STEMI – Primary Percutaneous Coronary Intervention

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Professor of Medicine

Outline

- **Primary PCI**

- **Aspiration, manual thrombectomy and distal protection devices**

- **Choice of stent**

- **Pharmacothaerpy, including IC GP IIb/IIIa inhibitors**

Decline in Deaths from Cardiovascular Disease in Relation to Scientific Advances
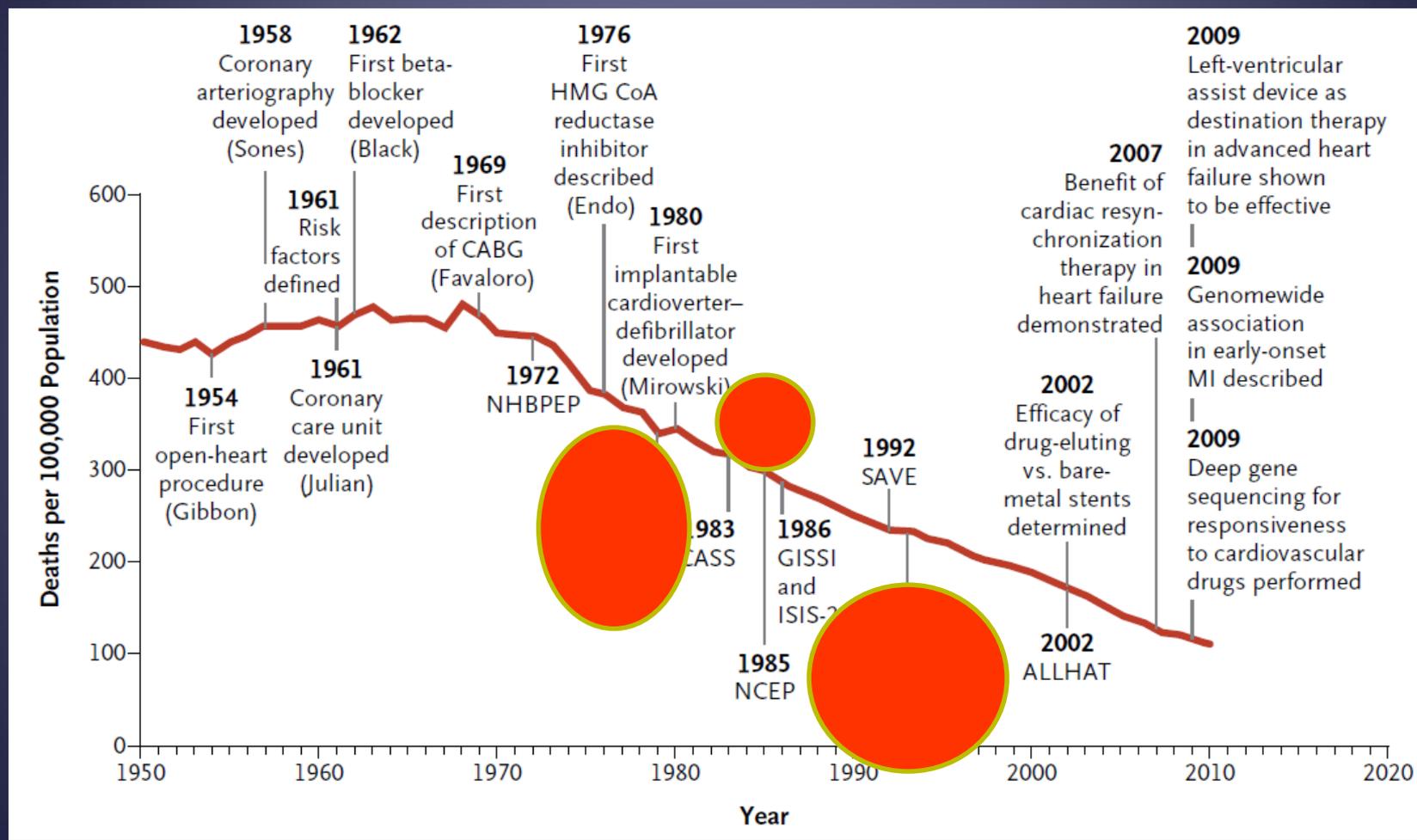
Geoffrey Hartzler, M.D.
First Primary Angioplasty in AMI, 1979
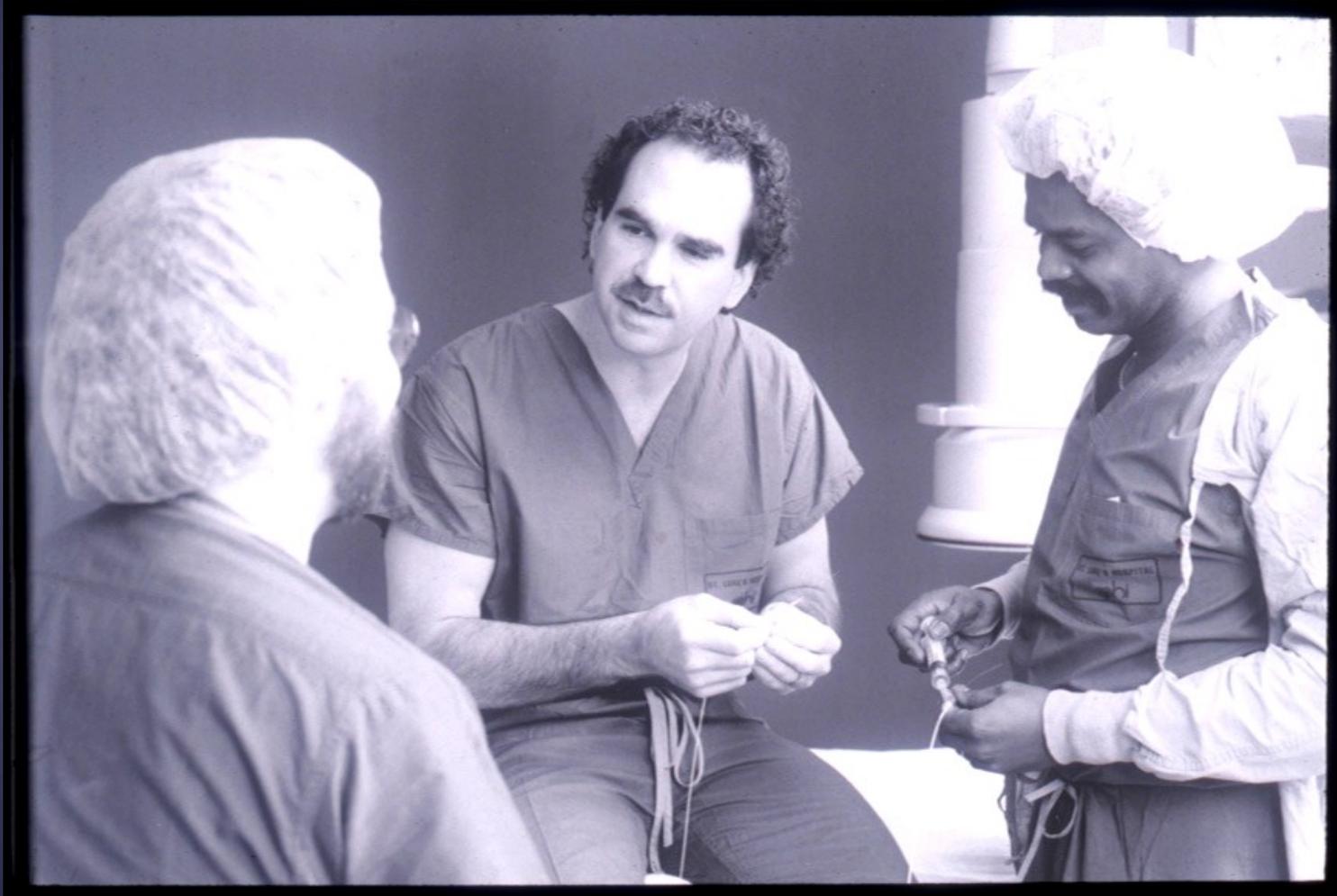
1946 - 2012

The Goal of Primary PCI in STEMI

•Restore flow in the culprit artery and optimize myocardial perfusion (by angio and EKG criteria)

•Preserve LV function.

•Reduce MI complications

•Reduce mortality.
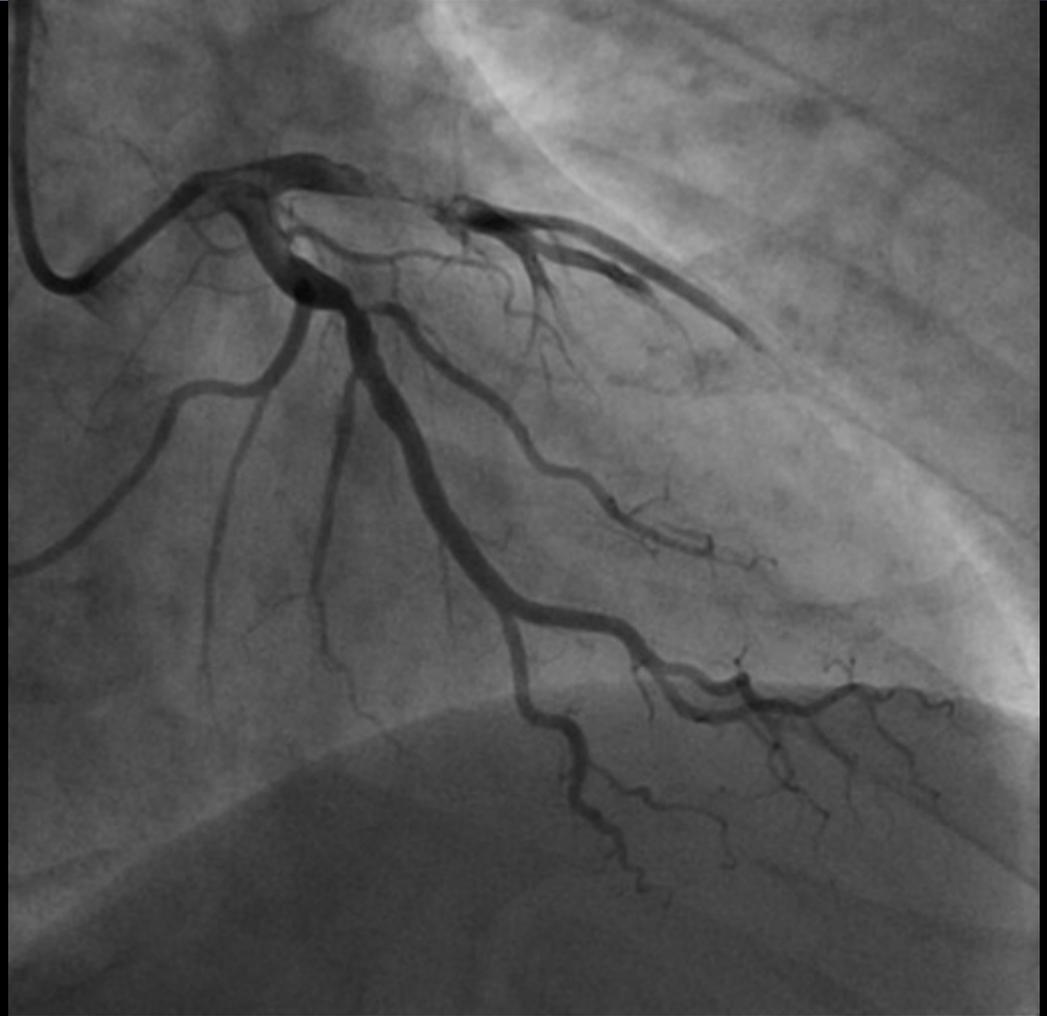
Prehospital and In-Hospital Management and Reperfusion Strategies

STEMI diagnosis[a]

Primary-PCI capable center

EMS or non primary-PCI capable center

Preferably <60 min

PCI possible <120 min?

Primary-PCI

Immediate transfer to PCI center

YES   **NO**

Preferably ≤90 min (≤60 min in early presenters)

Rescue PCI

Preferably ≤30 min

Immediately

Immediate transfer to PCI center

Immediate fibrinolysis

NO

Successful fibrinolysis?

YES

Preferably 3-24 h

Coronary angiography

[a]The time point the diagnosis is confirmed with patient history and ECG ideally within 10 min from the first medical contact (FMC). All delays are related to FMC (first medical contact).

Cath = catheterization laboratory; EMS = emergency medical system; FMC = first medical contact; PCI = percutaneous coronary intervention; STEMI = ST-segment elevation myocardial infarction

Primary PCI versus Thrombolytics Swedish Heart Intensive Care Registry (RIKS-HIA)

Stenestrand, U. et al. JAMA 2006;296:1749-1756.
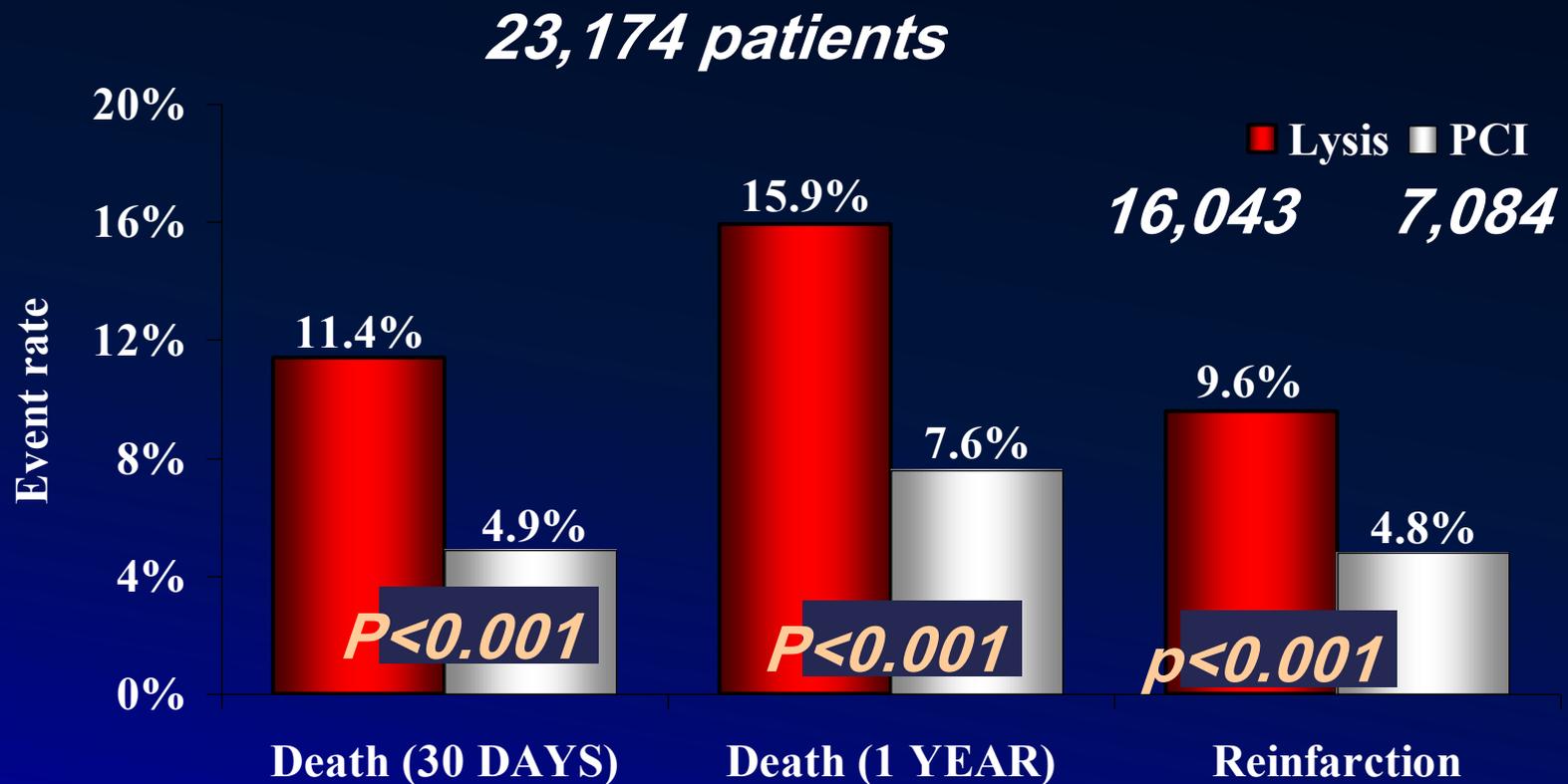
NRMI-3-4: Primary PCI
Door-to-Balloon Time vs. Mortality

N=29,222
P < 0.0001

Years 1999-02

Mortality (%)

Door-to-Balloon Time (minutes)

<90 → 3.0
90-120 → 4.2
121-150 → 5.7
>150 → 7.4
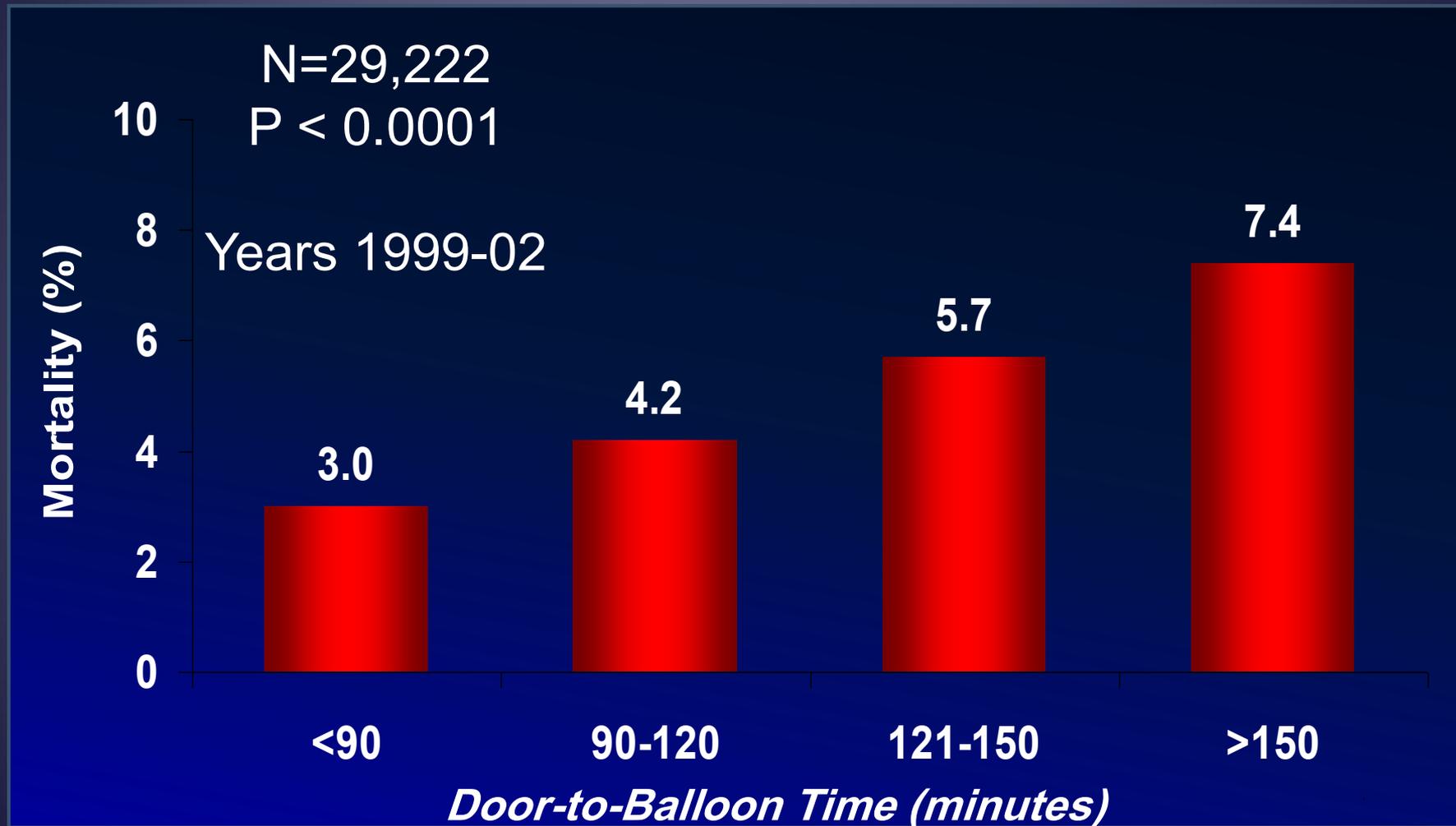
Impact of Delay to Primary PCI

90 DAY MORTALITY RELATED TO DOOR-TO-BALLOON TIME

Hudson MP et al. *Circ Cardiovasc Qual Outcomes* 2011;4:183-92
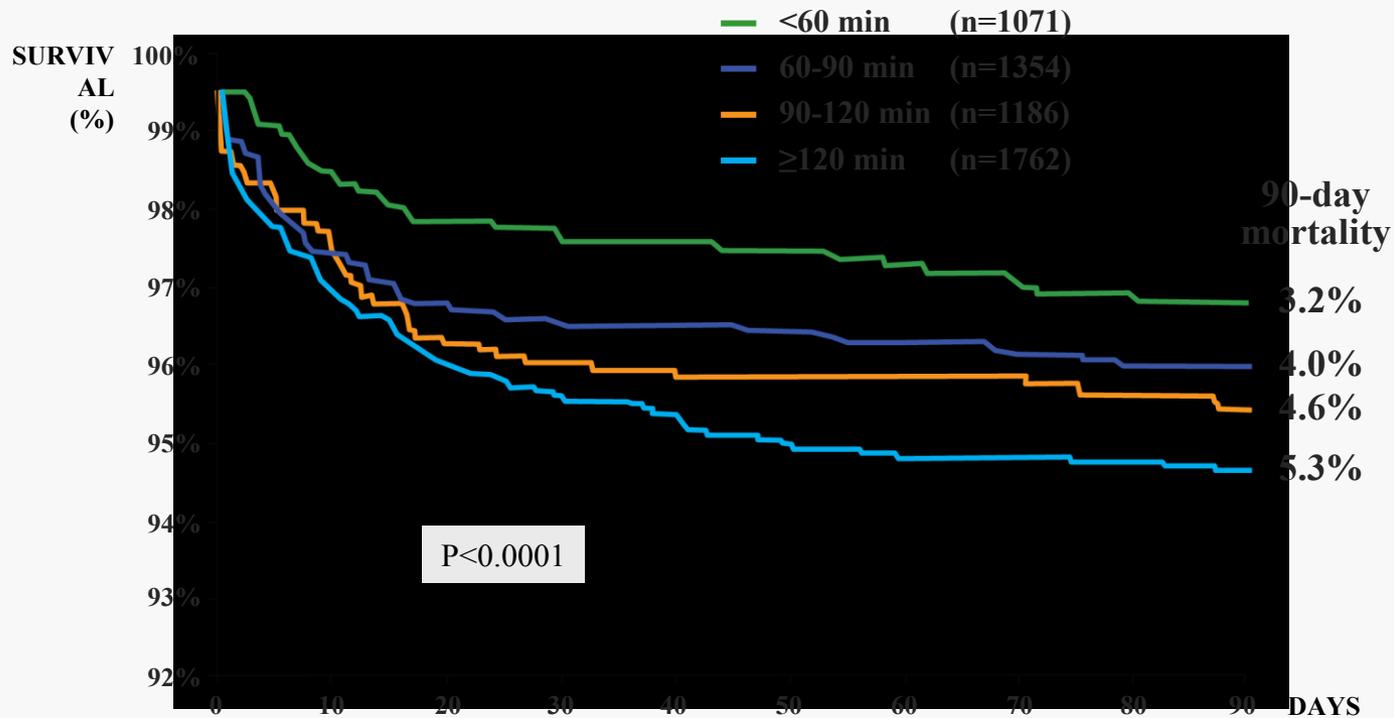
Do whatever it takes to reduce time from symptom onset to ER arrival and time from ER arrival to PCI!

