How can we improve reperfusion therapy in AMI

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Disclosure

- Potential conflicts of interest
- Unrestricted institutional grant for fellowship from Boston Scientific
- Speaker fees
 - Bosoton, Medtronic, Abbott Vascular, Miracor



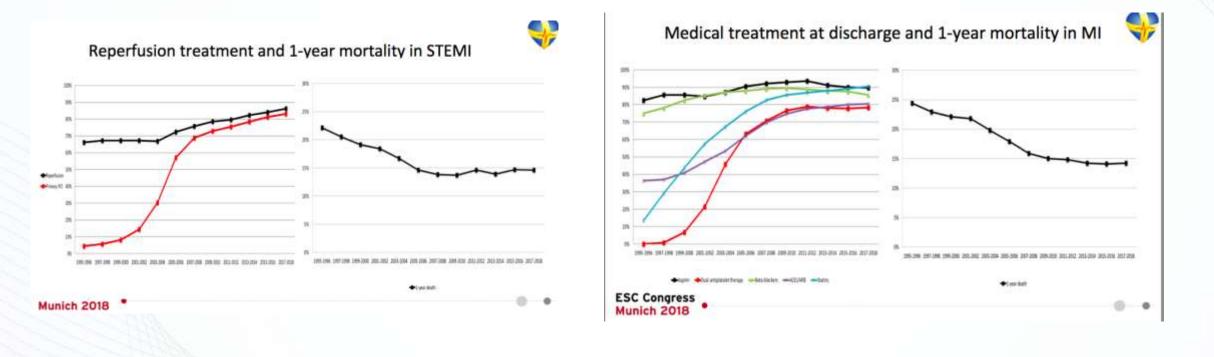
Reperfusion in STEMI

- Well its all fine isn't it since we started primary PCI?
- Outcomes are good: whats the problem?





Improvement in the outcomes for STEMI patients have plateaued But we seem to be doing our best !



CVRF

Mechanical

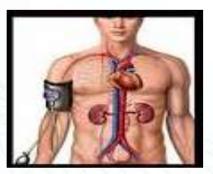












28th TCTAP



Pharmacological











To improve outcomes for those patients where "standard therapy" isnt enough – we need to know who they are likely to be



"Standard" therapy for STEMI Anticoagulation, Predilation /aspiration, Stent, DAPT

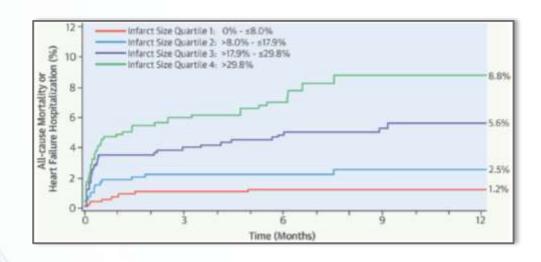
Works well for around 60-70% patients with STEMI

Individual identification would allow triage for additional therapy

Relationship Between Infarct Size and Clinical Outcomes Following PPCI

- Patient level meta-analysis 10 RCTs PPCI, N = 2362, infarct size assessed within 1 month by CMR or SPECT with clinical FU for >6M
- KM estimated 1 year rates:
 - ✤ All Cause Mortality 2.2%
 - Reinfarction 2.5%
 - Heart Failure Hospitalisation 2.6%

