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MYOCARDIAL REVASCULARIZATION IN PATIENTS WITH ISCHEMIC CARDIOMYOPATHY: REVIEW OF PREVIOUSLY CONDUCTED CLINICAL STUDIES

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Abstract: Objective: To evaluate the prognostic role of myocardial revascularization and myocardial viability assessment in patients with ischemic cardiomyopathy (ICM).

Methods and Results: A review of randomized controlled trials assessing revascularization strategies in ICM identified two major studies: the STICH Trial and REVIVED-BCIS2 Trial, involving 1,912 patients. Participants received either revascularization plus optimal medical therapy (OMT) or OMT alone. Long-term follow-up from the STICHES study showed that coronary artery bypass grafting (CABG) with OMT reduced all-cause mortality by 16% compared with OMT alone over 9.8 years. However, myocardial viability and ischemia severity did not significantly affect outcomes. In contrast, the REVIVED-BCIS2 trial found no significant benefit of percutaneous coronary intervention (PCI) plus OMT over OMT alone for all-cause mortality or heart failure hospitalization. Myocardial viability assessment was also not associated with improved long-term outcomes.

Conclusion: Current evidence suggests that CABG may improve long-term prognosis in patients with ICM, whereas PCI does not provide significant prognostic benefit. Routine assessment of myocardial viability or ischemia is not supported as a key determinant for selecting revascularization strategies in ICM.

Keywords: ischemic cardiomyopathy, CABG, PCI, myocardial viability, STICH, REVIVED-BCIS2

Introduction: Ischemic heart disease, most commonly caused by obstruction of the epicardial coronary arteries, represents the leading cause of left ventricular systolic dysfunction and ultimately contributes to the development of chronic heart failure [1,2]. The term “ischemic cardiomyopathy” (ICM) is commonly used to describe significant left ventricular systolic dysfunction associated with severe coronary artery disease, including patients with multivessel coronary artery disease or significant left main coronary artery stenosis, regardless of previous myocardial infarction history [3].

Most available evidence regarding ischemic cardiomyopathy has been derived from patients with heart failure and reduced left ventricular ejection fraction (LVEF ≤40%) [4–6]. However, patients with mildly reduced ejection fraction (LVEF 41–49%) are also currently considered a high-risk population because they demonstrate clinical characteristics and management strategies similar to those observed in patients with reduced ejection fraction heart failure [7].

The presence of ischemic cardiomyopathy is associated with a substantially increased risk of adverse cardiovascular outcomes. Previous investigations demonstrated that the 5-year survival rate in patients with ischemic cardiomyopathy is approximately 30% lower than in patients with non-ischemic left ventricular systolic dysfunction [8].

Despite advances in pharmacological treatment strategies, the optimal management of ischemic cardiomyopathy remains controversial. Several randomized clinical trials involving patients with chronic coronary syndromes and stable coronary artery disease have demonstrated limited prognostic benefit of myocardial revascularization, particularly percutaneous coronary

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intervention (PCI), compared with optimal medical therapy alone [9–11]. Nevertheless, current clinical guidelines continue to recommend complete myocardial revascularization in patients with ischemic cardiomyopathy, although the optimal method for achieving this objective remains uncertain [12,13].

Most evidence supporting myocardial revascularization in ischemic cardiomyopathy originates from observational studies, whereas more robust evidence has been obtained from randomized controlled trials [14,15]. Similarly, although recent studies have questioned the prognostic significance of myocardial ischemia assessment in patients with chronic coronary syndromes and preserved systolic function [10], assessment of myocardial viability continues to be recommended in patients with ischemic cardiomyopathy for guiding clinical decision-making and revascularization strategies [12].

Therefore, this review aimed to systematically evaluate available evidence from randomized controlled trials regarding:

1. the role of myocardial revascularization in patients with ischemic cardiomyopathy; and
2. the clinical significance of myocardial viability assessment in selecting treatment strategies.

STICH Trial (Surgical Treatment for Ischemic Heart Failure)

The STICH trial, published in 2011, remains one of the largest randomized clinical trials evaluating the role of myocardial revascularization in patients with coronary artery disease and severe left ventricular systolic dysfunction (LVEF ≤35%) [21].

A total of 1,212 patients were randomly assigned either to CABG combined with optimal medical therapy (602 patients) or to optimal medical therapy alone (610 patients). The primary endpoint of the study was all-cause mortality, while secondary endpoints included cardiovascular mortality and hospitalization for cardiovascular causes.

