

Culprit versus Multivessel PCI in Acute MI with Cardiogenic Shock:

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Disclosures

- ▶ I have no relevant financial disclosures

What We Know:



Of those patients who present with Acute Myocardial Infarction and Cardiogenic Shock (AMICS), 50-65% have multivessel disease (MVD)



Despite decreasing incidence of STEMI, cardiogenic shock (CS) complicating acute MI remains stable 7-10% and may be increasing



Mortality associated with AMICS remains high at 40-45%

Culprit
Only PCI

Multivessel
PCI

What is the ideal strategy in patients
presenting with acute cardiogenic shock
and MI with multivessel coronary artery
disease?

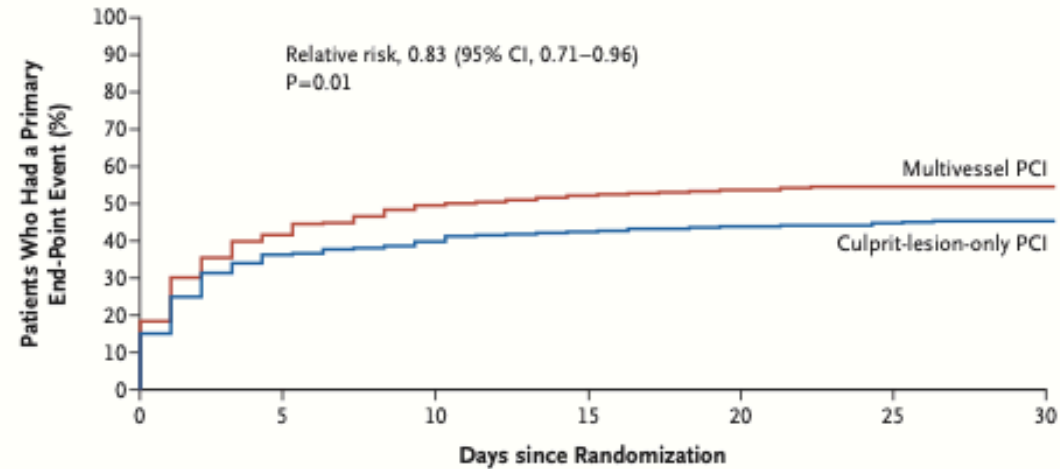


PCI Strategies in Patients with Acute Myocardial Infarction and Cardiogenic Shock

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- ▶ Multicenter, randomized, controlled trial of either PCI of the culprit lesion only or multivessel
- ▶ 706 patients with MVD, AMI, and cardiogenic shock
 - ▶ 66% had STEMI
- ▶ At 30 days, primary outcome, death and renal replacement significantly lower in the culprit lesion only group versus multivessel PCI group.
 - ▶ 45.9% versus 55.4%; relative risk, 0.83 [95% CI, 0.71–0.96]; $P=0.01$), driven primarily by an absolute 8.2% reduction in mortality.

