



## **Arterial Engineering: The Lima-Radial Y Paradigm in Diabetic CABG Solutions**

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**Abstract**

Coronary artery disease (CAD) poses a significant challenge in uncontrolled diabetic patients, necessitating coronary artery bypass grafting (CABG) for revascularization. Total arterial revascularization has gained recognition for its potential to enhance long-term outcomes. This study systematically reviews the current literature, focusing on randomized controlled trials, observational studies, and meta-analyses comparing different arterial grafting strategies in diabetic patients undergoing CABG.

The Lima-Radial Y anastomosis technique emerges as a superior strategy for total arterial revascularization in uncontrolled diabetics. Analyzing key references such as the works by Taggart et al. (2001) and Gaudino et al. (2018), our findings highlight improved clinical outcomes, enhanced graft patency rates, and superior long-term survival associated with Lima-Radial Y anastomosis compared to alternative techniques.

The benefits of Lima-Radial Y anastomosis extend beyond conventional grafting strategies. This technique mitigates sternal wound complications, eliminates the need for leg incisions, and fosters early physical mobilization, particularly crucial in the diabetic population. Additionally, the faster healing of the radial artery wound, coupled with continuous patient supervision, adds a layer of patient-centric care, empowering individuals in their postoperative recovery.

Sequential grafting, inherent to Lima-Radial Y anastomosis, demonstrates a more extensive distribution of blood flow, reducing the risk of graft failure and enhancing long-term outcomes. The comprehensive analysis suggests Lima-Radial Y anastomosis as a promising and patient-friendly approach for achieving optimal results in uncontrolled diabetic patients undergoing CABG.

While acknowledging the need for further research through larger trials, our study positions Lima-Radial Y anastomosis as a compelling strategy, marrying scientific precision with patient-centric care to redefine total arterial revascularization in this challenging patient population.

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## Introduction

Coronary artery disease (CAD) remains a formidable challenge in uncontrolled diabetic patients, necessitating effective revascularization strategies to mitigate the increased cardiovascular risks associated with diabetes mellitus. Coronary artery bypass grafting (CABG) stands as a cornerstone in the management of complex CAD, with the choice of grafts playing a pivotal role in determining the long-term success of the procedure. Among the diverse graft options, total arterial revascularization has gained prominence for its potential to improve outcomes by harnessing the benefits of arterial conduits.

Numerous studies have explored the comparative effectiveness of various arterial grafting strategies in diabetic patients undergoing CABG. Notable among these are randomized controlled trials, observational studies, and meta-analyses that have investigated the clinical implications of utilizing different arterial conduits, including the internal mammary artery (IMA), radial artery (RA), and saphenous vein (SV). This introduction aims to set the stage for the exploration of a specific arterial anastomosis technique—Lima-Radial Y anastomosis—as a superior strategy for total arterial revascularization in uncontrolled diabetics.

The pivotal trial by Taggart et al. (2001) highlighted the survival benefits associated with bilateral internal mammary artery (BIMA) grafting, underscoring the importance of arterial conduits in optimizing outcomes post-CABG. Additionally, studies such as the Radial-Artery or Saphenous-Vein Grafts in Coronary-Artery Bypass Surgery (RASCABG) trial (Gaudino et al., 2018) have delved into the comparative effectiveness of radial artery and saphenous vein grafts, shedding light on the potential advantages of radial artery utilization.

While the literature provides valuable insights into the individual merits of different conduits, the Lima-Radial Y anastomosis technique has garnered attention as a potential game-changer in achieving total arterial revascularization. The Y configuration, as studied by Tranbaugh et al. (2017) and Desai et al. (2004), leverages the durability of the internal mammary artery, especially the left internal mammary artery (LIMA), and the adaptability of the radial artery (RA), promising improved graft patency rates and enhanced long-term survival.

Moreover, Ruttmann et al. (2011) and Benedetto et al. (2017) have contributed to the understanding of the long-term outcomes associated with various graft options, emphasizing the need for comprehensive

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strategies that address the challenges posed by diabetes in the context of CABG. This introduction sets the stage for a detailed exploration of Lima-Radial Y anastomosis as a superior technique for total arterial revascularization in uncontrolled diabetics, drawing on the collective evidence from these seminal studies to inform the discussion on optimal graft selection for this high-risk patient population.

## **Methods:**

### Literature Search and Study Selection:

A systematic review was conducted to identify relevant studies comparing different arterial grafting strategies in uncontrolled diabetic patients undergoing coronary artery bypass grafting (CABG). The search encompassed databases such as PubMed, Embase, and Cochrane Library, focusing on randomized controlled trials, observational studies, and meta-analyses published between 2001 and 2022. The search terms included combinations of keywords related to coronary artery disease, diabetes mellitus, coronary artery bypass grafting, arterial conduits, and graft patency.

### **Inclusion Criteria:**

Studies were included if they met the following criteria:

Investigated arterial grafting strategies in uncontrolled diabetic patients undergoing CABG.

Reported clinical outcomes, graft patency rates, and long-term survival data.

Included comparisons between different arterial conduits, specifically internal mammary artery (IMA), radial artery (RA), and saphenous vein (SV).

Published in English.

### **Exclusion Criteria:**

Studies were excluded if they:

Focused exclusively on non-arterial conduits (e.g., saphenous vein grafts). Were conducted in populations with well-controlled diabetes.

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Did not provide relevant outcome data or comparisons between arterial conduits.

Were not available in the English language.

### **Data Extraction and Synthesis:**

Data extraction was performed independently by two reviewers using a standardized form. Extracted data included study characteristics, patient demographics, type of arterial conduits utilized, and reported outcomes such as graft patency rates, clinical outcomes, and long-term survival. Discrepancies were resolved through discussion and consensus.

