

# Multi-Arterial Coronary Artery Bypass Grafting (MAG-CABG) - Evolving Strategies in Indian Patients

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## Abstract

Multiple arterial grafts are known to provide greater survival benefits. We have used this technique in Indian patients with arterial grafts in different configurations to various target vessels to serve as a guideline for prospective patients. The use of routine postoperative CT Angio at different time periods will help in self-assessment for the surgeon as also maximize the benefits for the patients.

**Keywords:** Coronary Artery Disease; Saphenous Vein; Hamper Movement; Comorbidities

## Abbreviations

CABG: Coronary Artery Bypass Grafting; LIMA: Left Internal Mammary Artery; RSVG: Reversed Saphenous Vein Graft; MAG: Multi-Arterial Grafting; SAG: Single Arterial Grafting; ART: Arterial Revascularization Trial; BIMA: Bilateral Internal Mammary.

## Introduction

There are multiple options for management of symptomatic multivessel Coronary Artery Disease including coronary artery bypass grafting [1]. The high incidence of Coronary Artery Disease in India calls for optimisation of surgical strategy. Considering the younger age group involved, with more severe disease, long term benefits following Coronary Artery Bypass Grafting (CABG) is of prime importance. We have been taking various issues into consideration to provide a guideline – which graft for which target vessel for which patient.

The standard procedure being use of the Left Internal Mammary Artery (LIMA) and multiple segments of Reversed Saphenous Vein (RSVG). However, it has been widely acknowledged that arterial grafts are superior to venous grafts. Although there had been initial controversy over the benefit of Multi-Arterial Grafting (MAG) over Single Arterial Grafting (SAG) using only LIMA and saphenous vein, there is now ample studies in the contrary.

The highly anticipated 10-year results of the Arterial Revascularization Trial (ART) demonstrated no difference in mortality or major adverse cardiac and cerebrovascular events (MACCE) between the LIMA or Bilateral Internal Mammary (BIMA) groups [2]. However, it has been clearly demonstrated that two arterial grafts are better than one. We have tried to smoothen out the complexities in the study to take into account the many variables.

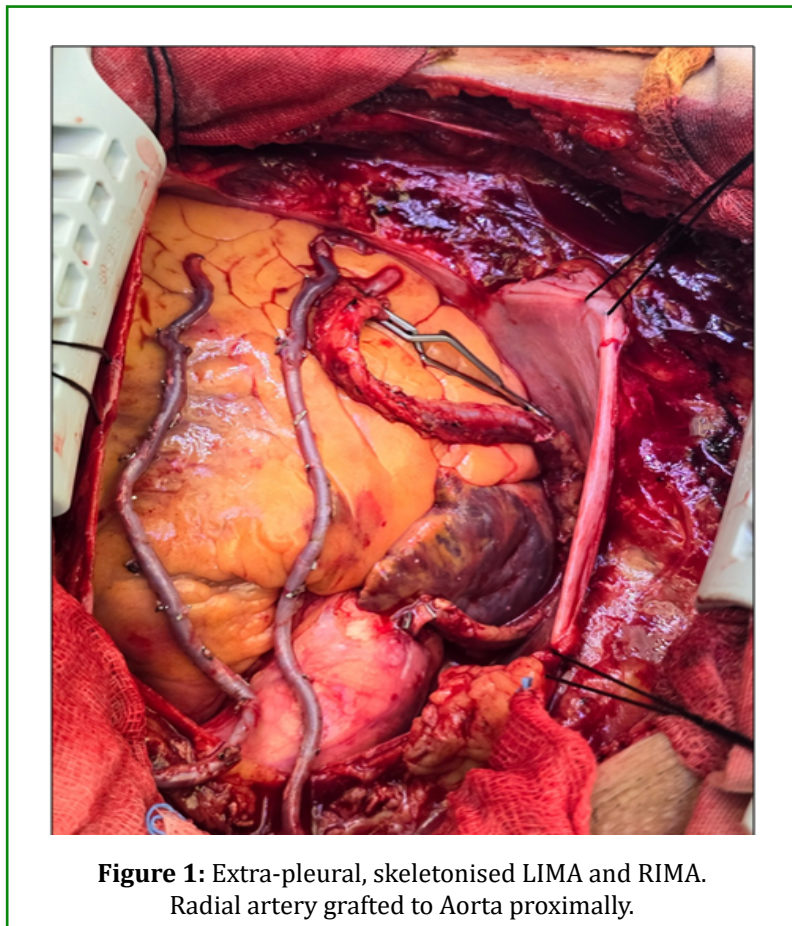
It has been estimated that only about 4-5% surgeons worldwide have adopted this technique. Although recent