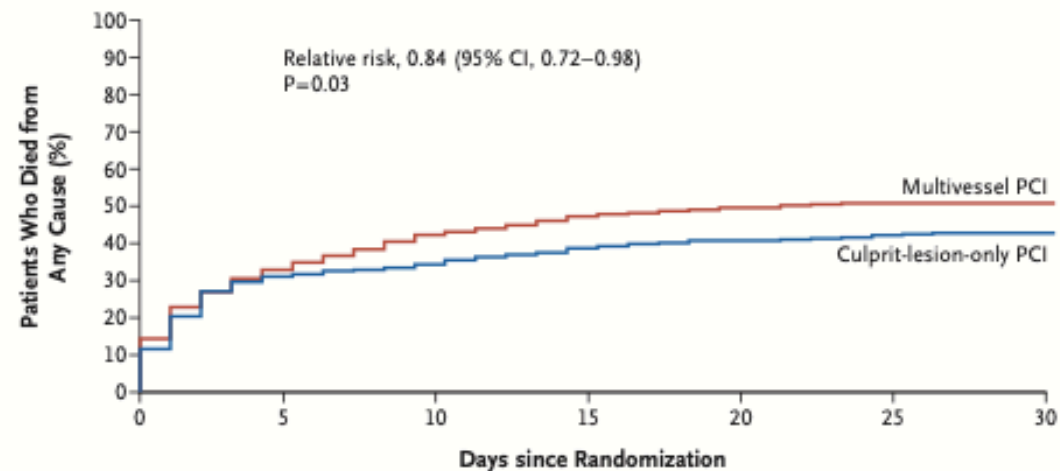
A Composite Primary End Point



No. at Risk

Multivessel PCI	341	199	172	162	156	153	152
Culprit-lesion-only PCI	344	219	207	198	192	189	184

B Death from Any Cause



No. at Risk

Multivessel PCI	341	229	197	179	170	166	165
Culprit-lesion-only PCI	344	237	226	211	203	198	193

Objective: To assess clinical outcomes after percutaneous coronary intervention (PCI) of the culprit lesion only than with immediate multivessel PCI

One-Year Outcomes after PCI Strategies in Cardioger

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- All-cause mortality: 50% vs. 56.9% (HR 0.88, 95% CI 0.76-1.01).
- Results were sustained up to 1 year of follow-up. The highest risk of mortality was within the first 30 days, after which rates were similar between the two arms.
- The results of this trial indicate that culprit-lesion-only PCI is superior to multivessel PCI among patients with AMICS and evidence of MVD on angiography.

Table 3. Clinical and Safety Outcomes at 1 Year.*

Outcome	Culprit-Lesion-Only PCI Group (N=344)	Multivessel PCI Group (N=341)	Relative Risk (95% CI)
	no. (%)		
Death from any cause†	172 (50.0)	194 (56.9)	0.88 (0.76–1.01)
Renal-replacement therapy‡	40 (11.6)	56 (16.4)	0.71 (0.49–1.03)
Recurrent myocardial infarction	6 (1.7)	7 (2.1)	0.85 (0.29–2.50)
Death or recurrent infarction	175 (50.9)	199 (58.4)	0.87 (0.76–1.00)
Rehospitalization for congestive heart failure	18 (5.2)	4 (1.2)	4.46 (1.53–13.04)
Death, recurrent infarction, or rehospitalization for heart failure	190 (55.2)	203 (59.5)	0.87 (0.93–1.06)
Repeat revascularization			
Any	111 (32.3)	32 (9.4)	3.44 (2.39–4.95)
PCI	107 (31.1)	29 (8.5)	3.66 (2.50–5.36)
Coronary-artery bypass grafting	4 (1.2)	3 (0.9)	1.32 (0.30–5.86)
Stroke	15 (4.4)	14 (4.1)	1.06 (0.52–2.17)
Bleeding			
Any	75 (21.8)	86 (25.2)	0.86 (0.66–1.13)
BARC type 2, 3, or 5§	65 (18.9)	79 (23.2)	0.82 (0.61–1.09)

Among patients with acute myocardial infarction and cardiogenic shock, the risk of death or renal-replacement therapy at 30 days was lower with culprit-lesion-only PCI than with immediate multivessel PCI, and mortality did not differ significantly between the two groups at 1-year follow-up

Limitations to CULPRIT-SHOCK

- ▶ Mechanical support was used in 28% of patients
 - ▶ 12% of the cohort was supported with Impella
- ▶ 24% of patients in the multivessel PCI arm had a chronic total occlusion for which revascularization was attempted
 - ▶ Likely increased contrast use with unclear benefit in cardiogenic shock.

