STEMI with MVD; How can we treat?

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Evoluting Guidelines of STEMI with MVD

2010 Revascularization

With the exception of Cardiogenic Shock(CS), PCI should be limited to the culprit stenosis.

IIa B

2014 Revascularization

Immediate revascularization of significant non-culprit lesions during the same procedure as primary PCI of the culprit vessel may be considered in selected patients.

IIb B

2020 ACS

Complete Revasculaization(CR) should be considered in NSTE-ACS patients without CS and with MVD

IIa C

Culprit Only → Complete Revascularization

2012 STEMI

The best strategy for STEMI patients with MVD, who underwent primary PCI of the IRA in the acute phase with remaining MVO, is still not well established.

2017 STEMI & 2018 Revascularization

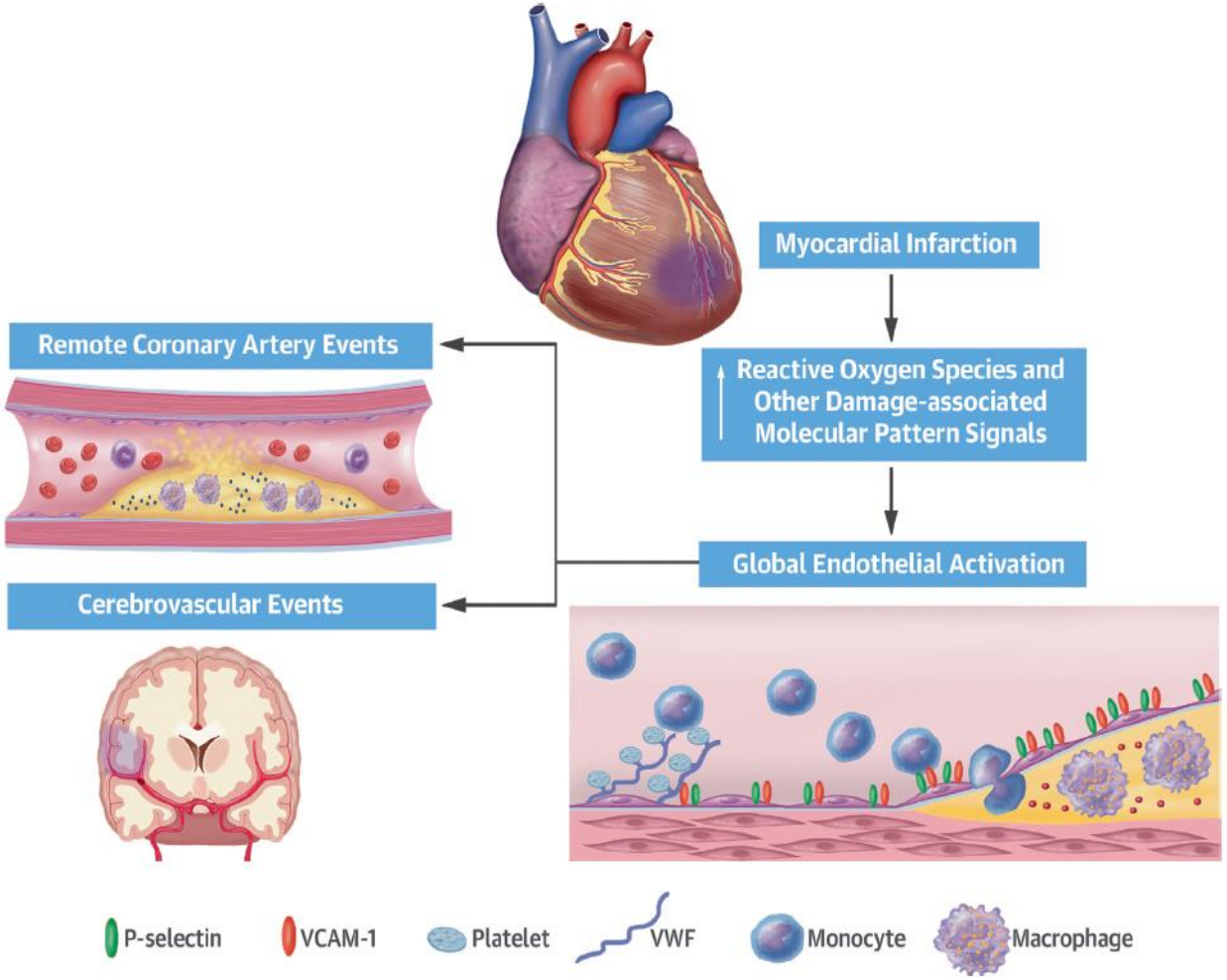
Routine revascularization of non-IRA lesions should be considered in STEMI patients with MVD before hospital discharge.

