XVII Jornadas SOLACI
6º Región Cono Sur

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"Angioplastía Primaria Optimizando la reperfusión tisular"

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Angioplastía Primaria
Optimizando la reperfusión tisular

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- En pacientes con IAMCSST lograr una adecuada reperfusión tisular con ATC primaria o trombolíticos, minimiza el daño miocárdico, preserva la FSVI, y se traduce en una mejor sobrevida y menor incidencia de complicaciones.

- Sin embargo existe un porcentaje significativo de pacientes (>30%) en los cuales a pesar de una exitosa repermeabilización del vaso epicárdico (flujo TIMI 3), no se alcanza una reperfusión efectiva a nivel tisular, entre otras causas debido a embolia o microembolia distal,mionecrosis con disrupción capilar, injuria de reperfusión, edema tisular, ausencia de salvataje miocárdico.

“Marcadores de Reperfusion Exitosa”

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- De acuerdo con la aceptación que la medición de una reperfusión exitosa debe incluir la evaluación más allá del flujo epicárdico, diferentes métodos han sido propuestos para la evaluación de la microvasculatura.

- **1) Resolución del supradesnivel del ST en ECG (Schroeder R; JACC 1995)**
- 2) Ecocardiografía con contraste miocárdico (Ito H; Circulation 1996)
- 3) Centellografía, evidencias de “No reflujo” post trombolisis (Schofer J; JACC 1985)
- **4) Evaluación angiográfica de reperfusión miocárdica / Blush Miocárdico (Van`t Hof A; Circulation 1998)**
- 5) RMI cardíaca (Wu KC; Circulation 1998)

“Valor del Análisis de la Resolución del ST en la era de la ATC primaria”

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- El valor pronóstico de la resolución del ST ha sido extensamente estudiado, estando bien establecido que la RCSST es un poderoso predictor de permeabilidad del vaso culpable, integridad microvascular, y menor incidencia de eventos en pacientes con IAM.
- Sin embargo no existe consenso establecido de cómo y cuando medir la resolución del ST.

ECG-analysis measures	Proposed abbreviations
Pre-interventional ST analysis (before PPCI)	
Spontaneous ST resolution before reperfusion treatment	spontSTR (yes/no)
ST-elevation dynamic before reperfusion treatment ((maxSTE−minSTE)/maxSTE)	STEdyn (%)
Maximal pre-interventional single-lead ST elevation	maxSTE (mV)
Maximal pre-interventional single-lead ST deviation	maxSTD (mV)
Maximal pre-interventional 12-lead cumulative ST elevation	maxΣSTE (mV)
Maximal pre-interventional 12-lead cumulative ST deviation	maxΣSTD (mV)
Per-interventional ST analysis (during PPCI)	
Presence of increase in ST elevation during PPCI	STpeak (yes/no)
Level of increase in ST elevation during PPCI ($STE_{PCI}-STE_{before\ PCI}$)	STpeak (mV)
Duration of increase in ST elevation during PPCI	T_{STpeak} (min)
Post-interventional ST analysis (after PPCI)	
Absolute single-lead ST elevation X minutes after PCI	$STE_{X\ min}$ (mV)
Absolute single-lead ST deviation X minutes after PCI	$STD_{X\ min}$ (mV)
12-Lead cumulative ST elevation X minutes after PCI	$\Sigma STE_{X\ min}$ (mV)
12-Lead cumulative ST deviation X minutes after PCI	$\Sigma STD_{X\ min}$ (mV)
Difference in single-lead STE/STD from pre- to X minutes post-PCI	$\Delta STE/\Delta STD_{pre\text{-}X\ min\text{-}post\text{-}PCI}$ (mV)
Difference in 12-lead cumulative STE/STD from pre- to X minutes post-PCI	$\Delta\Sigma STE/\Delta\Sigma STD_{pre\text{-}X\ min\text{-}post\text{-}PCI}$ (mV)
Single-lead relative ST resolution	STR (%)
12-Lead cumulative relative ST resolution	ΣSTR (%)
Achievement of 70% resolution of STE or ΣSTE X minutes after PCI	$STR70_{X\ min}/\Sigma STR70_{X\ min}$ (yes/no)
Time to 70% resolution of STE or ΣSTE	$T_{STR70}/T_{\Sigma STR70}$ (min)
Achievement of 100% resolution of STE or ΣSTE X minutes after PCI	$STR100_{X\ min}/\Sigma STR100_{X\ min}$ (yes/no)
Time to 100% resolution of STE or ΣSTE	$T_{STR100}/T_{\Sigma STR100}$ (min)
Timing of ECG analysis	
Pre-PCI STanalysis: pre-hospital, at local hospital, interhospital, at catheter laboratory?	
Per-PCI ST analysis: from 1.wire to final coronary intervention	
Post-PCI ST analysis: 0, 30, 60, 90 or 180 minutes after PCI?	
ECG sampling methods	
Single ECG acquisition: 12-lead, 15-lead, 24-lead?	
Continuous ECG monitoring: 12-lead, 15-lead, 24-lead, vectorcardiography?	

“Valor de la Resolucion del ST: Debemos medir la Resolución relativa o absoluta?”

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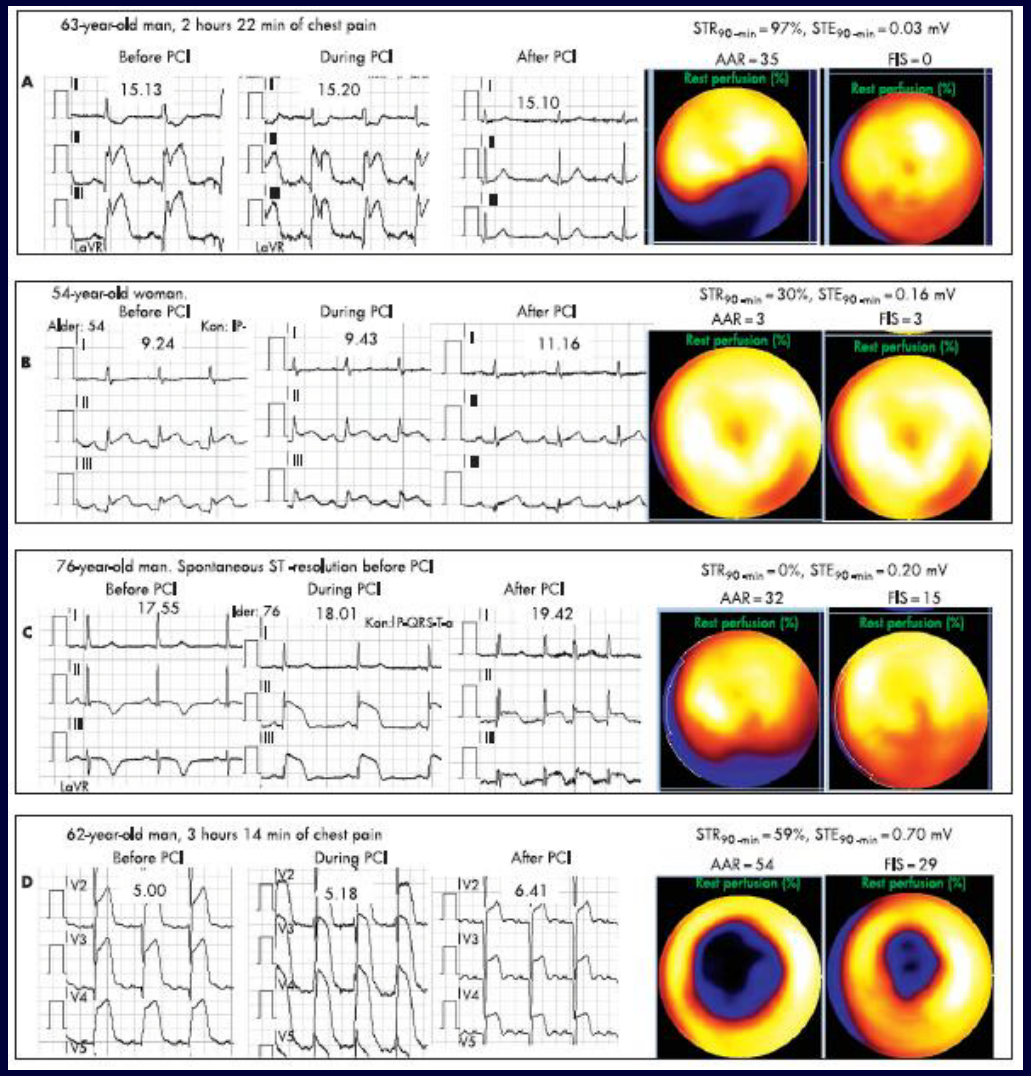
- En la mayoría de los estudios, se utiliza la resolución relativa del ST. Sin embargo esta es en gran medida dependiente de la sumatoria de ST basal.

