The Impact of Coronary Artery Dominance on Ischemic Heart Disease

Authors: Eric Anghel, Jean-Claude Mouradian, Chukwunomnso Mbata, Kelvin Oguejiofor, Mario Nieves

Research Mentor: Dr. Dhruva Kumar Revanoor

INTRODUCTION

Ischemic Heart Disease: The leading cause of death worldwide,[1] driven by risk factors like family history, hypertension, smoking, physical inactivity, dyslipidemia, hyperglycemia, and more.

Coronary Dominance: Defined by which artery supplies the posterior descending artery (PDA), affecting blood flow to the left ventricle;[2] Right Dominant by the RCA, Left Dominant by the LCx, and Codominant by both RCA and LCx.

Impact on Blood Flow & Risk: LD systems may limit collateral circulation, increasing myocardial risk during occlusion. RD and CD systems distribute blood flow better, reducing thrombotic risk.

Clinical Relevance: Coronary dominance insights can enhance screening, risk assessment, and personalized care in ischemic heart disease.

Methods

Research Approach: Narrative review (2010–2023) on coronary dominance, myocardial health, and left ventricular function in coronary artery disease.

Search & Selection: Systematic search (e.g., PubMed) using keywords like "coronary dominance" and "left ventricular function."

Inclusion & Exclusion: Focused on human studies analyzing coronary dominance types, myocardial infarction severity, prognosis, or LV function; excluded non-human, pediatric, and unrelated studies.

Study Selection: Key studies covered myocardial infarction, LV ejection fraction, and bypass surgery outcomes.

Data Analysis: Examined sample size, study design, and LV function metrics by dominance type.

Results

Key Findings:

- LD patients had higher risks of cardiac mortality, lower LV ejection fraction, and more adverse events within 30 days post-STEMI.[3,4]
- LD was linked to worse long-term outcomes after coronary bypass, including higher mortality and longer hospital stays, especially with LM artery disease.[5]
- Anatomical variations in LD, such as a wider PDA take-off angle from the LCx, led to increased LCx blood flow, raising susceptibility to shear stress, endothelial damage, and atherosclerosis.[6]
- Studies from China associated RD with higher risks in acute inferior MI and more severe atherosclerosis, suggesting regional or population differences.[7,8]

Limitations: Variability in imaging, sample sizes, and coronary dominance definitions complicates generalization. Small, single-center samples and limited diversity reduce statistical power. Short follow-ups hinder long-term insights, and inconsistent control of factors like age and comorbidities affects conclusions.

Future Research Directions: Standardize coronary dominance criteria for better study reliability. Conduct diverse, longitudinal studies with advanced imaging (e.g., CT angiography) to assess long-term impacts. Explore targeted treatments by comparing outcomes in left vs. right dominance in high-risk patients.

CONCLUSION

- Coronary dominance affects ischemic heart disease progression, the full impact is unclear.
- LD systems have higher short-term risks post-STEMI, PCI, and CABG, including increased mortality and reinfarction.
- Long-term outcomes depend on factors like vessel occlusion location and disease severity.
- More multi-center studies with diverse populations are needed to clarify its role and enhance treatments.

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