IIa A

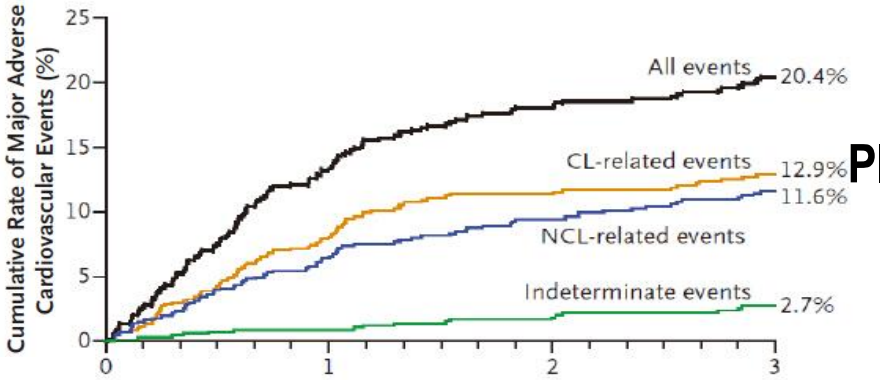
Routine revascularization of non-IRA lesions in Myocardial Infarction with Cardiogenic shock. III,B

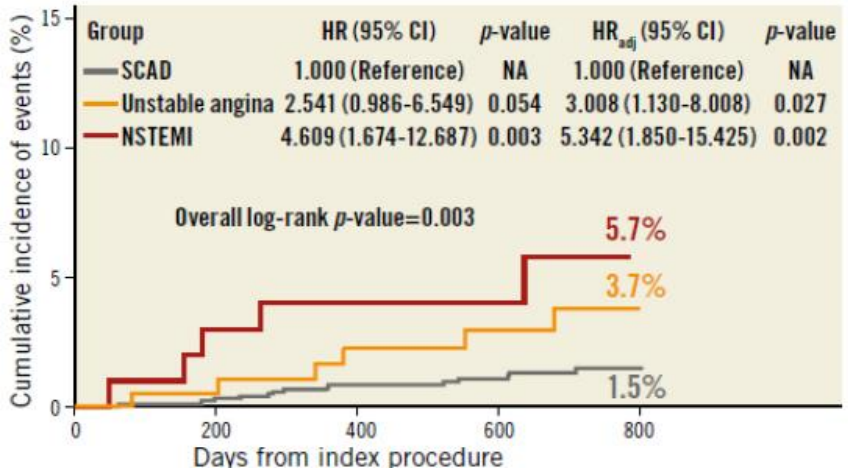
What happen to NCLs in MI

MI triggers systemic effecs,
Remote Endothelial Activation after MI



Non- Culprit Leions(NCLs) were associated with
More endothelial dysfunction
More inflammation





Plaque progression

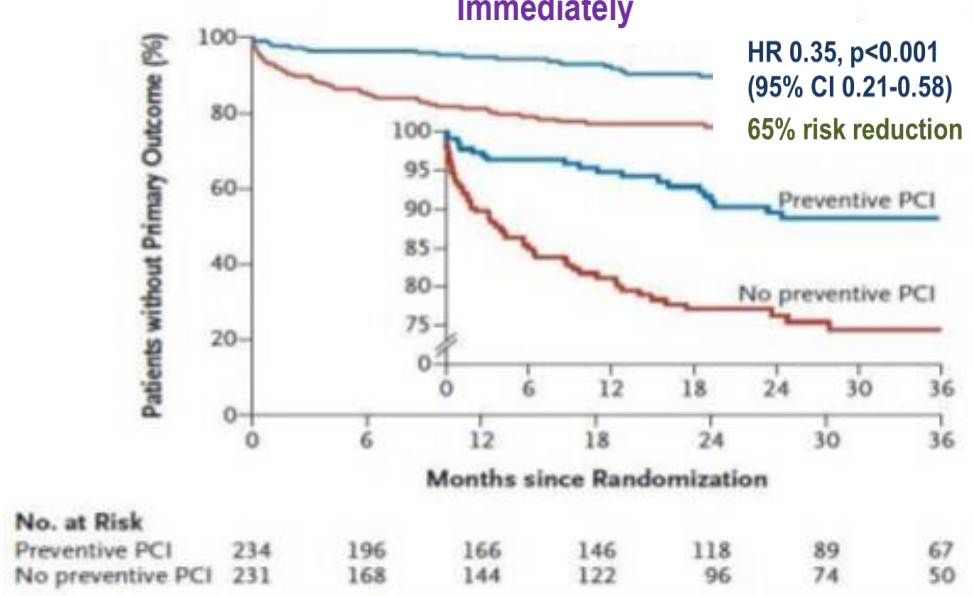
Worse outcomes

Moccetti at al, J Am Coll Cardiol 2018;72:1015
Gregg W. at al, N Engl J Med 2011;364:226
JM Lee et al, Eurointervention 2017;13:e1112

