

Peri-procedural elevation of troponins

Jan Ravkilde, M.D., FESC, FACC
Department of Cardiology
Aarhus University Hospital
Denmark



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Overview

Unifying PMI in 2006-

? Guidelines ?

ESC/ACC Task Force 2000

EJH 2000, JACC 2000

Any level Tn $> 1 \times 99^{\text{th}}$ $\wedge 10\% \text{CV}$

ACC/AHA Guidelines 2001

JACC 2001;37:2215.

CKMB $> 3 \times \text{ULN}$

ESC PCI Guidelines 2005

Eur Heart J 2005;26:804

CKMB $> 5 \times \text{ULN}$ Troponin?

What is the daily Practice ?

How many Procedural MI do you have in your cath. lab.?

None !

OK, do you diagnose Procedural MI by biomarkers ?

No ! ??.....Why ?

SEE NO DAMAGE



HEAR NO DAMAGE

SPEAK NO DAMAGE

Pathophysiology of PMI

Myocardial ischemic damage

Type I (proximal type)

Primary epicardial vascular obstruction

Type II (distal type)

Distal perfusion territory; i.e. related to structural and functional microvascular obstruction (50-75%)

INCIDENCE OF PMI ^{1/2}

Studies 1985-2005 - 70 studies
Biomarker >1xULN.

CKactivity	8 \pm 5 % (range 2-17)
CKMBactivity	15 \pm 11 % (- 4-25)
CKMBmass	23 \pm 12 % (- 0-47)
cTnT	23 \pm 11 % (- 7-69)
cTnI	27 \pm 12 % (- 5-53)

INCIDENCE OF PMI ^{2/2}

Studies 1985-2006 - 70 studies.

Incidence can vary remarkably depending on

- the choice of biomarker**
- biomarker assay**
- choosen cut-off value**
- blood sampling frequency**

Non-similarity among biomarker cut-off's.

AMI (2x ULN). Reference level CKMB 12 U/l.
CKMB 24 U/L equals CKMB_{mass} 30 µg/l

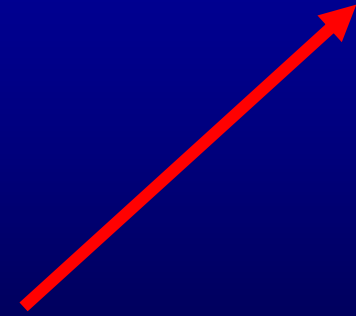
PCI (3x ULN)

CKMB 3 x 12 U/l = 36 U/l => CKMB_{mass} 45 µg/l

HOWEVER !!!!

CKMB_{mass} reference is 5 µg/l

CKMB_{mass} 3 x ULN is 15 µg/l



An Example

Aarhus University Hospital, DK

2 year period 2002-2003

Elective PCI Stable Angina Pectoris 449 patients

CKMBmass ULN 5 $\mu\text{g/l}$

**CKMB_{cat}
3xULN**

Normal -> elevated

15 (3xULN) -> 45 $\mu\text{g/l}$

CKMB mass	10 $\mu\text{g/l}$	12 %	8 %	-> 1.8 %
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0.09 (3xULN)-> 0.75 $\mu\text{g/l}$

Troponin T	0.06 $\mu\text{g/l}$	22 %	9 %	-> 2.0 %
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Prognosis