2021 ACC/AHA/SCAI Guideline for Coronary Artery Revascularization: A Report of the American College of Cardiology/American Heart Association Joint Committee on Clinical Practice Guidelines

Recommendations for Revascularization of the Non-Infarct Artery in Patients With STEMI

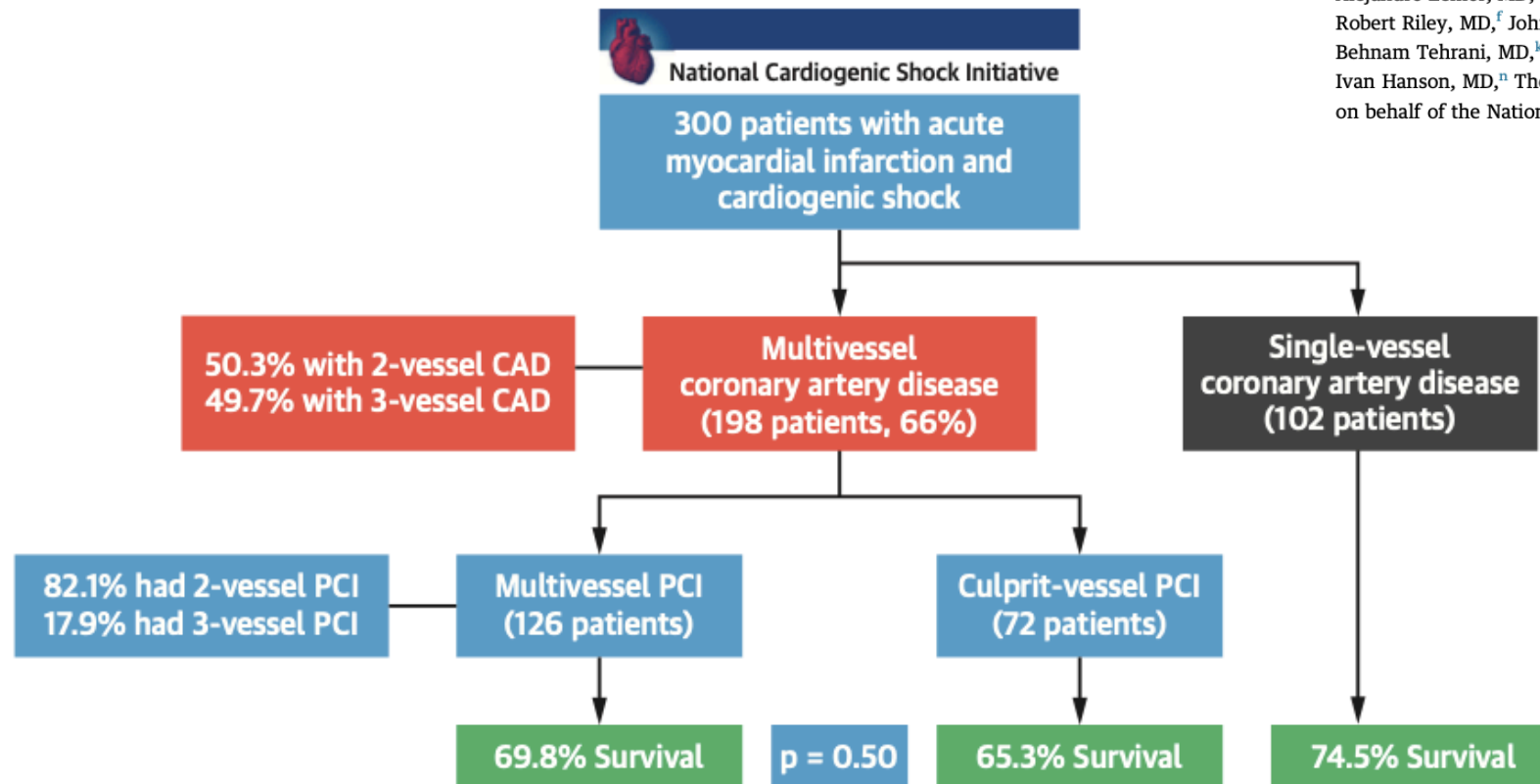
Referenced studies that support the recommendations are summarized in [Online Data Supplement 8](#).