↑ Public awareness of MI Sx

Chest pain centers of excellence with lower DBTs and excellent outcomes

Regional coordination

Ambulance ECG telemetry

Ambulance/ER CCL activation

ICs sleep in hospital

Continual QI

ESC STEMI guidelines 2012

Primary PCI is the recommended reperfusion therapy over fibrinolysis if performed by an experienced team within 120 min of FMC.	I	A

Primary PCI-capable centres must deliver a 24/7 service and be able to start primary PCI as soon as possible but always within 60 min from the initial call.	I	B
All hospitals and EMSs participating in the care of patients with STEMI must record and monitor delay times and work to achieve and maintain the following quality targets: • first medical contact to first ECG ≤10 min; • first medical contact to reperfusion therapy; • for fibrinolysis ≤30 min; • for primary PCI ≤90 min (≤60 min if the patient presents within 120 min of symptom onset or directly to a PCI-capable hospital).	I	B

AHA/ACC GL - Primary PCI of the Infarct Artery

IIIaIIbIII **A**

Primary PCI should be performed in patients within 12 hours of onset of STEMI.

IIIaIIbIII **B**

Primary PCI should be performed in patients with STEMI presenting to a hospital with PCI capability within 90 minutes of first medical contact as a systems goal.

IIIaIIbIII **B**

Primary PCI should be performed in patients with STEMI who develop severe CHF or cardiogenic shock and are suitable candidates for revascularization as soon as possible, irrespective of time delay

Survival Benefits in Patients Undergoing Late PCI of the Infarct-Related Artery

Meta-analysis of randomized trials

■ Conservative therapy
■ Invasive therapy

P=0.03
3560 pts

Event rate

12%
8.4%
8%
6.3%
4%
0%

Death at 3 yrs
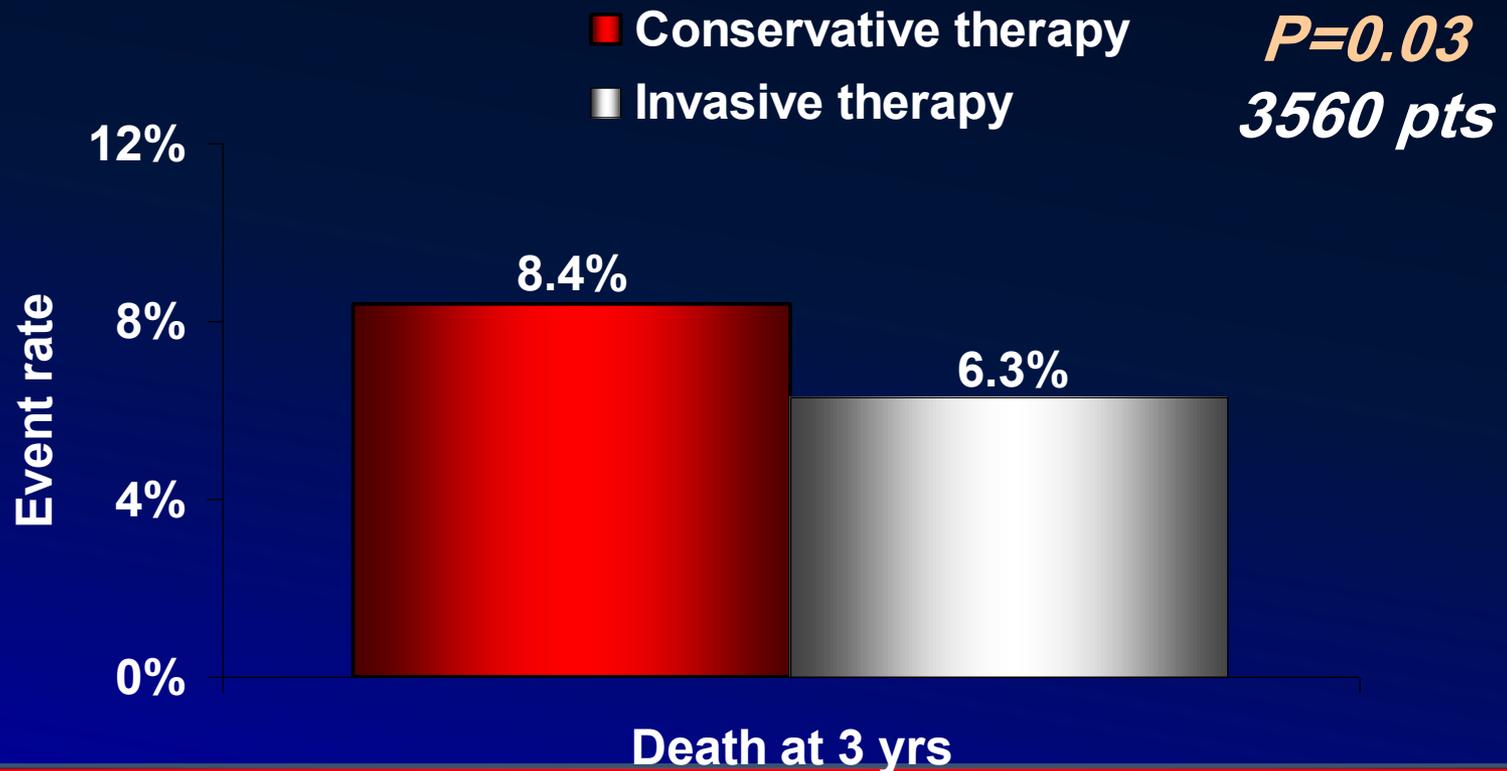
Abbate et al. J Am Coll Cardiol, 2008; 51:956-964

OAT: The Occluded Artery Trial Adverse events at 4 Years

Hochman JS et al. NEJM 2006;355:2395-407
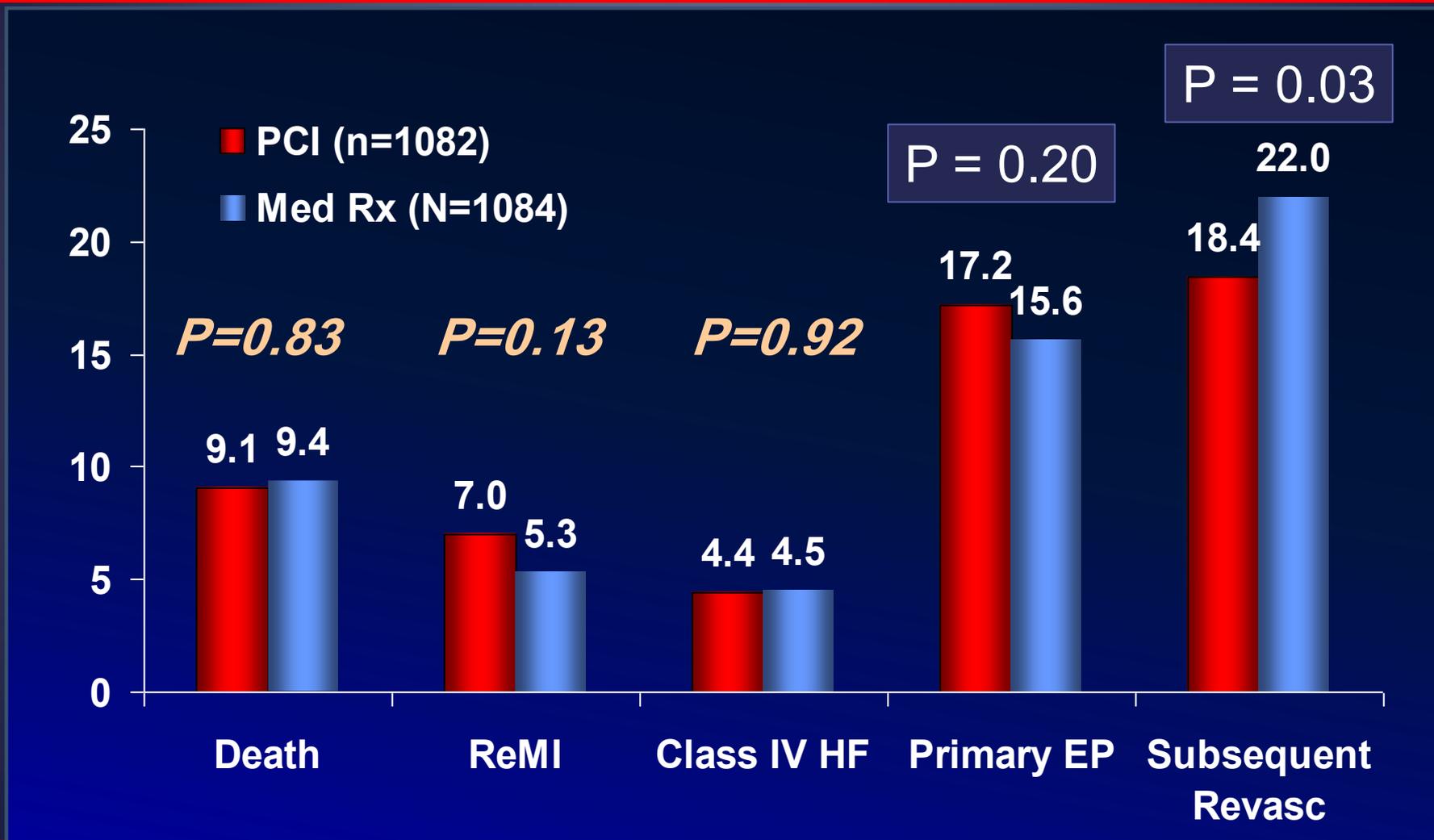
ACC/AHA GL - Primary PCI for STEMI Late Presentations

It is reasonable to perform primary PCI for patients with onset of symptoms within the prior **12-24** hours and ≥1 of the following

I IIaIIbIII
C

a. Severe CHF

b. Hemodynamic or electrical instability

c. Persistent ischemic symptoms

Mortality and complications are higher in patients presenting late
PCI is more challenging - Higher rate of no reflow, Organized thrombus

Door-to-Balloon Time and Mortality among Patients Undergoing Primary PCI

Daniel S. Menees, M.D., Eric D. Peterson, M.D., Yongfei Wang, M.S., Jeptha P. Curtis, M.D., John C. Messenger, M.D., John S. Rumsfeld, M.D., Ph.D., and Hitinder S. Gurm, M.B., B.S.

96738 patients with STEMI undergoing PCI 2005-9 participating in the Cath-PCI registry

Menees et al, NEJM 2013
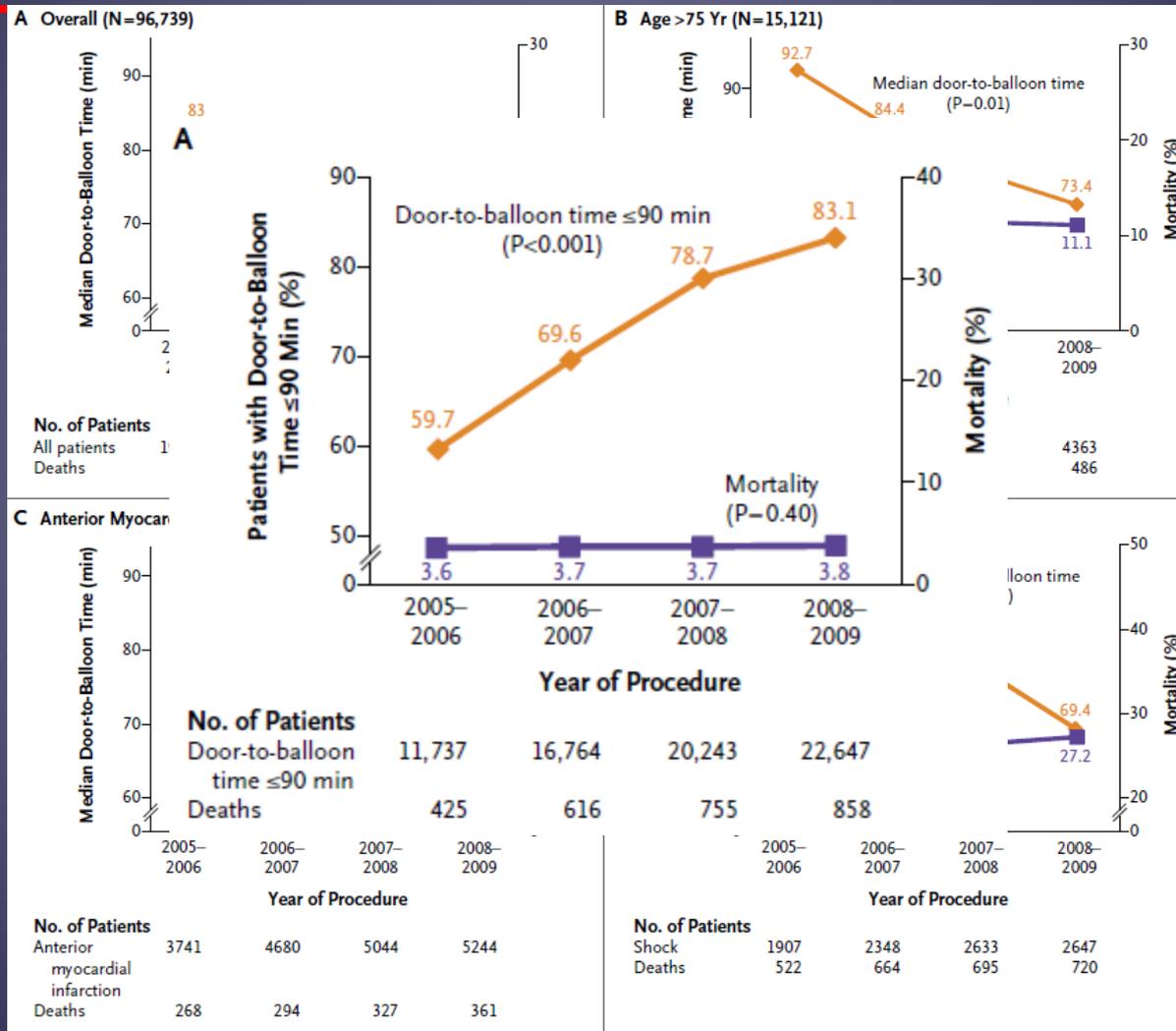
Markers of myocardial perfusion - ST Resolution and Myocardial Blush in STEMI

Sub-Analysis of the CADILLAC Trial (N=456)

Sorajja P. et al Eur Heart J 2005
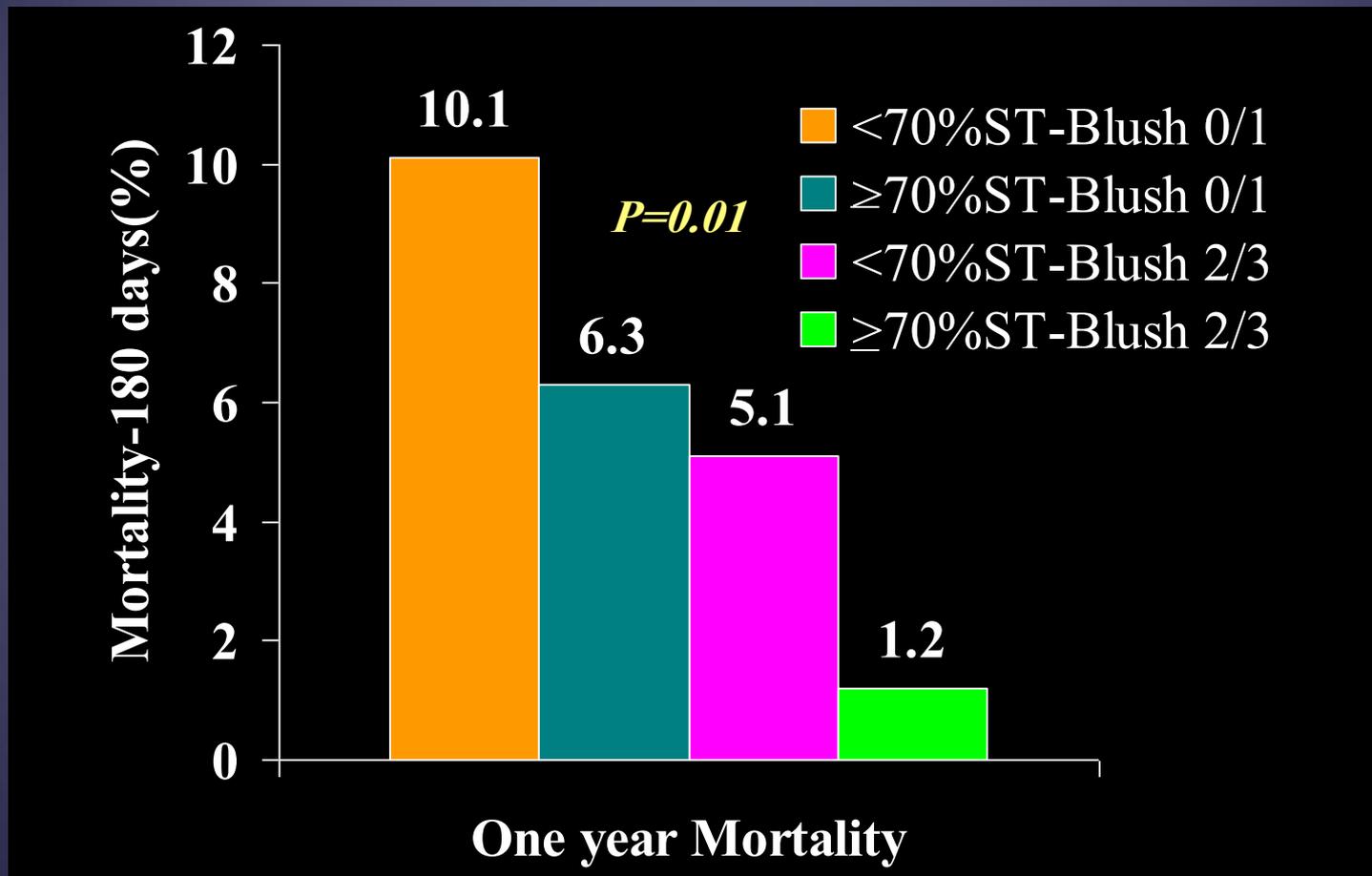
Impact of Macroscopic Distal Emboli