- Recientemente varios autores han reportado que el valor absoluto de ST post ATC primaria es equivalente o superior a la resolución relativa del ST en predecir eventos. (De Luca G, Heart 2008; Brodie B, AJC 2005; Mc Laughlin M, JACC 2004)



Terkelsen j ; Heart 2008

Evaluación angiográfica de reperfusión miocárdica / Blush

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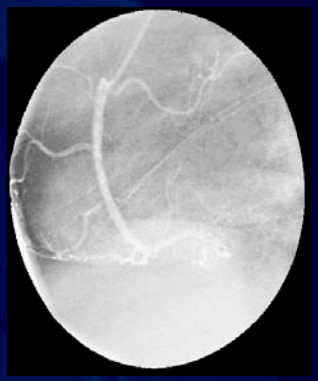
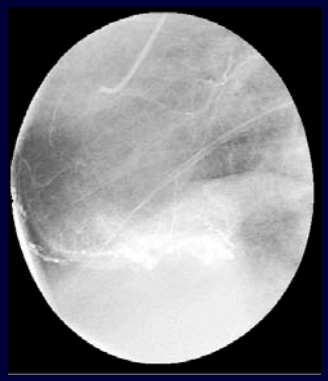
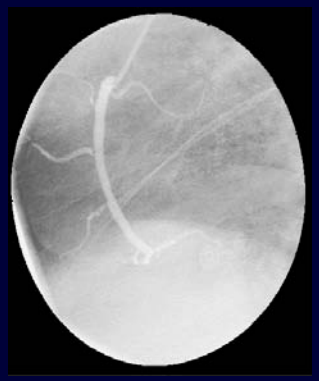
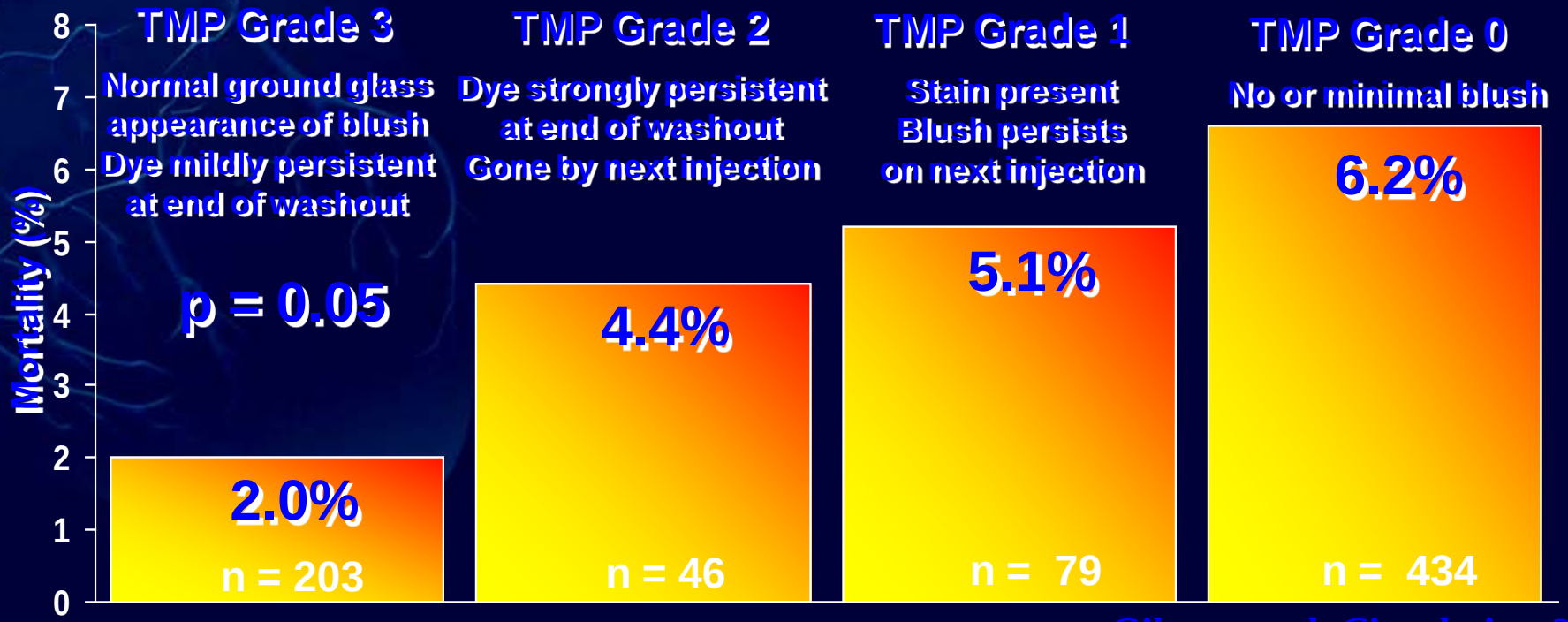


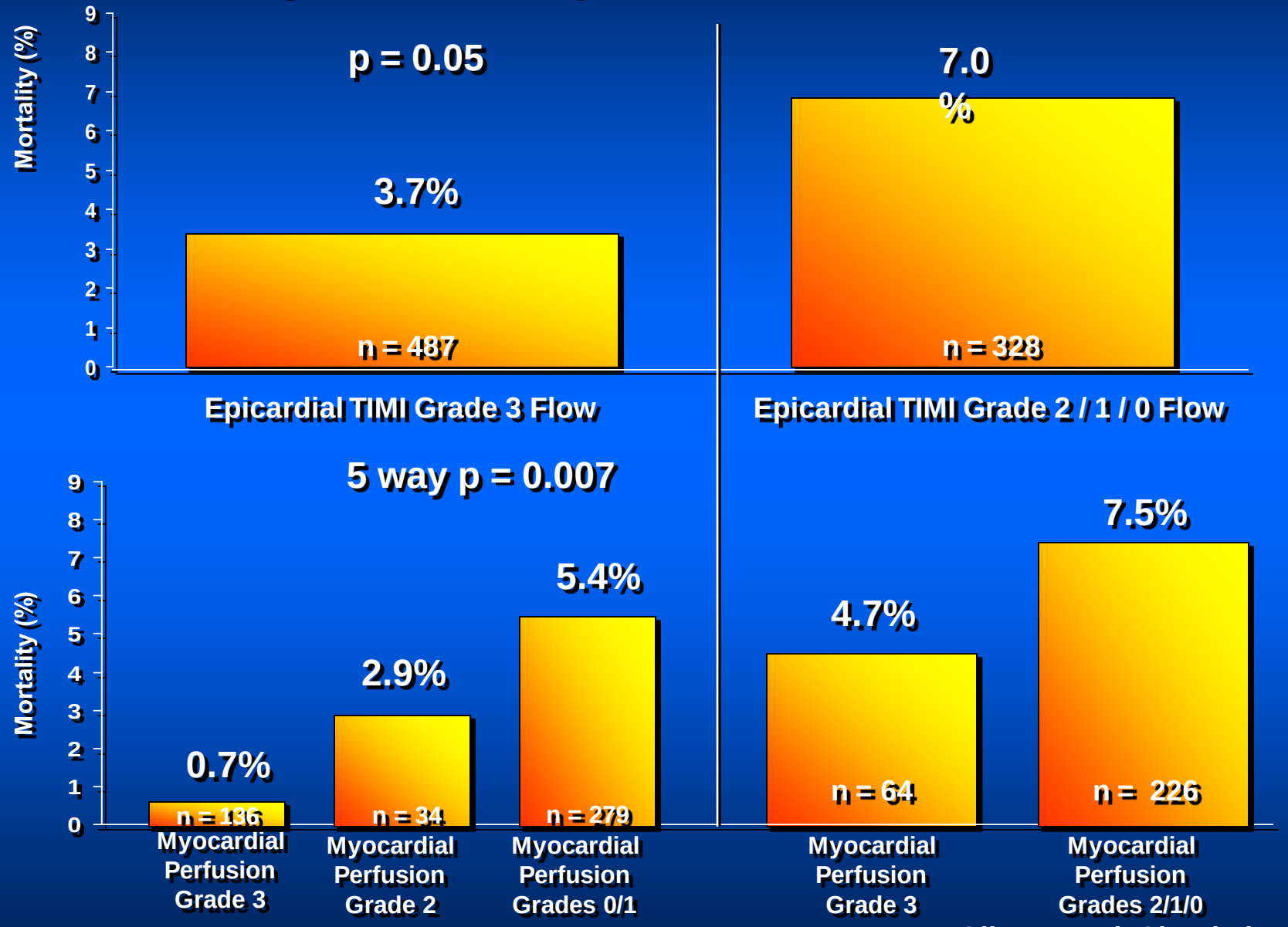






Gibson et al, Circulation 2000

Risk Stratification Within TIMI Flow Grades Using The TIMI Myocardial Perfusion Grades



Gibson et al, Circulation 2000

Is the Myocardial Blush Grade Scored by the Operator During Primary Percutaneous Coronary Intervention of Prognostic Value in Patients With ST-Elevation Myocardial Infarction in Routine Clinical Practice?