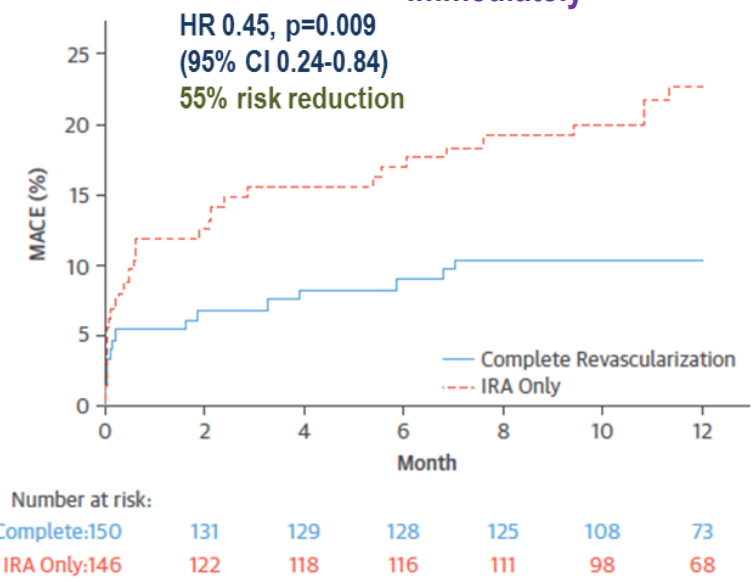
Evidence of CR in STEMI

Clinical Outcomes of Angiography-Guided Non-Culprit PCI

PRAMI – cardiac death, non-fatal MI, refractory angina
Immediately



CvLPRIT – all death, recurrent MI, HF, ischemia-revascularization
Immediately



Preventive PCI for non-culprit lesion >50% DS

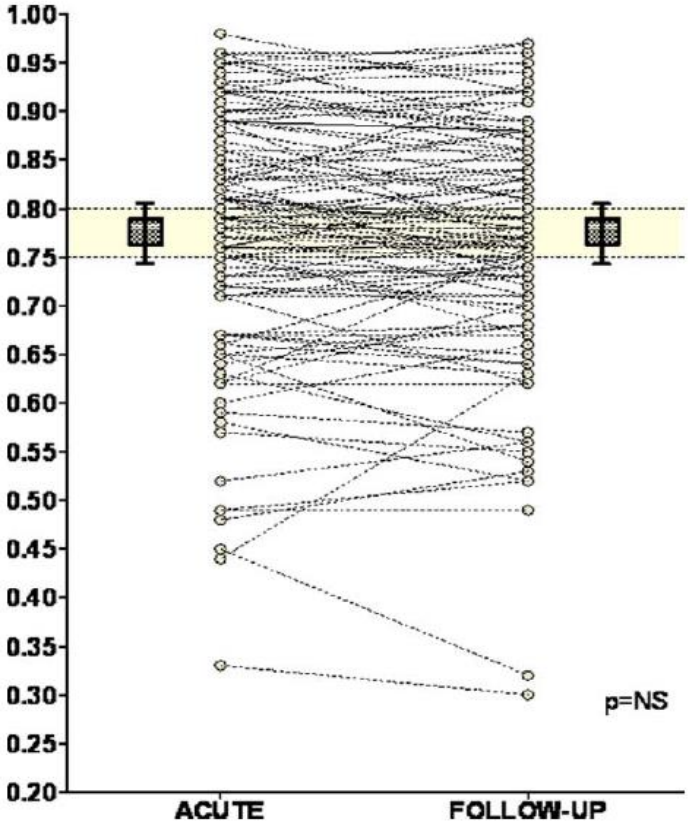
Preventive PCI for non-culprit lesion > 70% DS or > 50% DS in 2 views

Recent RCTs presented
"Angiography-guided" Complete Revascularization showed
Significant benefit in Patient's outcome than "Culprit-Only PCI"