Infarct Size and Prognosis After PPCI

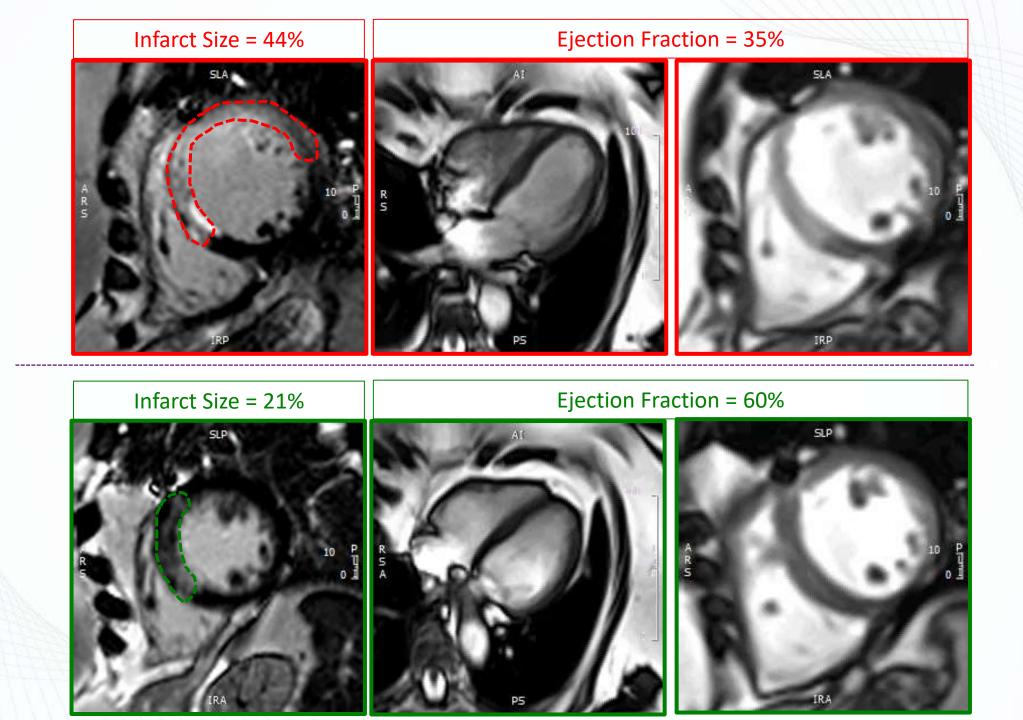


Relationship between Infarct Size and the Composite EP of All-Cause Mortality or HF Hospitalisation During 1Y FU