Periprocedural MI in PCI and Prognosis

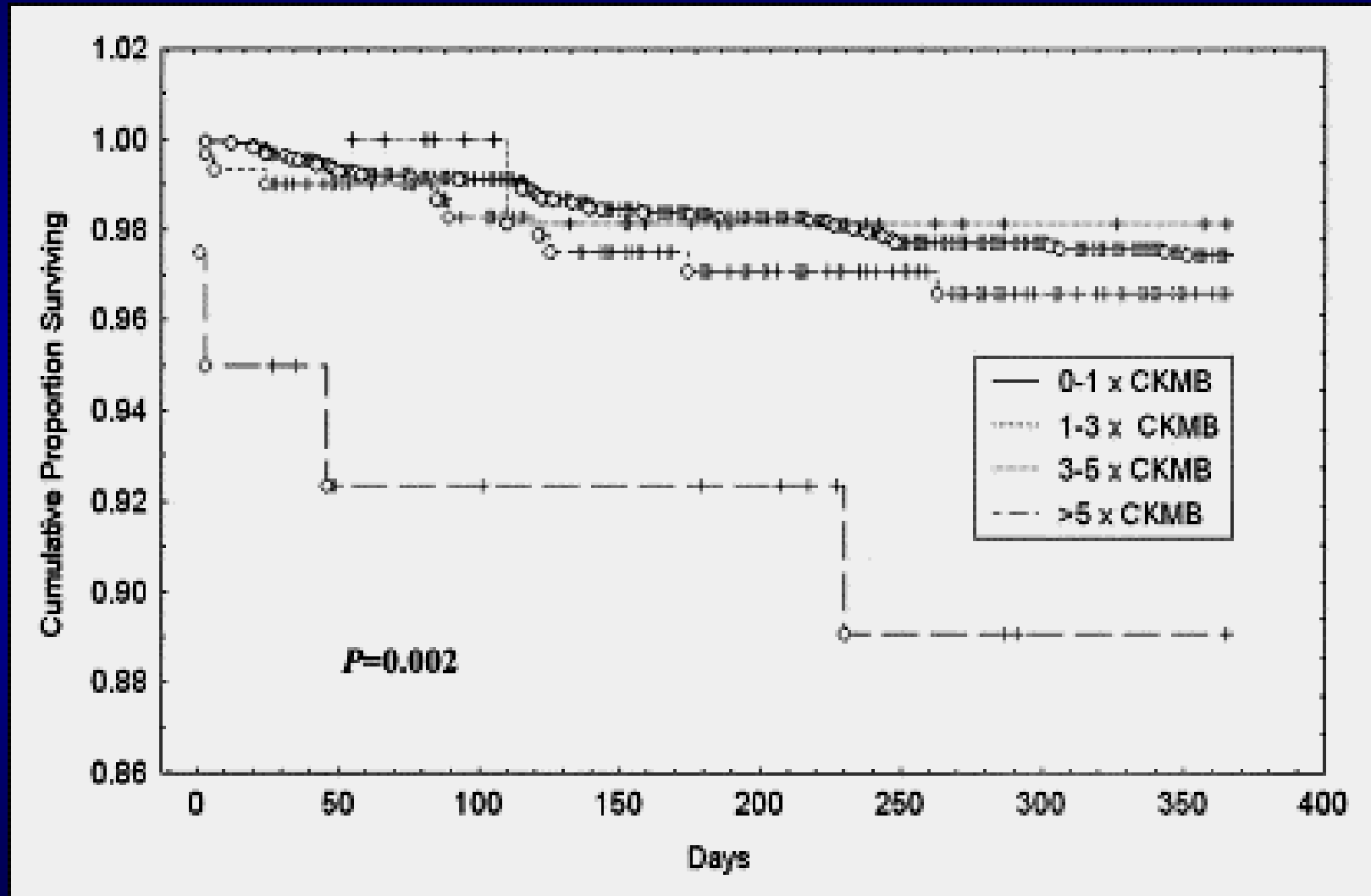
Study	No.Pts	Criteria	F-U yrs	Mortality (%)	
				Pos.	Neg.
Tardiff	2432	CKMB>1	0.5	3.0	1.4
Redwood	1897	CKMB>1	1	4.7	1.1
Harrington	1012	CKMB>2	1	3.8	1.5
Kugelmass	565	CKMB>2	2	8.0	6.0
Abdelmeg.	4461	CKMB>1	3	7.0	4.0
Kong	373	CKMB>1.5	3.5	15.8	7.0

Study	No.Pts	Criteria	F-U yrs	Death/MI (%)		
				Pos.	Neg.	
Simoons <small>Epic, Epilog, Capture</small>	5025	CKMB>3	0.5	8.5	3.0	(19%)
Tardiff	2065	CKMB>3	0.5	37.0	25.0	(21%)
Roe <small>IMPACT GUSTO IIb, PARAGON-A, PARAGON-B, PURSUIT</small>	2384	CKMB>3	0.6	5.0	2.1	(23%)
Harrington	483	CKMB>3	1.0	7.2	3.5	(30%)
Kini <small>WHC, US</small>	2873	CKMB>5	1.0	11	2	(1.6%)
Fuchs	1029	TnI>3	0.7	18.4	10.0	(24%)
Kini <small>Mono MSNY, US</small>	2873	TnI>3	1.0	3.5	2.5	(23%)
Herrmann	278	TnT>3	0.7	9.1	0.9	