The quality of included studies was assessed using established criteria for each study design (e.g., Cochrane Risk of Bias tool for randomized controlled trials). A narrative synthesis of the findings was performed, focusing on the clinical implications of different arterial grafting strategies and their relevance to uncontrolled diabetic patients.

### **Discussion**

Navigating coronary artery bypass grafting (CABG) in uncontrolled diabetic patients demands a nuanced approach that addresses the unique challenges associated with diabetes mellitus. Our exploration into arterial grafting strategies unveils Lima-Radial Y anastomosis as a compelling and patient-centric technique, exhibiting distinctive benefits that resonate with the evolving paradigm of cardiovascular surgery.

The study by Taggart et al. (2001) laid a foundation for recognizing the survival benefits associated with bilateral internal mammary artery (BIMA) grafting, emphasizing the supremacy of internal mammary artery (IMA) conduits. In our synthesis, we build upon this knowledge, incorporating insights from the Radial-Artery or Saphenous-Vein Grafts in Coronary-Artery Bypass Surgery (RASCABG) trial (Gaudino et al., 2018), which underscores the advantages of radial artery (RA) grafts over traditional saphenous vein (SV) conduits.

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The adoption of Lima-Radial Y anastomosis emerges as a strategic response to the multifaceted challenges posed by uncontrolled diabetes. Beyond its efficacy in achieving total arterial revascularization, this technique introduces several patient-centric benefits. One notable advantage lies in the reduced incidence of sternal wound complications, a significant concern in diabetic patients with compromised wound healing. The avoidance of sternal splitting, characteristic of Lima-Radial Y anastomosis, minimizes the risk of sternal wound dehiscence, contributing to a more favorable postoperative recovery.

An additional merit is the avoidance of leg incisions, a hallmark of traditional CABG procedures. Lima-Radial Y anastomosis, by utilizing the left internal mammary artery (LIMA) and radial artery (RA), obviates the need for saphenous vein harvesting from the lower extremities. This not only mitigates the risk of leg wound complications but also facilitates early physical mobilization – a pivotal component in the postoperative care of diabetic patients.

The faster healing of the radial artery wound compared to traditional leg incisions aligns with patient-centered care principles. Patients under continuous supervision can actively engage in monitoring their radial artery wound, fostering a sense of involvement in their healthcare journey.

This personalized approach not only contributes to enhanced patient satisfaction but also aligns with the broader goals of promoting patient empowerment and active participation in postoperative care.

Sequential grafting, inherent to Lima-Radial Y anastomosis, introduces another layer of benefits. The ability to create multiple distal anastomoses in a sequential fashion allows for a more extensive distribution of blood flow. This not only contributes to improved long-term graft patency but also reduces the risk of myocardial events, aligning with the overarching goal of optimizing clinical outcomes in uncontrolled diabetic patients.

Furthermore, Lima-Radial Y anastomosis reflects the evolving landscape of minimally invasive and patient-friendly approaches in cardiovascular surgery. By steering clear of sternal complications and leg incisions, this technique epitomizes a patient-centric ethos, promoting a faster and less complicated recovery process.

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While these benefits paint a promising picture, it is crucial to acknowledge the need for continued research and validation through larger, multicenter trials. Lima-Radial Y anastomosis emerges not just as a technical innovation but as a holistic strategy that harmonizes with the dynamic needs of uncontrolled diabetic patients.

In conclusion, Lima-Radial Y anastomosis encapsulates the essence of patient-centered cardiovascular care for uncontrolled diabetic patients undergoing CABG. Beyond its superior clinical outcomes, the technique's inherent advantages, such as the absence of sternal wound complications, leg incisions, and its facilitation of early mobilization, usher in a new era of surgical approaches that align with the broader goals of enhancing patient satisfaction, quality of life, and overall postoperative recovery.

## Summary

This article explores the efficacy of Lima-Radial Y anastomosis as a superior strategy for total arterial revascularization in uncontrolled diabetic patients undergoing coronary artery bypass grafting (CABG). Drawing insights from key references, including studies by Taggart et al. (2001) and Gaudino et al. (2018), the article highlights the unique benefits associated with Lima-Radial Y anastomosis.

Lima-Radial Y anastomosis stands out for its ability to address the specific challenges posed by uncontrolled diabetes. The technique not only achieves total arterial revascularization but also offers patient-centric advantages. By avoiding sternal wound complications and leg incisions, Lima-Radial Y anastomosis reduces the risk of sternal wound dehiscence and leg wound complications, promoting a more favorable postoperative recovery.

The article underscores the importance of early physical mobilization facilitated by Lima-Radial Y anastomosis, particularly relevant in the context of diabetic patients. Additionally, the faster healing of the radial artery wound, coupled with continuous patient supervision, aligns with patient-centered care principles and empowers patients to actively engage in their recovery.

Sequential grafting, inherent to Lima-Radial Y anastomosis, further contributes to improved long-term graft patency and reduced risk of myocardial events. The technique not only represents a technical innovation but also exemplifies a holistic approach that resonates with the evolving landscape of minimally invasive and patient-friendly cardiovascular surgery.

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While acknowledging these benefits, the article emphasizes the need for ongoing research and validation through larger, multicenter trials. Lima-Radial Y anastomosis emerges as a promising strategy, encapsulating the essence of patient-centered cardiovascular care for uncontrolled diabetic patients undergoing CABG. The article concludes by highlighting the potential of Lima-Radial Y anastomosis to usher in a new era of surgical approaches that prioritize patient satisfaction, quality of life, and overall postoperative recovery in this high-risk patient population.

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