

To revascularize or not to revascularize: a dilemma in heart failure

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In developed nations, the leading cause of heart failure is coronary artery disease.¹ Established treatment options for ischemic heart failure include medical therapy, revascularization and cardiac transplantation. Cardiac resynchronization therapy has been recently introduced as a treatment modality for heart failure, but other modalities remain investigational.² Despite therapeutic advances, outcomes of medical therapy in severe heart failure remain poor.^{1,3} For many categories of patients, the potential benefits of revascularization must be weighed against its high periprocedural risks.

Randomized controlled trials of coronary revascularization in patients with heart failure have yet to be completed. Because of the paucity of data from contemporary therapies, practice decisions are largely based on surgical studies performed nearly 2 decades ago. In the 2 largest retrospective series, the Coronary Artery Surgery Study registry (420 medical and 231 surgical patients)⁴ and the Duke University Cardiovascular Database (409 medical and 301 surgical patients),⁵ a significant long-term survival advantage has been observed for CABG over medical therapy, but the surgical survival benefits have been greatest for those patients with the severest left-ventricular (LV) systolic dysfunction (LV ejection fraction [LVEF] < 25%), most extensive coronary-artery disease and most intense angina. Although results from these and other smaller studies overall favoured surgery over medical therapy, important limitations have included selection bias for revascularization, inadequate medical therapy in both medical and surgical groups, use of surgical techniques now outdated⁶ and small numbers of patients, particularly of patients whose symptoms are predominantly those of heart failure.

Perioperative mortality rates for coronary-artery bypass grafting (CABG) in patients with LV systolic dysfunction vary widely, from about 5% among younger adults to more than 30% among older people, who have more severe LV systolic dysfunction and comorbidities.⁷ Similarly, exclusive PTCA (percutaneous transluminal coronary angioplasty) in patients with LV systolic dysfunction is associated with a high periprocedural rate of death (2.5%–5%). In a report⁸ of registry data from before stents came into use, 18.2% of patients with LVEFs of 25%–35% experienced nonfatal myocardial infarction and acute closure.

The article by Tsuguki and colleagues⁹ in this issue is a retrospective analysis in which they compared the rate of death among patients with heart failure treated with revascularization with that among those treated with medical therapy, irrespective of myocardial viability. This report displays the same limitations as previous observational studies. Furthermore, although the authors have adjusted for clinical variables,

most of the revascularizations were undertaken not because of symptoms of heart failure but rather those of acute coronary syndrome. In deed, only 7.7% of the patients underwent cardiac catheterization because of heart-failure symptoms. The study reflected patients studied in 1995–2000. Because both medical therapy and revascularization procedures have improved considerably in the last few years, the treatment modalities they experienced are unlikely to mimic the state-of-the-art treatments patients currently are likely to receive. In this study, fewer than half of the patients were taking angiotensin-converting enzyme (ACE) inhibitors or angiotensin blockers; only one-third were taking β -blockers; and none were taking spironolactone. The report does not clarify whether stents were placed into any members of the percutaneous revascularization group.

Perioperative death rates for CABG can exceed 30% among older patients.

Although published retrospective series have alluded to the potential survival benefits of revascularization in heart failure, limitations in study design and higher periprocedural risk have created uncertainty about the optimal treatment strategy. This provides a rationale for noninvasive testing for myocardial viability in patients with LV systolic dysfunction, which, although based mainly on findings from observational studies, has potential value before revascularization in cases of moderate to severe ischemic cardiomyopathy. Several studies have assessed medium-term death rates among patients who were managed medically or with revascularization after testing for myocardial viability by means of positron- or single-photon emission CT and dobutamine echocardiography.^{10–12} Death rates were relatively high in all groups except patients with hibernating myocardium who underwent revascularization. A meta-analysis¹³ of 24 nonrandomized studies found that 3.2% of patients with myocardial viability who had revascularization died, compared with 17% of those who were treated with medical therapy — an 80% relative reduction in mortality ($p < 0.001$), accompanied by a collective 51% relative reduction in other adverse events. The difference in benefit when viability was absent (6.2% v. 7.7%) was not statistically significant. When the meta-analysis was limited to the 9

studies with sufficient data to calculate the odds ratio for treatment–viability interaction,¹⁴ revascularization still had a greater effect on long-term rate of death than medical therapy in patients with viable myocardium, although the magnitude of the effect in the subgroup was far lower than for the larger cohort.

The main shortcoming of these studies is that they were retrospective and observational. Clearly, prospective randomized studies are needed to obtain definitive conclusions on the prognostic value of revascularization in patients with heart failure. Two major randomized, prospective studies are underway to compare revascularization and medical therapy in the treatment of heart failure, involving patients whose predominant symptom is breathlessness. The intention in the Surgical Treatment in Ischemic Heart Failure trial (STICH), a global trial being conducted in the United States, is to randomly assign 1600 patients to receive either medical therapy alone or revascularization along with medical therapy.¹⁵ Evidence of myocardial viability forms no part of the trial's inclusion or exclusion criteria, although those data are being collected. A UK study, on the other hand — the Heart Failure Revascularization Trial (HEART) — randomly assigns patients with evident myocardial viability into the 2 groups.¹⁶

In conclusion, uncertainty remains as to whether revascularization of patients with heart failure and coronary artery disease is safe or beneficial, even when myocardial viability is present. Findings from the STICH and HEART trials will help address these questions.

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