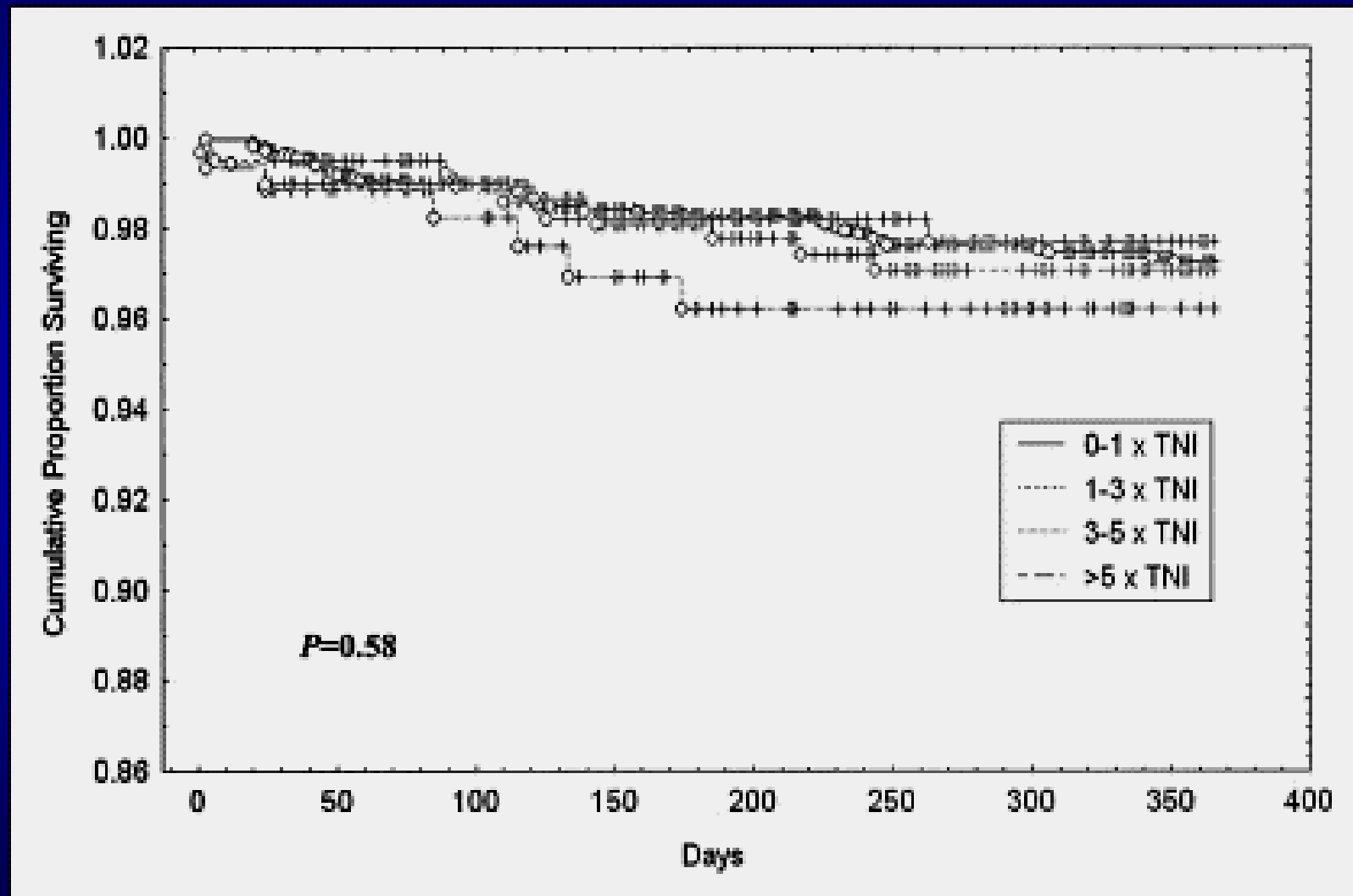
PMI in PCI and Prognosis

Study	No.Pts	Criteria	F-U yrs	Revasc (%)	
				Pos.	Neg.
Kizer	125	TnT>3	5.5	44	22
Shuy	61	TnT>3	0.6	24	6
Ramirez	147	TnI>1	0.8	92	65
Saadeddin	96	TnI>4	1	46	16
Ricciardi	286	TnI>14	1	51	30
Cantor	481	TnI>1	0.3	8.9	3.7 MI
6 studies	2540	TnI/T>1-7	0.8-6		None