COR	LOE	Recommendations
1	A	1. In selected hemodynamically stable patients with STEMI and multivessel disease, after successful primary PCI, staged PCI of a significant non-infarct artery stenosis is recommended to reduce the risk of death or MI. ¹⁻⁴
2a	C-EO	2. In selected patients with STEMI with complex multivessel non-infarct artery disease, after successful primary PCI, elective CABG is reasonable to reduce the risk of cardiac events.
2b	B-R	3. In selected hemodynamically stable patients with STEMI and low-complexity multivessel disease, PCI of a non-infarct artery stenosis may be considered at the time of primary PCI to reduce cardiac event rates. ^{1,2,5-7}
3: Harm	B-R	4. In patients with STEMI complicated by cardiogenic shock, routine PCI of a non-infarct artery at the time of primary PCI should not be performed because of the higher risk of death

Multivessel Versus Culprit-Vessel Percutaneous Coronary Intervention in Cardiogenic Shock



CENTRAL ILLUSTRATION Flowchart With Patient Selection



Lemor, A. et al. J Am Coll Cardiol Interv. 2020;13(10):1171-8.

A total of 300 patients with acute myocardial infarction cardiogenic shock were enrolled in the study period, of which 198 patients had multivessel CAD, 126 underwent multivessel PCI, and 71 culprit-vessel PCI. Survival rates were 69.8% and 65.3%, respectively ($p = 0.50$). A total of 102 patients had only 1-vessel CAD, and their survival rate was 74.5%. CAD = coronary artery disease; PCI = percutaneous coronary intervention.

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► Single arm, prospective multicenter study to assess outcomes in patients who present with AMICS treated with PCI and early mechanical support (MCS).

TABLE 4 Primary and Secondary Outcomes

	Single-Vessel CAD (n = 102)	All Multivessel CAD (N = 198)	Multivessel PCI (n = 126)	Culprit-Vessel PCI (n = 72)	p Value
Survived hospitalization	74.5	68.2	69.8	65.3	0.51
Acute kidney injury*	20.9	31.4	29.9	34.2	0.64
Length of stay	8 (4-13)	9 (4-16)	10 (5-16)	8 (4 - 14)	0.50

Figure 1: Variable Comparison Between Acute MI Cardiogenic Shock Studies and Clinical Trials

Variable	Sample Size	Age	Inotropes	Cardiac Arrest	HR	BP	Lactate	Lactate ≥ 2 mmol/l	Survival %
SHOCK	302	66	99	28	102	89/54	N/A	N/A	53%
IABP SHOCK	600	70	90	45	92	90/55	4.1	74%	60%
Culprit SHOCK	686	70	90	54	91	100/60	5.1	66%	49%
DanGer	100	68	94	0	N/A	76/50	5.5	100%	N/A
NCSI	300	64	86	43	88	78/51	5.3	75%	70%

30 Day Outcomes for Patients Receiving Multivessel PCI

Conclusions

- ▶ Early use of MCS in AMICS there is no difference in hospital survival observed between patients undergoing multivessel PCI versus culprit only PCI
- ▶ AKI rates were similar between patients
- ▶ Survival did not vary in any relevant subgroups

Limitations

- ▶ Single arm observational study in which all patients received MCS and may be underpowered to detect any significant differences between groups
- ▶ The ultimate decision to perform multivessel PCI was at the operator's discretion

Long-Term Outcomes of Cardiogenic Shock Complicating Myocardial Infarction



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TABLE 4 Annual Trends in Incidence and Mortality of Cardiogenic Shock Complicating Acute Myocardial Infarction in Ontario