DE occurred in 27 of 178 (15%) pts after primary PTCA

⇒

↓ ST res

↑ Infarct size

↑ Mortality

PLCX filling defect at primary PCI site

Distal thromboemboli

Henriques JPS et al. *EHJ* 2002;23:1112-7
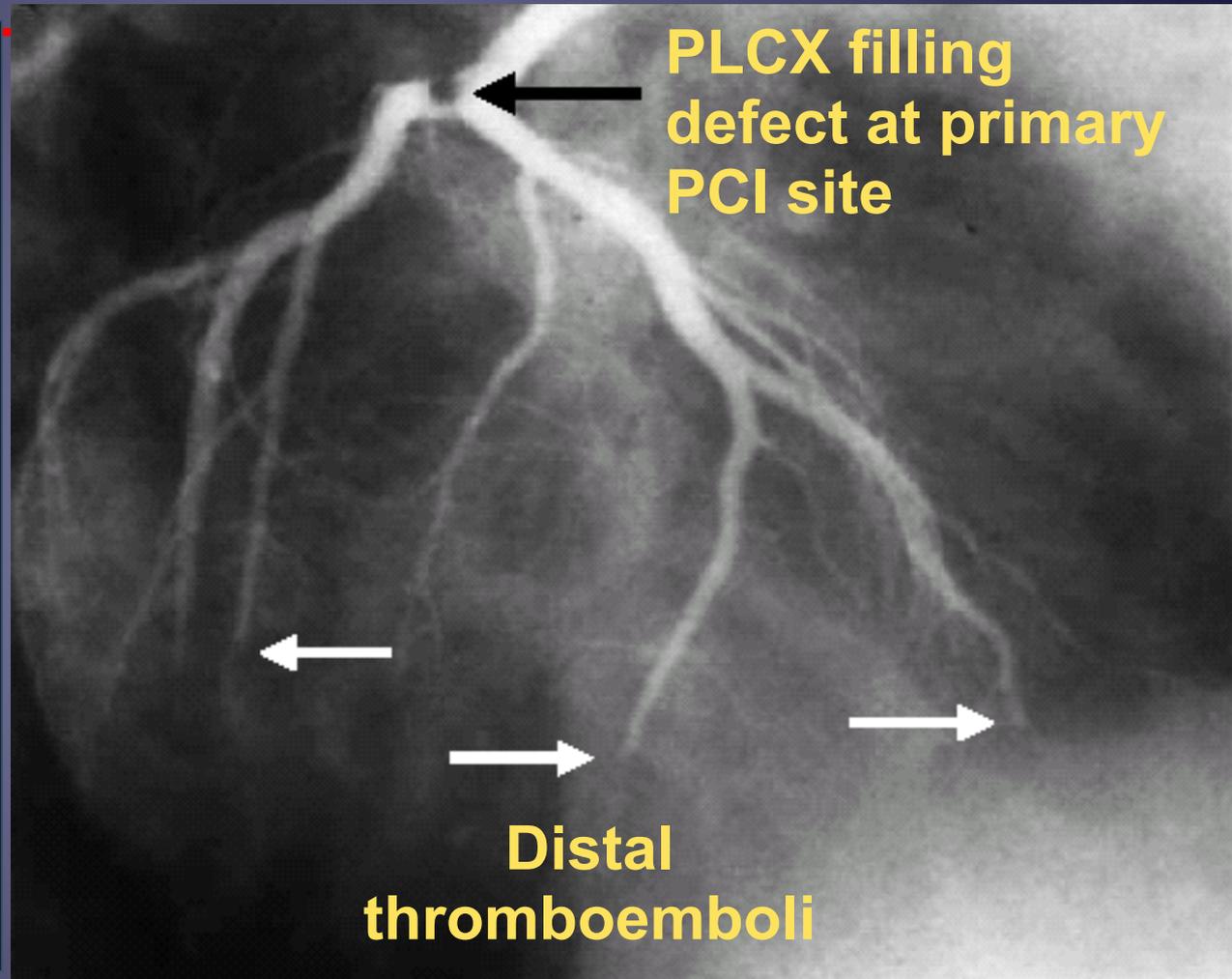
Mechanical Approaches to Thrombus

Thrombus aspiration
(Rinspirator, Pronto, Export, Rescue. Eliminate. etc.)
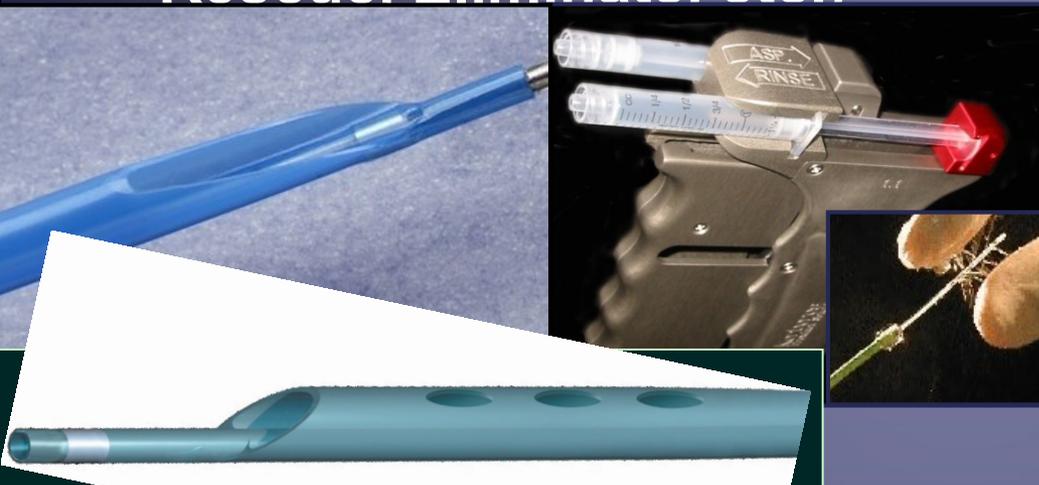
Thrombectomy
(AngioJet, X-Sizer)

Distal protecti ardWire, FilterWire, AngioGuard, etc.)

FilterWire, An
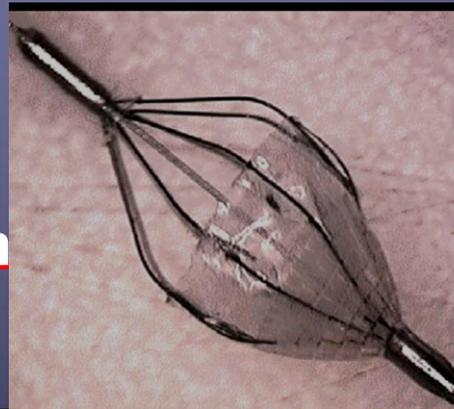
Manual thrombectomy and distal embolic protection devices : Myocardial Blush

Device	Treatment n/N	Control n/N	OR (random) 95% CI	Weight %	OR (random) 95% CI
Distal protection (n=7 studies)	314/610	251/595		44.76	1.73 (1.09–2.75)
Thrombectomy (n=8 studies)	339/728	226/711		55.24	2.64 (1.35–5.16)
All (n=15 studies)	653/1338 48.8%	477/1306 36.0%		100.00	2.21 (1.48–3.32)

P=0.0001

0.1 0.2   0.5 1   2   5   10

Favors Control   Favors Adjunctive Devices

Meta-analysis of 15 STEMI studies
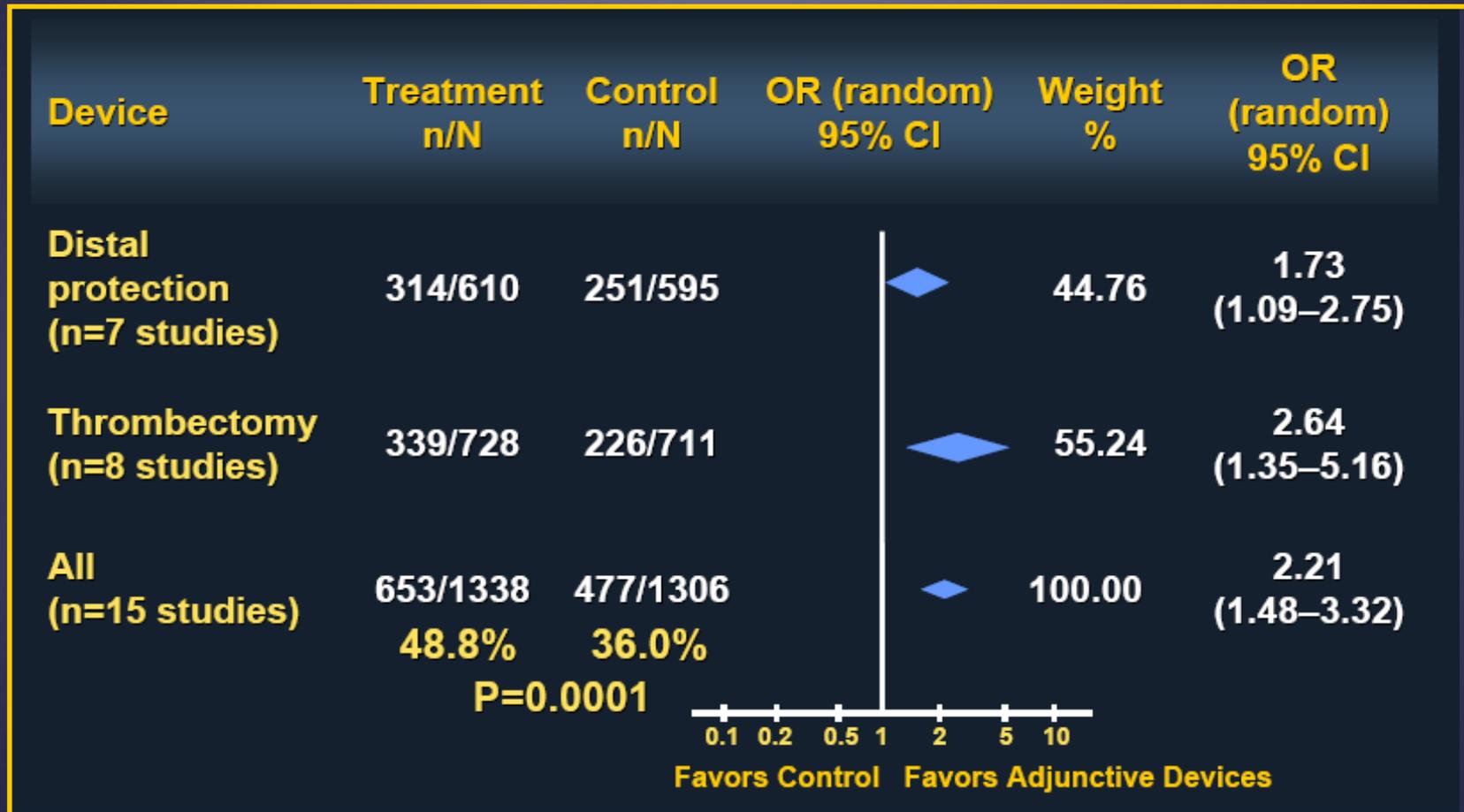
Manual thrombectomy and distal embolic protection devices : 30 day mortality

Device	Treatment n/N	Control n/N	OR (random) 95% CI	RR (95% CI)	P Value
Distal protection (n=6 studies)	16/672 2.4%	24/659 3.6%		0.65 [0.35, 1.21]	0.18
Thrombectomy (n=12 studies)	28/1076 2.6%	21/1065 2.0%		1.32 [0.76, 2.29]	0.33
All (n=18 studies)	44/1748 2.5%	45/1724 2.6%		0.96 [0.64, 1.45]	0.86

P=0.88

0.1 0.2 0.5 1 2 5 10

Favors Adjunctive Devices   Favors Control

Meta-analysis of 18 STEMI studies
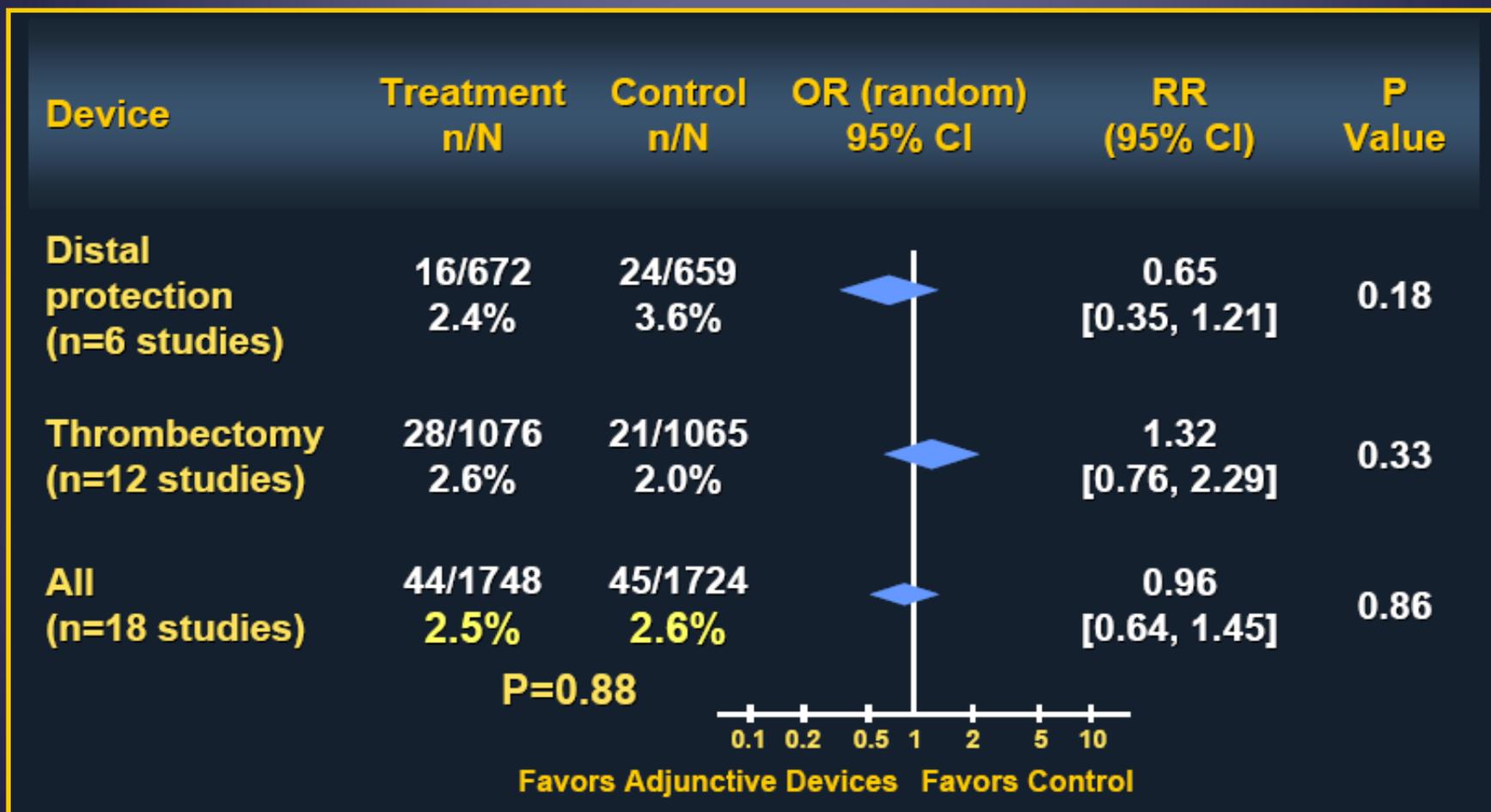
THROMBUS ASPIRATION

TAPAS Study overview

Randomized, Open Label, Single Center Trial

Patients presenting with Acute Myocardial Infarction within 12 hours after onset of symptoms

1:1 randomization
N = 1071 patients
1 site
Netherlands

Primary Aspiration with Export Catheter n = 535

Conventional Stenting n = 536

Procedure   30d   1yr
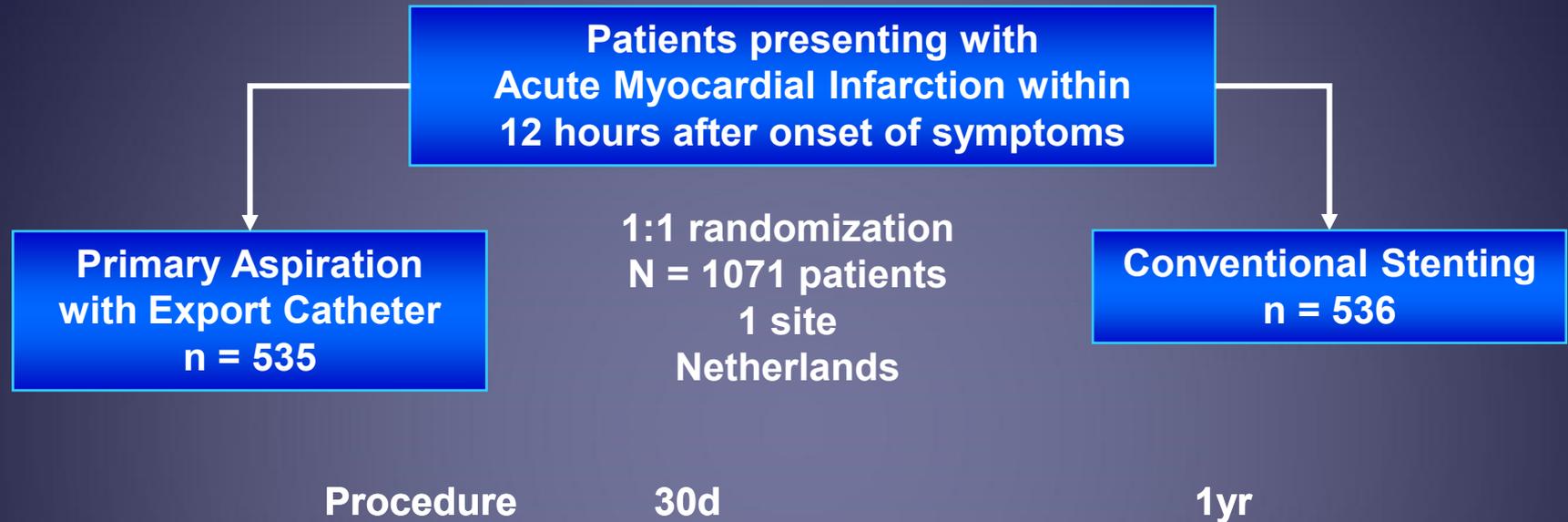
Primary Endpoint:
• **Myocardial Blush Grade of 0 or 1**

Secondary Endpoints:
• **TIMI 3 flow**
• **Complete resolution of ST-segment elevation**
• **Absence of persistent ST-segment deviation,**
• **Reinfarction, death, and MACE at 30 days.**

Svilaas T et al. N Engl J Med 2008

TAPAS study

Blush score — ST Resolution @60 min

Svilaas T et al. N Engl J Med 2008
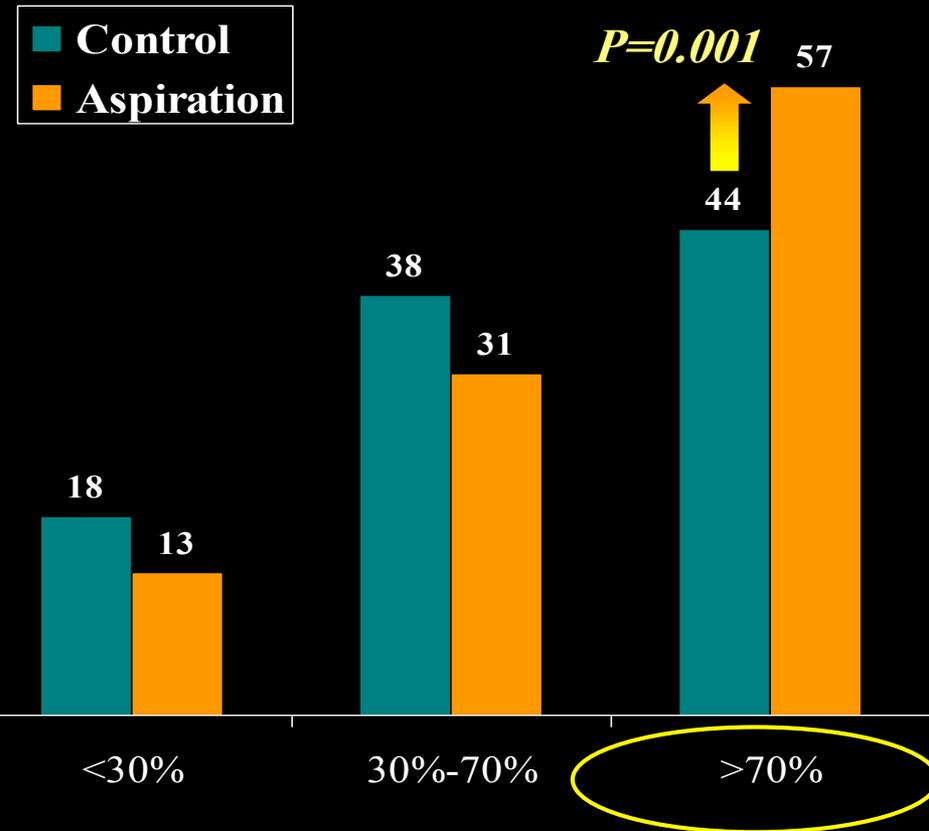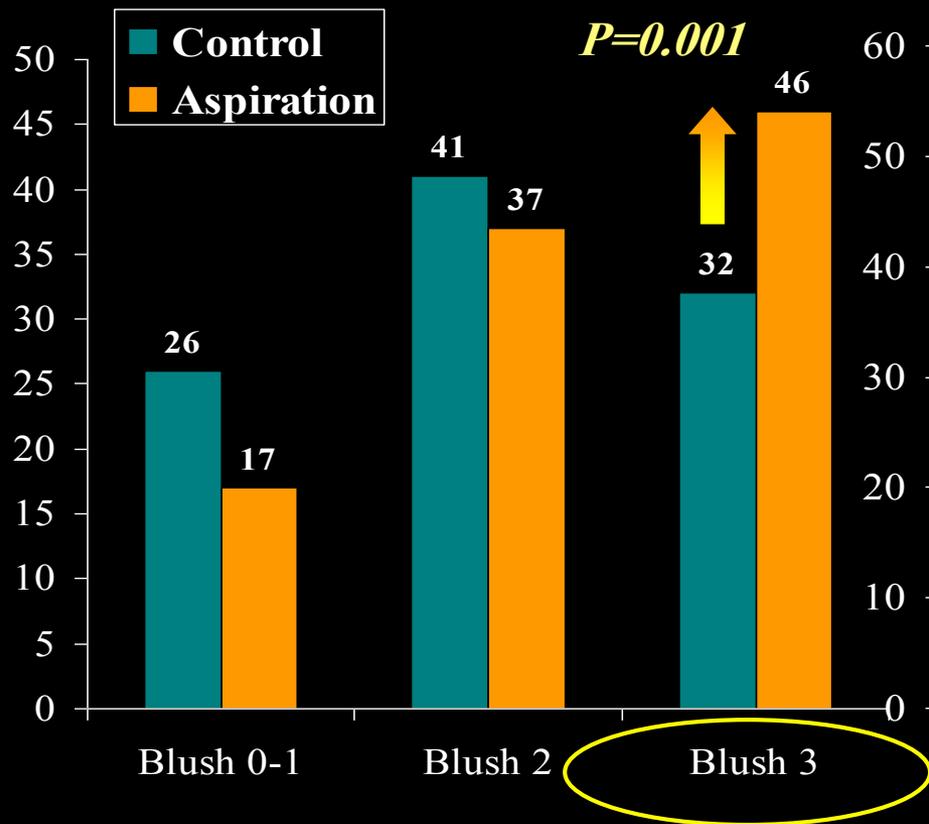
TAPAS Study: Clinical Events