infarct Size >17.9%	infarct Sizu ±12.9%	HB 195% CT	HID 19535, CT	P-Value for Interaction
Age < vs = median No. of Events/Total No.		the province of	the Frank of	0.10
16/571 (2.8%) 58/577 (10.2%)	1/592 (0.2%) 20/600 (1.1%)		+ 1730 [2.27, 128.92] 3.04 [1.83, 5.07]	
				0.53
43/911 (4.7% 32/237 (13.5%)	12/896 (1.3%) 9/296 (3.0%)		3.47[1.82, 6.60] 4.69[2.24, 9.83]	
				0.32
25/222 (11.3%) 50/925 (5.4%)	4/195-(2.1%) 17/994-(1.2%)		5.72 [1.99, 16.44] 3.12 [1.80, 5.43]	
		1.12		0.30
25/472 (5.3%) 46/639 (7.2%)	5/508 (1.0%) 15/653 (2.3%)		5.57 [2.13, 14.54] 3.08 [1.71, 5.53]	
				0.04
58/824 (2:0%) 17/323 (5:3%)	5/517 (1.0%) 16/669 (2.4%)		2.41 [2.97, 18.50] 2.24 [1.13, 4.44]	
				0.30
50/578 (8.7%) 25/569 (4.4%)	17/647 (2.6%) 4/547 (0.7%)		3.26 [1.88, 5.68] 6.39 [2.35, 72.79]	
				0.51
11/185 (5.9%) 52/829 (6.3%)	5/211 (2.4%) 13/796 (1.6%)		2.55 [0.89, 7.33] 3.82 [2.07, 7.03]	
it device + vs = media	in .			0.37
31/541 (5.7%) 41/569 (7.2%)	8/655 (1.2%) 12/477 (2.5%)		4.70 [2.15, 10.25] 2.94 [1.54, 5.59]	
				0.58
56/810 (6.9%) 18/296 (6.1%)	10/577 (1.7%) 11/528 (2.1%)	1000	4.00 (2.04, 7.85) 2.98 [1.41, 6.31]	
				0.80
22/147 (15:0%) 53/985 (5:4%)	3/81 (3.7%) 18/1077 (1.7%)		3.93 [1.17, 13.24] 3.31 [1.94, 5.65]	
	>17,9% No. of Even 16/571 (2.8%) 59/577 (10.2%) 43/911 (4.7% 32/737 (13.5%) 25/222 (11.3%) 50/925 (5.4%) 25/472 (5.3%) 46/639 (7.2%) 58/824 (2.0%) 17/523 (5.3%) 50/578 (8.7%) 25/569 (4.4%) 11/185 (5.9%) 52/569 (4.4%) 11/185 (5.9%) 41/569 (7.2%) 52/569 (4.4%) 11/185 (5.9%) 41/569 (7.2%) 56/810 (6.9%) 11/296 (6.1%) 22/147 (15.0%)	>17,9% ±17,9% No. of Events/Tobal No. 16/571 (2.8%) 1/592 (0.2%) 58/577 (10.2%) 20/600 (2.196) 43/911 (4.7%) 12/896 (1.3%) 25/227 (11.3%) 9/296 (2.1%) 25/227 (11.3%) 9/296 (2.1%) 25/222 (11.3%) 4/195 (2.1%) 50/925 (5.4%) 17/994 (1.7%) 25/472 (5.3%) 5/508 (1.0%) 46/639 (7.2%) 15/653 (2.3%) 50/526 (8.2%) 15/653 (2.3%) 50/526 (8.2%) 16/869 (2.4%) 17/123 (5.3%) 16/869 (2.4%) 10/185 (5.9%) 13/796 (1.6%) 11/185 (5.9%) 5/211 (2.4%) 52/569 (4.4%) 13/796 (1.6%) 11/185 (5.9%) 13/796 (1.6%) 12/477 (2.5%) 12/477 (2.5%) 56/810 (6.9%) 10/577 (1.7%) 110/296 (0.1%) 10/577 (1.7%) 110/296 (0.1%) 10/577 (1.7%)	>17.9% ±12.9% HB [95% C] No. of Events/Tobal No. HB [95% C] 16/521 (2.8%) 1/592 (0.2%) 39/527 (10.2%) 20/600 (1.1%) 43/991 (4.7%) 12/896 (1.3%) 12/7277 (13.5%) 9/296 (3.0%) 25/222 (11.3%) 4/195 (2.1%) 25/222 (11.3%) 4/195 (2.1%) 25/477 (5.3%) 5/508 (0.0%) 25/477 (5.3%) 5/508 (0.0%) 25/477 (5.3%) 5/517 (1.0%) 26/232 (11.3%) 4/196 (2.4%) 25/477 (5.3%) 5/517 (1.0%) 17/7323 (5.3%) 15/653 (2.3%) 50/578 (8.7%) 17/647 (2.5%) 10/185 (5.9%) 5/211 (2.4%) 50/578 (8.7%) 17/647 (2.5%) 11/185 (5.9%) 5/211 (2.4%) 25/549 (4.5%) 12/977 (2.5%) 11/185 (5.9%) 12/9477 (2.5%) 56/810 (6.9%)1 10/577 (2.7%) 56/810 (6.9%)1 10/577 (2.7%) 11/296 (6.1%) 10/577 (2.7%) 22/147 (05.0%) 3/81 (3.7%)	H7.9% £17.9% £17.9% HR [95% C] HR [95% C] No. of Events/Tabli No. 1/592 (0.2%) 1/592 (0.2%) 1/592 (0.2%) 39/577 (10.2%) 20/600 (1.1%) 1/592 (0.2%) 1/100 [2.27, 128.93] 39/577 (10.2%) 20/600 (1.1%) 1/00 [2.27, 128.93] 1/00 [2.27, 128.93] 43/971 (4.7%) 1/2896 (1.0%) 1/00 [2.27, 128.93] 1/00 [2.27, 128.93] 25/227 (11.3%) 9/296 (1.0%) 1/00 [2.24, 9.83] 1/00 [2.24, 9.83] 25/222 (11.3%) 4/195 (2.1%) 1/17994 (0.7%) 5/7 [1.94, 16.44] 50/925 (5.4%) 5/508 (0.0%) 5/57 [2.13, 14.54] 3/08 [1.77, 5.53] 26/022 (11.3%) 5/508 (0.0%) 5/57 [2.13, 14.54] 3/08 [1.77, 5.53] 58/824 (2.0%) 5/517 (1.0%) 2/34 [1.33, 4.44] 2/34 [1.33, 4.44] 50/578 (8.7%) 17/647 (2.5%) 2/35 [0.89, 7.33] 3/82 [2.07, 7.03] 1/7323 (5.3%) 1/7647 (2.5%) 4/3628 (2.07%) 4/36 [2.07, 7.03] 1/7323 (5.3%) 1/7647 (2.5%) 2/35 [0.89, 7.33] 3/82 [2.07, 7.03] 1/7323 (5.3%) 5/211 (2.4%) 2/3

