Surgical Revascularization in the Older Adult with Ischemic Cardiomyopathy

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KEYWORDS

• Coronary artery bypass graft • Revascularization • Cardiomyopathy • Left ventricular dysfunction

KEY POINTS

- With the totality of data supporting coronary artery bypass graft (CABG) for mortality benefit, symptomatic angina, and quality of life improvement, the authors subscribe to the concept that CABG should be a class I indication for patients with ischemic cardiomyopathy and severe left ventricular (LV) dysfunction.
- As the population ages and more patients are referred for CABG, however, a careful risk-benefit assessment should be an important part of the consideration regarding revascularization strategies.
- A heart team approach in consultation with a referring cardiologist, interventional cardiologist, and a cardiothoracic surgeon is critical to arrive at the best decision for each patient.
- The underlying substrate, clinical judgment, coronary anatomy, functional status, end-of-life issues, and patient preferences must all be considered as part of the decision-making process.
- Age, alone, should not be a contraindication because there are data to support a reduction in cardiovascular mortality with CABG in older patients.

Coronary artery disease affects a substantial portion of the population and dictates short-term, medium-term, and long-term morbidity and mortality. According to the 2016 American Heart Association heart disease and stroke statistics update, coronary artery disease accounted for 1 in 7 deaths in the United States in 2013 with an American suffering a coronary event every 34 seconds.[1] There has been a paradigm shift in the presentation and mode of death of coronary artery disease in the past 2 decades. The rapid recognition of acute coronary syndromes and increased availability and utilization of percutaneous coronary interventions coupled with excellent secondary preventive pharmacotherapies have led to a shift from sudden cardiac death and early in-hospital mortality to longer survival.[2–5] The longer survival, however, translates into a substantial proportion of the population living with heart failure due to scarred myocardium or myocardium with poor contractile reserve and LV dilatation and remodeling. One in 5 survivors of first myocardial infarction develops heart failure within 5 years of the initial presentation.[6]

Currently, 6 million Americans are living with heart failure and the prevalence is projected to increase by 46% from 2012 to 2030.[1,7] The etiology of heart failure in the United States has shifted in

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recent years, with 60% to 62% of patients with LV systolic dysfunction diagnosed with coronary artery disease as the likely etiology.[8,9] Heart failure due to ischemic heart disease portends a poorer prognosis compared with systolic dysfunction due to nonischemic etiologies.[10] Aging is associated with an increased risk of coronary artery disease (22.8% of men and 13.9% of women aged 60–79 years and 35.5% of men and 20.8% of women aged 80 years) and an increase in incident heart failure (which doubles with every 10-year increase in men 65–85 years of age and triples for women aged 65–74 and 75–84 years).[1,11,12] Aging is not only a risk factor for coronary artery events and heart failure but also a risk factor for increased morbidity and mortality post–surgical revascularization due to increased frailty, comorbidities, and poorer functional status.[13] Elderly patients with multivessel coronary artery disease and low ejection fraction (EF) with LV dilatation present a challenge to both referring physicians and the operating surgeons.

ISCHEMIC CARDIOMYOPATHY

Although Raftery and colleagues[14] described the causal relationship between coronary artery disease and congestive cardiomyopathy in 1969, it was Burch and coworkers[15] who introduced the term “ischemic cardiomyopathy” a year later. Ischemic cardiomyopathy is defined by LV systolic dysfunction with EF less than or equal to 40% in the setting of coronary artery disease. Despite the inconsistencies and variability in the definitions of ischemic cardiomyopathy in the past, the authors believe that physician judgment in assessing severity of coronary artery disease is paramount.[10,16] In particular, attention should be paid to the extent of coronary artery disease, regional wall motion abnormalities, and exclusion of alternative etiologies of LV systolic dysfunction. The diagnosis of ischemic cardiomyopathy not only provides prognostic information but also helps guide therapy, especially surgical revascularization, which is not a consideration in nonischemic etiologies of dilated cardiomyopathy.

Balancing the potential benefits of surgical revascularization to the risks of increased operative and postoperative mortality in elderly patients with low EF and multiple comorbidities poses unique challenges to caregivers. Availability of multivessel percutaneous coronary interventions, which is a viable option in surgically high or prohibitive risk patients, often offers a lower-risk partial revascularization strategy that may be considered by patients and physicians alike. Hence, deciding the appropriate revascularization strategy in a background of goal-directed medical and device therapies for a particular patient is imperative. In this article, based on contemporary data from the Surgical Treatment for Ischemic Heart Failure (STICH) trial, the authors emphasize the rationale and simplify patient selection for surgical revascularization in elderly patients with ischemic cardiomyopathy.[17]

RATIONALE FOR REVASCULARIZATION

Myocardial scarring and fibrosis after myocyte cell death are central to the development of ischemic cardiomyopathy. Myocardial scarring leads to adverse ventricular remodeling, cavity dilatation, papillary muscle malalignment, and secondary mitral regurgitation. The chronic volume overload sets a vicious cycle by worsening LV geometry, impairing pump function, and accelerating mitral regurgitation. Most of the LV remodeling occurs due to scarring and fibrosis, but chronic hibernating myocardium (adaptive changes secondary to chronic ischemia that lead to loss in contractile proteins and lower oxygen demands of the myocardial tissue) can induce molecular and structural changes, which are reversible with successful revascularization.[18–22] The target for revascularization, however, are these reversible forms of myocardial dysfunction that render the myocardium hypocontractile but viable and are frequently present in patients with ischemic cardiomyopathy.[23] The substrate for ischemic cardiomyopathy is extremely heterogeneous with normal, stunned, hibernating, and scarred myocardium coexisting simultaneously not only in a patient but also in a cross-section of myocardial tissue. Many imaging modalities have been used to prospectively quantify the extent of viable hibernating myocardium and guide patient selection, including using single-photon emission CT (SPECT), dobutamine stress echocardiography, cardiac magnetic resonance, and PET, but there is no single best imaging modality that accurately guides patient selection due to this heterogeneous substrate.[24]

Improvement in global and regional LVEF has been reported after revascularization of viable but hypocontractile myocardium in numerous studies and provides the rationale for offering revascularization on top of maximally tolerated guideline-recommended medical therapy.[25,26] Hibernating myocardium, viability studies, and revascularization have been the areas of intense basic, translation, and clinical research in the field of ischemic cardiomyopathy, but there remain controversies in appropriate patient