*Sig. reduction of **cardiac death or non-fatal MI** in Aspiration Group at 1 year*
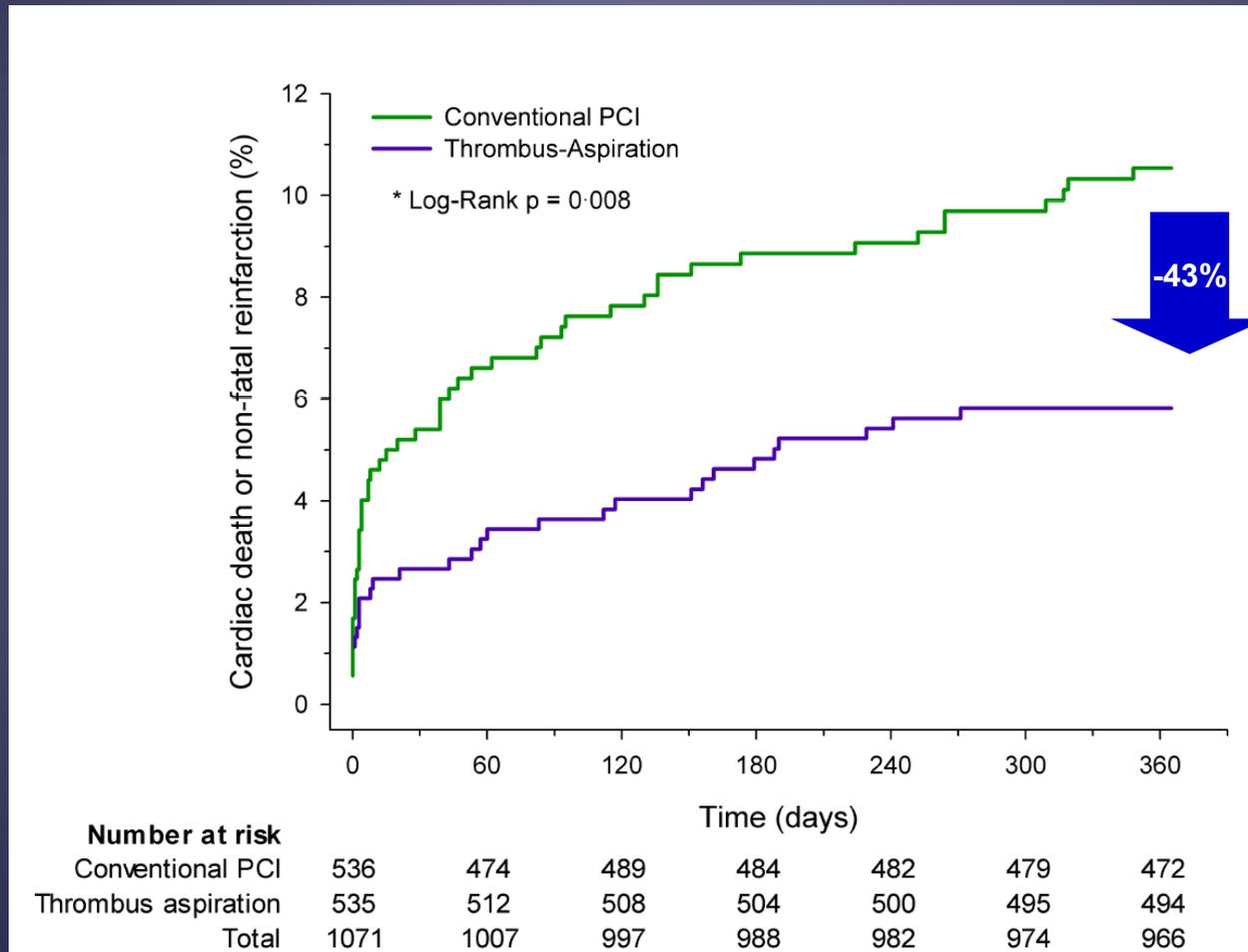
Vlaar et al (TAPAS): a 1-year follow-up study, Lancet 2008; 371: 2008; 1915-20

TAPAS Study: Clinical Events

Mortality

Svilaas T et al. N Engl J Med 2008
Vlaar PG et al. Lancet 2008
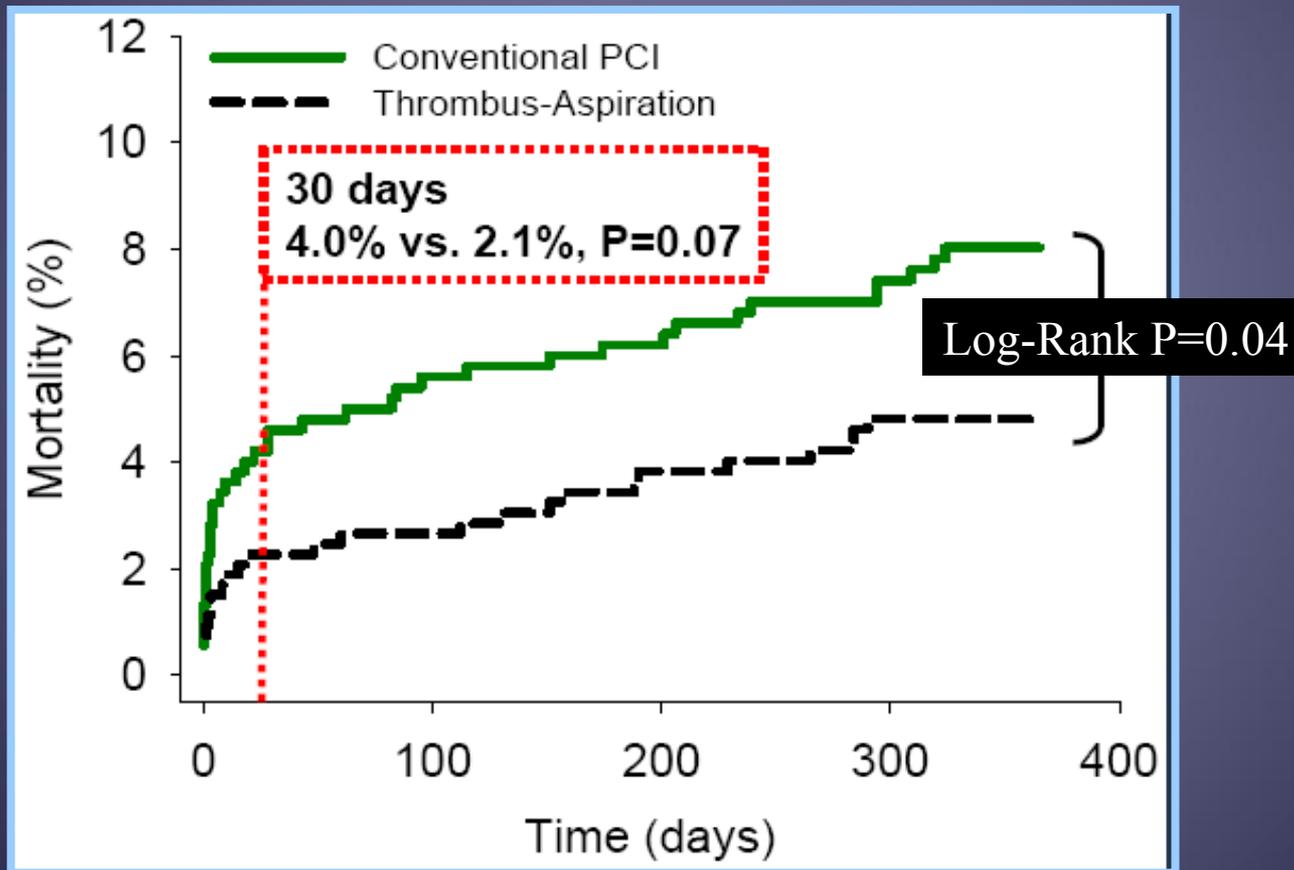
INFUSE-AMI Trial

452 pts with anterior STEMI
Anticipated Sx to PCI <5 hrs, TIMI 0-2 flow in prox or mid LAD
Primary PCI with bivalirudin anticoagulation

Pre-loaded with aspirin and
clopidogrel 600 mg or prasugrel 60 mg

R 1:1

Stratified by symptoms to angio <3 vs ≥3 hrs,
and prox vs mid LAD occlusion

Manual aspiration

No aspiration

R 1:1

R 1:1

IC Abcx

No Abcx

IC Abcx

No Abcx

Primary endpoint: Infarct size at 30 days (cMRI)
2° endpoints: TIMI flow, blush, ST-resolution, MACE (30d, 1 yr)

Infuse-AMI, Stone G et al, JAMA 2012

INFUSE-AMI: Reperfusion post-PCI*

No aspiration
N=223

P=0.36

TIMI 0/1	1.7%	.2%
TIMI 2	5.7%	7.6%
TIMI 3	92.6%	90.1%

Corrected TIMI frame counts: 20 [16, 26] vs. 20 [16, 26]   P=0.40

MBG 0/1	16.6%	20.7%
MBG 2/3	83.4%	79.3%

P=0.26

*Core laboratory assessed
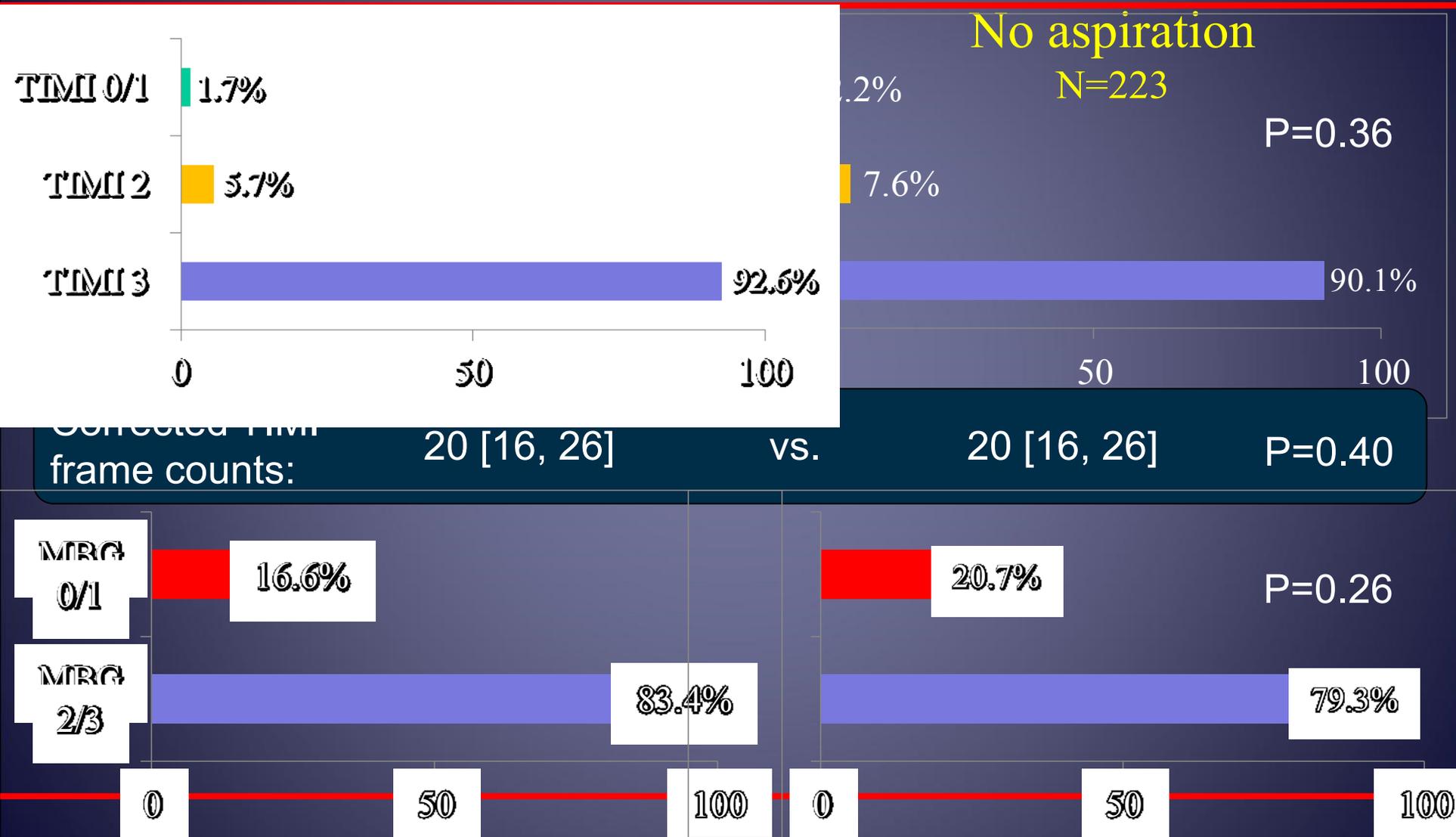
Infuse-AMI, Stone G et al, JAMA 2012

INFUSE-AMI: STR 60 minutes post-PCI*

ST-segment resolution (%)

P=0.37

P=0.23

[45.2, 87.2]
[55.8, 87.4]
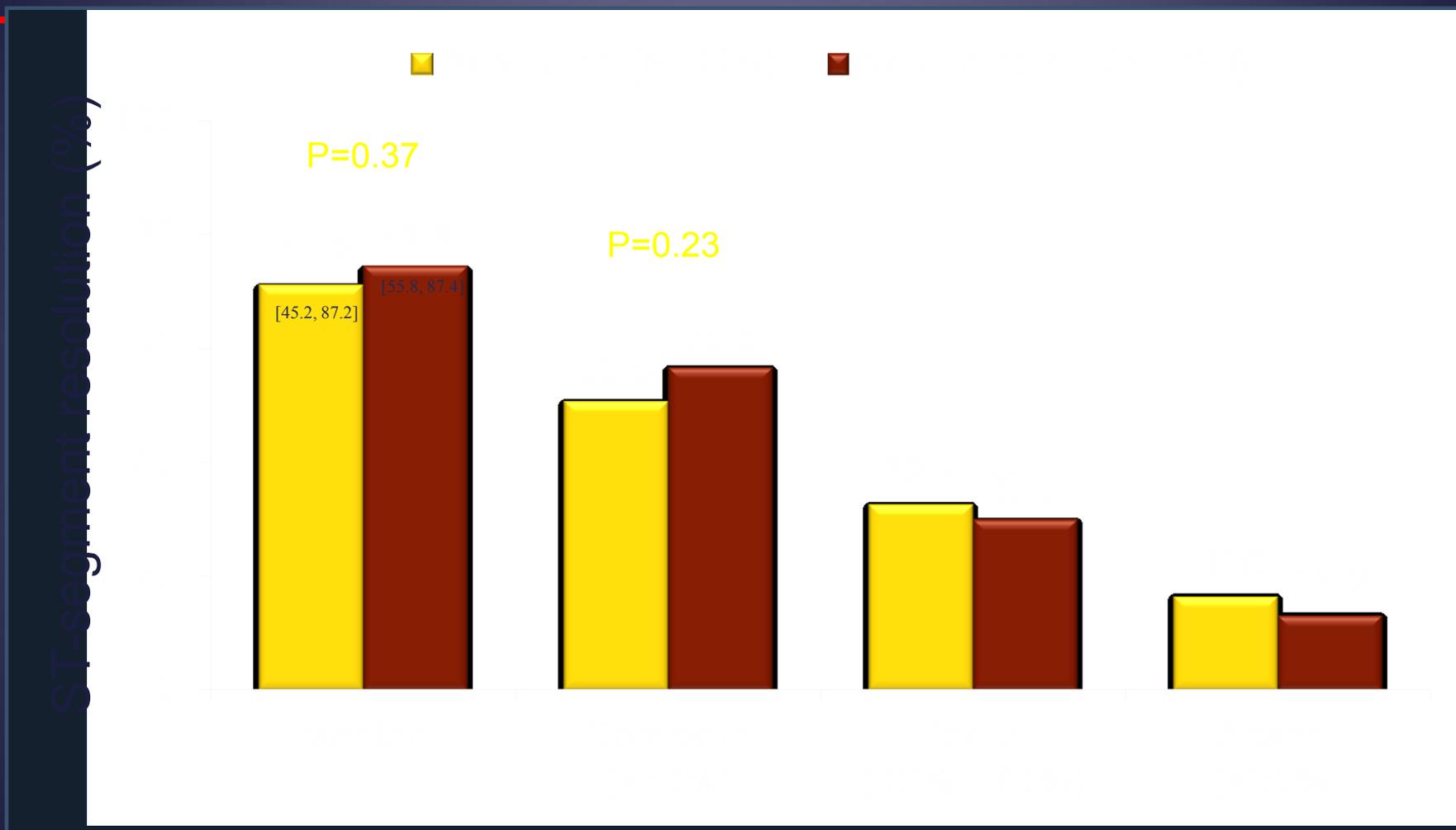
*Core laboratory assessed

Infuse-AMI, Stone G et al, JAMA 2012

INFUSE-AMI: Infarct size at 30 days*
- Major secondary endpoint -
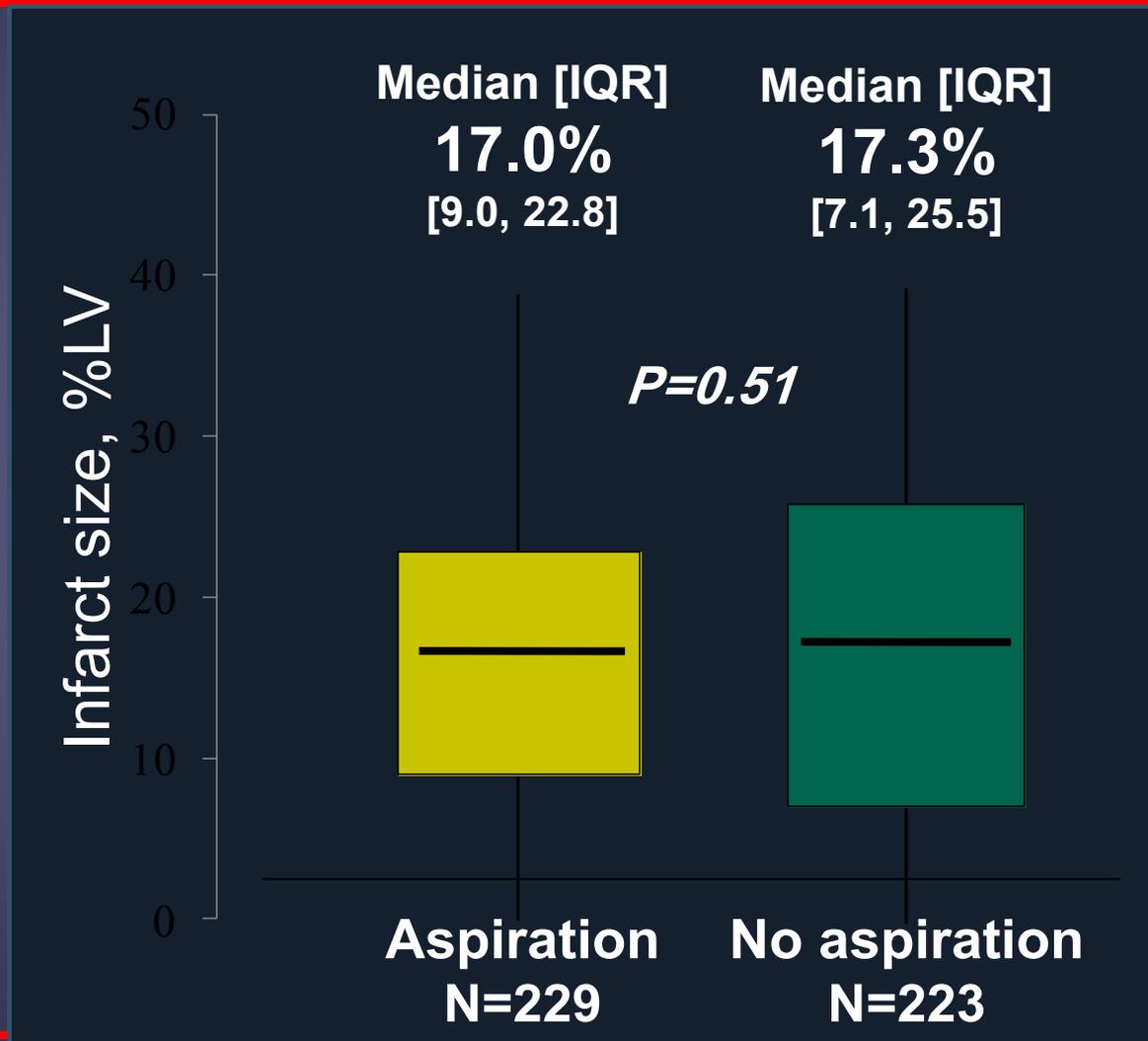
*Core laboratory assessed. No interaction was present between the 2 randomization groups for the primary 30-day infarct size endpoint (p=0.46)

INFUSE-AMI: Infarct size at 30 days
Effect of IC abciximab via Clearway RX

Median [IQR]
15.1%
[6.8, 22.7]

Median [IQR]
17.9%
[10.3, 25.4]