Marthe A. Kampinga, MD; Maarten W.N. Nijsten, MD, PhD; Youlan L. Gu, MD; W. Arnold Dijk, MSc; Bart J.G.L. de Smet, MD, PhD; Ad F.M. van den Heuvel, MD, PhD; Eng-Shiong Tan, MD, PhD; Felix Zijlstra, MD, PhD

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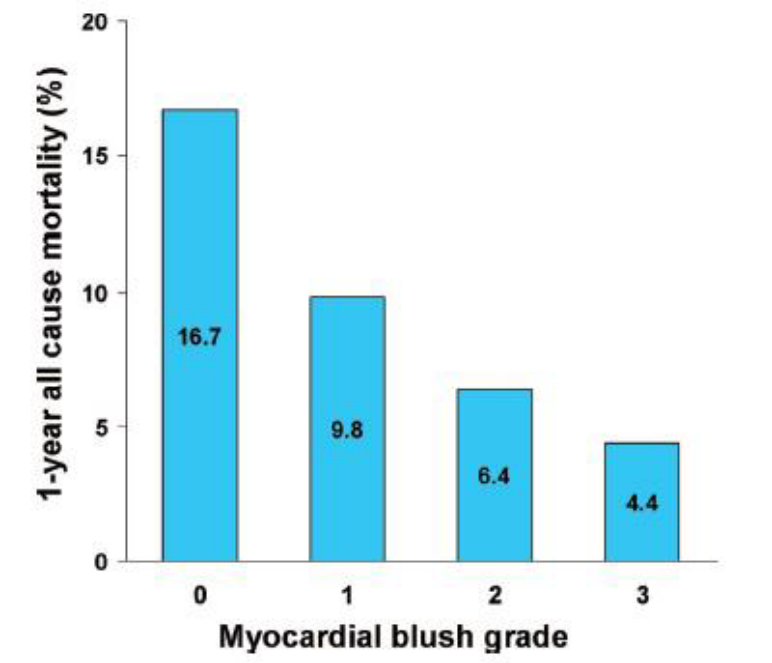

Table 2. Odds Ratio for 1-Year Mortality Including Operator MBG in all Consecutive STEMI Patients (n=2118)

	Univariate Analysis		Multivariable Analysis	
	Odds Ratio (95% CI)	*P*	Odds Ratio (95% CI)	*P*
Age, y	1.05 (1.04 to 1.07)	<0.001	1.05 (1.03 to 1.06)	<0.001
Anterior infarction	1.46 (1.07 to 2.01)	0.018		
Creatinine kinase peak >1500 U/L	1.69 (1.21 to 2.36)	0.002	1.53 (1.07 to 2.18)	0.020
TIMI pre-PCI 0 or 1	1.90 (1.30 to 2.80)	0.001		
TIMI post-PCI <3	2.43 (1.71 to 3.44)	<0.001		
MBG 0 or 1	3.71 (2.69 to 5.12)	<0.001	2.75 (1.95 to 3.86)	<0.001

Circ Cardiovasc Interv 2010

“Evaluation of ST Segment Elevation Resolution after Primary Angioplasty – Results of a Multicenter Registry of Acute Myocardial Infarction with ST Segment Elevation in Argentina”

Aníbal Damonte[1], Leandro Lasave[1], Fernando Kozak[1], Maximiliano Rossi[1], Marcelo Gamen[1], Fernando Cura[2], Daniel Berrocal[3], Oscar Mendiz[4], Eduardo Picabea[1]

Instituto Cardiovascular de Rosario[1], Rosario, Argentina; Instituto Cardiovascular de Buenos Aires[2], Buenos Aires, Argentina; Hospital Italiano de Buenos Aires[3], Buenos Aires, Argentina; Fundación Favaloro[4], Buenos Aires, Argentina

Background

- The magnitude of ST segment elevation resolution is a marker of myocardial reperfusion in patients with ST elevation myocardial infarction (STEMI)
- The aims of our study were to describe the frequency of Incomplete ST resolution (ISTR) in a contemporary registry of primary angioplasty (PCI) and compare the in-hospital outcomes with patients with Complete ST elevation resolution (CSTR)

Methods

- From July 2008 to February 2010, we included 373 consecutive patients with STEMI (<24hs) undergoing PCI from 8 centers in Argentina to a prospective STEMI registry. ISTR was defined as a decrease <70% of ST elevation between the baseline ECG and 60 minutes post PCI.
- Clinical, angiographic and procedural variables were analized as well as a composite endpoint of in-hospital cardiac events (CE), including mortality, reinfarction, shock, mechanical complications and urgent target vessel revascularization.
- Regression analysis was performed using the variables with p<0.1 in the univariate analysis

Results

Baseline Clinical Characteristics

	ISTR n = 195	CSTR n = 159	P Value
Age	63.7±12.4	61.5±11.9	0.08
Male (%)	78.9	74.2	0.35
Hypertension (%)	64.1	64.8	0.98
Hyperlipidemia (%)	62.0	57.8	0.49
Diabetes (%)	17.9	11.9	0.15
Baseline glycaemia	152.6±56.9	139.96±49.2	0.03
Smoker (%)	36.4	48.4	0.04
Prior AMI (%)	15.9	8.18	0.04
KK > 1 (%)	41.0	17.6	0.001

Results

Angiographic and Procedural Characteristics

	ISTR n = 195	CSTR n = 159	P Value
IRA LAD (%)	51.8	29.5	0.001
IRA Difusse disease (%)	26.7	14.8	0.007
Multivessel disease (%)	42.2	42.7	NS
D2B time (minutes)	74.1±46	65.1±46	0.1
Thrombus (%)	59.5	61.6	NS
Aspiration/Filter (%)	29.7	29.56	NS
GPIIbIIIa (%)	20.5	24.5	NS
Direct Stenting (%)	15.4	27.7	0.01
Stent Length (mm)	24.4±11	23.4±9	NS
Baseline TIMI 0-1 (%)	77.4	*79.8*	NS
Final TIMI 3 (%)	88.7	93.0	NS

Results

In – Hospital Results

	ISTR n = 195	CSTR n = 159	P Value
Ejection Fraction	46.4±12	50.0±10	0.007
Composite Cardiac Events (%)	12.8	3.77	0.005
Mortality (%)	10.26	2.52	0.007

Results

In-Hospital Results

- Regression analysis was performed using the following variables: age, smoking, previous AMI, baseline glycaemia, Killip class > 1, D2B time, LAD as IRA, diffuse IRA, direct stenting, ejection fraction and ISTR.

- Multivariate regression analysis showed that EF (CI 95% 0.85-0.94, p= 0.0001) and Incomplete ST segment resolution (CI 95% 0.17-0.09, p= 0.05) were independent predictors of in-hospital cardiac events.

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“Angioplastía Primaria”

Cómo podemos optimizar la perfusión tisular?

TAPAS Study Setup

Single-center, Prospective, Randomized, Open Trial

All consecutive patients with
a possible ST-elevated Acute Myocardial
Infarction within
12 hours after onset of symptoms

Conventional PCI
n = 536

1:1 pre-angiography randomization
N = 1'071 patients
University Medical Center Groningen,
the Netherlands

