RIGHT INTERNAL MAMMARY ARTERY (RIMA);

A FAVOURABLE UNDERUSED ARTERIAL CONDUIT FOR CORONARY ARTERY BYPASS GRAFTING (CABG)

ESSAY

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Abstract

Based on many studies, the Right Internal Mammary Artery (RIMA) is proved to be a good arterial conduit in Coronary Artery Bypass Grafting (CABG) having the same advantages as the Left Internal Mammary Artery (LIMA) concerning patency rates and access to both the left and right coronary systems by variable surgical techniques.

It is also proven to be superior to the Radial Artery (RA) and Saphenous Vein (SV) grafts in long-term patency and cardiac-related interventions.

Key words :

Acute Myocardial Infarction – Millimeter Mercary

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To My Family

Contents

Page

List of Figures

Index of Abbreviations and Acronyms

AMI : Acute Myocardial Infarction

CABG : Coronary Artery Bypass Grafting

CAD : Coronary Artery Disease

CARACCASS : Complete Arterial Revascularization and Conventional Coronary Artery Surgery Study trial

COPD : Chronic Obstructive Pulmonary Disease

CPB : Cardio-Pulmonary Bypass

CT scan : Computed Tomography scan

DWI : Deep Wound Infection

IMA(s) : Internal Mammary Artery (arteries)

LAD : Left Anterior Descending coronary artery

LIMA : Artery Left Internal Mammary

LVEF : Left Ventricular Ejection Fraction

MI : Myocardial Infarction

mmHg	: millimeter mercury
MRI	: Magnetic Resonance Imaging
NYHA	: New York Heart Association
OPCAB	: Off-Pump Coronary Artery Bypass grafting
RA	: Radial Artery
RAPCO	: Radial Artery Patency and Clinical Outcome Study
RAPS	: Multicenter Radial Artery Patency Study
RCA	: Right Coronary Artery
RGEA	: Right Gastro-Epiploic Artery
RIMA	: Right Internal Mammary Artery
SV(s)	: Saphenous Vein (veins)
SVG	: Saphenous Vein Graft
TECAB	: Totally Endoscopic Coronary Artery Bypass grafting
UA	: Unstable Angina
VATS	: Video-Assisted Thoraco-Scopic Approach

Introduction

Routine use of the Internal Mammary Artery (IMA) in Coronary Artery Bypass Grafting (CABG) began in the 1980s, when the IMA was proven to be less likely to become obstructed than the saphenous vein **(*Barner HB et al, 1985*).**

Evidence of better long-term patency of Internal Mammary Artery (IMA) grafts, compared with vein grafts **(*Cameron A et al, 1996*),** promotes the use of arterial grafts for myocardial revascularization. Despite availability of various arterial conduits, the IMA remains the ideal arterial graft ***(Barener H, 1999)*,** and several investigations appear to confirm the benefit of bilateral IMA (BIMA) over single IMA (SIMA) grafting for myocardial revascularization ***(Endo M et al, 2001; Lytle BW et al, 1999; Stevens LM et al, 2004)*.**

The increasing use of multiple and/or composite arterial grafts for myocardial revascularization is favoured by the evidence of better long-term patency of IMA grafts, compared to vein grafts and the IMA remains the ideal arterial graft, due to its site and the histological properties of the vessel wall**.** The use of both IMAs, either “in situ” or as a composite graft, might therefore be advantageous. Occasionally, in patients with chronic

obstructive lung disease, due to a large lung volume, or distal anastmosis site, both right and left IMAs would require lengthening to reach the target vessel to avoid excessive graft tension; alternatively, they can be used as “free grafts” and anastmosed proximally to the ascending aorta ***(Calafiore AM et al, 2000).***

Since the early 1980s, the use of the Left Internal Mammary Artery (LIMA) for grafting of the Left Anterior Descending (LAD) artery became the standard of care based on reports of superior graft patency, reduced cardiac events, decreased need for further intervention and enhanced long-term survival when compared with patients receiving only venous conduits ***(Cameron A et al,1996; Dougenis D et al,1998; Loop FD et al,1986; Pick AW et al,1997)***. The widely accepted success of the LIMA has led to the use of both Internal Mammary Arteries (IMAs), although the Right Internal Mammary Artery (RIMA), used as an “in situ” or free graft, has never become popular, despite convincing observational data ***(Lytle BW et al, 1999)*.**

The development of surgical strategies to achieve total arterial revascularization has led to the search of other arterial conduits, especially the Radial Artery (RA). The use of the RA for coronary artery bypass grafting was first introduced by Carpentier

et al ***(Carpentier A et al, 1973)*** in 1971. At that time, the study was conducted in a limited number of patients with use of mechanical dilation, diathermy for harvesting and no vasodilator treatment post-operatively. This strategy resulted in a high rate of graft failure and its use as a conduit was abandoned after 1976. Late angiography of some patients from the earlier series found patent and disease-free RA conduits which previously had been considered occluded ***(Acar C et al, 1992)*.** This led to the revival of interest in the RA with improved patency ***(Acar C et al, 1998; Possati G et al, 1998).***

Recently, however, the reputation of the RA as a bypass graft has been questioned by Khot et al ***(Khot UN et al, 2004)*.** Along with these developments, recent information suggests that late patency of Saphenous Vein (SV) grafts may have improved. The patency of RIMA and LIMA are not significantly different. Graft patencies of the RIMA and LIMA are superior to those of RA and saphenous vein which are themselves not significantly different. These findings suggest that the RIMA has been underused and that wider application of the RIMA might improve the results of CABG. So, consideration should be given to the routine use of both IMAs for CABG when possible ***(Buxton BF et al, 2003)*.**

Coronary artery bypass grafting (CABG) reoperations can be done without cardiopulmonary bypass, using “in situ” arterial grafts. Arterial conduits have many advantages at the time of reoperation, such as ready availability, the tendency to remain patent even when used as grafts for diffusely diseased coronary arteries, and lack of need for proximal anastmosis. In the event that the left internal mammary artery (LIMA) has already been used, the right internal mammary artery (RIMA) is a good “in situ” alternative as a new conduit during coronary reoperation. Several studies have suggested that the “in situ” RIMA is as good a graft as the LIMA, with identical patency rates when grafted to the left anterior descending coronary artery (LAD) in primary operations as well ***(Buxton BF et al, 2000; Calafiore AM et al, 1996; Dion R et al, 2000).***

Bilateral harvesting IMAs implies, however, extensive devascularization of the sternum and increases the risk of postoperative tissue ischemia, leading to wound infection and dehiscence, in particular in patients with additional risk factors of wound complications as diabetes mellitus, obesity, chronic obstructive pulmonary disease, or peripheral arteriopathy ***(Kouchoukos NT et al, 1990; Loop FD et al, 1990; Molina JE et al, 2004; Ridderstolpe L et al, 2001).***

As a consequence, although the technique of skeletonization of the IMA using scissors and silver clips may limit the extent of devascularization of the sternum and reduce the risk of complications, BIMA harvesting is frequently avoided in patients with multiple risk factors ***(Athanasiou T et al, 2004; Calafiore AM et al, 1999; De Paulis R et al, 2005; Gummert JF et al, 2003; Matsa M et al, 2001; Parish MA et al, 1992; Peterson MD et al, 2003).***