

# Immediate revascularization for cardiogenic shock after MI reduced 6-month mortality

Hochman JS, Sleeper LA, Webb JG, et al., for the Shock Investigators. Early revascularization in acute myocardial infarction complicated by cardiogenic shock. *N Engl J Med.* 1999 Aug 26; 341:625-34.

## QUESTION

In patients with myocardial infarction (MI) who develop cardiogenic shock, is early emergency revascularization more effective than initial medical stabilization?

## DESIGN

Randomized (allocation concealed\*), blinded (outcome assessors, except for mortality),\* controlled trial with 6-month follow-up.

## SETTING

30 clinical sites in North and South America, Europe, Australia, and New Zealand.

## PATIENTS

302 patients (mean age 66 y, 68% men, 76% white) (1492 screened) with ST-segment elevation, a Q-wave MI, new left bundle-branch block, or a posterior MI with anterior ST-segment depression; development of cardiogenic shock within 36 hours of MI; hypotension with end-organ perfusion; and cardiac index  $\leq 2.2$  L/min per  $m^2$  of body surface area and pulmonary-capillary wedge pressure  $\geq 15$  mm Hg. Exclusion criteria were severe systemic illness, severe valvular disease, dilated cardiomyopathy, or unsuitability for revascularization. Follow-up was 100%.

## INTERVENTION

152 patients were allocated to immediate revascularization (angioplasty or bypass surgery to be done as soon as possible and within 6 h of randomization). 150 patients were allocated to medical stabilization (intra-aortic balloon counterpulsation and thrombolytic therapy with delayed revascularization [minimum 54 h after randomization]).

## MAIN OUTCOME MEASURE

30-day mortality.

## MAIN RESULTS

Shock developed at a median of 5.6 hours after MI. A trend toward reduced mortality at 30 days favored the immediate revascularization group ( $P = 0.1$ ); the difference between the groups reached statistical significance by 6 months ( $P = 0.03$ ) (Table). The groups did not differ for adverse effects.

Subgroup analyses of 10 factors showed that only age  $\geq 75$  years was associated with decreased benefit of revascularization at 30 days ( $P = 0.01$ ) and 6 months (0.003).

## CONCLUSION

Immediate revascularization reduced 6-month mortality more than did initial medical stabilization for patients with myocardial infarction who developed cardiogenic shock caused by left ventricular dysfunction.

Sources of funding: National Heart, Lung, and Blood Institute and American Heart Association.

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\*See Glossary.

## Immediate revascularization vs medical stabilization for patients with myocardial infarction who develop cardiogenic shock caused by left ventricular dysfunction†

Outcomes	Revascularization	Stabilization	RRR (95% CI)	NNT (CI)
All-cause mortality at 3 mo	47%	56%	17% (-4 to 33)	Not significant
All-cause mortality at 6 mo	50%	63%	20% (3 to 35)	8 (5 to 66)

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

## COMMENTARY

Until now, debate over the value of early revascularization in cardiogenic shock after MI has been principally driven by the lack of data from randomized controlled trials. Many studies have associated early revascularization with improved survival, but all have been tainted by the possibility that selection of less sick patients was at least partly responsible for the apparent benefit of revascularization. The study by Hochman and colleagues has largely resolved the controversy; it is unlikely that future trials will be done given the difficult recruitment and positive findings.

Although the primary end point of mortality at 30 days was not significantly reduced by revascularization, the absolute risk reduction of 9% (47% vs 56%,  $P = 0.1$ ) indicates the potential for a large clinically significant benefit from early revascularization. Few treatments actually save 1 life for every 11 patients treated. The lack of statistical significance for this end point may be because of the trial design, which was powered to show an ambitious 20% absolute reduction in mortality. The survival curves progressively diverge after 30 days so that the secondary end point of 6-month mortality is significantly reduced by revascularization.

The benefit seems to be limited to patients with cardiogenic shock who are  $< 75$  years old, which suggests that older patients may not have the reserve necessary to survive the insult of cardiogenic shock, regardless of the cardiac intervention. Too few elderly patients, however, were studied to be able to draw firm conclusions about whether they should be treated differently than the group as a whole. Revascularization techniques have improved since patients in this study were treated, which would probably increase the technical success of angioplasty and further amplify the benefits of revascularization.

The study suggests that patients who are candidates for revascularization should be taken to the cardiac catheterization laboratory at the earliest sign of cardiogenic shock. One may also extrapolate that patients who have MI and may be prone to the development of cardiogenic shock should be transferred to a referral center experienced with revascularization.

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