P=0.03

Infarct size, %LV

50

40

30

20

10

0

IC abciximab
N=229

No abciximab
N=223
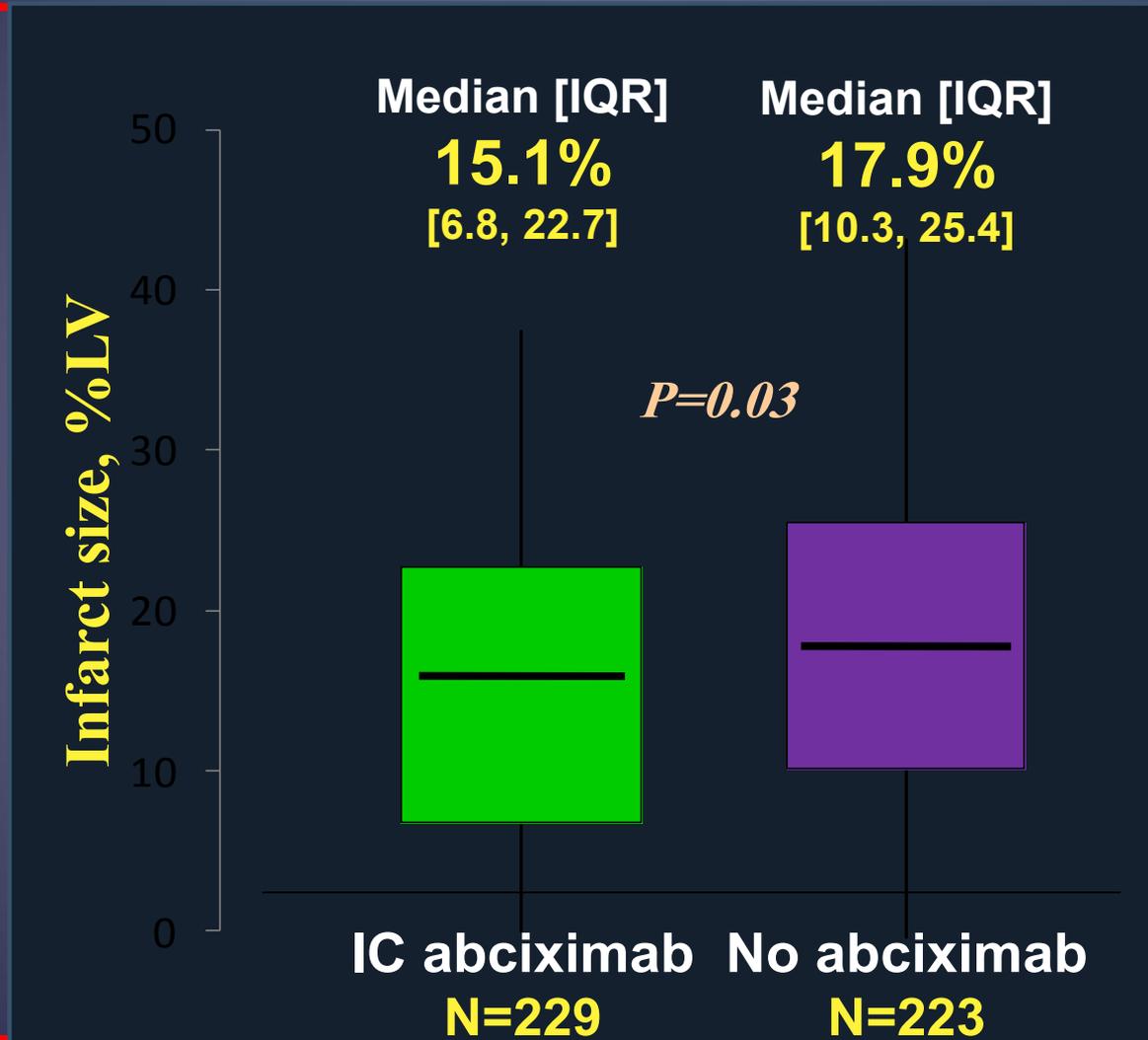
*Core laboratory assessed

Stone GW et al. JAMA 2012;307:0n-line

Updated aspiration meta-analysis

- **Aspiration thrombectomy vs. conventional PPCI (18 trials, n=3,936):**

- **ST-segment resolution** at 60 minutes (RR=1.31; 95% CI 1.16-1.48; p<0.0001) and **TIMI blush grade 3** post-PCI (RR=1.37; 95% CI 1.19-1.59; p<0.0001) **were both improved by aspiration**

- **MACE:** RR = 0.76; 95% CI 0.63-0.92; p=0.006 with aspiration

- **All-cause mortality** (RR=0.71, 95% CI 0.51-0.99; p=0.049) - significantly reduced with aspiration

- Final infarct size (p=0.64) and ejection fraction (p=0.32) at 1 month were similar.

TASTE Trial

ORIGINAL ARTICLE

Thrombus Aspiration during ST-Segment Elevation Myocardial Infarction

Ole Fröbert, M.D., Ph.D., Bo Lagerqvist, M.D., Ph.D., Göran K. Olivecrona, M.D., Ph.D., Elmir Omerovic, M.D., Ph.D., Thorarinn Gudnason, M.D., Ph.D., Michael Maeng, M.D., Ph.D., Mikael Aasa, M.D., Ph.D., Oskar Angerås, M.D., Fredrik Calais, M.D., Mikael Danielewicz, M.D., David Erlinge, M.D., Ph.D., Lars Hellsten, M.D., Ulf Jensen, M.D., Ph.D., Agneta C. Johansson, M.D., Amra Kåregren, M.D., Johan Nilsson, M.D., Ph.D., Lotta Robertson, M.D., Lennart Sandhall, M.D., Iwar Sjögren, M.D., Ollie Östlund, Ph.D., Jan Harnek, M.D., Ph.D., and Stefan K. James, M.D., Ph.D.

TASTE Trial

- **7244 pts with STEMI undergoing PCI were randomly assigned to manual thrombus aspiration + PCI or PCI only (as part of the SCAAR registry)**

- **No differences in 30 day mortality (primary endpoint), trends for less rehospitalization for Re-MI (p=0.09) and for less stent thrombosis (p=0.06) with aspiration**

NEJM 2013
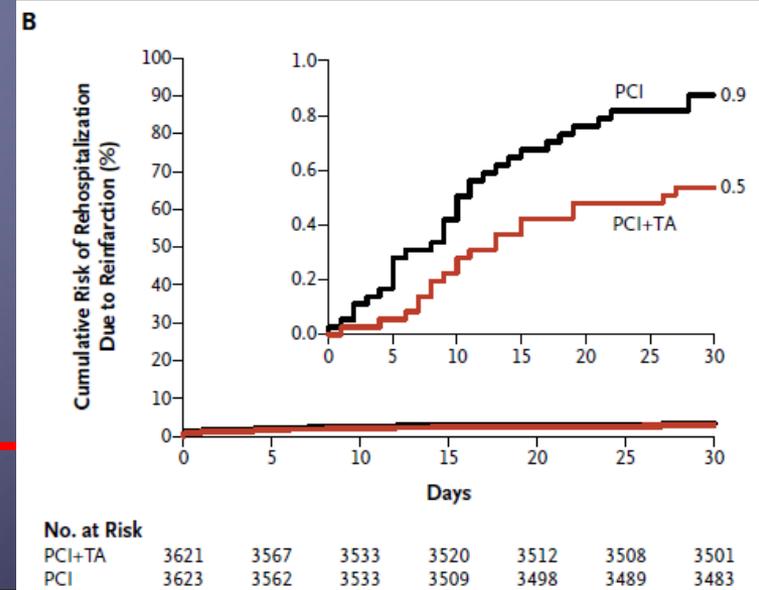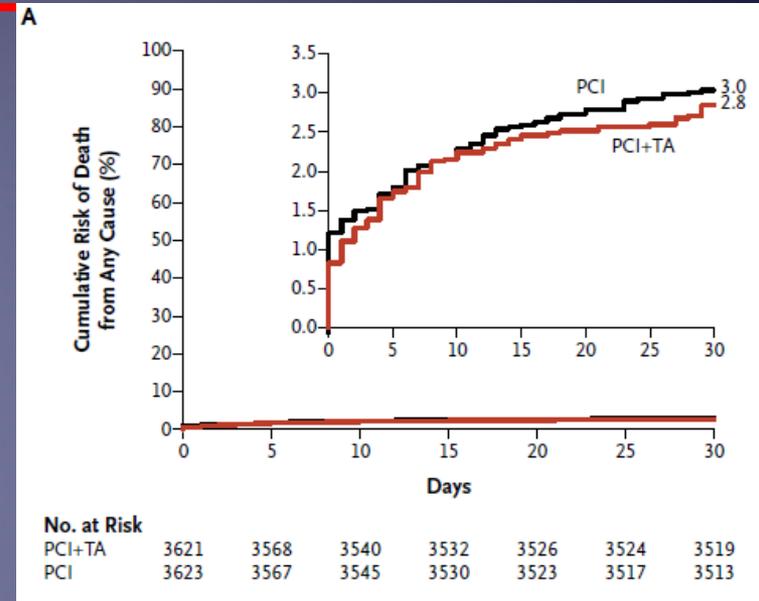
2012 STEMI ESC Guidelines

Recommendations	Class[a]	Level[b]	Ref[c]
Indications for primary PCI			
Primary PCI is the recommended reperfusion therapy over fibrinolysis if performed by an experienced team within 120 min of FMC.	I	A	69, 99
Primary PCI is indicated for patients with severe acute heart failure or cardiogenic shock, unless the expected PCI related delay is excessive and the patient presents early after symptom onset.	I	B	100
Procedural aspects of primary PCI			
Stenting is recommended (over balloon angioplasty alone) for primary PCI.	I	A	101, 102
Primary PCI should be limited to the culprit vessel with the exception of cardiogenic shock and persistent ischaemia after PCI of the supposed culprit lesion.	IIa	B	75, 103–105
If performed by an experienced radial operator, radial access should be preferred over femoral access.	IIa	B	78, 79
If the patient has no contraindications to prolonged DAPT (indication for oral anticoagulation, or estimated high long-term bleeding risk) and is likely to be compliant, DES should be preferred over BMS.	IIa	A	80, 82, 106, 107
Routine thrombus aspiration should be considered.	IIa	B	83–85
Routine use of distal protection devices is not recommended.	III	C	86, 108
Routine use of IABP (in patients without shock) is not recommended.	III	A	97, 98

2011 STEMI Update
Thrombus Aspiration During PCI for STEMI

NEW
Recommendation

I IIaIIbIII

B

Aspiration thrombectomy is reasonable for patients undergoing primary PCI

Kushner et al. Circulation. 2009;120:2271–2306

CHOICE OF STENT

Long-term (3-5 year) FU after DES vs. BMS in AMI
TVR (N=6,026 pts)

TVR	DES	BMS	OR [95%CI]	P
DEDICATION	8.9%	19.8%	0.40 [0.25, 0.64]	<0.01
PASEO	6.1%	21.1%	0.24 [0.11, 0.54]	<0.01
STRATEGY	10.3%	26.1%	0.33 [0.14, 0.75]	0.01
SESAMI	8.3%	16.0%	0.46 [0.23, 0.92]	0.03
MISSION	8.9%	15.8%	0.54 [0.27, 1.09	0.09
TYPHOON	11.9%	21.5%	0.49 [0.30, 0.80]	<0.01
PASSION	7.7%	10.5%	0.73 [0.42, 1.26]	0.26
HORIZONS-AMI	12.5%	17.7%	0.67 [0.53-0.84]	0.001
META-ANALYSIS			**0.50 [0.40-0.64]**	**<0.001**

Long-term (3-5 year) FU after DES vs. BMS in AMI
Stent thrombosis (N=6,026 pts)

Stent thrombosis	DES	BMS	OR [95%CI]	P
DEDICATION	2.9%	3.2%	0.90 [0.36, 2.24]	0.82
PASEO	1.1%	2.2%	0.49 [0.07, 3.57]	0.48
STRATEGY	6.9%	7.9%	0.86 [0.28, 2.66]	0.79
SESAMI	5.1%	5.1%	1.00 [0.37, 2.73]	1.00
MISSION	3.1%	2.0%	1.69 [0.40, 7.20]	0.48
TYPHOON	5.3%	5.5%	0.90 [0.42, 2.00]	0.83
PASSION	4.2%	3.4%	1.19 [0.52, 2.69]	0.68
HORIZONS-AMI	5.1%	4.4%	1.15 [0.77-1.72]	0.50
META-ANALYSIS			1.06 [0.81-1.39]	0.67

Long-term (3-5 year) FU after DES vs. BMS in AMI
Mortality (N=6,026 pts)

DEATH	DES	BMS	OR [95%CI]	P
DEDICATION	10.5%	6.4%	1.73 [0.97, 3.08]	0.06
PASEO	8.3%	12.2%	0.65 [0.29, 1.49]	0.31
STRATEGY	18.4%	15.9%	1.19 [0.54, 2.62]	0.66
SESAMI	3.2%	5.0%	0.61 [0.20, 1.92]	0.40
MISSION	4.4%	6.6%	0.69 [0.25, 1.85]	0.46
TYPHOON	4.0%	6.6%	0.61 [0.27, 1.36]	0.23
PASSION	8.9%	11.5%	0.75 [0.45, 1.27]	0.29
HORIZONS-AMI	5.6%	6.6%	0.84 [0.60-1.17]	0.33
META-ANALYSIS			0.88 [0.68-1.11]	0.27

EXAMINATION Trial
1504 pts with STEMI undergoing PCI within 48° (85% primary PCI within 12°) were randomized to Xience V EES vs. Vision BMS

Stent thrombosis (Def/prob) within 1 year
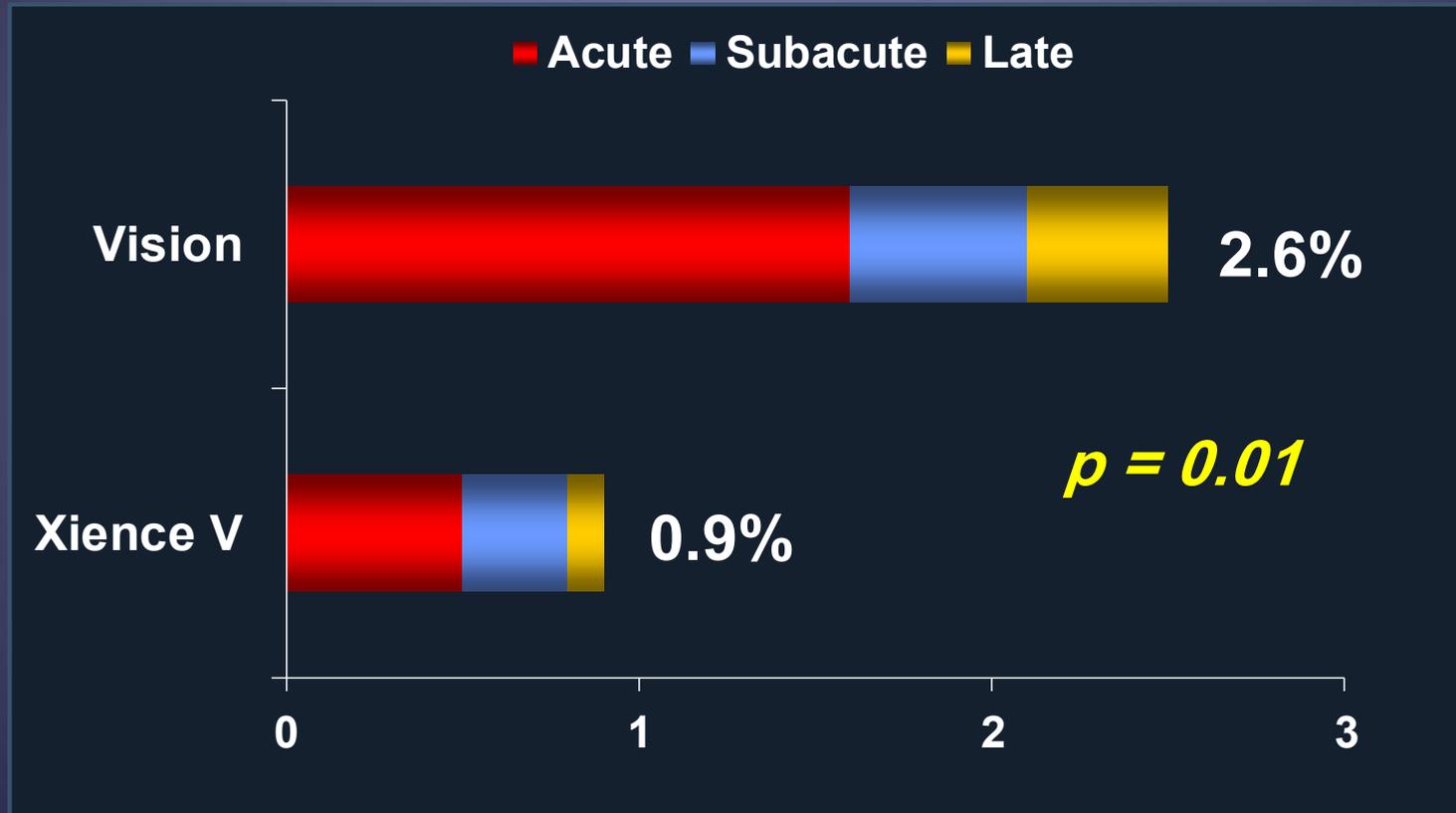
Definite ST was reduced with Xience V from 1.9% to 0.5%, p=0.01

Sabate M. et al, Lancet 2012

Guidelines

ESC - STEMI 2012

If the patient has no contraindications to prolonged DAPT (indication for oral anticoagulation, or estimated high long-term bleeding risk) and is likely to be compliant, DES should be preferred over BMS.	IIa	A

AHA/ACC - STEMI 2012

I IIaIIbIII

B

It is reasonable to use a drug-eluting stent as an alternative to a bare-metal stent for primary PCI in STEMI

The MGuard Coronary Stent System

- A stent wrapped with ultra-thin (20μm) polymer mesh sleeve.

- The mesh is designed for plaque sealing during stent expansion in order to prevent embolization of athero-thrombotic debris.

- The sleeve expands seamlessly when the stent is deployed, without affecting the structural integrity of the stent.
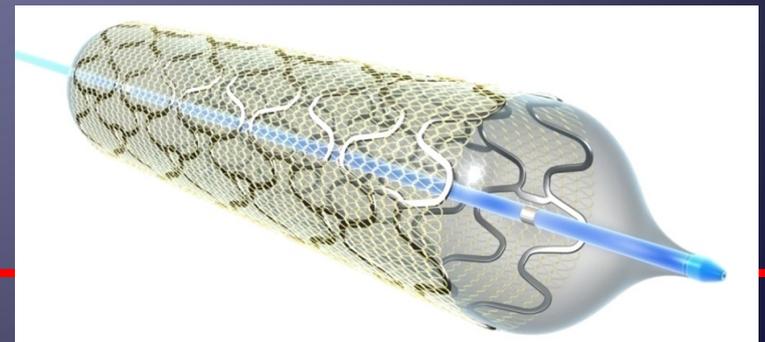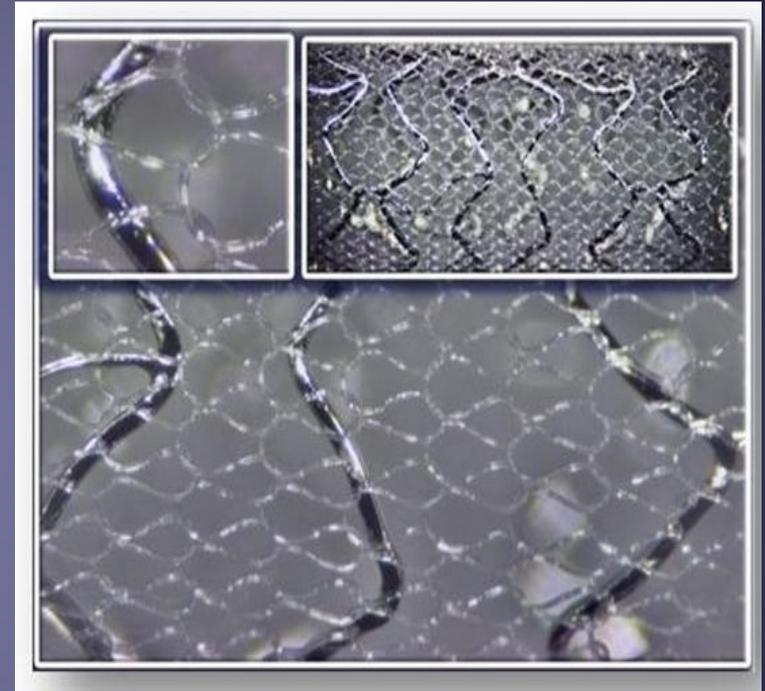
MASTER TRIAL DESIGN

432 patients with STEMI
pain <12 hrs, *de novo* lesions

↓

Pre-dilatation and/or Aspiration
TIMI 2 or 3

↓

R
1:1

MGuard | BMS or DES

Primary Endpoint: complete ST-segment resolution at 60-90 min
Secondary endpoints: TIMI flow, Myocardial Blush Grade, MACE (30d, 6m, 12m)
Substudies: Cardiac MRI at 3-5 days (2x30 patients)
Angiographic follow-up at 13 months (50 patients)

Stone G et al, JACC 2012

TIMI FLOW

Stone et. al, *J Am Coll Cardiol*. 2012;60:1975-1984.