Thrombus Aspiration with
Export®
n = 535

Clinical

Proc — 30d — 1yr

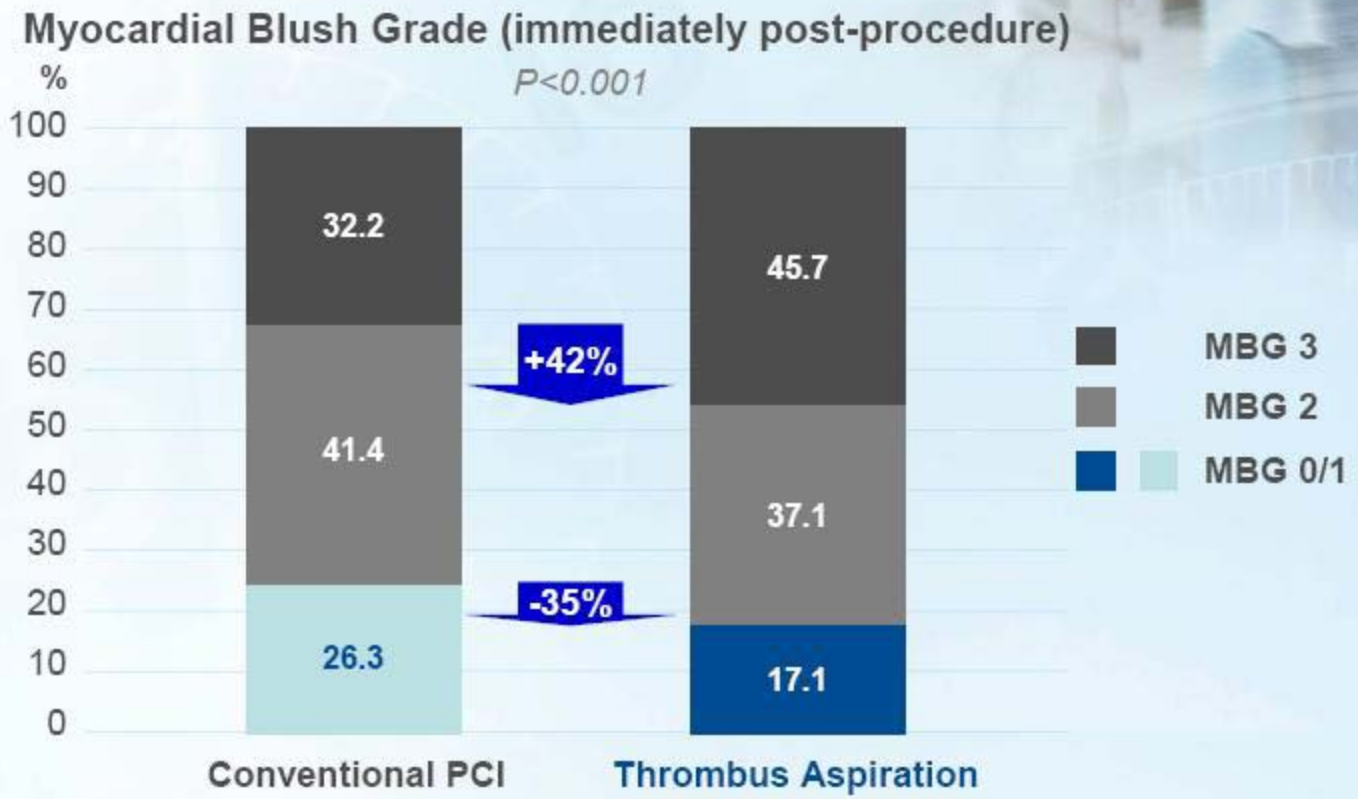
Primary Endpoint: MBG 0 or 1 as assessed by core lab

Secondary Endpoints: TIMI 3 flow, complete resolution of ST-segment elevation, absence of persistent ST-segment deviation, TVR, reinfarction, death, and MACE by 30 days

Svilaas T. et al., NEJM, February 7, 2008, Vol. 358, No. 6

Primary Endpoint Results*

35% Fewer Patients with MBG 0/1 in the Thrombus Aspiration Group

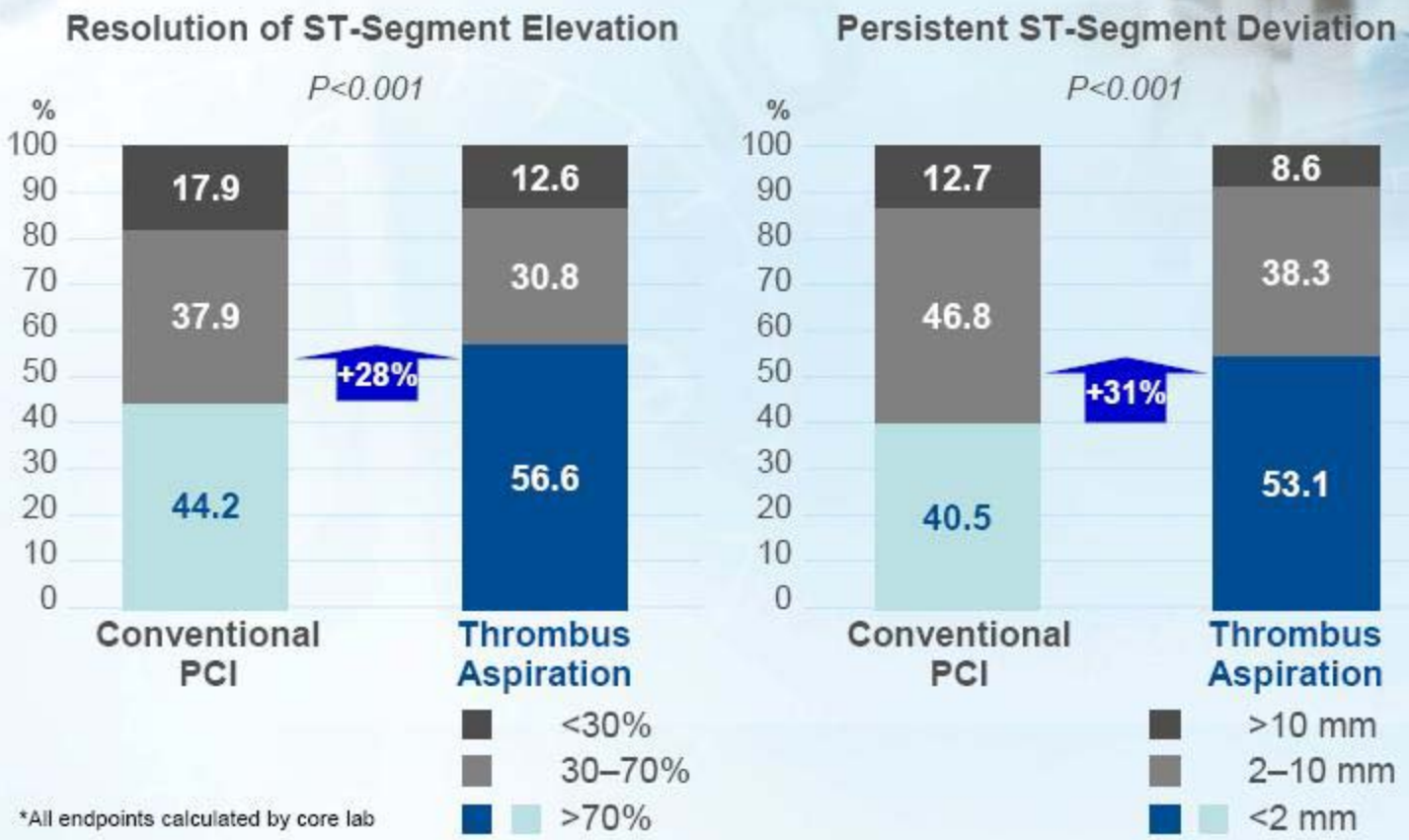


* All endpoints calculated by core lab

Svilaas T. et al., NEJM, February 7, 2008, Vol. 358, No. 6

Primary Endpoint Results*

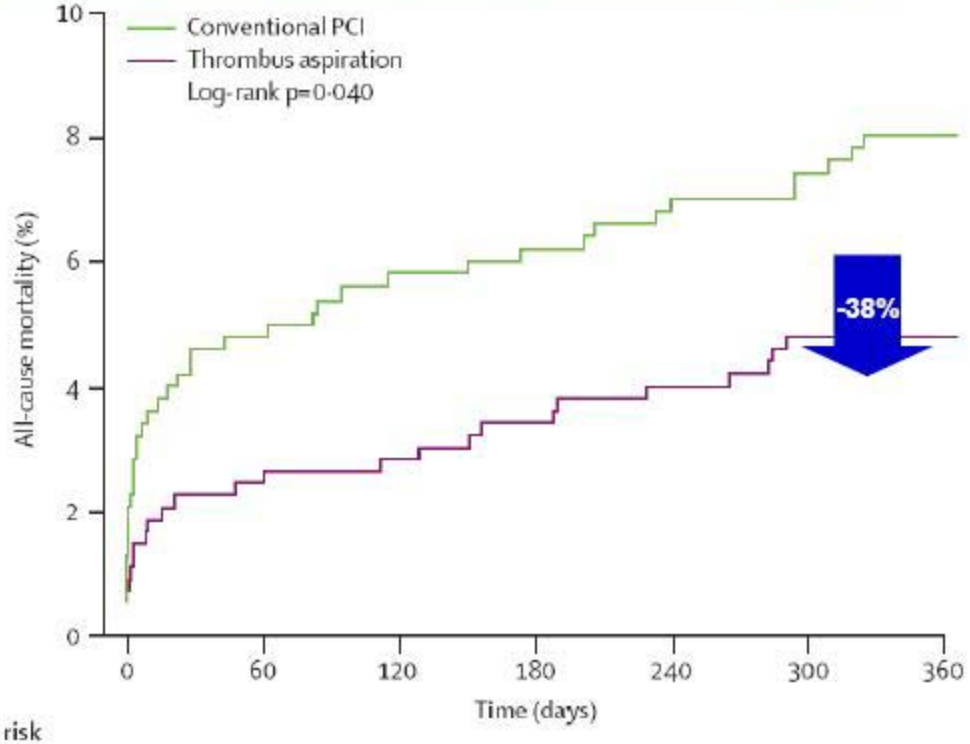
28% More Patients with Complete ST-Segment Resolution in the Thrombus Aspiration Group



