

Women's Heart & Vascular Symposium

Bypass Grafts in Women: What Is the Gold Standard?

Natalia Roa-Vidal, BS¹; Lauren K. Barron, MD^{2,3}

¹School of Medicine, University of Puerto Rico, Medical Sciences Campus, San Juan, Puerto Rico

²Division of Cardiothoracic Surgery, Michael E. DeBakey Department of Surgery, Baylor College of Medicine, Houston, Texas

³Department of Cardiovascular Surgery, The Texas Heart Institute, Houston, Texas



Keywords: Coronary artery bypass; women; coronary artery disease

Introduction

Operative mortality and morbidity for coronary artery bypass graft (CABG) surgery has decreased in recent years, but not for women.¹ Operative mortality rates for CABG in female patients are consistently higher than they are for male patients.^{1,2} This finding appears to have multiple contributors. Timely diagnosis of coronary artery disease (CAD) in women is lacking, and the patient's average condition at presentation demonstrates this: Women diagnosed with CAD are 7 to 10 years older at diagnosis than men diagnosed with CAD³; have more comorbid conditions, such as diabetes, hypertension, and hyperlipidemia; and are more likely to undergo urgent rather than elective CABG.² Treatment also appears to be affected by sex, with women less likely to receive guideline-directed revascularization, multiple arterial grafts, or complete revascularization.⁴ Disparities in diagnosis and treatment are marked, emphasizing a need for more research because current recommendations for CABG are based on study populations comprising mostly male patients.

Are There Anatomical Differences Between Men and Women?

By evaluating computed tomography imaging, Hiteshi and colleagues⁵ found that women have smaller coronary arteries than men do, even when correcting for height, body mass index, and left ventricular mass. Vessel diameter has been inversely associated with disease severity⁶ and perioperative mortality.⁷ Taken together, this information suggests that smaller vessel size contributes to the severity of disease at presentation and results in a more technically challenging operation.

Conduit Selection

When it comes to tailoring the revascularization strategy, lesion location and degree of stenosis, patient age and comorbid conditions, and conduit features are key factors that affect the selection of the second conduit. The literature offers data to guide revascularization technique, but the lack of diverse representation in study populations results in recommendations that are not always clearly sound clinical decisions at the bedside.

The internal mammary artery offers patency and mortality benefits to both sexes and is a American College of Cardiology/American Heart Association/Society for Cardiovascular Angiography and Interventions class 1 recommendation as the primary conduit in surgical revascularization.⁸ In multivessel disease in women, the second conduit is often challenging to determine. Saphenous vein grafts provide a simple and expeditious option, making them ideal for urgent and emergent cases, which female patients are more likely to experience; however, placing the conduit with the lowest patency in the population with the longer life span⁹ may not be the best fit.

Citation: Roa-Vidal N, Barron LK. Bypass grafts in women: what is the gold standard? *Tex Heart Inst J*. 2024;51(1):238238.

doi:10.14503/THIJ-23-8238

Corresponding author: Lauren K. Barron, MD, 6770 Bertner Ave, Ste C330, Houston, TX 77030 (lauren.barron@bcm.edu)

Multiple arterial conduits present their own issues in female patients. Data from literature on radial artery access have established that female sex is a predictor of radial artery vasospasm.¹⁰ Female patients are more likely to present with elevated body mass index and diabetes, creating a population with an elevated risk of sternal wound infection and making bilateral internal mammary arteries less optimal for use as conduits in surgical revascularization. Without data powered to detect significance in this population, it is obvious that the optimal strategy is not yet known.

The Randomization of Single vs Multiple Arterial Grafts (ROMA) trial was designed to answer the question of whether arterial grafts are the optimal second conduit. The investigators found the same sex underrepresentation (20% female enrollment) as was present in the study's predecessors and realized that the current study cohort would be underpowered to find an answer for women. To address this issue, the investigators created a nested trial, which will continue to enroll only female patients (N = 2,000) until, for the first time in history, there is a trial designed to answer the primary objectives in women.¹¹

Conclusions

It is not known why women present with CAD later and with more advanced disease, have a delayed timeline to intervention, and are less likely to receive and adhere to guideline-directed treatment. What is known is that women with CAD do not have the same outcomes as men in the present system. The guidelines applied to the treatment of CAD in women are based on studies not powered to detect statistically significant differences in this patient group. A consensus on the optimal revascularization strategy in female patients has not been reached. What is clear, though, is that optimization will be multifactorial, should start with a heart team, and be aimed at a tailored approach that maximizes long-term outcomes.