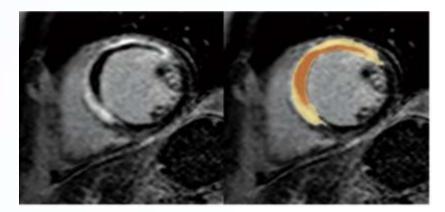
Outcomes were examined in patients with large versus small infarct size (IS) (above or below the median of 17.9%). Interaction p values are for comparison of the hazard ratios in each subgroup. HF = heart failure; LAD = left anterior descending; TME = Thrombolysis InMyocardial Infarction.

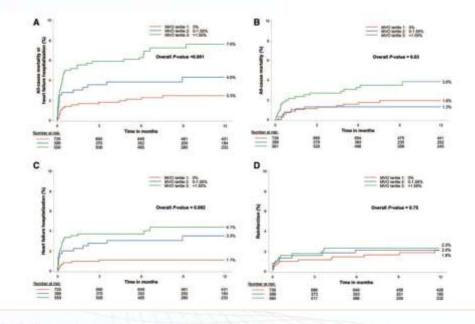
¹Stone GW. et al. J Am Coll Cardiol. 2016;67:1674-83;

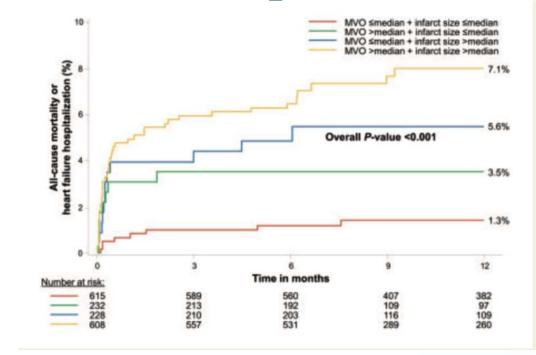


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Added value of detecting MVO