ST SEGMENT RESOLUTION

Stone et. al, *J Am Coll Cardiol*. 2012;60:1975-1984.
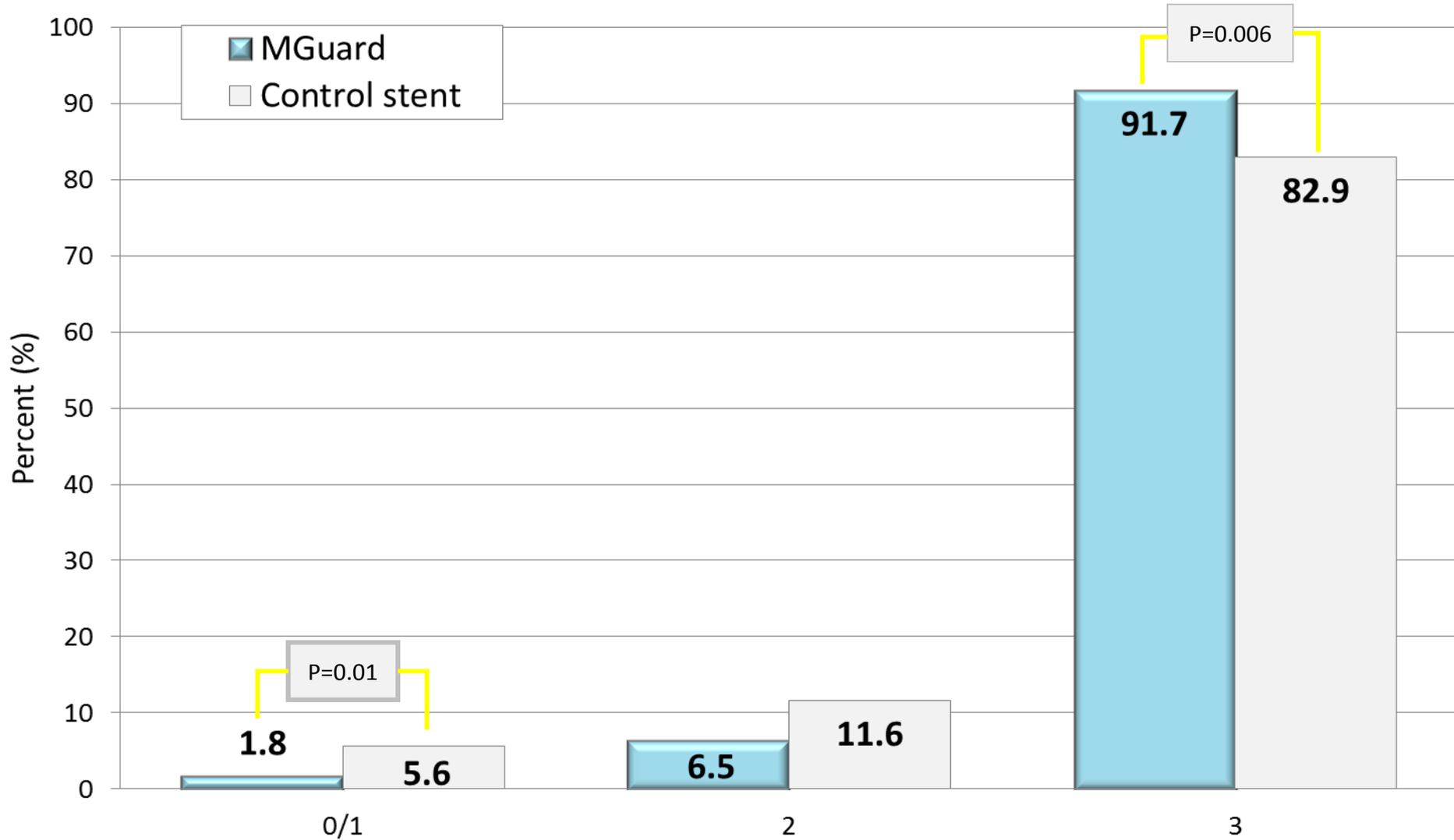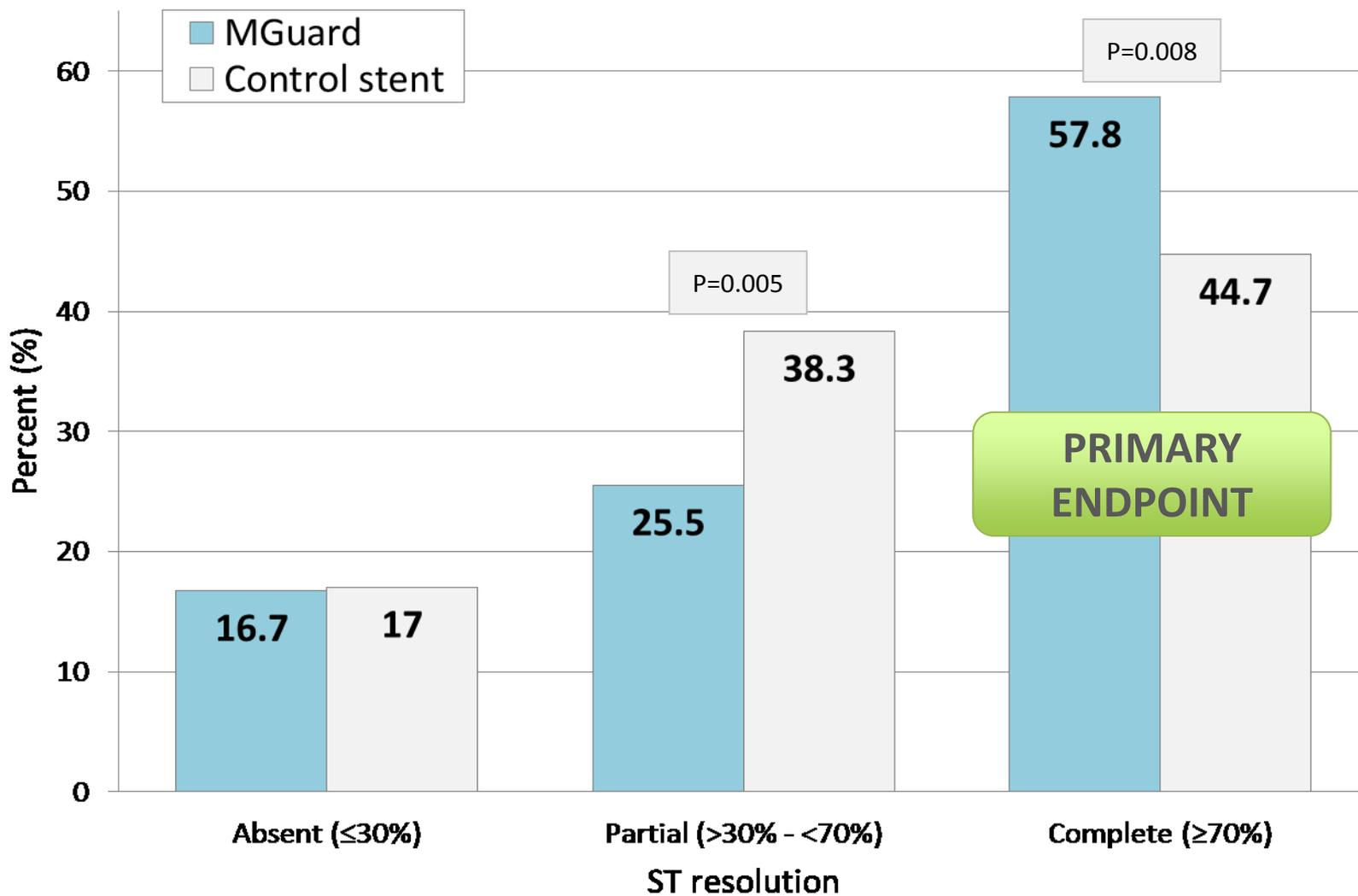
30 DAYS CLINICAL RESULTS

	MGUARD (N=217)	CONTROL BMS / DES (N=216)	P
MACE	4 (1.8%)	5 (2.3%)	0.75
All cause mortality	0 (0.0%)	4 (1.9%)	0.06
Cardiac death	0 (0.0%)	4 (1.9%)	0.06
Reinfarction	3 (1.4%)	2 (0.9%)	1.00
TLR, ischemia-driven	4 (1.8%)	1 (0.5%)	0.37
TVR, ischemia-driven	5 (2.3%)	1 (0.5%)	0.10
Stent Thrombosis			
Definite or Probable	3 (1.4%)	2 (0.9%)	0.67
Definite	3 (1.4%)	1 (0.5%)	0.62
Stroke	1 (0.5%)	0 (0.0%)	1.00
TIMI Bleeding			
Major or Minor	4 (1.9%)	4 (1.9%)	0.75
Major	3 (1.4%)	2 (0.9%)	1.00

* Secondary endpoints
Stone et. al, *J Am Coll Cardiol*. 2012;60:1975-1984.

Anti-thrombotic Therapy

TRITON-TIMI 38: STEMI Subgroup Analysis (n=3,534)

Legend: Prasugrel, Clopidogrel

- All cause Death: P=0.05
- CV death: P=0.045
- RE-MI: P=0.01
- Stent thrombosis: P=0.01
- Non CABG bleeding: P=0.4
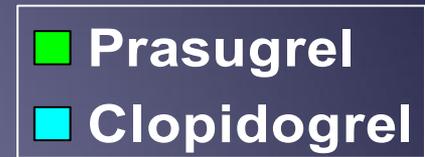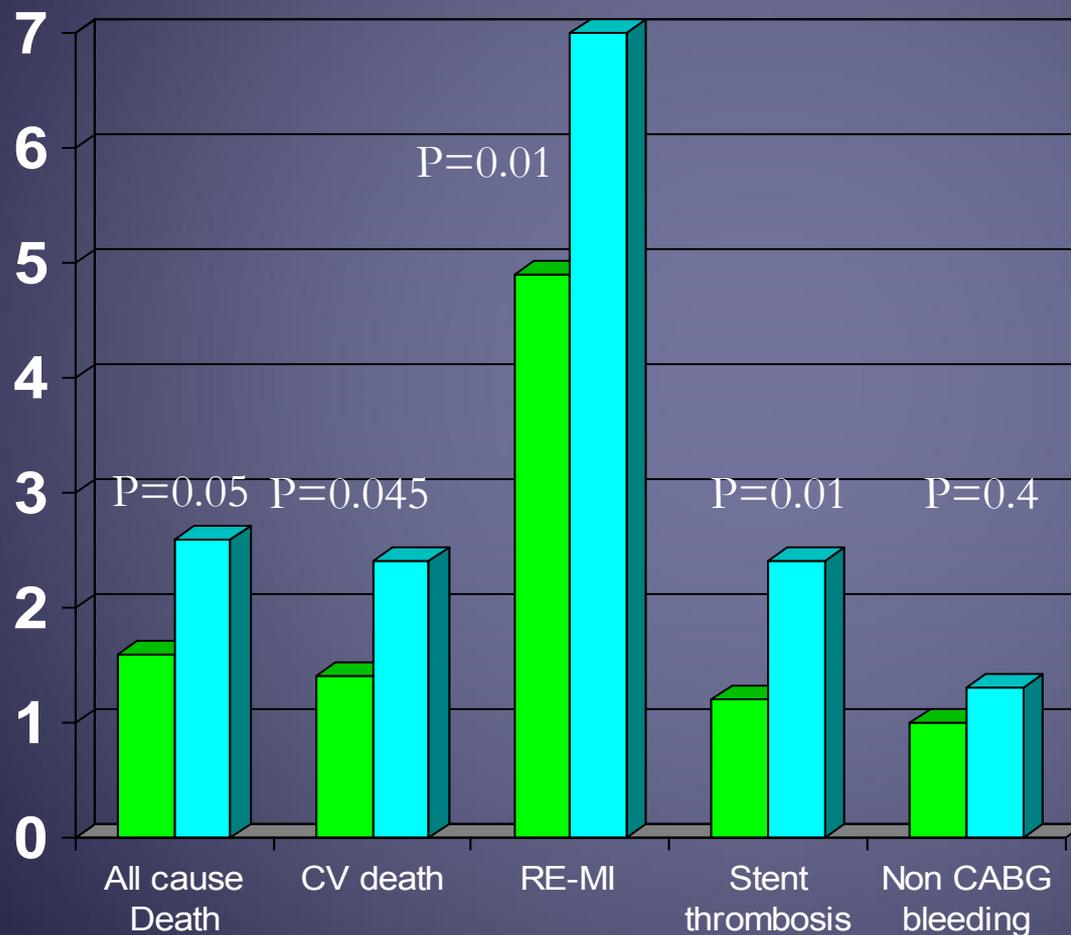
No information on markers of perfusion

Montalescot et al, Lancet 2009

TRITON-TIMI 38: STEMI Subgroup Analysis (n=3,534)

Death
MI
Stroke

Death
MI
UTVR
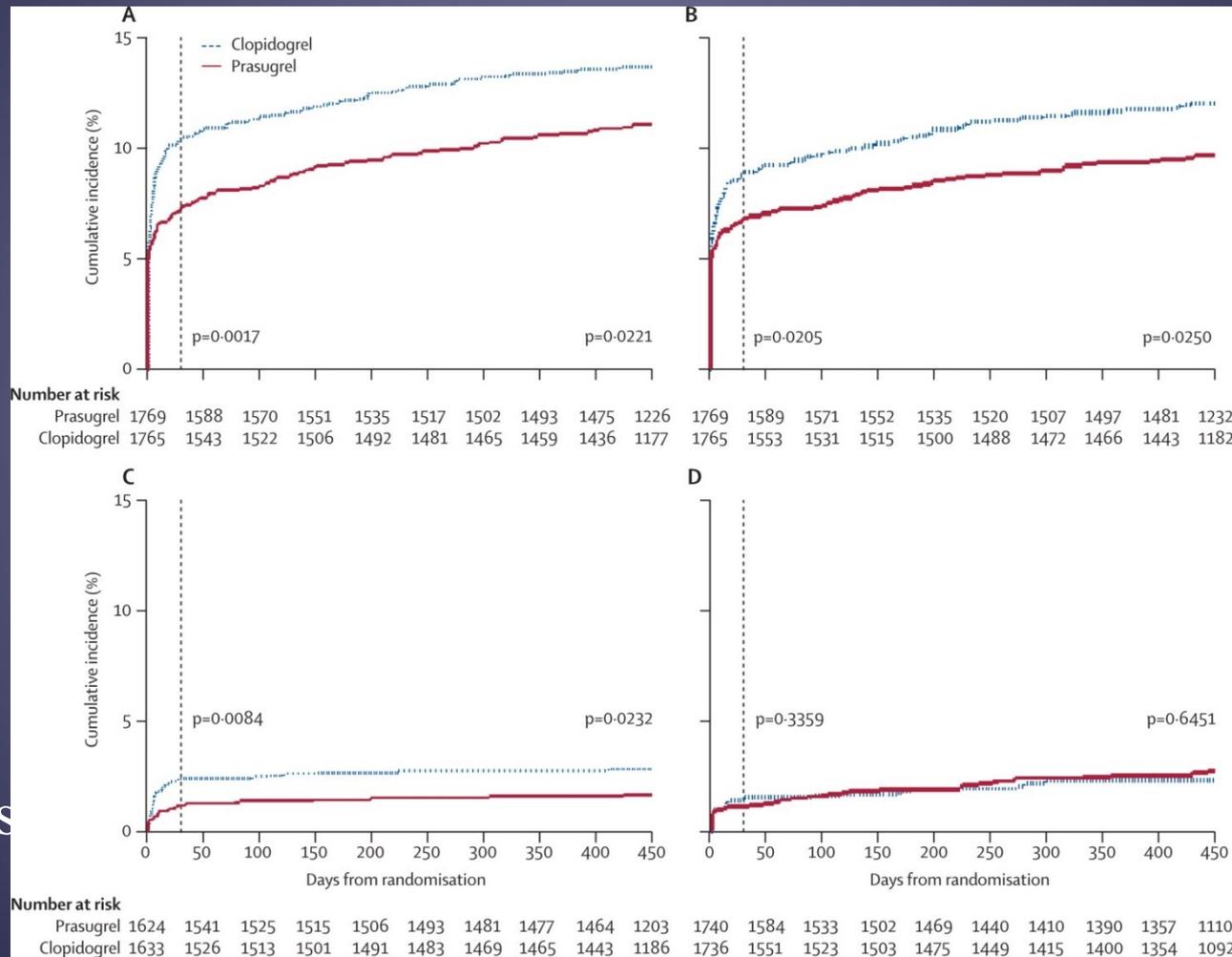
Stent Thrombosis

Non-CABG Related TIMI Major Bleeding

PLATO STEMI – 8,430 patients
Primary endpoint: CV death, MI or stroke

Clopidogrel **11.0**

9.3
Ticagrelor

HR: 0.85 (95% CI = 0.74–0.97), p=0.07

K-M estimated rate (% per year)

Months
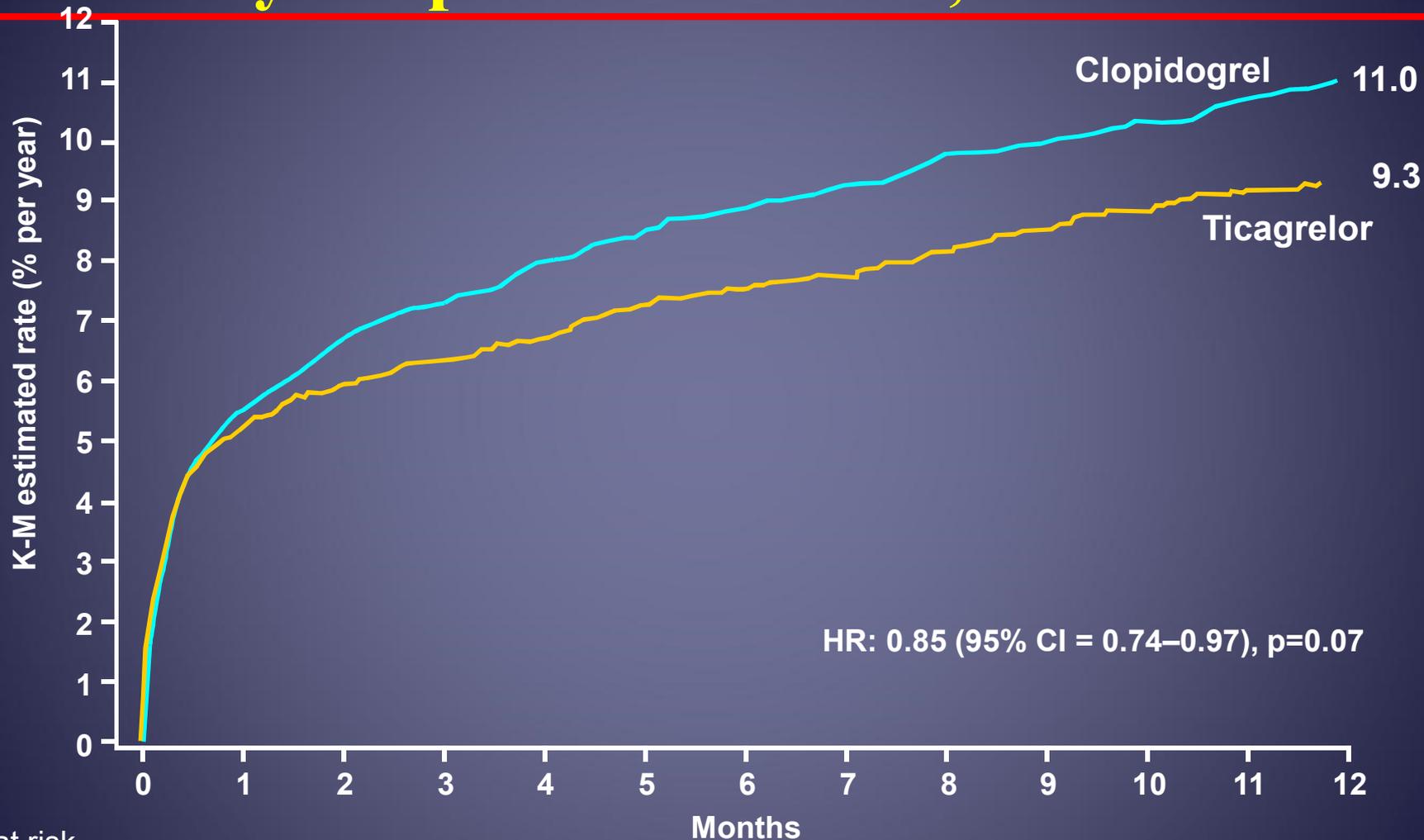
No. at risk							
Ticagrelor	4,201	3,887	3,834	3,732	3,011	2,297	1,891
Clopidogrel	4,229	3,892	3,823	3,730	3,022	2,333	1,868

PLATO STEMI - Primary safety event: major bleeding
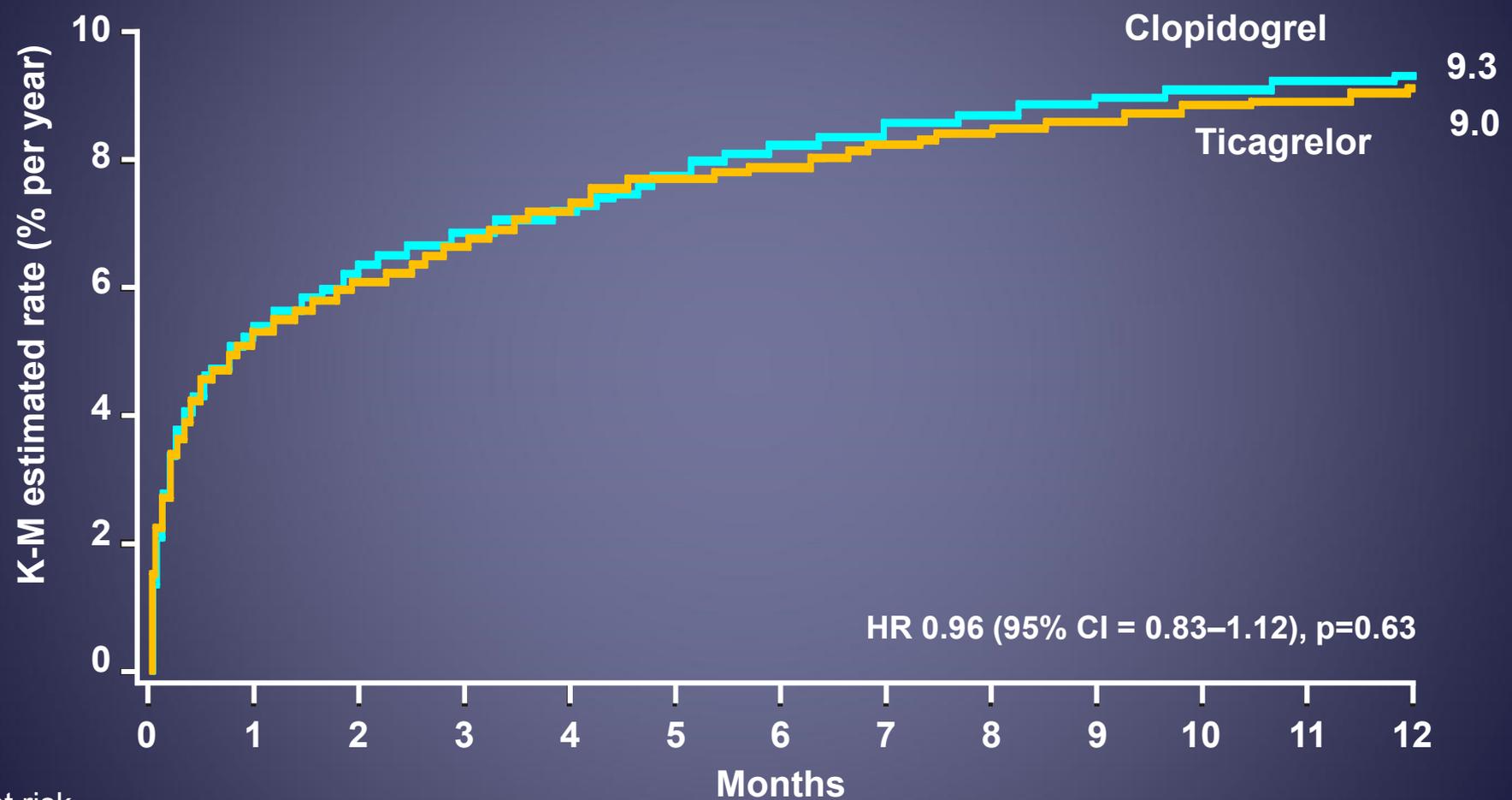
Steg G et al, *Circulation 2010*

ESC STEMI Guidelines 2012

Antiplatelet therapy		
Aspirin oral or i.v. (if unable to swallow) is recommended	I	B
An ADP-receptor blocker is recommended in addition to aspirin. Options are:	I	A
• Prasugrel in clopidogrel-naive patients, if no history of prior stroke/TIA, age <75 years.	I	B
• Ticagrelor.	I	B
• Clopidogrel, preferably when prasugrel or ticagrelor are either not available or contraindicated.	I	C
GP IIb/IIIa inhibitors should be considered for bailout therapy if there is angiographic evidence of massive thrombus, slow or no-reflow or a thrombotic complication.	IIa	C
Routine use of a GP IIb/IIIa inhibitor as an adjunct to primary PCI performed with unfractionated heparin may be considered in patients without contraindications.	IIb	B

Is there still a role for GP IIb/IIIa inhibitors in the era of the new platelet ADP receptor inhibitors ?