Wald et al, N Engl J Med, 2013
Gershlick et al, J Am Coll Cardiol , 2015

Reliability of NCVs FFR in AMI

Non-culprit vessel of AMI Patient

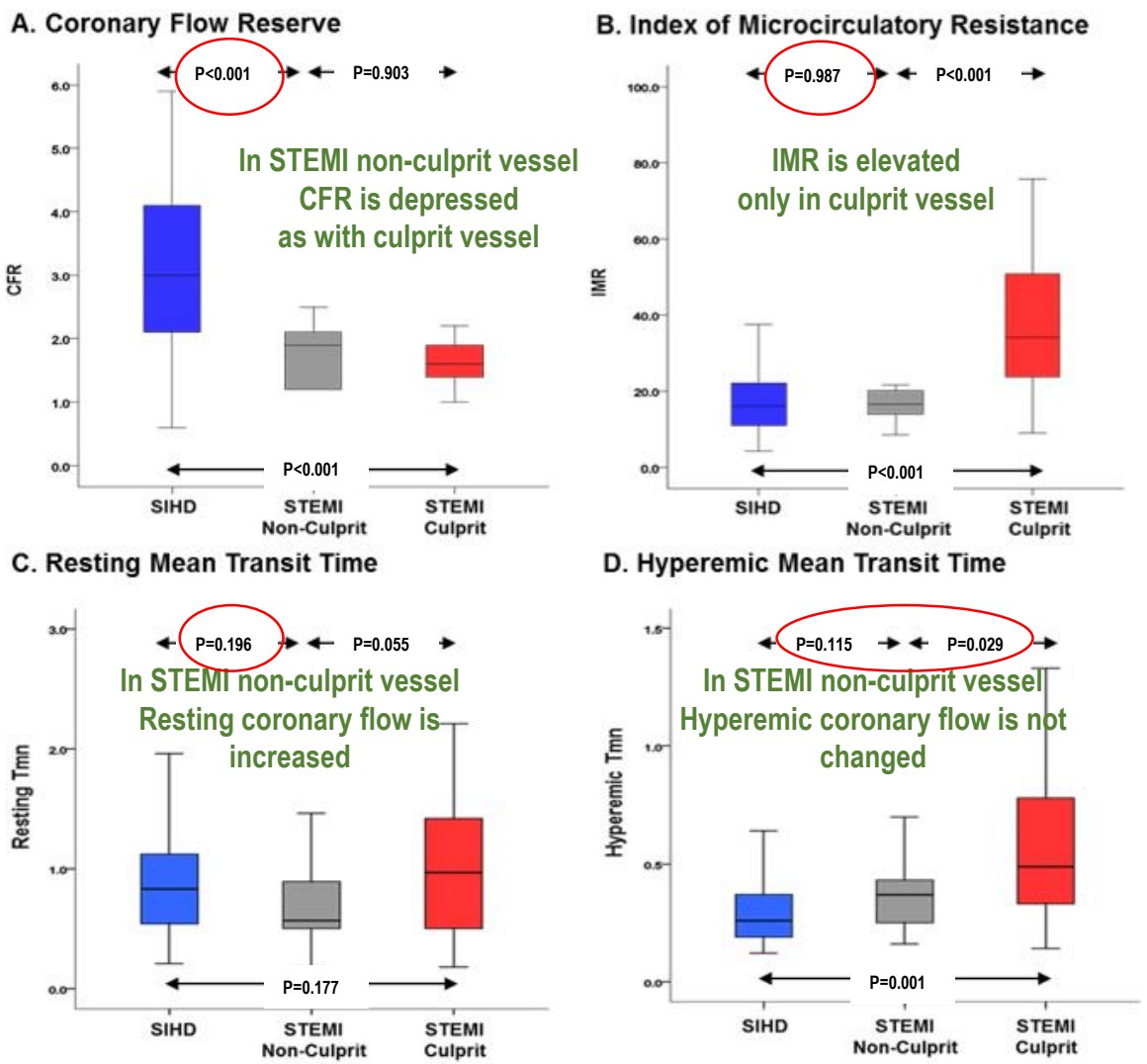


	Acute Phase (n=101)	1M Follow-Up (n=101)	P Value
LVEF (%)	59 ± 15	61 ± 14	NS
LVEDP (mmHg)	18 ± 7	17 ± 7	NS
FFR nonculprit	0.77 ± 0.13	0.77 ± 0.13	NS
IMR nonculprit (IU)	20 ± 3	24 ± 6	NS
DS nonculprit (%)	56 ± 14	55 ± 14	NS
TIMI flow nonculprit	2.93 ± 0.30	2.97 ± 0.20	NS
cTFC nonculprit	15 ± 6	15 ± 6	NS

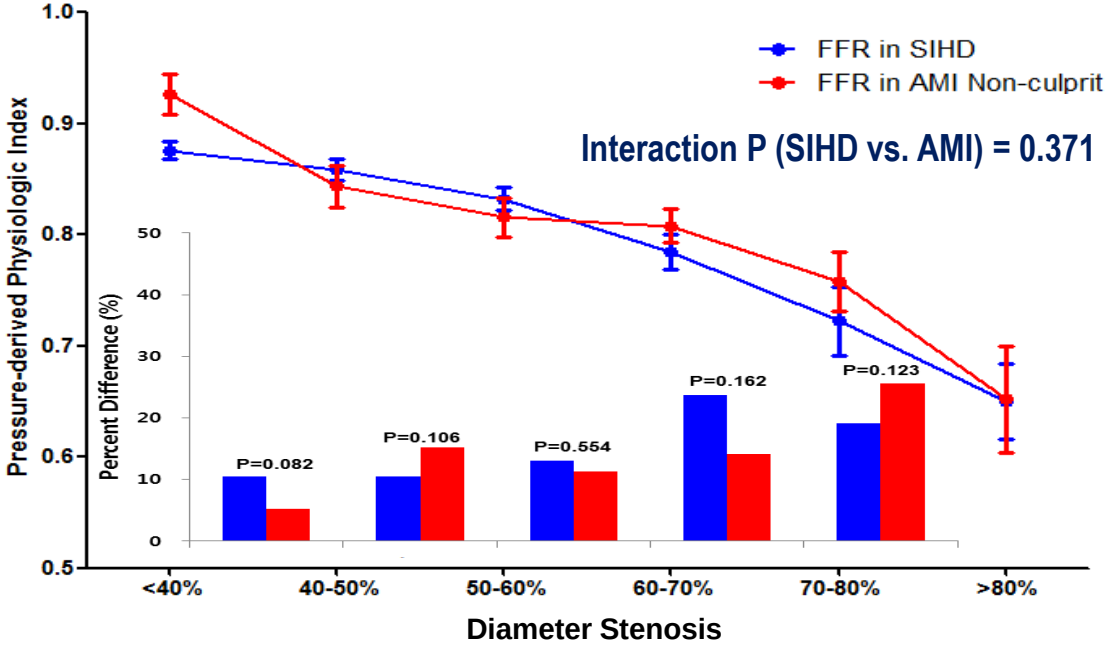
In patients with acute MI (including STEMI and NSTEMI), Non-culprit FFR did not show significant change.

Ntalianis et al, JACC: Cardiovascular Intervention, 2010

Reliability of NCVs FFR in STEMI



Variables	Total (n=303)	SIHD (n=203)	AMI (n=100)	P value
Age (years)	60.8 ± 13.2	59.6 ± 13.7	63.3 ± 11.8	0.020
Male	230 (75.9%)	150 (73.9%)	80 (80.0%)	0.305
Clinical presentation				<0.001
Stable ischemic heart disease		203 (100%)		
Non ST-segment elevation myocardial infarction			66 (66.0%)	
ST-segment elevation myocardial infarction			34 (34.0%)	