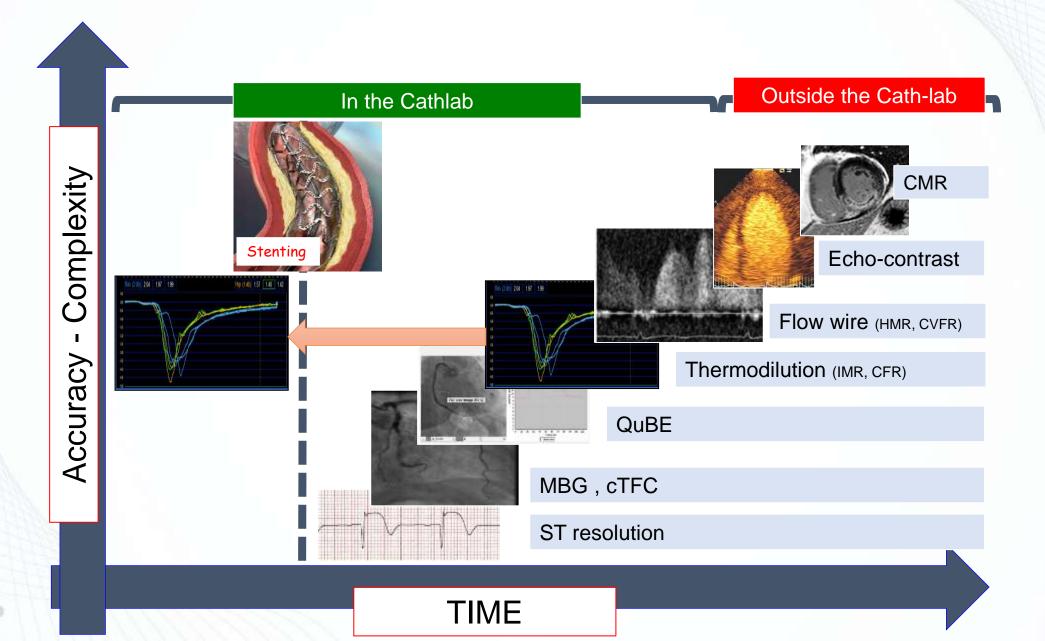




European Heart Journal (2017) **38**, 3502–3510 doi:10.1093/eurheartj/ehx414

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How and when can we predict the outcome in STEMI?



TCTAP

Can we predict the outcome in the lab during STEMI?

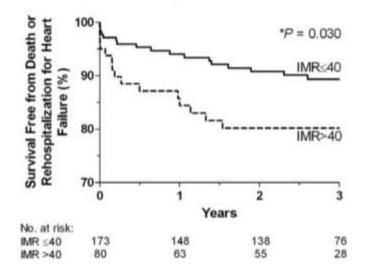






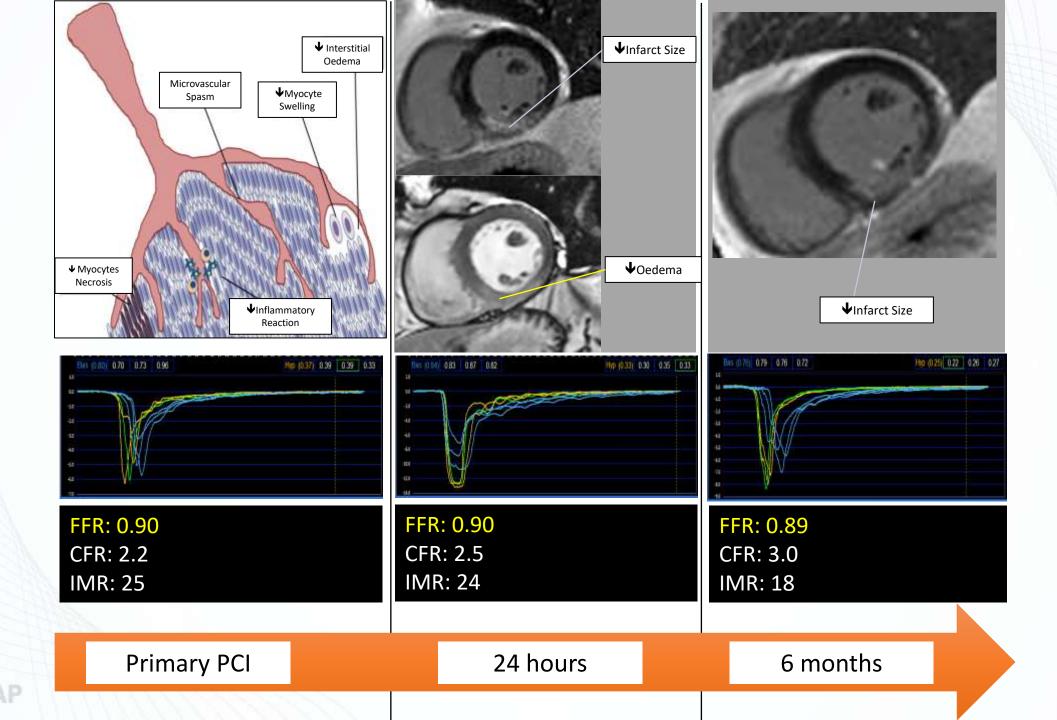
Prognostic Value of the Index of Microcirculatory Resistance Measured After Primary Percutaneous Coronary Intervention