Abciximab in Primary PCI Meta-analysis

8 RCTs – 3,949 pts with AMI w/i 12° undergoing primary (7) or rescue (1) PCI rand to abciximab vs. placebo or control

Mortality

p=0.06
RR 0.71
[0.49,1.02]

p=0.01
RR 0.72
[0.55,0.94]

6–12 months

De Luca G et al. *JAMA* 2005;293:1759–1765
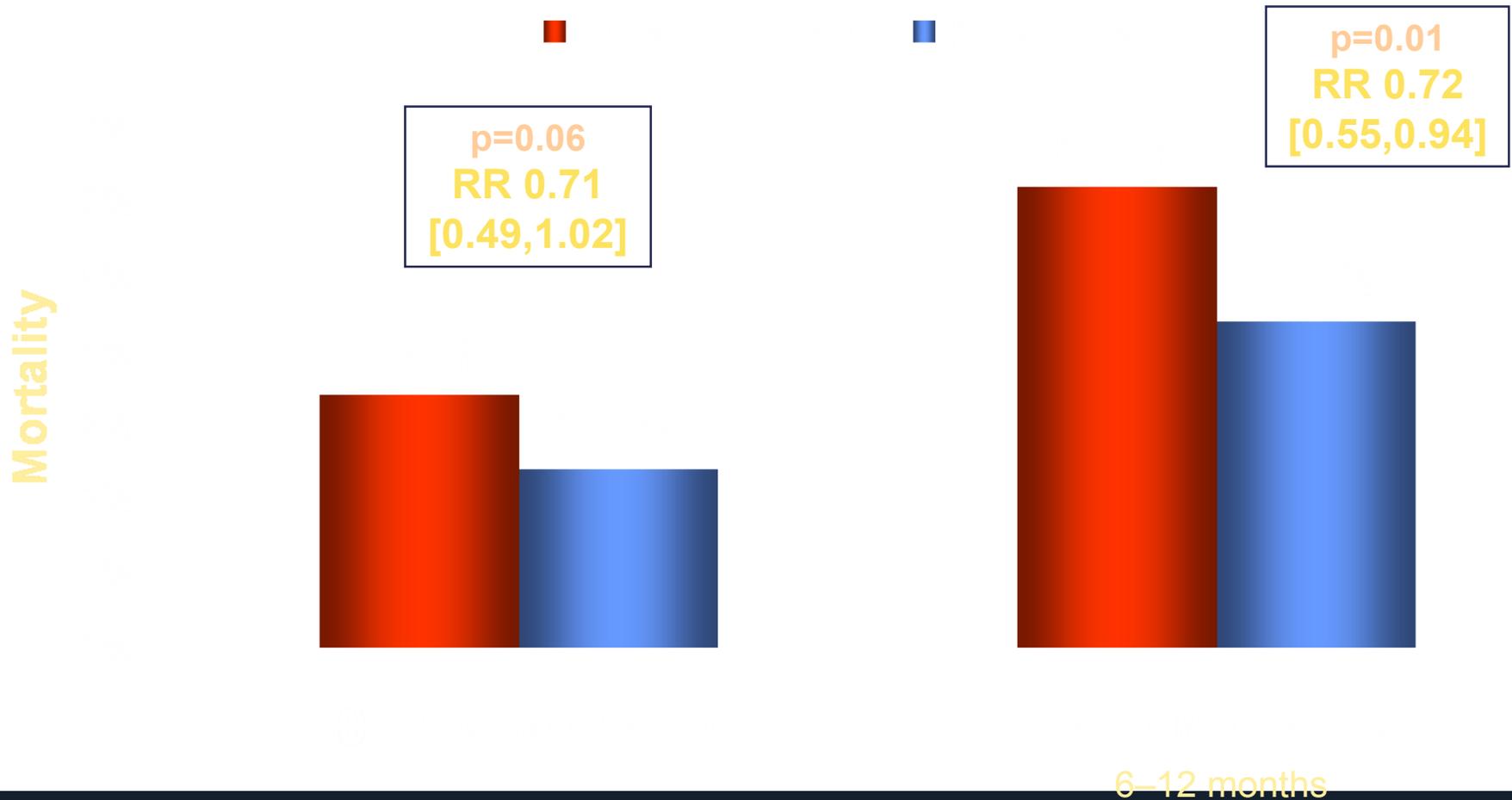
Updated meta-analysis of effect of GPIs on 30 day mortality in pts with STEMI

Study	Gp IIb-IIIa inh n/N	Control n/N	OR (fixed) 95% CI	Weight %	OR (fixed) 95% CI
ACE	7/200	8/200		5.46	0.87 [0.31, 2.45]
ADMIRAL	5/149	10/151		6.79	0.49 [0.16, 1.47]
APE	3/29	3/30		1.87	1.04 [0.19, 5.62]
ASSIST	7/201	4/199		2.75	1.76 [0.51, 6.11]
BRAVE-3	13/401	10/399		6.87	1.30 [0.56, 3.01]
CADILLAC	20/1052	24/1030		16.84	0.81 [0.45, 1.48]
Ernst et al	1/85	0/27		0.52	0.98 [0.04, 24.67]
HORIZONS MI	56/1802	38/1800		26.07	1.49 [0.98, 2.26]
ISAR	4/201	8/200		5.56	0.49 [0.14, 1.64]
Lee et al	1/32	0/36		0.32	3.48 [0.14, 88.40]
ON-TIME 2	11/473	19/477		13.08	0.57 [0.27, 1.22]
Petronio et al.	1/44	4/45		2.74	0.24 [0.03, 2.22]
Petronio et al.	0/30	3/60		1.64	0.27 [0.01, 5.39]
Petronio et al.	1/17	1/14		0.73	0.81 [0.05, 14.28]
RAPPORT	6/241	5/242		3.44	1.21 [0.36, 4.02]
Steen et al.	1/25	1/30		0.62	1.21 [0.07, 20.35]
Zorman et al.	4/112	5/51		4.69	0.34 [0.09, 1.33]
Total (95% CI)	141/5094	143/4991		100.00	0.96 [0.76, 1.22]

Test for heterogeneity: Chi² = 15.62, df = 16 (P = 0.48), I² = 0%
Test for overall effect: Z = 0.31 (P = 0.75)

Favors GPIs   Favors Control

Updated meta-analysis of effect of GP IIb/IIIa inhibitors on 30 day re-MI

Study	Gp IIb-IIIa inh n/N	Control n/N	OR (fixed) 95% CI	Weight %	OR (fixed) 95% CI
ACE	1/200	9/200		10.92	0.11 [0.01, 0.85]
ADMIRAL	2/149	4/151		4.78	0.50 [0.09, 2.77]
ASSIST	3/201	1/199		1.21	3.00 [0.31, 29.09]
CADILLAC	8/1052	9/1030		11.01	0.87 [0.33, 2.26]
ERNST	0/85	0/27			Not estimable
HORIZONS MI	32/1802	32/1800		38.35	1.00 [0.61, 1.64]
ISAR	1/201	3/200		3.65	0.33 [0.03, 3.18]
Lee et al	0/32	0/36			Not estimable
ON-TIME 2	13/473	14/477		16.53	0.93 [0.43, 2.01]
Petronio et al.	0/17	0/14			Not estimable
Petronio et al.	0/44	1/45		1.79	0.33 [0.01, 8.41]
RAPPORT	8/241	10/242		11.77	0.80 [0.31, 2.05]
Zorman et al.	0/112	0/51			Not estimable
Total (95% CI)	68/4609	83/4472		100.00	0.82 [0.59, 1.13]

Test for heterogeneity: Chi² = 6.96, df = 8 ($P = 0.54$), $I^2 = 0\%$
Test for overall effect: $Z = 1.23$ ($P = 0.22$)

Favors GPIs   Favors control

De Luca et al, EHJ 2009

Updated meta-analysis of effect of GP IIb/IIIa inhibitors on major bleeding
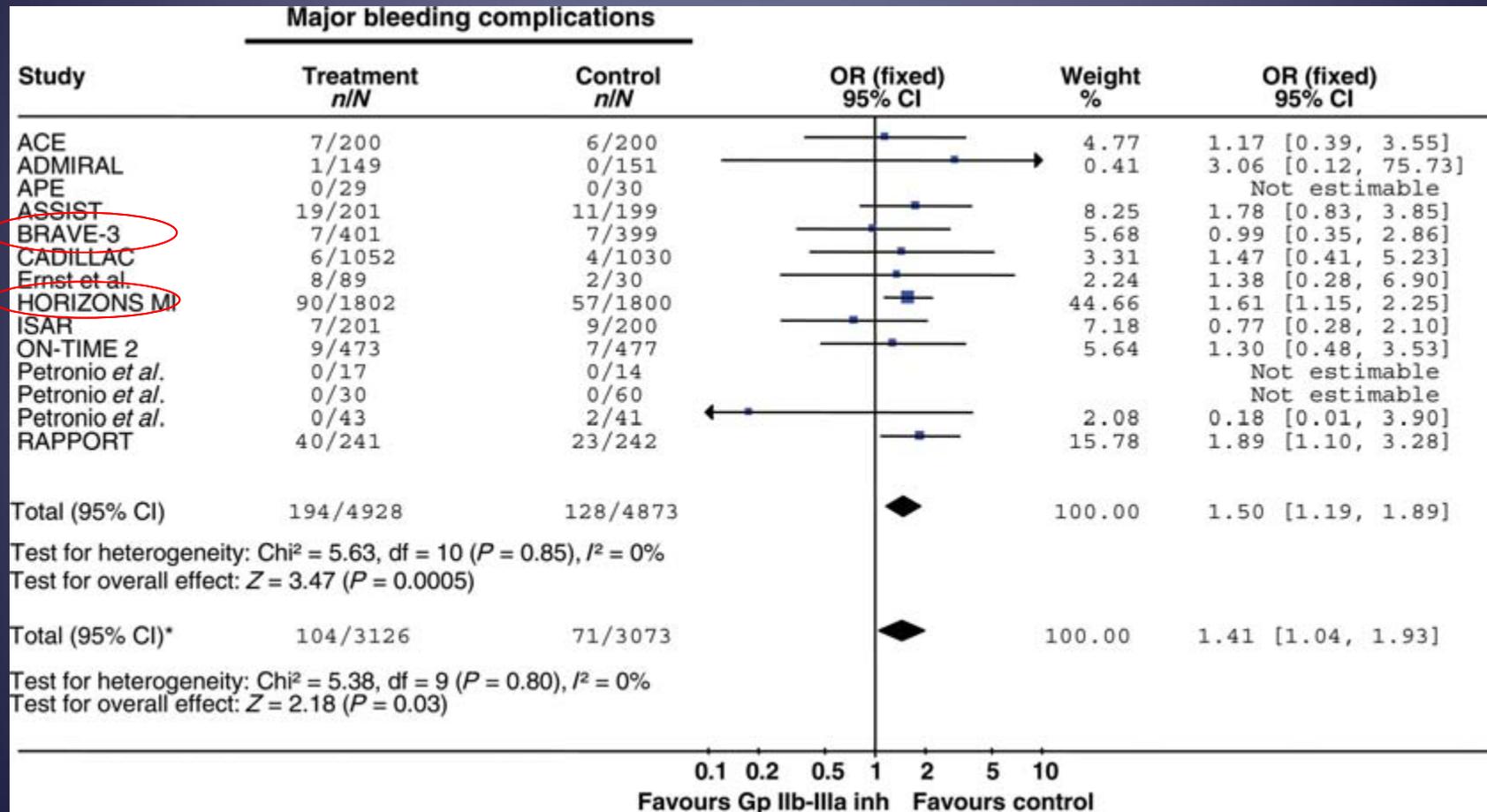
De Luca rt al, EHJ 2009

HORIZONS - 1-Year Major Bleeding (non-CABG)

Legend:
- Bivalirudin alone (n=1800)
- Heparin + GPIIb/IIIa (n=1802)

Y-axis: Major Bleeding (%)
X-axis: Time in Months

9.2%

5.8%

Diff [95%CI] = -3.4% [-5.2, -1.7]

HR [95%CI] = 0.61 [0.48, 0.78]

P<0.0001
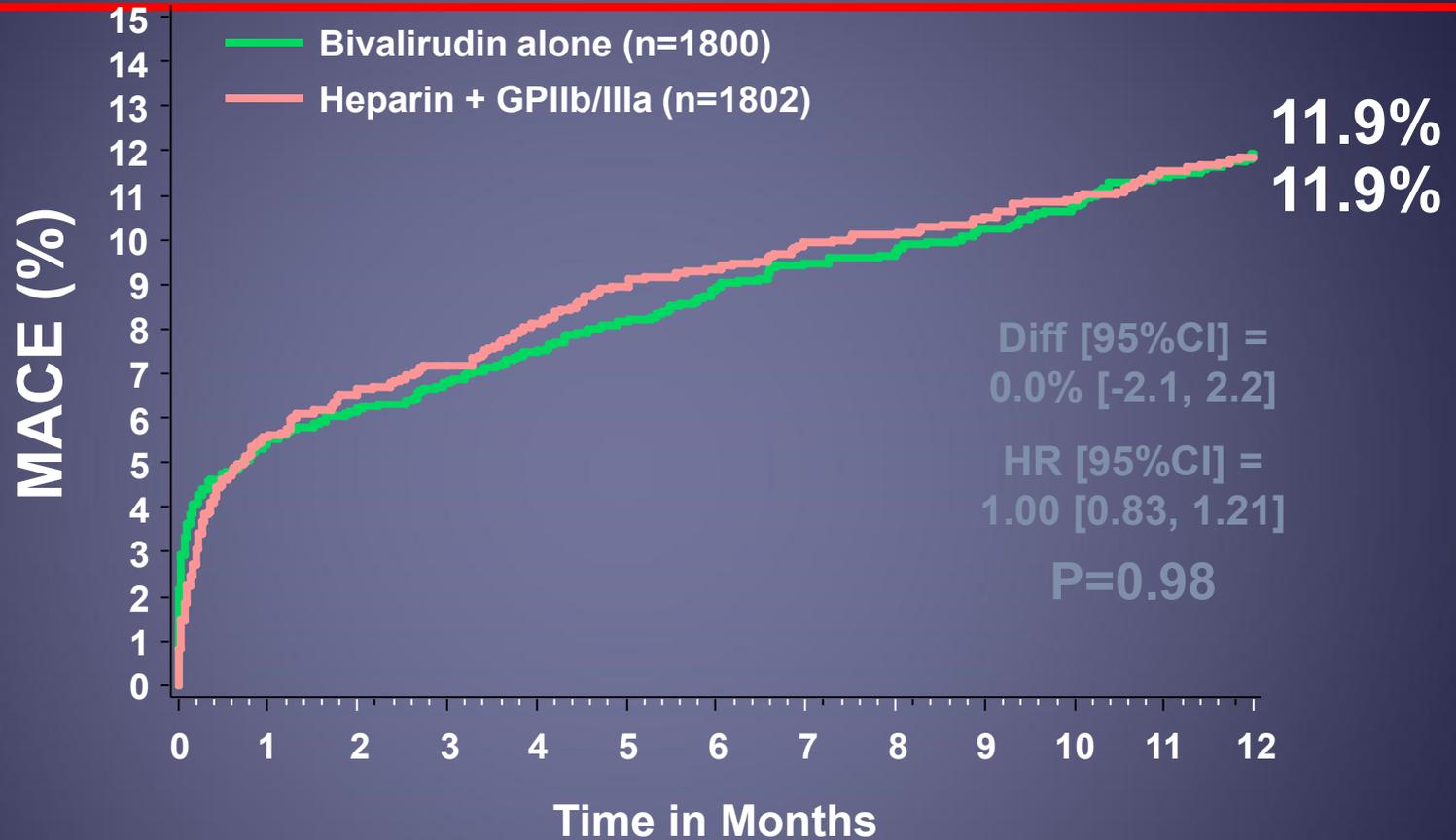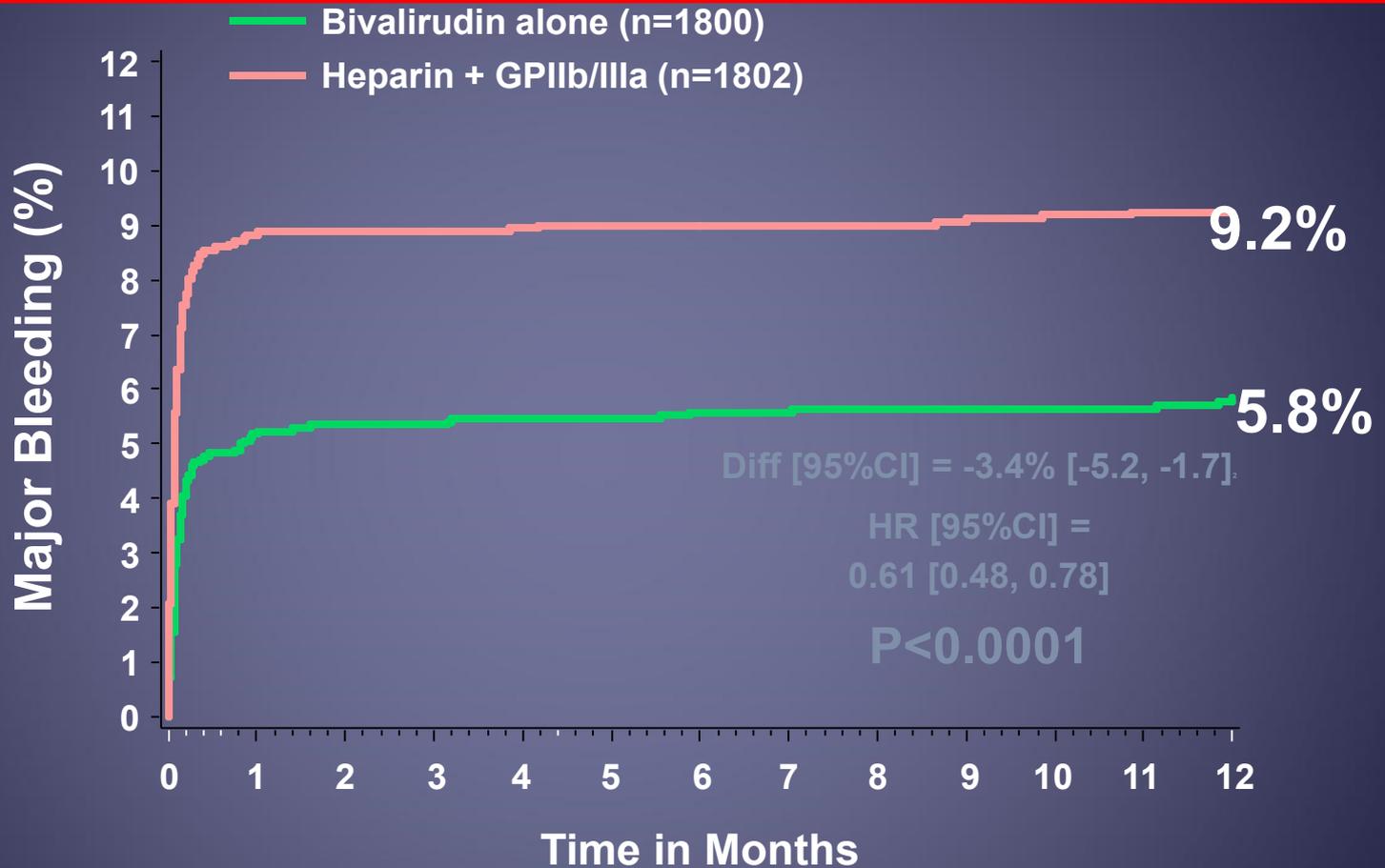
Number at risk