*All endpoints calculated by core lab

Svilaas T. et al., NEJM, February 7, 2008, Vol. 358, No. 6

Statistically Significant Reduction of all-cause mortality in Favor of thrombus aspiration Group at 1 year (-38%)

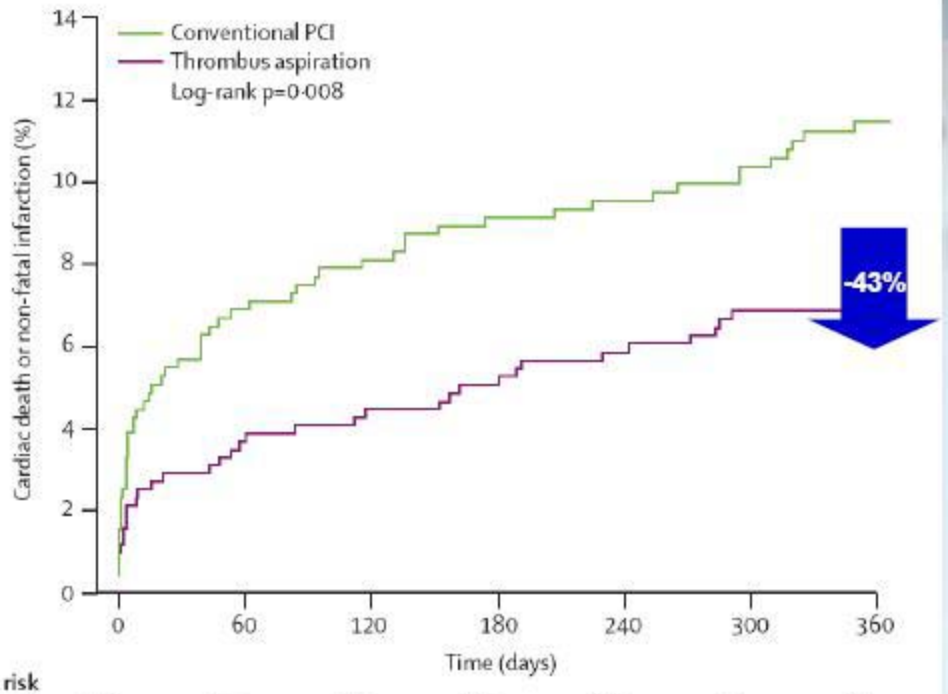


Number at risk							
Conventional PCI	536	506	501	499	495	494	489
Thrombus aspiration	535	519	517	514	510	506	505
Total	1071	1025	1018	1013	1005	1000	994

Ref. Vlaar et al, Cardiac death and reinfarction after 1 year in the Thrombus Aspiration during Percutaneous coronary intervention in Acute myocardial infarction Study (TAPAS): a 1-year follow-up study, Lancet 2008; Vol 371: June 2008; 1915-1920

Svilaas T. et al., NEJM, February 7, 2008; Vol. 358, No. 6

Statistically Significant Reduction of Cardiac death or non-fatal reinfarction in Favor of thrombus aspiration Group at 1 year (-43%)



Number at risk							
Conventional PCI	536	495	489	484	482	479	472
Thrombus aspiration	535	512	508	504	500	495	494
Total	1071	1007	997	988	982	974	966

Ref. Vlaar et al, Cardiac death and reinfarction after 1 year in the Thrombus Aspiration during Percutaneous coronary intervention in Acute myocardial infarction Study (TARAS): a 1-year follow-up study, Lancet 2008; Vol 371: June 2008; 1915-1920

Vlaar et al, NEJM, February 7, 2008, Vol 358, No. 6

Recommendations for Thrombus Aspiration during PCI for STEMI

Thrombus Aspiration During PCI for STEMI

NEW Recommendation

Aspiration thrombectomy is reasonable for patients undergoing primary PCI

ONLINE FIRST

Intracoronary Abciximab and Aspiration Thrombectomy in Patients With Large Anterior Myocardial Infarction

The INFUSE-AMI Randomized Trial

JAMA®

The Journal of the American Medical Association

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INFUSE-AMI: Background

- Myocardial recovery after primary PCI is often suboptimal despite restoration of TIMI 3 flow, in part due to thrombus embolization which results in impaired microvascular perfusion and increased infarct size
- Two strategies proposed to reduce embolization after primary PCI are bolus IC abciximab and manual thrombus aspiration
- However, prior studies have reported conflicting results as to whether IC abciximab or manual aspiration reduce infarct size or improve clinical outcomes, in part due to enrollment of a high proportion of small infarcts (e.g. non-anterior and/or with TIMI 3 flow), and/or pts presenting late (>4-6 hrs)
- Single center thrombectomy trials have mostly been positive, whereas multicenter trials have mostly been negative

ONLINE FIRST

Intracoronary Abciximab and Aspiration Thrombectomy in Patients With Large Anterior Myocardial Infarction
The INFUSE-AMI Randomized Trial

JAMA®
The Journal of the American Medical Association

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INFUSE-AMI Trial

452 pts with anterior STEMI
Anticipated S x 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