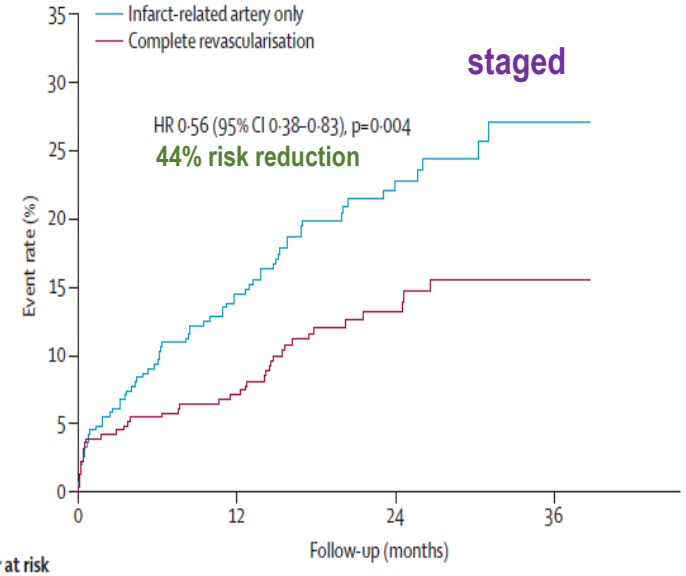


Local microvascular damage in culprit vessel was not extended to NCV territory, and NCV FFR and IMR were not changed at all.

Evidence of CR in STEMI

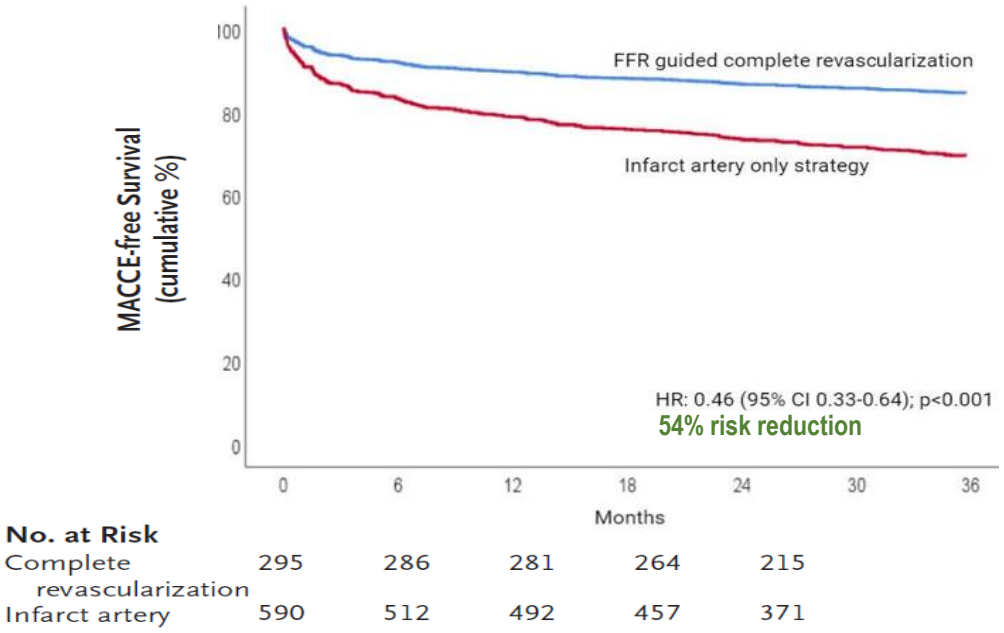
Clinical Outcomes of Physiology-Guided Non-Culprit PCI

DANAMI-3-PRIMULTI (Death, MI, IDR)



Mainly driven by ischemia-driven revascularization
(both urgent and planned)

COMPARE-ACUTE (Death, MI, Revascularization, Stroke)



Mainly driven by revascularization
(1/3 Unstable angina)

FFR-guided decision for non-culprit vessel in STEMI patients are strongly supported by 2 RCTs (Both Staged Measurement and Acute phase Measurement)

Engstrom et al, Lancet, 2015
Smits et al, N Engl J Med, 2017

Evidence of CR in STEMI

COMPLETE Trial Design

STEMI WITH MULTIVESSEL CAD AND SUCCESSFUL PCI TO THE CULPRIT LESION
MVD defined as at least one additional non-culprit lesion ≥ 2.5 mm diameter
and ≥70% stenosis or 50-69% with FFR ≤0.80 FFR Guided Enrollment<1%

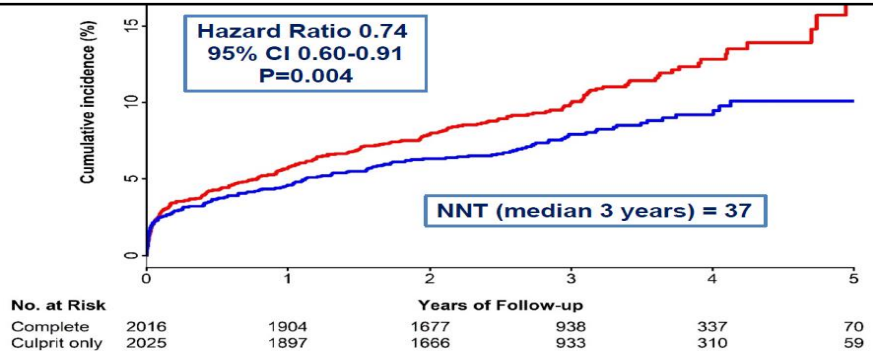
Almost Angiography-Guided Non-Culprit PCI