studies have beyond doubt shown the survival benefits of MAG over SAG, failure to adopt this technique can be attributed to the fact that the time and skill required for MAG, using Bilateral Internal Mammary Arteries, the Radial Artery and at times the Right Gastro-epiploic Artery, is very high, often deters a surgeon from performing a surgery which will give the best long term survival benefits to the patient. A steep learning curve and lack of proper proctorship prevents widespread adaptation of a technique which demands extreme skill & patience. The radial artery is almost as versatile as the LIMA and RIMA, with excellent long term patency rates of 89% and 86% at 10 years and 20 years respectively [3].

## Methods

We have been performing this procedure for deserving

candidates, preferably in their 5<sup>th</sup> to 6<sup>th</sup> decades, over the last many years. The technique has been further refined in the recent past to involve Bilateral Skeletonised and in-situ Mammary arteries. Further, the LIMA and RIMA are harvested in an extra-pleural fashion to reduce the incidence of chest complications to the same levels as seen in routine LIMA and Saphenous vein grafting. Skeletonised vessels have a longer length and wider diameter than non-skeletonised ones, giving flexibility of doing more than one graft with one conduit (Figure 1). The complexity of the procedure cannot be exaggerated but outcomes have been a driving force to let patients benefit from MAG. Moreover, in-hospital mortality & morbidity is the same as seen in SAG. In fact, patients can be mobilised earlier and more completely without a leg incision to hamper movement.



**Figure 1:** Extra-pleural, skeletonised LIMA and RIMA. Radial artery grafted to Aorta proximally.

## Results and Discussion

We have included angiographic outcomes (CT-A within 30 days of surgery) to establish conclusions on the patency [4] and speculate regarding the potential survival benefits associated with the different approaches of MAG. The

angiographic findings also help assess the orientation of the different combinations of arterial grafts and plan future surgical approaches to maximise the use of arterial grafts. Early (Short Term) patency rates have been almost 100%. Repeat angiograms at 1 year and 5 years are under way to assess long term benefits and have been very encouraging.

Graft patency varies according to vessel type and coronary territory. Hence the importance of proper patient selection and graft planning. Overall graft patency reported is, in general, 1 year patency for arterial grafts at 96% and that for venous grafts 68% only.

Accelerated late vein graft failure, a matter of concern, is taken care of by this technique. MAG is associated with higher survival & freedom from significant MACCE.

## Conclusion

MAG is associated with greater survival and freedom from MACCE and should be considered in all suitable candidates [5]. Routine CTA helps assessment of graft configuration and permits flexibility of graft planning in future cases. It further provides scope for the surgeon to introspect about one's own technique and results. Because of the complexity of graft selection, further investigation is warranted in an attempt to discern positive and negative prognostic factors of graft function. A detailed understanding of conduit performance in variable coronary locations and patients with various preoperative comorbidities will permit optimal conduit selection and a tailored surgical approach to CABG. This will be further strengthened by CTA findings at periodic phases postoperatively.

MAG CABG should be the procedure of choice for patients undergoing CABG using either 2 or 3 arterial grafts, in appropriate patients with reasonable life expectancy and acceptable comorbidities. In the Indian context, further

studies are needed from different institutions to assess the potential benefits of this procedure.

## References

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