	Fiscal Year									
	2009-2010	2010-2011	2011-2012	2012-2013	2013-2014	2014-2015	2015-2016	2016-2017	2017-2018	2018-2019
Incidence rate ^a (95% CI)	8.1 (7.5-8.6)	9.9 (9.3-10.5)	8.8 (8.2-9.4)	8.9 (8.4-9.5)	8.4 (7.9-9.0)	8.2 (7.7-8.8)	9.7 (9.1-10.3)	9.4 (8.8-10.0)	9.5 (9.0-10.1)	9.6 (9.0-10.2)
Mortality										
In hospital	248 (30.1)	332 (32.4)	273 (29.6)	303 (32.0)	287 (31.6)	316 (35.4)	277 (26.1)	298 (28.5)	311 (29.1)	316 (28.9)
30 d	239 (29.0)	323 (31.5)	259 (28.1)	285 (30.1)	280 (30.8)	305 (34.2)	258 (24.3)	282 (27.0)	305 (28.5)	310 (28.4)
1 y	338 (41.1)	454 (44.3)	381 (41.3)	404 (42.6)	387 (42.6)	407 (45.6)	392 (36.9)	409 (39.2)	414 (38.7)	418 (38.3)
2 y	379 (46.1)	506 (49.3)	434 (47.1)	448 (47.3)	433 (47.6)	452 (50.7)	440 (41.4)	467 (44.7)	467 (43.6)	465 (42.6)
IABP use	112 (13.6)	165 (16.1)	146 (15.8)	155 (16.4)	128 (14.1)	139 (15.6)	154 (14.5)	158 (15.1)	152 (14.2)	155 (14.2)
Any MCS use	112 (13.6)	165 (16.1)	146 (15.8)	156 (16.5)	131 (14.4)	141 (15.8)	157 (14.8)	161 (15.4)	156 (14.6)	159 (14.6)
Mortality (hospital survivors)										
30 d	14 (2.4)	18 (2.6)	13 (2.0)	15 (2.3)	12 (1.9)	17 (3.0)	11 (1.4)	12 (1.6)	17 (2.2)	20 (2.6)
1 y	90 (15.7)	122 (17.6)	109 (16.8)	101 (15.7)	100 (16.1)	92 (16.0)	115 (14.6)	111 (14.9)	103 (13.6)	104 (13.4)
2 y	131 (22.8)	174 (25.1)	162 (25.0)	145 (22.5)	146 (23.5)	136 (23.6)	163 (20.7)	169 (22.7)	156 (20.6)	149 (19.2)
Days at home after discharge										
30 d	27.1 ± 6.8	27.0 ± 6.6	26.9 ± 7.1	26.9 ± 6.7	26.8 ± 6.7	26.5 ± 7.3	27.4 ± 5.9	27.2 ± 6.4	27.4 ± 6.4	26.5 ± 7.5
365 d	308.1 ± 111.6	296.6 ± 117.3	306.7 ± 109.3	304.6 ± 110.8	307.3 ± 107.9	303.4 ± 112.8	310.8 ± 108.3	311.1 ± 106.8	313.6 ± 106.4	313.6 ± 105.7

Conclusions

1. Early MCS and revascularization of nonculprit lesions was associated with similar hospital survival in comparison to those with culprit only revasc with known multivessel disease
2. Factors such as size and distribution of non-culprit vessel, patient stability, operator comfort, contrast use must be considered.
3. Selected angiographic scenarios such as subtotal nonculprit lesions with reduced TIMI (Thrombolysis in Myocardial Infarction) grade flow or multiple possible culprit lesions may benefit from immediate multivessel PCI.
4. These decisions and scenarios are complex and not addressed in practice guidelines, absent a robust clinical trial for each decision step, requiring individualized consideration on a patient and lesion basis.

Henry, T. et al. (2021). Invasive Management of Acute Myocardial Infarction Complicated by Cardiogenic Shock: A Scientific Statement From the American Heart Association. *Circulation*,

Thank you!

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