of November 1993. These patients were divided into three groups.

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|-----------|----------------------------------|
| Group I | Patients with Vein Grafts only. |
| Group II | Patients with Single IMA Grafts. |
| Group III | Patients with Bilateral IMA. |

There were 361 male and 23 female patients. None of the female patients had Bilateral IMA. Age group ranged from 29 ~ 75 years (Average Age = 51). Total number of grafts were 1,228 (3.2 grafts per patient). All were operated upon with cross-clamping and crystalloid cardioplegic solution (St. Thomas' solution was used) utilizing membrane oxygenation. All were operated by one surgeon.

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TABLE 1
Preoperative Risk Factors

Group	Diabetes	Hyper-lipidemia	Hypertensive on Rx	Smoker
I	40% Insulin dependent 10%	7%	25%	40%
II	35% Insulin 10%	5%	20%	35%
III	30% Insulin 0%	4%	20%	30%

All those patients who had single IMA, LIMA was anastomosed to LAD as pedicle graft except in five cases, where LIMA was used as a free graft and proximal anastomosis was performed to the Ascending Aorta (in these cases a LIMA was either tight on a pedicle or damaged during harvesting). In those cases where Bilateral IMA was used, RIMA was anastomosed to the following vessels:-

- o The LAD as a pedicled graft in 23 out of 30 patients.
- o The Right Coronary Artery in 3 cases. (All pedicle grafts).
- o OM branch of Circumflex vessel in 2 cases (both free grafts and proximals to ascending Aorta).
- o The LAD in 2 cases as free grafts (both proximal to ascending Aorta).

In all the Group III patients LIMA was anastomosed to OM branches on 28 patients and to the LAD in 2 patients.

TABLE 2

Operation Time

	Group I	Group II	Group III
Ave. Time in OR (3 grafts)	3.5 hours	4 hours	5 hours
Cross Clamp Time (3 grafts)	35 min.	40 min.	45 min.
Bypass Time	70 min.	70 min.	60 min.

All these three groups were studied post-operatively and immediate post-operative course in the ICU and wards was monitored and all those patients who were approachable were studied on long-term follow up.

TABLE 3

ICU Stay

	Group I Vein Grafts only	Group II Single IMA	Group III Bilateral IMA
Drainage	400 ml	600 ml	750 ml
Reoperation for Bleeding	3/51 (6%)	25/303 (8%)	2/30 (7%)
Blood Consumption (Averaged)	300 ml	550 ml	700 ml

Note: Average ICU stay for all these patients was 2 days.

Perioperative Ischaemia

Group I (Vein Grafts only)

- o Four patients had signs of perioperative infarction as documented by post-operative ECG changes and elevated CKMB. Out of these, two patients had endarterectomy performed (one of RCA and the other of LAD).
- o Four patients had minor S-T changes which were not significant.

Group II (Single IMA + Vein grafts)

- o Two patients had perioperative signs of infarction (S-T changes and elevated CKMB).
- o One patient was extubated but she had a cardiac arrest after two hours. On reopening the chest, all the grafts were patent and she was resuscitated but had brain damage during the arrest.
- o Three patients died on the table (all had tight left main stem disease and were operated under emergency).
- o Ten patients had minor insignificant S-T segment changes.

Group III (Double IMA with vein grafts)

- o One patient had minor S-T segment changes.
- o One patient died on the table (Left main stem disease)

TABLE 4

Morbidity

	Group I Vein Grafts	Group II Single IMA	Group III Bilateral IMA
Superficial Wound	4/51	20/303	2/30
Infection	8%	7%	7%
Sternal Dehiscence	2/51 4%	3/303 1%	0/30 0%
Mediastinitis	None	None	None
CVA	1	1	None

TABLE 5

Average Stay in Hospital

	Group I Vein Grafts	Group II Single IMA	Group III Bilateral IMA
Average Hospital Stay	7 days	6 days	7 days

TABLE 6

Mortality

	Group I Vein Grafts	Group II Single IMA	Group III Bilateral IMA
Mortality (30 Day)	3/51 6%	10/303 3%	1/30 3%

Late Results

All those patients who were available for follow up and were willing were sent for ETT. From Group I, Twentytwo patients out of Fiftyone; from Group II, Fifty out of Three hundred three and from Group III, Fifteen out of Thirty were sent for ETT following CABG. Average time after operation was between three months and two years. The results were as follows:-

TABLE 7

	Group I Vein Grafts	Group II Single IMA	Group III Bilateral IMA
Negative ETT	12/15	35/50	12/22
Borderline	3/15	10/50	6/22
Early Positive	None	5/50	4/22

Group II early positive patients showed an improved percentage compared to pre-op. ETT.

Repeat Angiograms

Ten patients from Group III (Bilateral IMA) were restudied (all were symptom free). Eight patients from Group II and four from Group I were also restudied. All twelve were symptomatic. The results were as follows:-

TABLE 8

Group I	Group II	Group III
10/10 All grafts were patent	1) In four patients all grafts were patent	Four patients were studied
	2) In two patients, one vein graft was patent	Two patients - all grafts were patent
	3) In two patients all grafts were patent but there was diffuse nature vessel disease	Two patients - one vein graft was blocked

Readmission in hospital

Group I Three patients were admitted with some kind of chest pain.

Group II Ten patients were readmitted.

Group III None of these patients was readmitted.

Conclusion

The Internal Mammary Artery is the only vessel in which atherosclerosis is almost non-existent. Most of the surgeons now routinely use single left internal mammary artery because it is easy to use as a pedicle graft on to the LAD system. Quite a number of studies have established longer potency in IMA grafts (92% after 10 years). Surgeons have not much experience

using the right IMA routinely and it is not preferred by many as it is technically difficult to use as pedicle graft.

It can be anastomosed on to the following vessels.

- i. The RCA, if stenosis is proximal and anastomosis can be performed before crux.
- ii. The LAD, but it will cross the midline. Many surgeons raise the objection that redo will be difficult with the RIMA coming in the way.
- iii. Onto high branches of the Circumflex system especially trifurcation branch with pedicle RIMA brought through transverse sinus.

In our experience more and more younger patients (50% between 30—40 years) are presenting with Ischaemic Heart Disease. If two major systems are covered with IMA grafts most probably a redo wont be required even if supplemented vein grafts block off.

There is no doubt that early complications as more in bilateral IMA group, i.e.,

- i. Post-op. bleeding is more as compared to other two groups and consequently more reopening for bleeding and more blood consumption.
- ii. Chances of sternal dehiscence is more especially insulin dependent diabetics.
- iii. Incidence of perioperative ischaemia is more in bilateral IMA group.

Late results are better in bilateral IMA group. Incident-free period is longer in bilateral IMA group. None of our patients with bilateral IMA was readmitted with recurrence of angina.

Our study shows that bilateral IMA should be used as frequently as possible because of better long-term results especially in Pakistani population where patients present in early age with diffuse native vessel disease.

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