Patients enrolled in the study had severe left ventricular systolic dysfunction and were followed for a median period of 56 months. The study demonstrated no statistically significant difference in all-cause mortality between treatment groups (41% in the OMT group versus 36% in the CABG+OMT group; p=0.12). However, significant reductions in cardiovascular mortality and combined cardiovascular mortality or hospitalization were observed in patients undergoing CABG.

Cardiovascular mortality occurred in 33% of patients receiving OMT alone compared with 28% of patients undergoing CABG combined with OMT (p=0.05). Additionally, cardiovascular mortality or hospitalization occurred in 68% of patients treated with OMT alone and in 58% of patients undergoing CABG (p<0.001).

These findings suggested that although CABG did not significantly reduce overall mortality during intermediate follow-up, it substantially decreased cardiovascular complications and hospitalizations.

STICHES Extension Study: The extended follow-up analysis of the STICH trial, known as the STICHES study, was published in 2016 and provided 10-year follow-up results [4]. This extended analysis demonstrated a significant long-term survival benefit associated with CABG combined with optimal medical therapy compared with medical therapy alone.

All-cause mortality occurred in 58.9% of patients in the CABG+OMT group compared with 66.1% in the OMT-only group (p=0.02). Cardiovascular mortality was observed in 40.5% and 49.3% of patients, respectively. Furthermore, all-cause mortality or cardiovascular hospitalization occurred in 76.6% of patients receiving CABG+OMT compared with 87.0% of patients treated with OMT alone.

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These long-term findings strongly supported the prognostic advantage of surgical myocardial revascularization in patients with ischemic cardiomyopathy.

STICH Viability Substudy: A substudy of the STICH trial evaluated myocardial viability in 601 patients using either dobutamine stress echocardiography or single-photon emission computed tomography (SPECT) imaging [12].

Among these patients, 487 demonstrated viable myocardium, whereas 114 patients showed no evidence of myocardial viability. During a median follow-up period of 5.1 years, mortality occurred in 37% of patients with viable myocardium compared with 51% of patients without viable myocardium (p=0.003).

Despite this observation, no statistically significant interaction was identified between myocardial viability status and treatment strategy regarding all-cause mortality or cardiovascular outcomes. Therefore, myocardial viability assessment did not reliably predict which patients would derive greater benefit from surgical versus medical treatment.

REVIVED-BCIS2 Trial: Evidence regarding the role of PCI in patients with ischemic cardiomyopathy has remained limited. The REVIVED-BCIS2 trial, published in 2022, investigated the effectiveness of PCI in patients with severe ischemic left ventricular dysfunction (LVEF ≤35%), extensive coronary artery disease, and demonstrable myocardial viability [15].

A total of 700 patients were randomized either to PCI combined with optimal medical therapy (347 patients) or to optimal medical therapy alone (353 patients). The primary endpoint included all-cause mortality or hospitalization for heart failure.

Patients were followed for a median duration of 41 months. The primary outcome occurred in 37.2% of patients in the PCI+OMT group and in 38.0% of patients in the OMT-only group, indicating no statistically significant difference between treatment strategies.

Similarly, all-cause mortality occurred in 31.7% of patients receiving PCI and in 32.6% of patients treated medically. Rates of heart failure hospitalization were also comparable between groups.

No significant improvement in left ventricular ejection fraction was observed at either 6 or 12 months after PCI. Although quality-of-life assessment using the Kansas City Cardiomyopathy Questionnaire demonstrated temporary improvement in the PCI group, these differences diminished during longer follow-up.

Overall, the study demonstrated that PCI did not significantly improve survival, reduce heart failure hospitalization, or improve ventricular systolic function in patients with ischemic cardiomyopathy.

Myocardial Viability and Clinical Outcomes: Myocardial viability data from both the STICH and REVIVED-BCIS2 trials were available for approximately 1,301 patients. Combined analyses demonstrated no significant survival differences between patients with or without detectable myocardial viability.

These findings challenge the traditional assumption that viability assessment should play a central role in determining indications for myocardial revascularization in ischemic cardiomyopathy.

Conclusion: Recent advances in optimal medical therapy have substantially improved outcomes in patients with heart failure. Nevertheless, ischemic cardiomyopathy continues to represent a patient population with extremely high cardiovascular risk.

Current evidence from randomized controlled trials suggests that surgical myocardial revascularization through CABG may provide significant long-term prognostic benefit in patients with ischemic cardiomyopathy. In contrast, PCI has not demonstrated comparable clinical benefit in this population.

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Furthermore, available evidence does not support routine myocardial viability testing as a decisive factor for selecting revascularization strategies.

Considering the increasing prevalence of ischemic cardiomyopathy, additional large-scale studies are required to determine the most effective diagnostic and therapeutic algorithms for this complex patient population.

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