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

R 1:1

Manual aspiration

No aspiration

R 1:1

IC Abcx

No Abcx

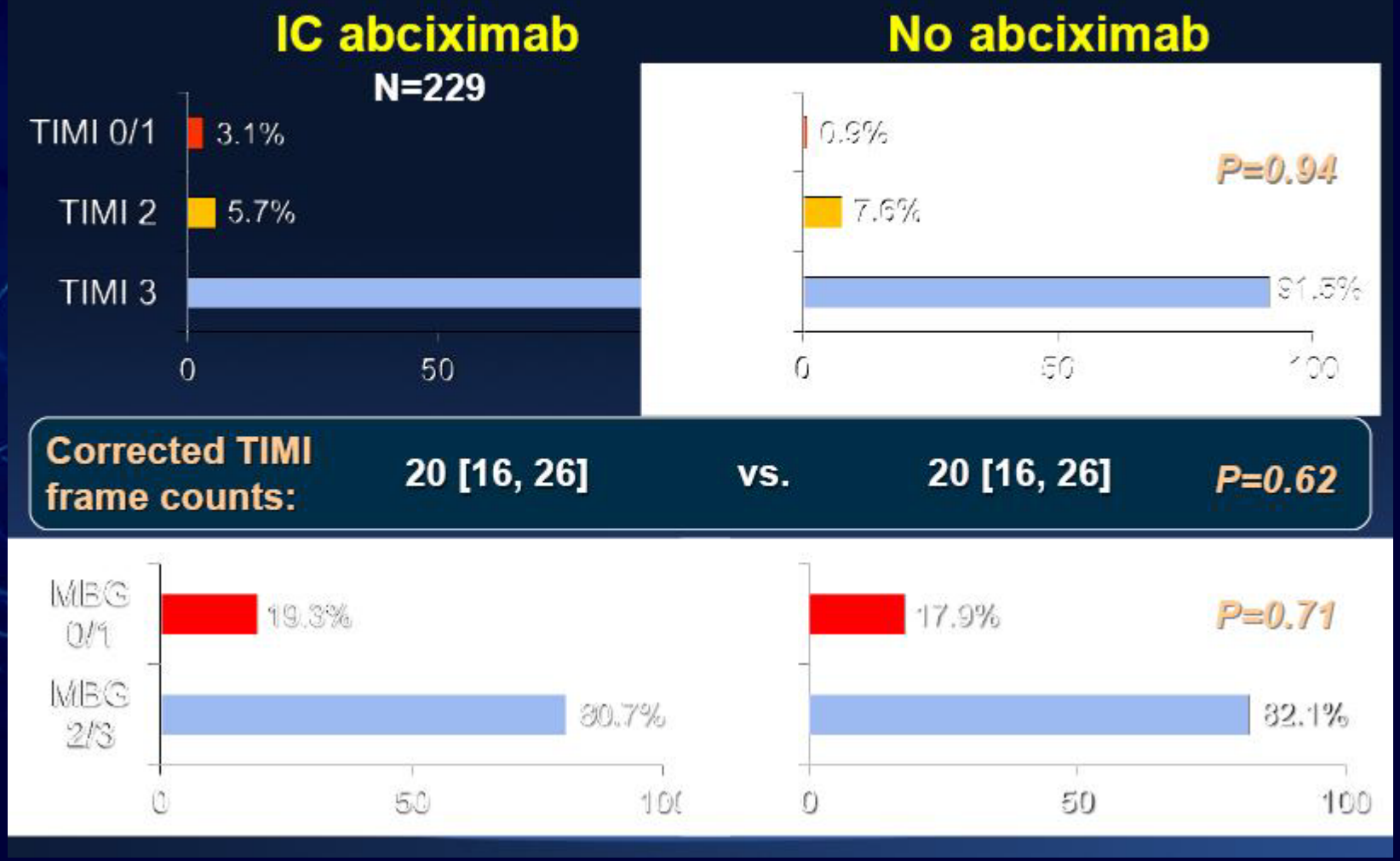
R 1:1

IC Abcx

No Abcx

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

INFUSE-AMI: Reperfusion post-PCI*



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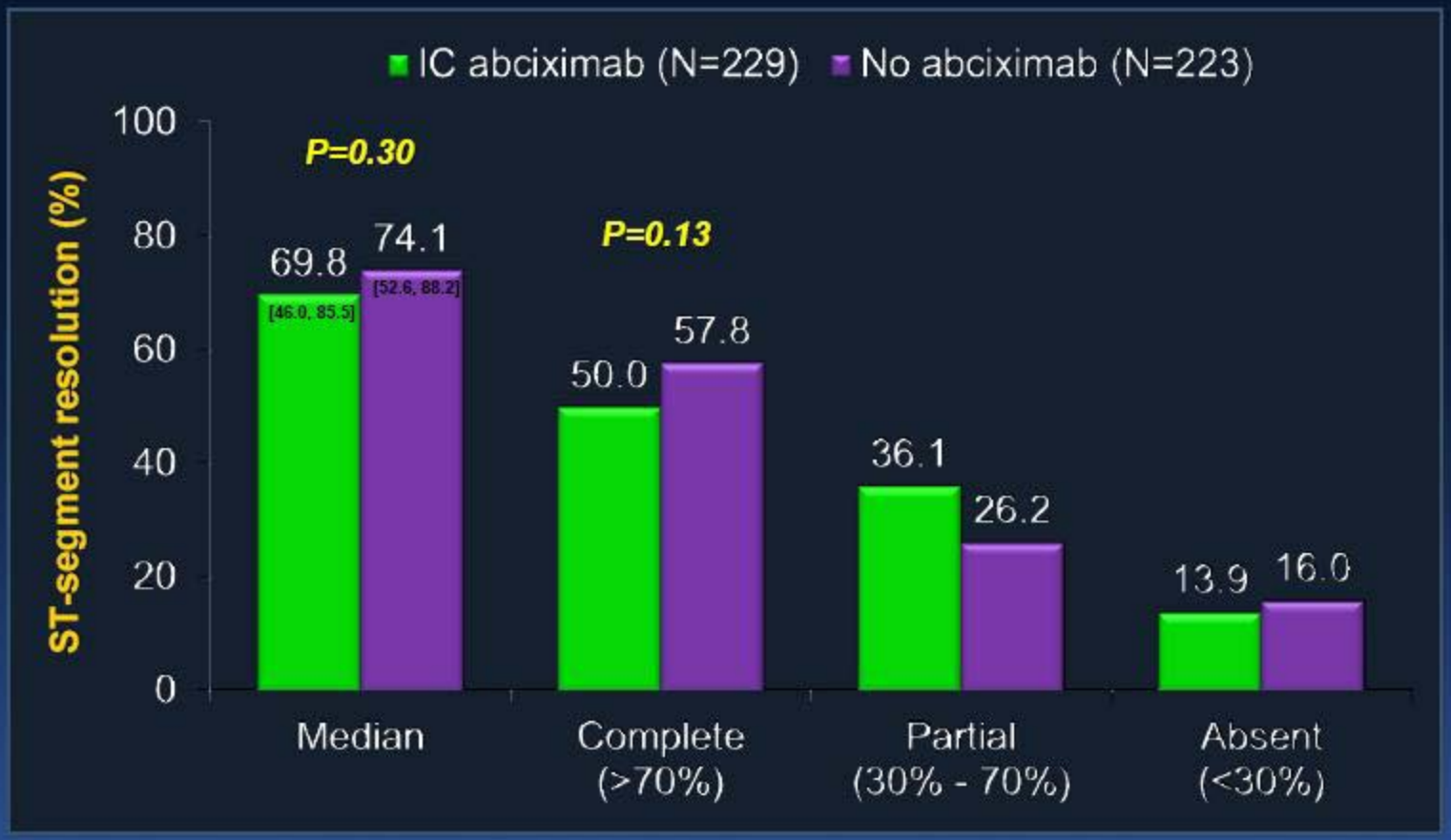
INFUSE-AMI: STR 60 minutes post-PCI*



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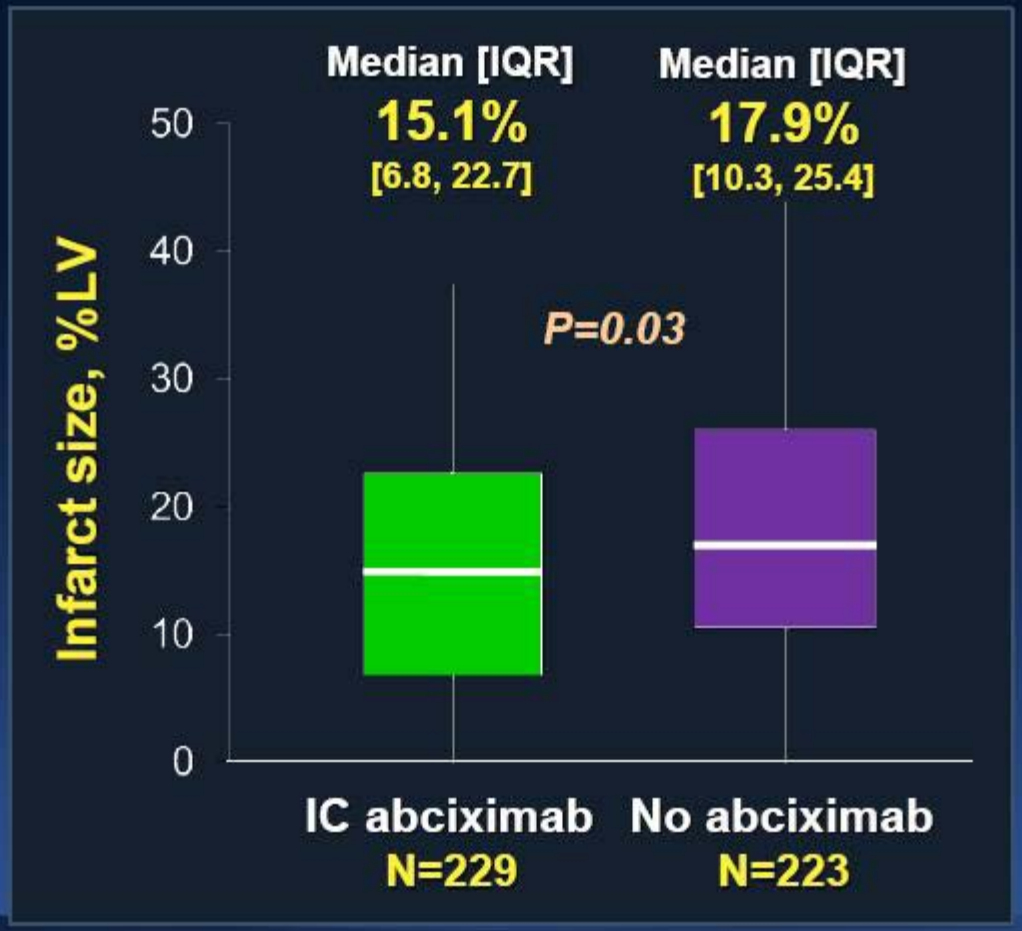
INFUSE-AMI: Infarct size at 30 days*