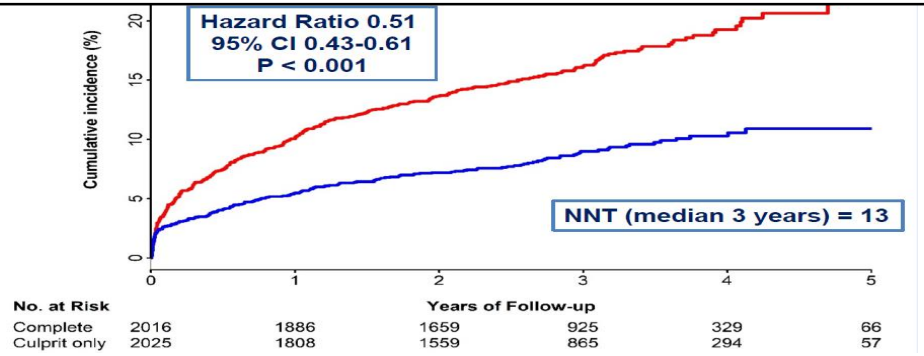
Exclusion Criteria: Intent to revascularize NCL, planned surgical revascularization, prior CABG

RANDOMIZATION
Stratified for intended timing of NCL PCI:
During initial hospitalization or after discharge (max 45 d)

Actual Time to study NCL PCI in Complete Group (median)
During initial hospitalization: 1 day (IQR 1-3)
After hospital discharge: 23 days (IQR 12.5-33.5)

Benefits of CR in STEMI are 'No Doubt'





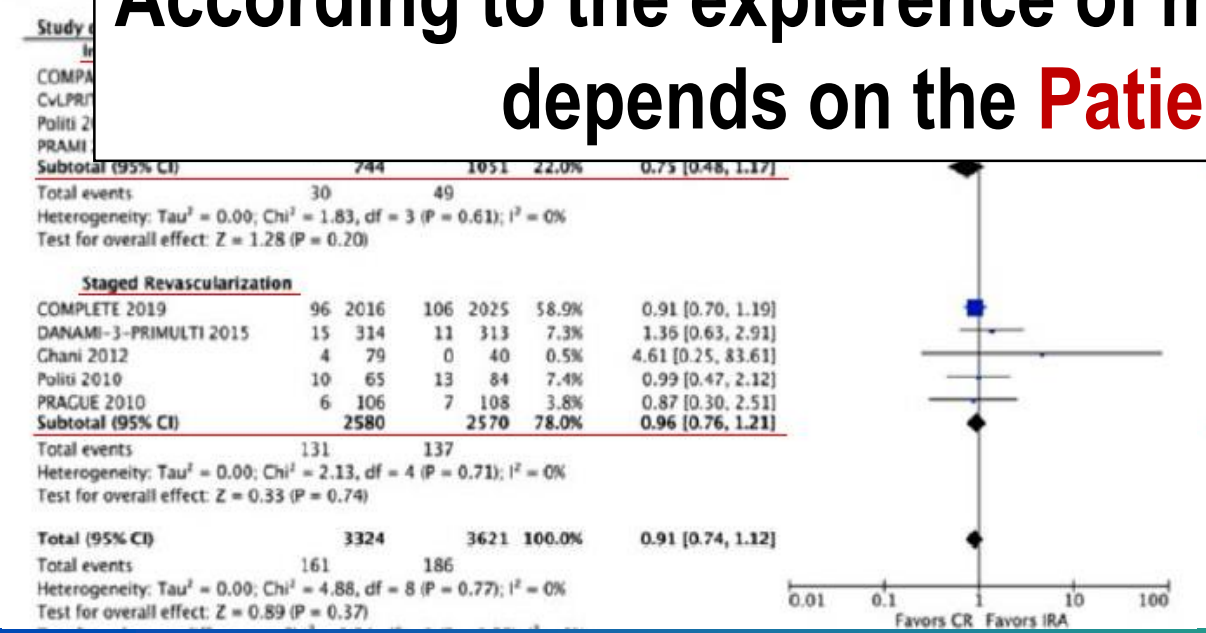
Reduced CV death or new MI by 26% (P=0.004), NNT = 37
Reduced CV death, new MI, or IDR by 49% (P<0.001), NNT = 13

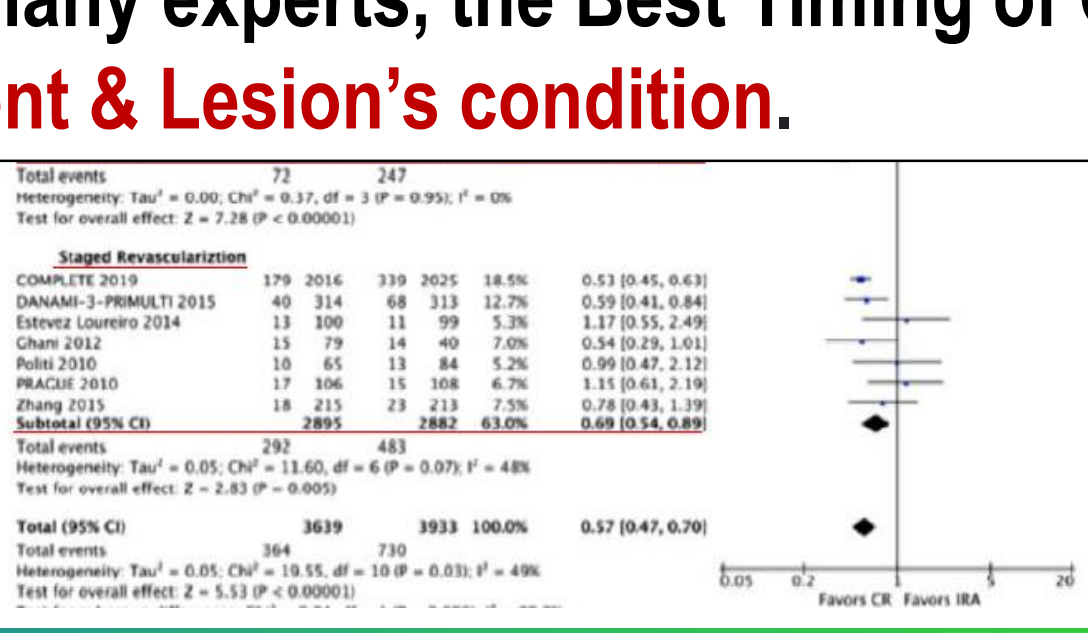
What is the Best Timing of CR?