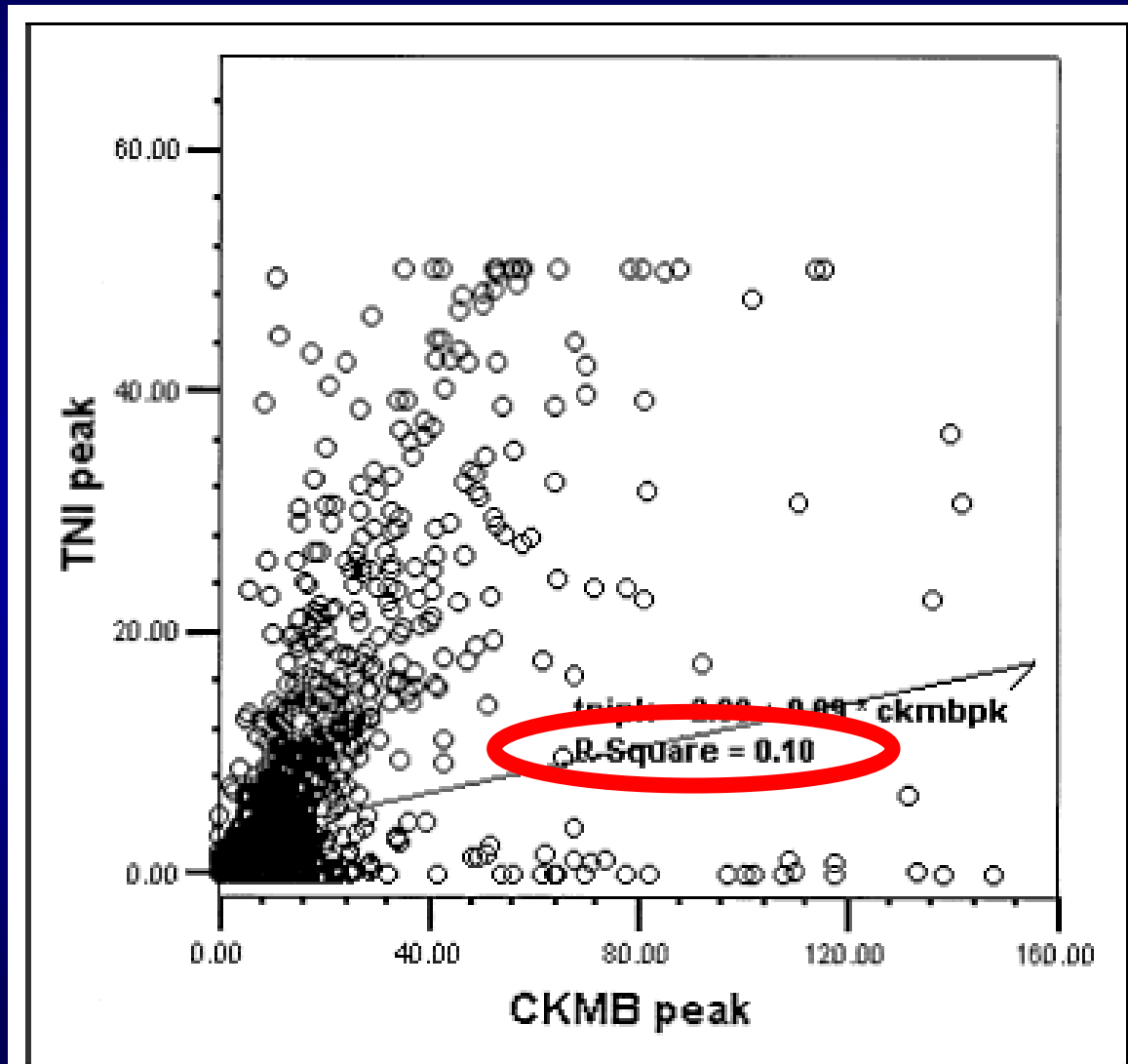
Procedural MI



Procedural MI




Procedural MI



Is prognosis of PMI and AMI equal ?

Rel. increases in CKMB	Absolute risk at 6 m mortality	
	PMI* (8838)	Spont. AMI** (5583)
< 1	1.3 %	4.1 %
1-3	2.0 %	8.6 %
> 3-5	2.3 %	9.0 %
> 5-10	4.3 %	14.3 %
> 10	7.4 %	15.5 %