Bivalirudin alone	1800	1621	1601	1586	1448
Heparin+GPIIb/IIIa	1802	1544	1532	1515	1368

Stone G et al, NEJM 2008, Lancet 2009

HORIZONS AMI 1-Year Mortality

GPIIb/IIIa's and prasugrel in the TRITON

Similar findings for ticagrelor in the PLATO
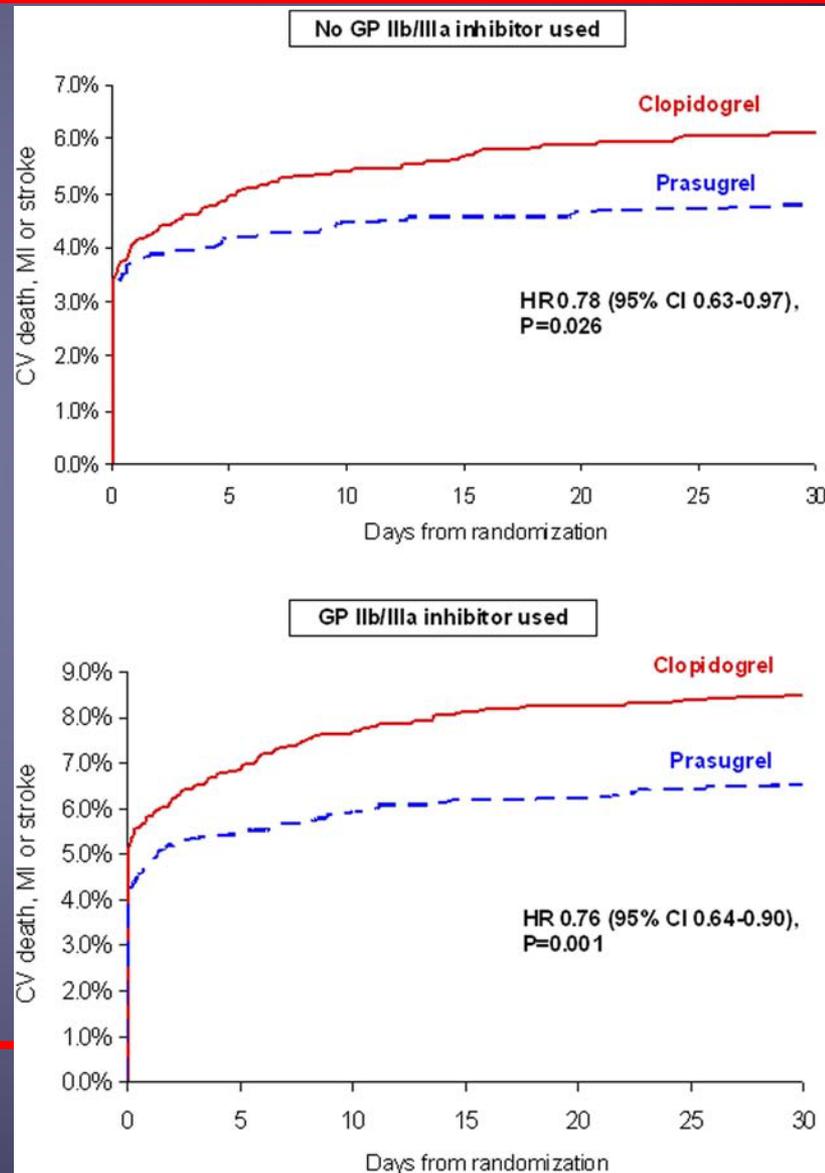
RAPID Study
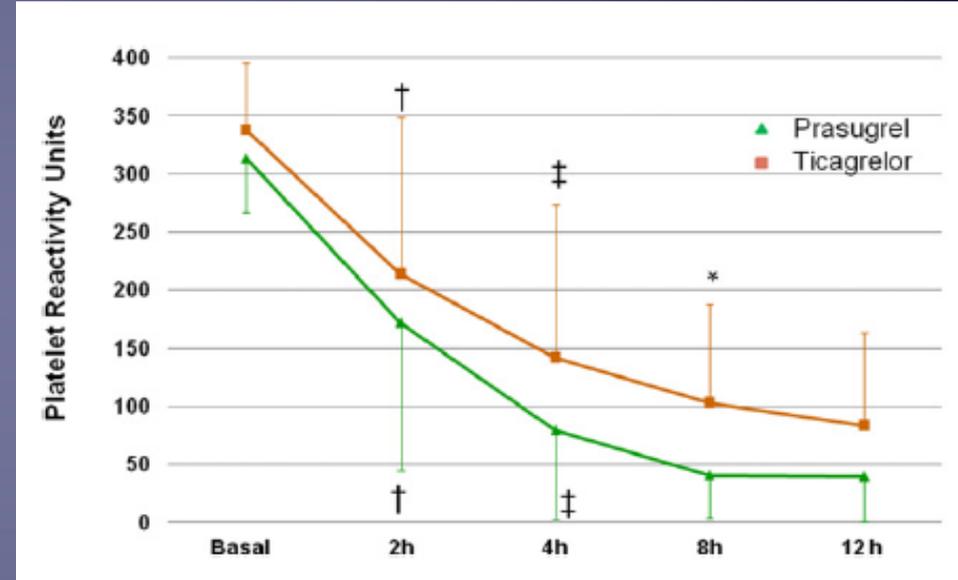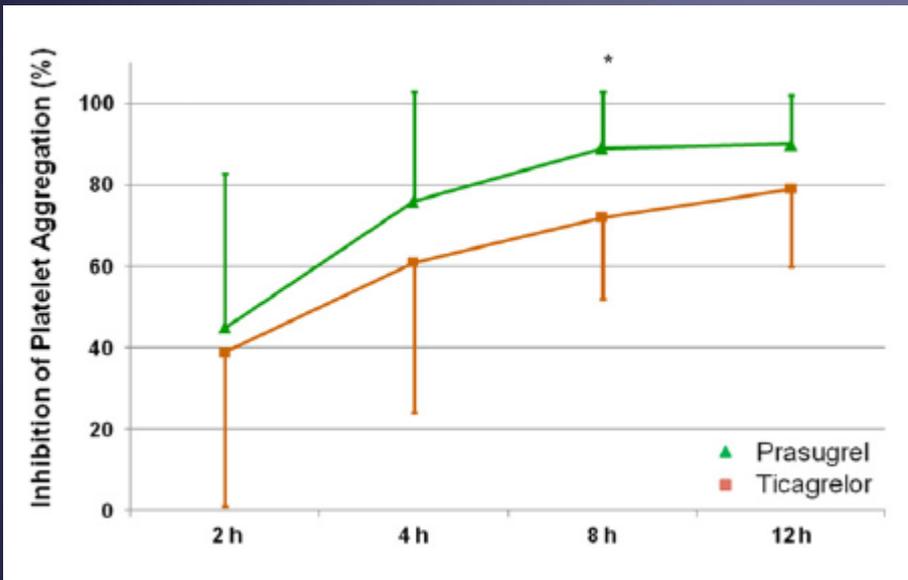
50 paients with STEMI undergoing primary PCI

FABULOUS-PRO Study

Valgimigli et al, JACC Card Interv 2012
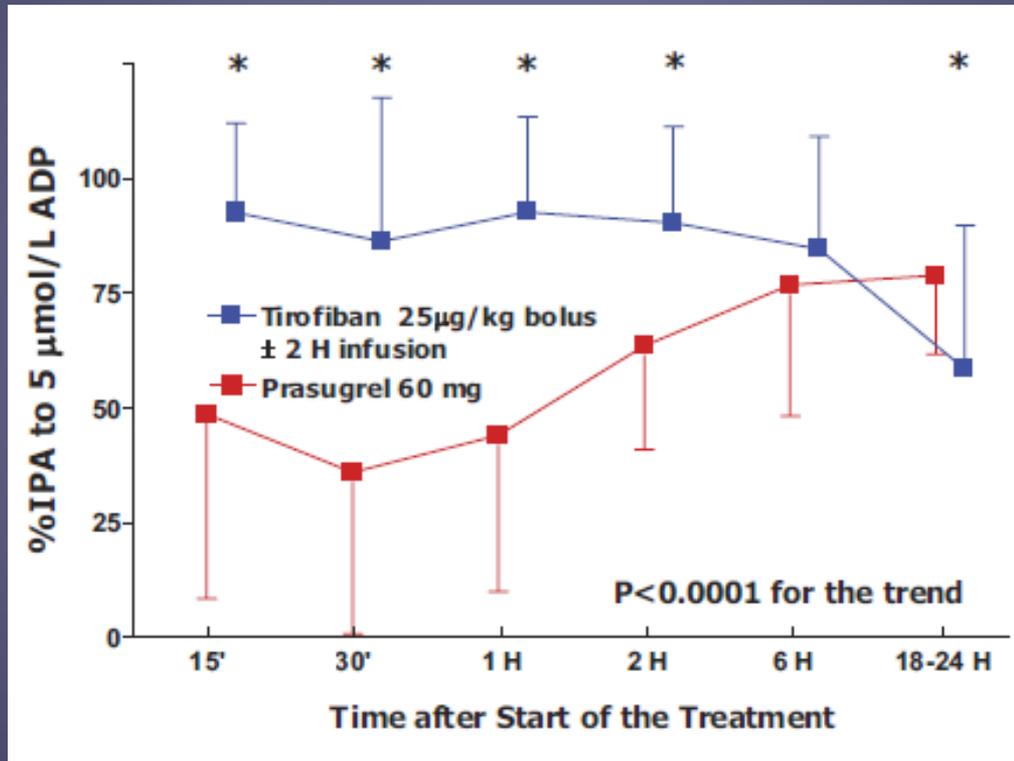
IC Abciximab During STEMI

IC vs. IV Abciximab in 154 patients with STEMI

30 day estimator:
0.146 (95% CI 0.070 ; 0.222)

Abciximab i.v.

p=0.06

30 day estimator:
0.052 (95% CI 0.003 ; 0.101)
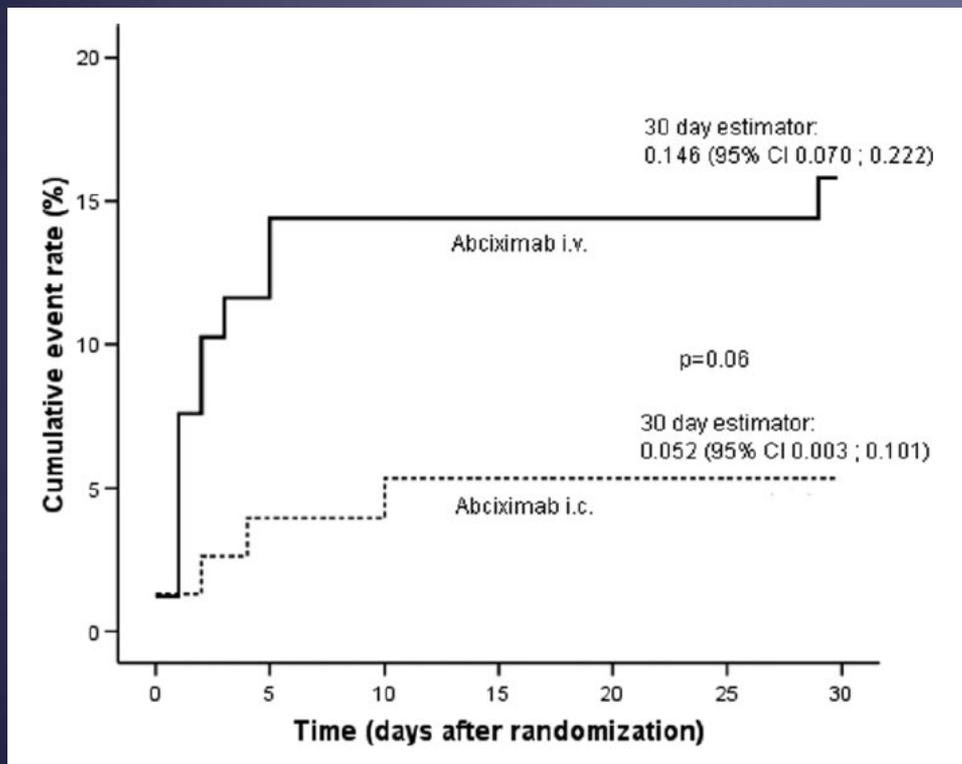
Abciximab i.c.

Death, re-infarction, CHF, TVR

Thiele et al, Circulation 2008

CICERO trial
IC vs. IV Abciximab in STEMI

P=0.02

P=0.01

- IV Abciximab
- IC Abcixinab

MBG 2-3 | Comp. ST Resolution | Infarct size - CK*100
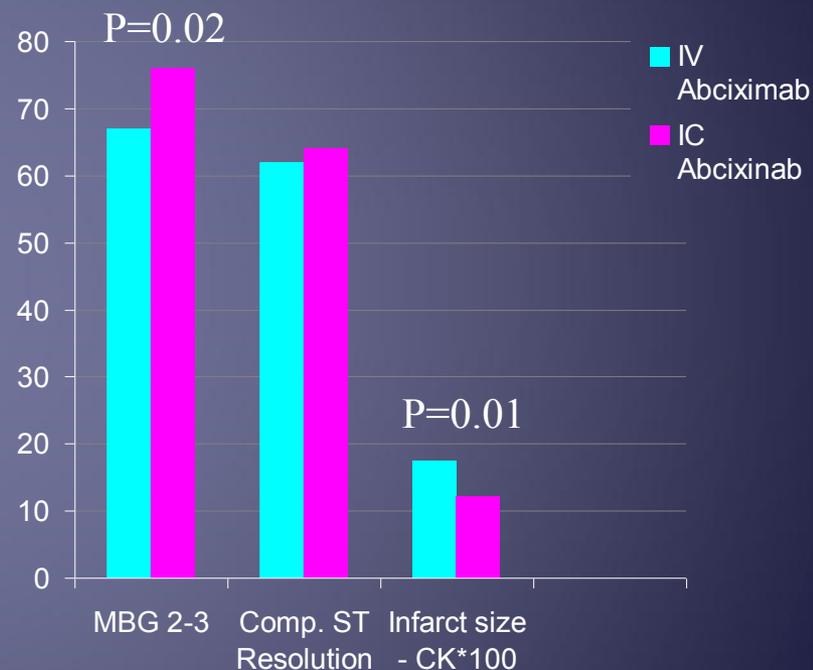
534 STEMI patients,
all underwent thrombus aspiration

Gu et al, Circulation 2010

AIDA STEMI: 2065 pts with STEMI <12° rand to PPCI with IC vs IV bolus abcx (+12° IV abcx in all)

Primary EP @ 90 days	IC Abcx (n=935)	IV Abcx (n=932)	OR (95% CI)	P value
Death, ReMI, or new CHF	65 (7.0%)	71 (7.6%)	0.91 (0.91-1.28)	0.58
- Death	42 (4.5%)	34 (3.6%)	1.24 (0.78-1.97)	0.36
- Cardiac	35	33		
- Non-cardiac	7	1		
- Reinfarction	17 (1.8%)	17 (1.8%)	1.0 (0.51-1.96)	0.99
- New CHF	22 (2.4%)	38 (4.1%)	0.57 (0.33-0.97)	0.04

Meta-analysis of IV vs IC Bolus Abciximab (+ 12° Infusion) During Primary PCI in STEMI

6 RCTs, 1246 total pts randomized
30-Day Mortality

Study or Subgroup	Intracoronary abciximab Events	N	Intravenous abciximab Events	N	Weight	Odds Ratio M-H, Fixed 95% CI	Odds Ratio M-H, Fixed 95% CI
CICERO 2010	5	271	7	263	33.7%	0.69 (0.22, 2.19)	
Crystal AMI 2010	0	25	1	23	7.4%	0.29 (0.01, 7.59)	
Dominguez-Rodriguez 2009	0	25	0	25		Not estimable	
EASY-MI 2010	0	53	0	52		Not estimable	
Iversen 2011	2	185	9	170	44.8%	0.20 (0.04, 0.92)	
Thiele 2008	2	77	3	77	14.1%	0.66 (0.11, 4.05)	
Total (95% CI)		636		610	100.0%	0.43 (0.20, 0.94)	
Total events	9	1.4%	20	3.3%			

Heterogeneity: Chi^2=1.88, df=3 (P=0.60); I^2=0%

Test for overall effect: Z=2.11 (P=0.03)

0.01 0.1 1 10 100
Favors IC   Favors IV
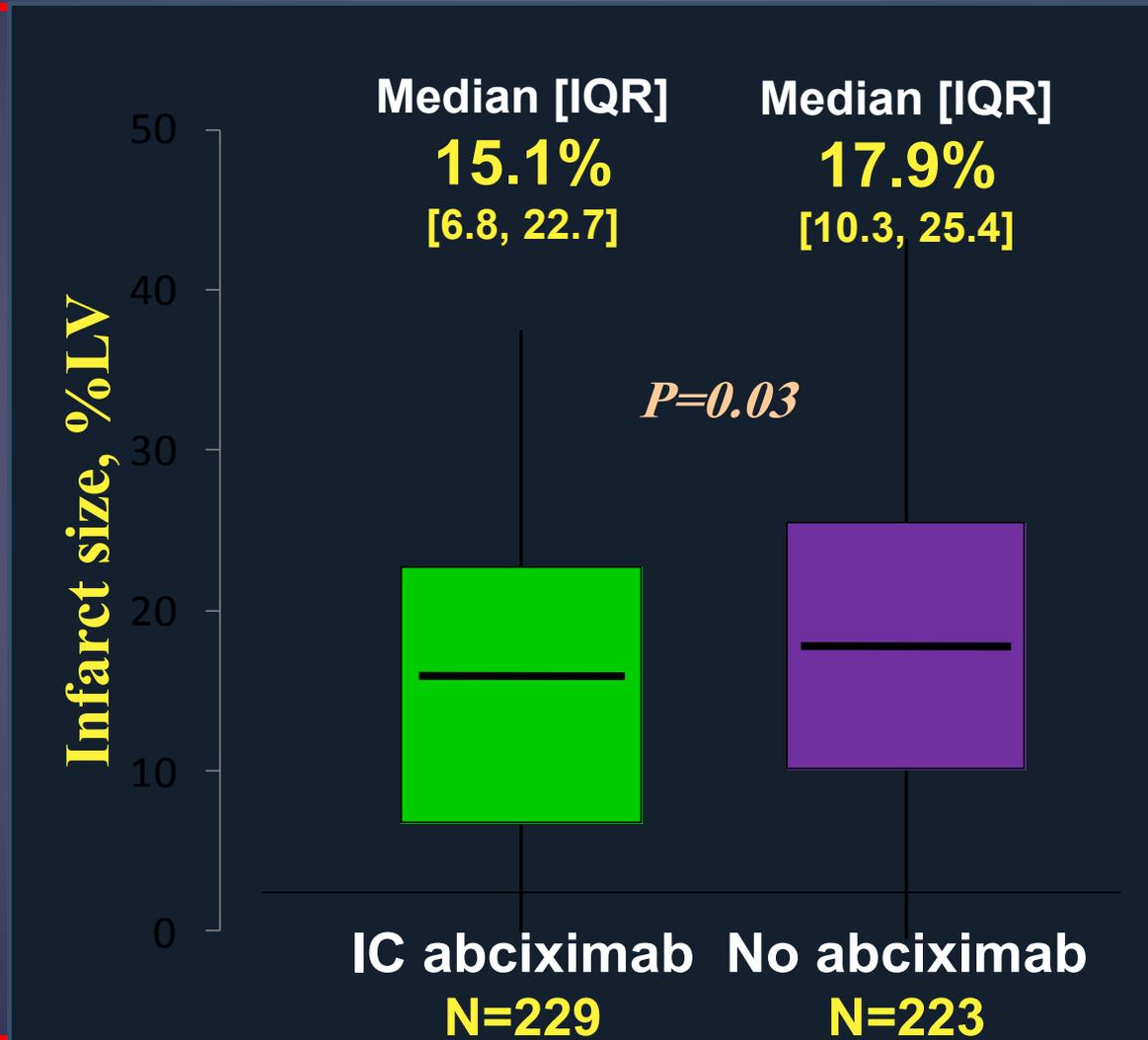
Summary

- Optimizing myocardial perfusion during STEMI is challenging.

- Manual thrombus aspiration appeared promising especially from initial studies (TAPAS), but recent studies (INFUSE-MI, TASTE) and registries failed to duplicate the favorable effect

- Embolic protection devices are of doubtful benefit for STEMI PCI

- DES preferred stents; MGuard stent may be beneficial in STEMI PCI but needs to be tested in further clinically powered trials.

- Pharmacotherapy: the new anti-platelet agents clearly have an advantage over clopidogrel in the setting of STEMI primary PCI, all should be given ASAP

- GP IIb/IIIa inhibitors should mainly be given in "bailout" situations, but early administrartion as "bridge" should be studied

- IC GP IIb/IIIa administration appears to have an advantage over IV

Thank you !