William F. Fearon, Adrian F. Low, Andy S. Yong, Ross McGeoch, Colin Berry, Maulik G. Shah, Michael Y. Ho, Hyun-Sook Kim, Joshua P. Loh and Keith G. Oldroyd



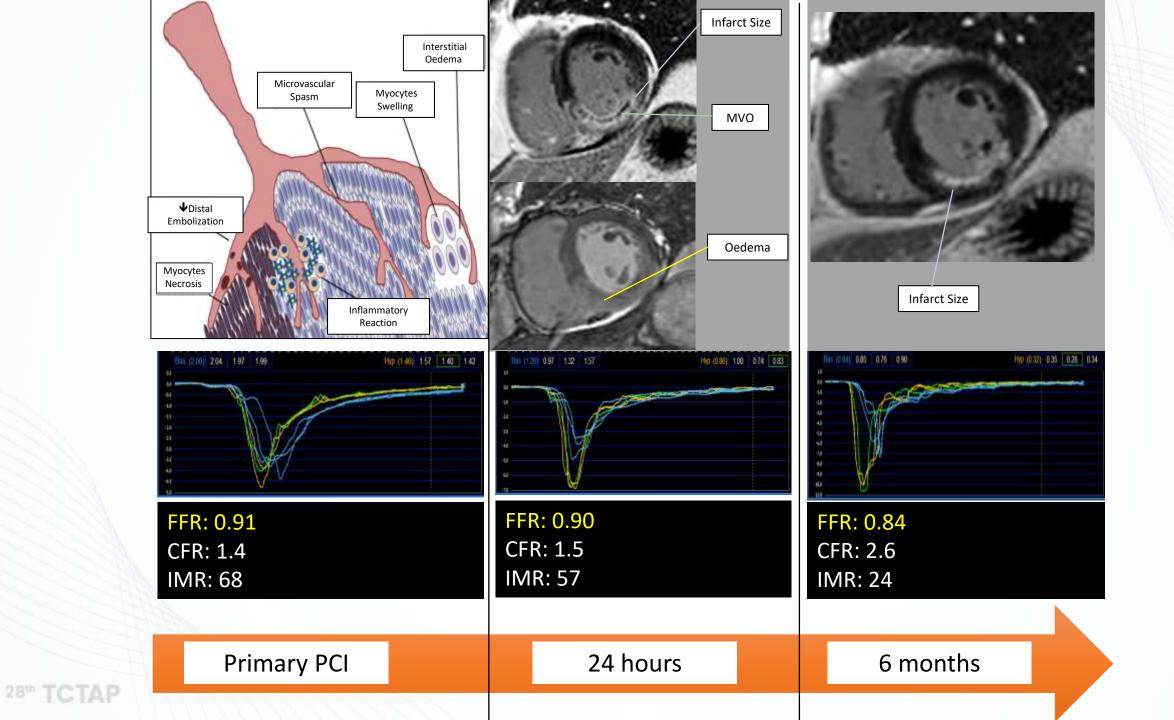
In STEMI an IMR > 40 at the end of the procedure predicts an adverse outcome