- Primary endpoint -



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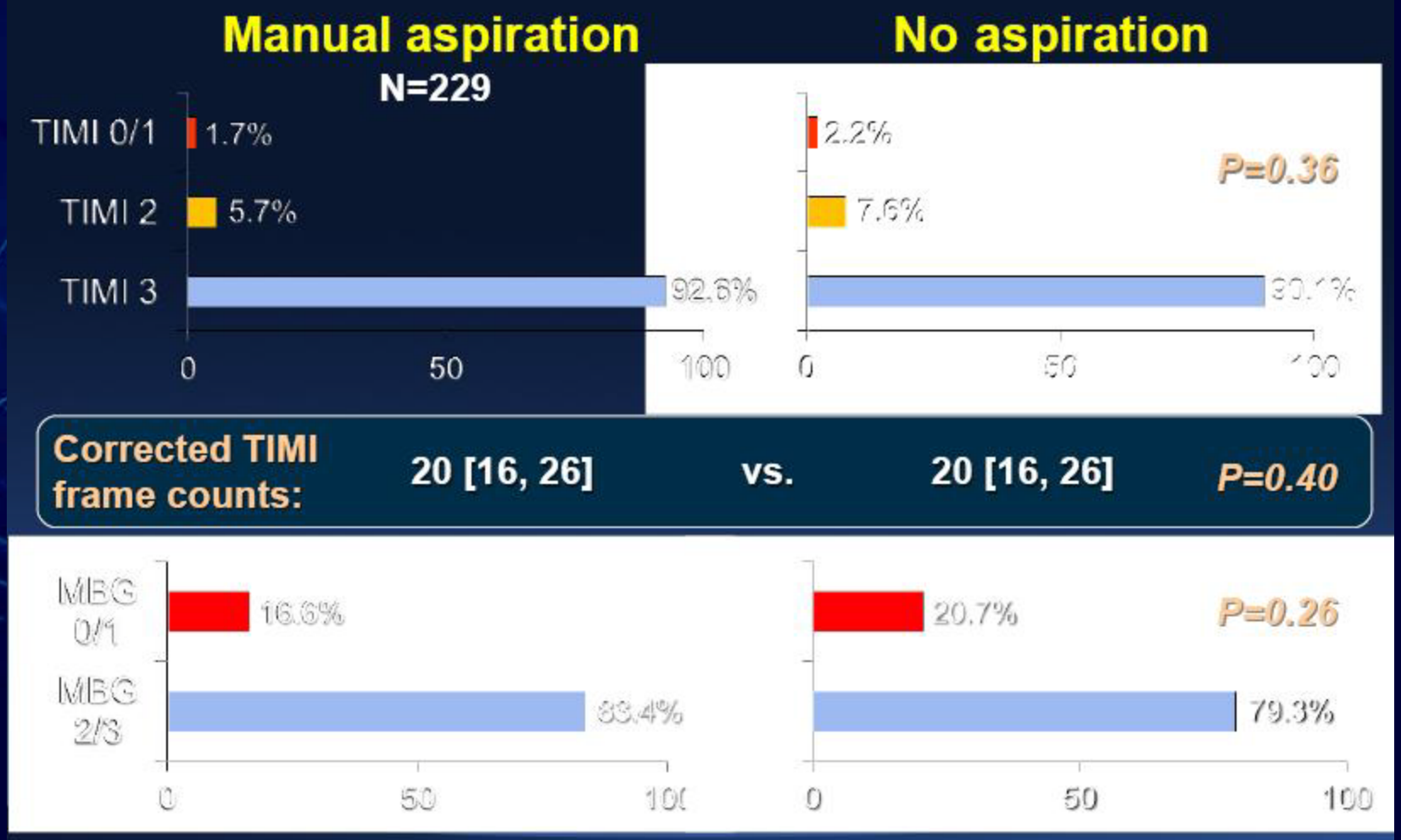
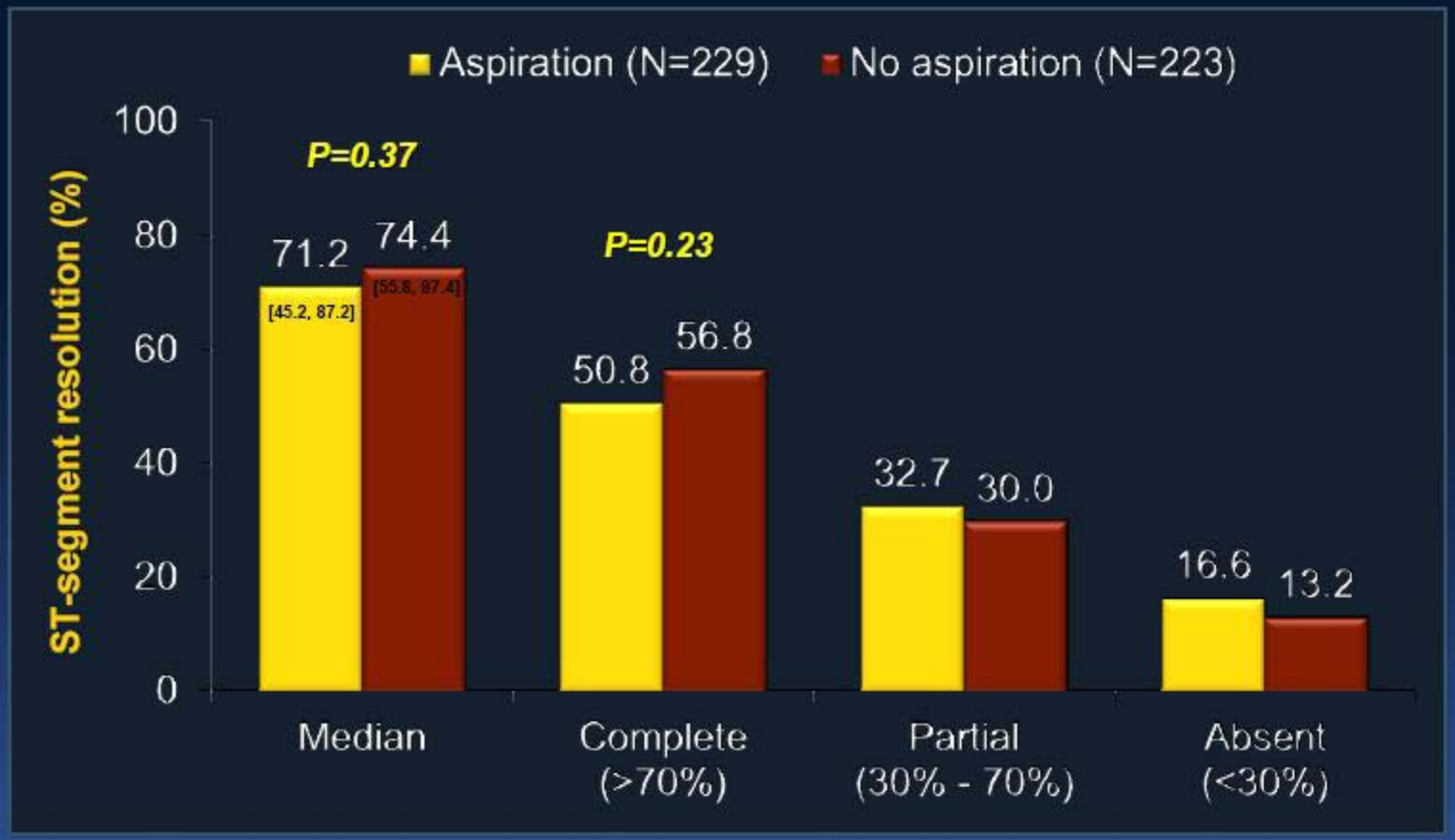
INFUSE-AMI: Reperfusion post-PCI*



INFUSE-AMI: STR 60 minutes post-PCI*



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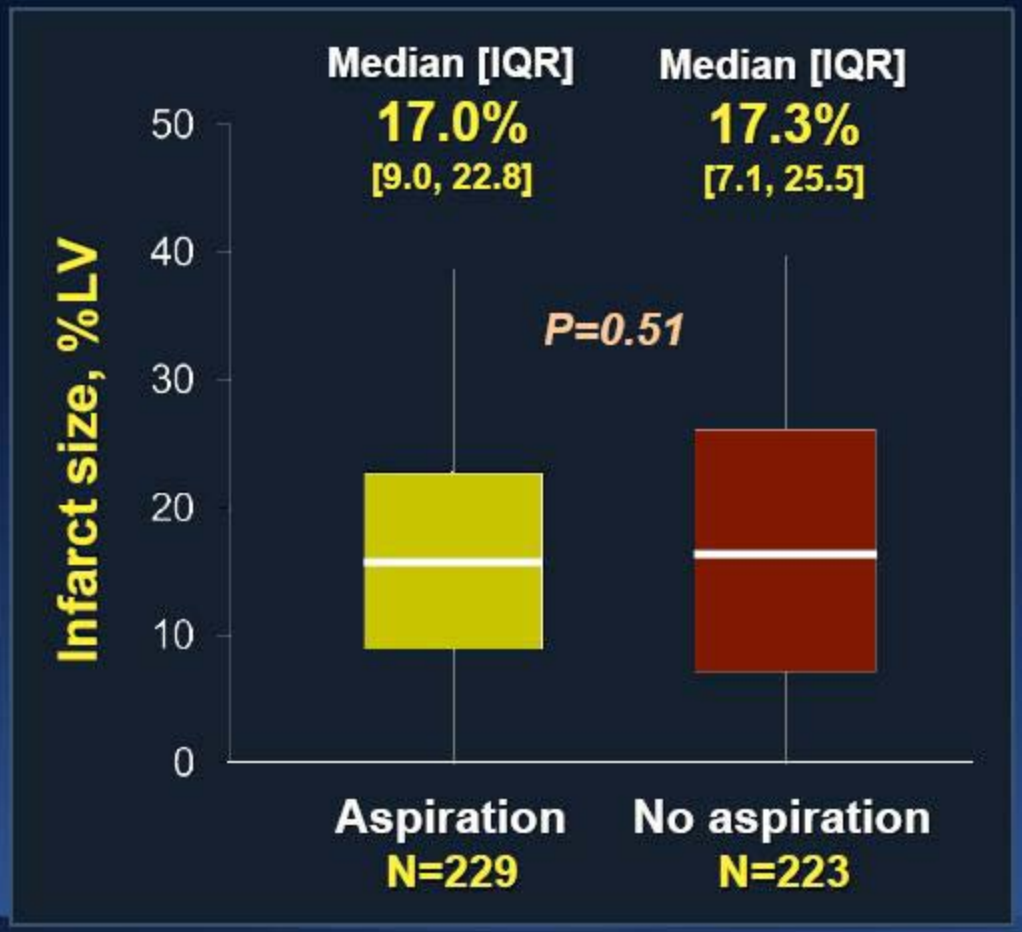
INFUSE-AMI: Infarct size at 30 days*

