

# Early revascularization improved long-term survival after myocardial infarction with cardiogenic shock

Hochman JS, Sleeper LA, Webb JG, et al. Early revascularization and long-term survival in cardiogenic shock complicating acute myocardial infarction. *JAMA*. 2006;295:2511-5.

**Clinical impact ratings:** Emergency Med ★★★★★☆ Hospitalists ★★★★★☆☆ Cardiology ★★★★★☆☆

## QUESTION

In patients with acute ST-elevation myocardial infarction (STEMI) and cardiogenic shock (CS), is early revascularization more effective than initial medical stabilization for improving long-term survival?

## METHODS

**Design:** Randomized controlled trial (Should We Emergently Revascularize Occluded Coronaries for Cardiogenic Shock [SHOCK] trial).

**Allocation:** {Concealed}†.\*

**Blinding:** {Unblinded}†.\*

**Follow-up period:** Mean 5.9 years (range 1 to 11 y) for those discharged from hospital alive.

**Setting:** 29 centers in North and South America, Europe, Australia, and New Zealand.

**Patients:** 302 patients (mean age 66 y, 68% men) with STEMI who developed CS because of left ventricular failure within 36 hours of symptom onset and had ST-segment elevation or Q waves, posterior infarction, or new left bundle-branch block. {Exclusion criteria were severe systemic illness, severe valvular disease, dilated cardiomyopathy, or unsuitability for revascularization}†.

**Intervention:** Early revascularization with either percutaneous coronary intervention (PCI) or coronary artery bypass graft (CABG) surgery within 6 hours of randomization ( $n = 152$ ) or initial medical stabilization, involving thrombolysis, intraaortic balloon counterpulsation, and revascularization  $\geq 54$  hours after randomization if clinically indicated ( $n = 150$ ).

**Outcomes:** 3- and 6-year mortality.

**Patient follow-up:** 100% (intention-to-treat analysis).

## MAIN RESULTS

Early revascularization reduced 3- and 6-year mortality more than did initial medical stabilization (Table). The overall hazard ratio for death was 0.74 (95% CI 0.57 to 0.97) with revascularization compared with stabilization; the death rates per 100 patient-years were 9.5 and 26.4, respectively, in the first year, and 8.0 and 10.7, respectively, after the

first year. For patients who were discharged alive from the hospital, the overall hazard ratio for death was 0.59 (CI 0.36 to 0.95) with revascularization; the death rate per 100 patient-years was 8.3 in the revascularization group and 14.3 in the stabilization group.

## CONCLUSION

In patients with acute myocardial infarction and cardiogenic shock, early revascularization improved long-term survival more than did initial medical stabilization.

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\*See Glossary.

†Hochman JS, Sleeper LA, Webb JG, et al. *N Engl J Med*. 1999;341:625-34.

## Early revascularization vs initial medical stabilization for myocardial infarction with cardiogenic shock†

Outcome	Follow-up	Revascularization	Stabilization	RRR (95% CI)	NNT (CI)
Mortality	3 y	59%	72%	19% (4 to 32)	8 (5 to 37)
	6 y	67%	80%	17% (5 to 28)	8 (5 to 28)

†Abbreviations defined in Glossary; RRR, NNT, and CI calculated from data in article.

## COMMENTARY

CS complicates acute STEMI in approximately 8% of patients and is associated with hospital mortality rates of 50% to 80% (1). Although some patients develop CS because of mechanical complications (papillary muscle dysfunction or rupture, ventricular septal rupture, free wall rupture, or right ventricular infarction), most have left ventricular failure because of myocardial infarction and ischemia. Vasopressors, inotropic agents, and intraaortic balloon pump counterpulsation do not decrease mortality, nor does fibrinolytic therapy, presumably because low diastolic arterial pressures are associated with low reperfusion rates. Only early, successful restoration of infarct artery patency and flow, with either PCI or CABG surgery, and reperfusion of ischemic myocardium decrease mortality. Hochman and colleagues confirmed this clinical observation in the SHOCK trial: The absolute 1-year survival advantage of 13 lives saved per 100 patients treated with an early-invasive strategy was maintained at 3 and 6 years.

Unfortunately, many potentially viable patients with CS do not receive the survival advantage of early coronary artery revascularization because they are not treated at hospitals with PCI capability. A disturbing observation about the difference in quality of care among health systems is that patients with CS have 80% mortality at hospitals without revascularization capability compared with 50% at hospitals that

have this capability (2). Patients with CS in whom further care is not considered futile should immediately be transferred to hospitals with PCI capability for revascularization consideration.

Even with coronary revascularization, hospital mortality rates remain high, so other interventions are needed. Preliminary reports suggest that a systemic inflammatory response syndrome with excess nitric oxide production inhibits the normal compensatory mechanisms regulating vascular tone and cardiac contraction. Tilorarginine acetate, an agent that inhibits nitric oxide production, is being tested by Hochman and colleagues in a randomized, placebo-controlled trial with 658 patients (TRIUMPH).

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## Reference

- Babaev A, Frederick PD, Pasta DJ, et al. Trends in management and outcomes of patients with acute myocardial infarction complicated by cardiogenic shock. *JAMA*. 2005;294:448-54.
- Babaev A, Every N, Frederick P, Sichrovsky T, Hochman JS. Trends in revascularization and mortality in patients with cardiogenic shock complicating acute myocardial infarction. Observations from the National Registry of Myocardial Infarction [abstract]. *Circulation*. 2002;106(Suppl II): II-364.