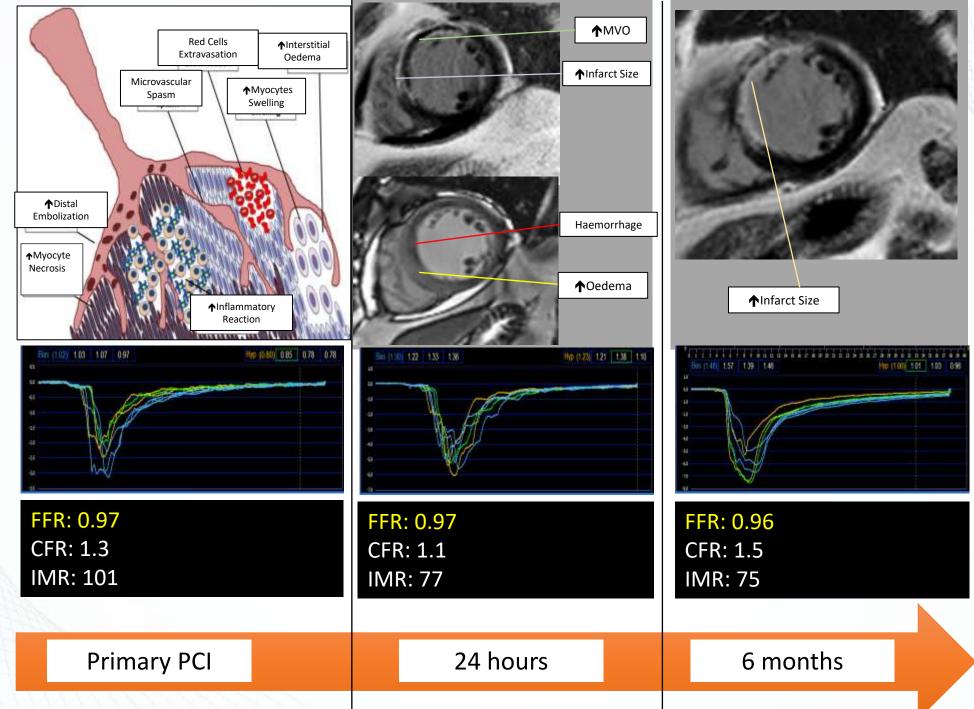


CVRF

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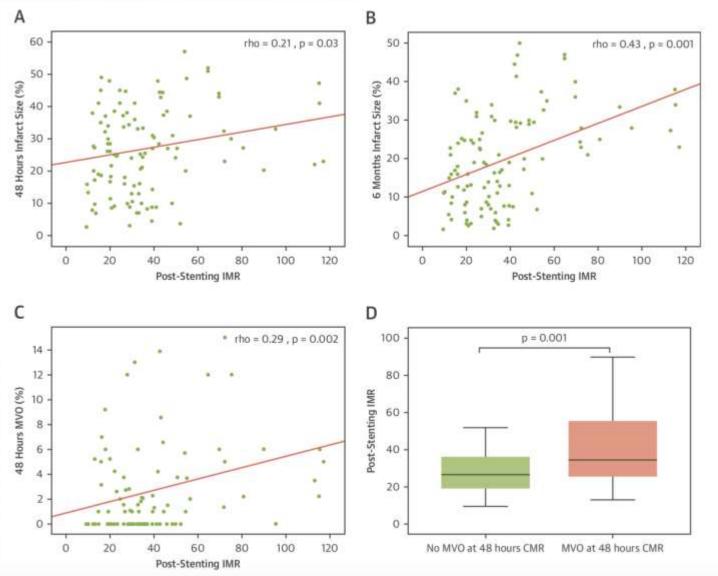


CVRF



28th TCTAP

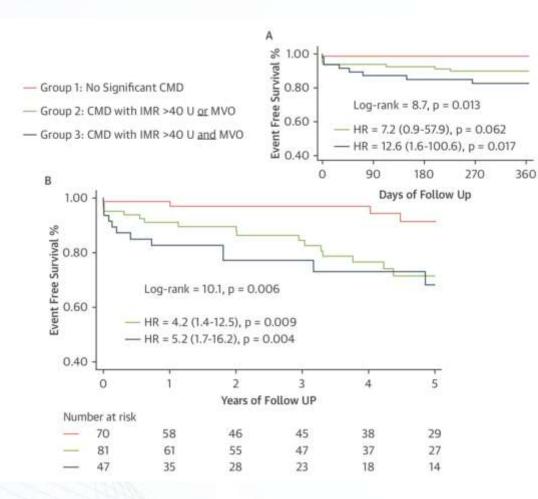
CVRF



How do IMR & MRI measured infarct size /MVO relate in practice ?