Article Information

Published: 12 February 2024

Open Access: © 2024 The Authors. Published by The Texas Heart Institute®. This is an Open Access article under the terms of the Creative Commons Attribution-NonCommercial License (CC BY-NC, <https://creativecommons.org/licenses/by-nc/4.0/>), which permits use and distribution in any medium, provided the original work is properly cited, and the use is noncommercial.

Abbreviations and Acronyms

CABG	coronary artery bypass graft
CAD	coronary artery disease

Author Contributions: The authors confirm contribution to the paper as follows: L.B. performed the study conception, design, and data collection; N.R.V. drafted and prepared the manuscript. All authors reviewed and approved the final version.

Conflict of Interest Disclosure: None.

Funding/Support: None.

Meeting Presentation: Presented at the 12th Annual Women's Heart & Vascular Symposium; May 6, 2023; Houston, Texas.

References

- Gaudino M, Chadow D, Rahouma M, et al. Operative outcomes of women undergoing coronary artery bypass surgery in the US, 2011 to 2020. *JAMA Surg*. 2023;158(5):494-502. doi:10.1001/jamasurg.2022.8156
- Alam M, Bandiali SJ, Kayani WT, et al. Comparison by meta-analysis of mortality after isolated coronary artery bypass grafting in women versus men. *Am J Cardiol*. 2013;112(3):309-317. doi:10.1016/j.amjcard.2013.03.034
- Prescott E, Hippe M, Schnohr P, Hein HO, Vestbo J. Smoking and risk of myocardial infarction in women and men: longitudinal population study. *BMJ*. 1998;316(7137):1043-1047. doi:10.1136/bmj.316.7137.1043
- Jawitz OK, Lawton JS, Thibault D, et al. Sex differences in coronary artery bypass grafting techniques: a Society of Thoracic Surgeons database analysis. *Ann Thorac Surg*. 2022;113(6):1979-1988. doi:10.1016/j.athoracsur.2021.06.039
- Hiteshi AK, Li D, Gao Y, et al. Gender differences in coronary artery diameter are not related to body habitus or left ventricular mass. *Clin Cardiol*. 2014;37(10):605-609. doi:10.1002/clc.22310
- Zhou FF, Liu YH, Ge PC, et al. Coronary artery diameter is inversely associated with the severity of coronary lesions in patients undergoing coronary angiography. *Cell Physiol Biochem*. 2017;43(3):1247-1257. doi:10.1159/000481765
- O'Connor NJ, Morton JR, Birkmeyer JD, Olmstead EM, O'Connor GT. Effect of coronary artery diameter in patients undergoing coronary bypass surgery. Northern New England Cardiovascular Disease Study Group. *Circulation*. 1996;93(4):652-655. doi:10.1161/01.cir.93.4.652
- Lawton JS, Tamis-Holland JE, Bangalore S, et al. 2021 ACC/AHA/SCAI Guideline for coronary artery revascularization: executive summary: a report of the American College of Cardiology/American Heart Association Joint Committee on Clinical Practice Guidelines. *Circulation*. 2022;145(3):e4-e17. doi:10.1161/cir.0000000000001039
- Centers for Disease Control and Prevention. *QuickStats*: life expectancy at birth, by sex—National Vital Statistics System, United States, 2019-2021. *MMWR Morb Mortal Wkly Rep*. 2023;72(28):775. doi:10.15585/mmwr.mm7228a5
- Curtis E, Fernandez R, Khoo J, Weaver J, Lee A, Halcomb L. Clinical predictors and management for radial artery spasm: an Australian cross-sectional study. *BMC Cardiovasc Disord*. 2023;23(1):33. doi:10.1186/s12872-023-03042-z

11. Gaudino M, Fremes SE, Mehran R, Bairey Merz CN; ROMA:Women Steering Committee and Investigators. ROMA:Women: innovative approaches for the first cardiac surgery trial in women. *Circulation*. 2023;148(17):1289-1291. doi:10.1161/CIRCULATIONAHA.123.064033