- Major secondary endpoint -



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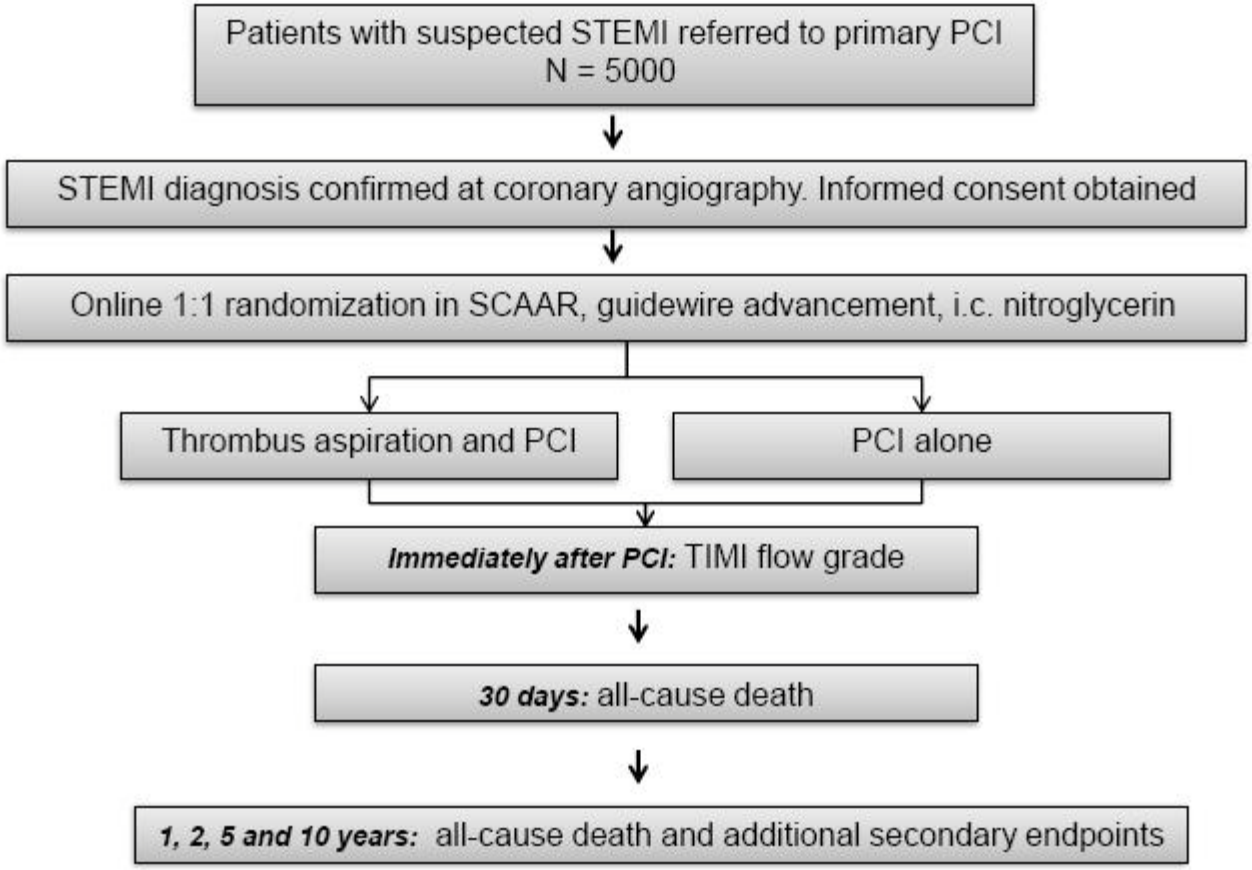
SCAAR SWEDEHEART

TASTE trial flow chart



TOTAL

TOTAL trial Study Design

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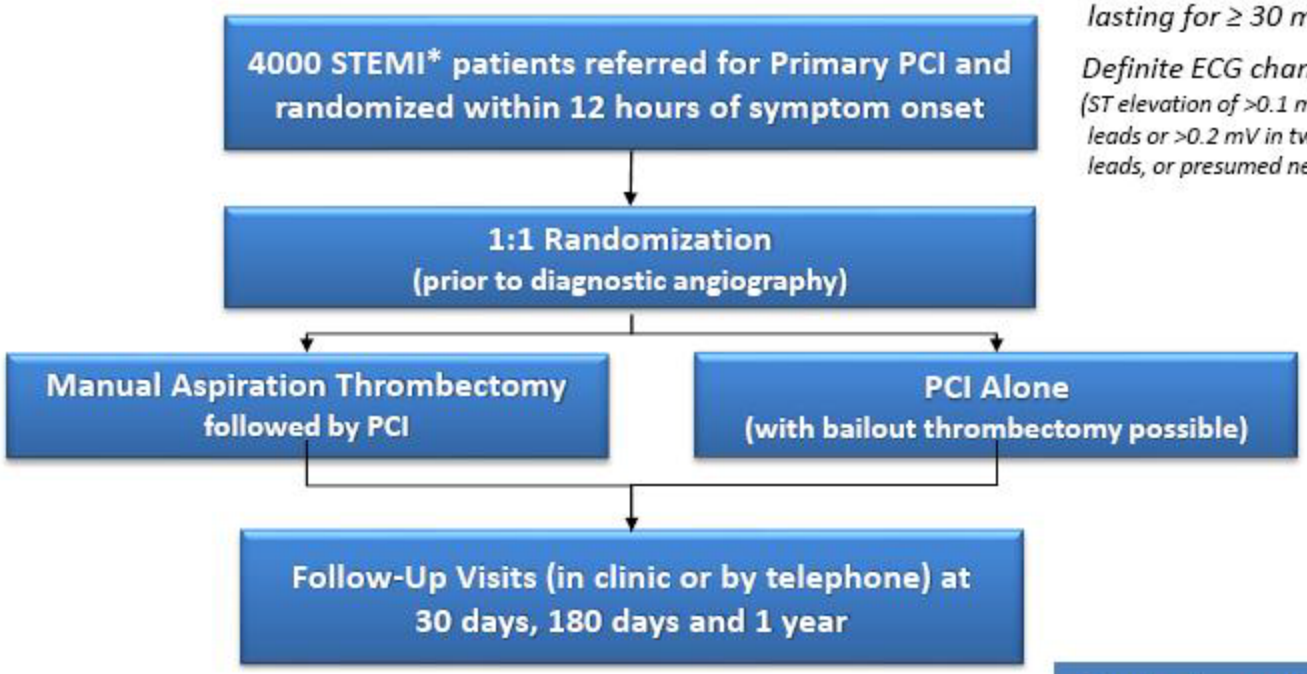

** Symptoms of myocardial ischemia lasting for ≥ 30 min, and*

Definite ECG changes indicating STEMI (ST elevation of >0.1 mV in two contiguous limb leads or >0.2 mV in two contiguous precordial leads, or presumed new left bundle branch block)

Contact email: total @phri.ca

Primary outcome: CV death, recurrent MI, cardiogenic shock and new or worsening NYHA Class IV HF at 180 days

Optimizando la reperfusión tisular
Conclusiones

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- A pesar de las drogas y dispositivos disponibles en la actualidad, existe un significativo porcentaje de pacientes que no alcanzan una reperfusión miocárdica completa, lo cuál se asocia con una peor evolución, y refuerza la necesidad de persistir en la búsqueda de estrategias para optimizar la reperfusión miocárdica tisular.
- Un ensayo clínico dimensionado para evaluar eventos clínicos es necesario para determinar si la reducción del tamaño del IAM con Abciximab IC evidenciado en INFUSE-AMI es clinicamente relevante.
- Los resultados contradictorios respecto al rol de la tromboaspiración manual requiere esperar los resultados de los grandes estudios clínicos actualmente en curso para definir la recomendación de su utilización sistemática en ATC primaria

“MUCHAS GRACIAS”

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