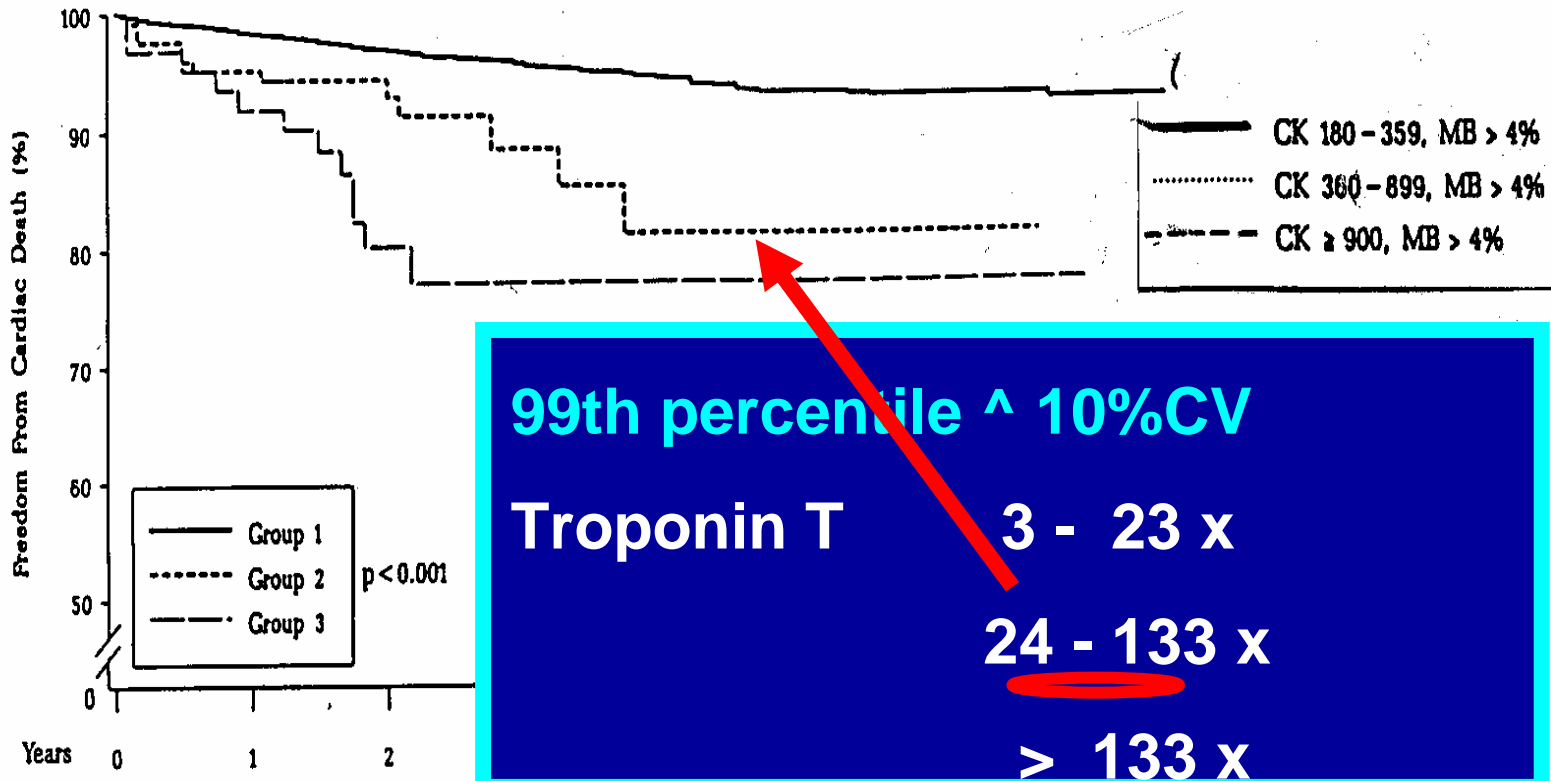


* PURSUIT

** PURSUIT, Capture, EPIC, EPILOG, IMPACT-II

Akkerhuis et al. *Circulation* 2002;105:554-6

Total CK for MI in PCI



N	0	1	2	3	4	5	6	7	8	9	10
Group 1	4461	4292	2430	1514	1087	654	583	130	1		
Group 2	122	114	60	29	12	7	7	0	0		
Group 3	61	55	30	20	18	9	8	4	0		

PMI in PCI Conclusion ^{1/2}

- * PMI in PCI and spontaneous AMI are not equivalents, and should be *clearly differentiated* as they have different pathophysiology and carry different prognosis
- * Troponin elevations compared to CKMB needs higher multiple fold of 99th ^ CV10%
- * Prognostically the higher value of biomarker the worse the prognosis

EvidenceBased PeerReviewed Suggestion for PMI in PCI ^{2/3}

Diagnostic

Troponin I or T > 5x 99th percentile ^ 10%CV

Prognostic

Troponin I or T > 20x 99th percentile ^ 10%CV