De Maria, Banning A et al. JACC Cardiov Imaging 2019

High IMR and/or MVO : impact on prognosis



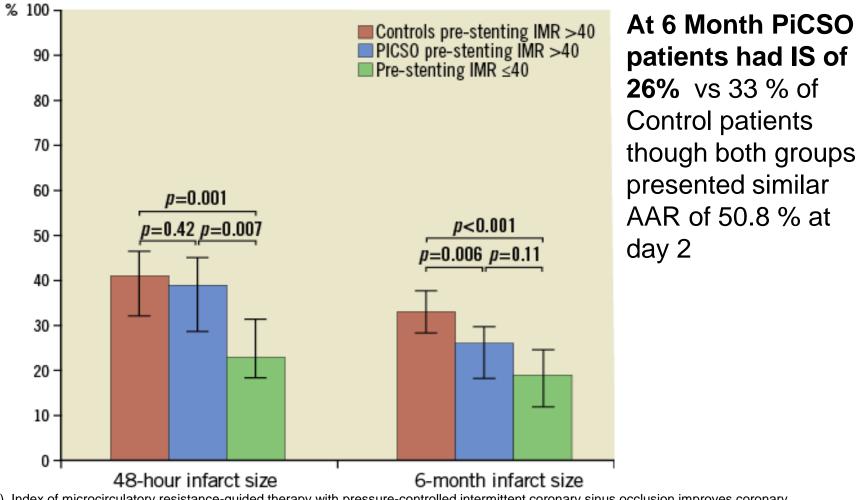


Scarsini R, Banning A et al. JACC Cardiov Imaging 2021



OxAMI - PiCSO

7% Absolute Infarct Size Reduction Post PiCSO at 6 Months



De Maria, G. L, et al (2018). Index of microcirculatory resistance-guided therapy with pressure-controlled intermittent coronary sinus occlusion improves coronary microvascular function and reduces infarct size in patients with ST-elevation myocardial infarction (OxAMI-PICSO study). *EuroIntervention*. doi:10.4244/EIJ-D-18-00378

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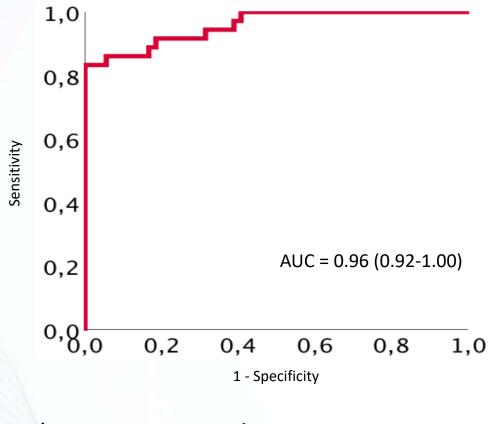
QMS-SD 10101[1.0]

Can we use a wire free angio-based index of CMD in STEMI?

- Application of invasive IMR in practice is limited
- Main limitations of IMR remains:
 - pressure-wire based technique
 - instrumentation of the infarct-related artery
 - extra procedural time
 - technical complexity
 - extra costs
- angio-derived IMR (IMR_{angio}) has been recently developed through application of computational flow dynamic to 3-D vessel modelling

De Maria GL, Banning et al. Int J Cardiov Imaging 2020 De Maria GL, Banning. Eur Heart J Acute Cardiovasc Care 2021

Diagnostic accuracy of IMR_{angio} in STEMI



*IMR_{angio} in predicting IMR>40 U

IMR _{angio} diagnostic performance			
Accuracy	92.4%		
Sensitivity	83.0%		
Specificity	100%		
Negative predictive value	90.2%		
Positive predictive value	96.8%		

De Maria GL, Banning et al. Int J Cardiov Imaging 2020

Conclusions

Outcomes for patients presenting with STEMI have plateaued

Surrogate measures of likely clinical outcome following/during STEMI are desirable

Infarct size cMRI and MVO

IMR measured with pressure wire (and possibly IMR_{angio})

Both MVO and IMR are predictive and may even be additive

Additional therapies for pts with STEMI are required for a sizeable minority – triaged therapy using IMR may be best approach

Conclusions

Treating all patients with STEMI is no longer appropriate



Low risk cases (low IMR) : early mobilisation and discharge

High risk cases (high IMR +/- MVO) early identification Longer monitoring Optimised medical therapy Consideration for additional treatments- randomised trials