Compare of 5 RCTs & Meta-Analysis(Subgroup)

PRAMI	CvLPRIT	COMPARE-ACUTE	DANAMI-3-PRIMULTI	COMPLETE
Angiographic Guided	Angiographic Guided	FFR Guided	FFR Guided	Angiographic Guided

Immediately CR outcome seems to be slightly better than Staged CR.
But, Comparative RCTs on this topic have not yet been reported.
According to the expierence of many experts, the Best Timing of CR depends on the Patient & Lesion's condition.



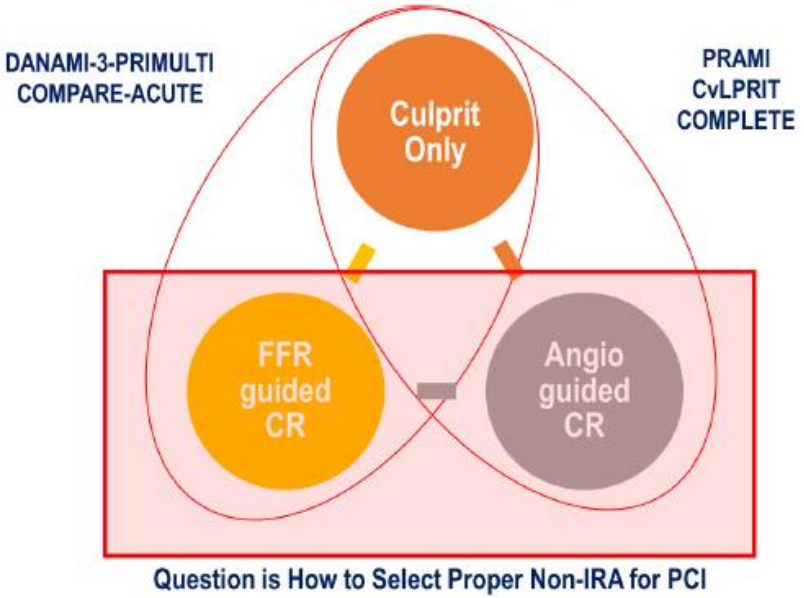


Mohammed Osman. et al, Am J Cardiol, 2020;125:513-520

How to define 'signicant' NCLs?

Both Angio- and FFR- are supported by RCTs

Angiographic stenosis	FFR immediate phase	FFR staged phase
PRAMI	COMPARE-ACUTE	DANAMI-3-PRIMULTI
CvLPRIT		
COMPLETE		



Question is How to Select Proper Non-IRA for PCI

AMERICAN COLLEGE of CARDIOLOGY

FLOWER-MI

Flow Evaluation to Guide Revascularization in Multivessel ST-Elevation Myocardial Infarction

Randomized, open-label, multicenter trial

1,171 PATIENTS

INCLUSION CRITERIA: Patients with STEMI and multi-vessel non-culprit coronary disease

PCI based on FFR≤0.80 vs. >50% visual stenosis concurrent

vs.

FFR-GUIDED REVASCULARIZATION (N=590)

ANGIOGRAPHY-GUIDED REVASCULARIZATION (N=581)

Profiles	FFR(n=586)	Angio(n=577)
Lesions with PCI (non-IRA)	546/980(55.7%)	806/891(90.5%)
Patients with ≥ 1PCI (non-IRA)	388/586(66.2%)	560/577(97.1%)
Mean Stent No. (non-IRA)	1.01±0.99	1.50±0.86
Non-IRA Post PCI TIMI3	686/980(70%)	827/891(92.8%)
Non-fatal MI	18(3.1%)	10(1.7%)
Periprocedural MI	7/18(38.9%)	2/10(20%)
Cardiac death	2/9(22.2%)	7/10(70%)
Non-cardiac death	7/9(77.8%)	3/10(30%)
Urgent revascularization	15(2.6%)	11(1.9%)
Non-IRA Treatment	8/15(53.5%)	3/11(27.3%)

A

FFR-Guided revascularization was not superior to angiography-guided revascularization

Similar Clinical outcome, Given the 40% less PCI(Time, Cost, contrast, Procedure risk etc.) in FFR-guided group.

EDITORIALS

PCI for Nonculprit Lesions in Patients with STEMI — No Role for FFR

12

No. at Risk

Angiography-guided PCI	577	570	567	565	560	560	557	555	555	554	552	548	371
FFR-guided PCI	586	577	573	570	567	566	566	562	559	553	553	549	385

PCI strategy of MI with MVD in CS

CULPRIT-SHOCK(All cause Death)

Relative risk, 0.88 (95% CI, 0.76–1.01)

Immediately >70%stenosis

Outcome 28.2% Mechanical support

17.7% Steged Multivessel PCI & 12.5% Immeduately

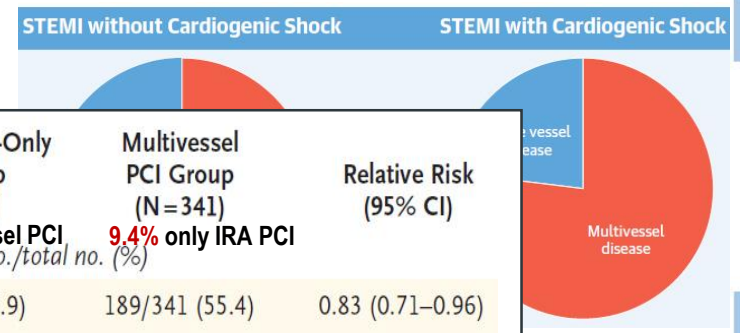
9.4% only IRA PCI

	Culprit-Lesion-Only PCI Group (N=344)	Multivessel PCI Group (N=341)	Relative Risk (95% CI)
	no./total no. (%)		
30d f/u: Primary end point: death from any cause or renal-replacement therapy	158/344 (45.9)	189/341 (55.4)	0.83 (0.71–0.96)
30d f/u: Death from any cause*	149/344 (43.3)	176/341 (51.6)	0.84 (0.72–0.98)
30d f/u: Renal-replacement therapy	40/344 (11.6)	56/341 (16.4)	0.71 (0.49–1.03)
1year f/u: Death from any cause†	172 (50.0)	194 (56.9)	0.88 (0.76–1.01)
1year f/u: Renal-replacement therapy‡	40 (11.6)	56 (16.4)	0.71 (0.49–1.03)
1year f/u: Recurrent myocardial infarction	6 (1.7)	7 (2.1)	0.85 (0.29–2.50)
1year f/u: Death or recurrent infarction	175 (50.9)	199 (58.4)	0.87 (0.76–1.00)
1year f/u: Rehospitalization for congestive heart failure	18 (5.2)	4 (1.2)	4.46 (1.53–13.04)
1year f/u: Death, recurrent infarction, or rehospitalization for heart failure	190 (55.2)	203 (59.5)	0.87 (0.93–1.06)
1year f/u: 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)

Days since Randomization

No. at Risk

Multivessel PCI	165	161	160	156	152	149	131
Culprit-lesion-only PCI	195	186	181	178	174	172	147



KAMIR-NIH Nationwide Multicenter Registry (2011.11 ~ 2015.12)

13,104 patients with Acute myocardial infarction

Exclusion criteria
- NSTEMI, N = 6,804
- STEMI onset >12h, N = 24
- No cardiogenic shock, N = 4,923
- Initial thrombolysis, N = 103
- Single vessel disease, N = 549
- Unsuccessful IRA PCI, N = 27
- Lost to follow-up, N = 15

Study population N = 659 — 26.7% Mechanical support

Median follow-up of 359.0 days

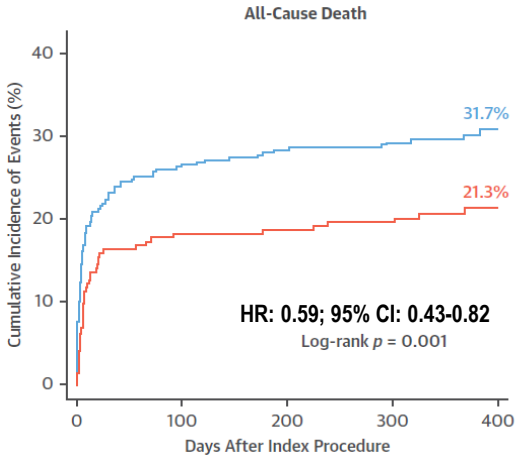
IRA-only PCI N = 399

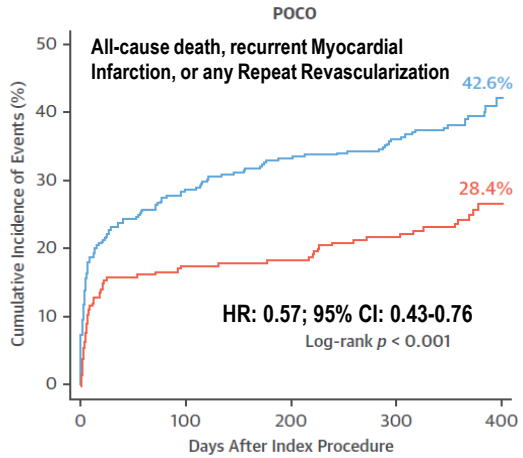
Multivessel PCI N = 260

Immediately PCI during Indexprocedure N=157(60.4%)

Staged PCI before discharge N=103(39.6%)

>50%





IRA-Only PCI — Multivessel PCI

Thiele. et al, N Engl J Med, 2017;377:25 & 2018;379:18

Lee JM, Rhee TM, Hahn JY et al. J Am Coll Cardiol 2018;71:844

Conclusion

Previous abundant evidence exists regarding the benefits of complete revascularization for STEMI patients

Even in cardiogenic shock patients too. Of course, hemodynamic stabilization is a priority.

Further research is still needed on the best timing of CR.

Recent RCT demonstrated that FFR-guided CR did not have a signicant benefit over an Angiography-guided CR with respect to the risk of death, MI, urgent revascularization. But, given the 40% less PCI(Time, Cost, contrast, Procedure risk etc.) in FFR-guided CR.

Thank You

For your attention

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