No reflow phenomenon during CHIP PCI

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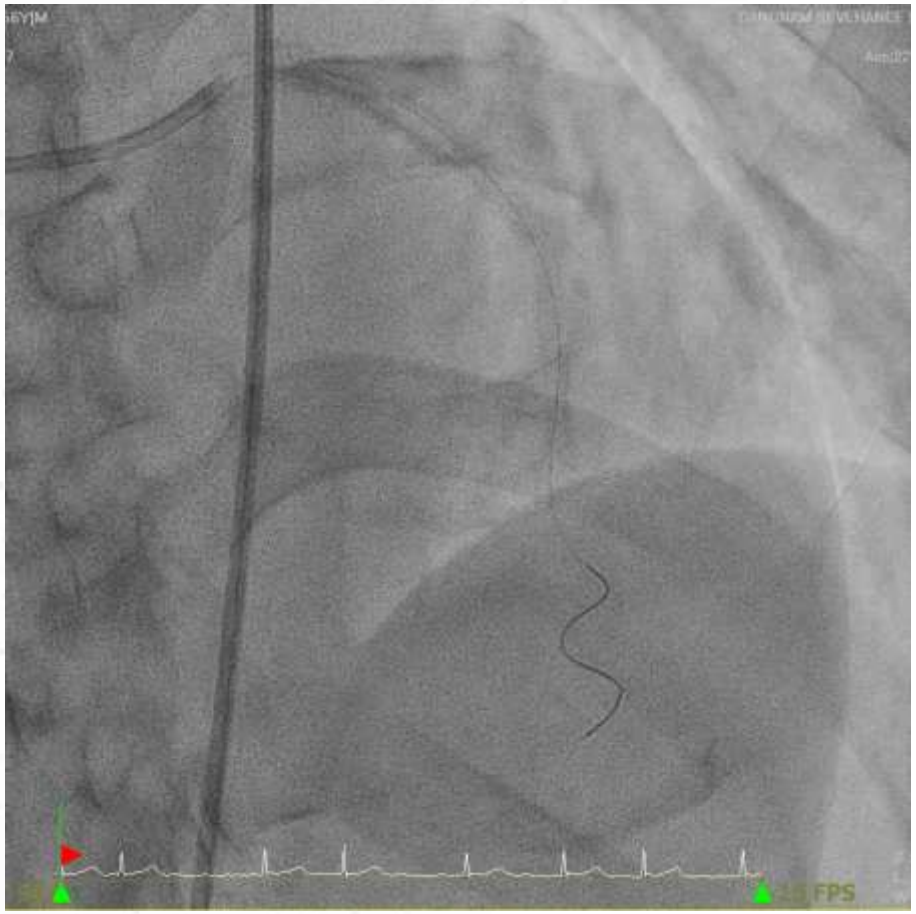
Introduction ; No-reflow



- First decribed in the kidney in 1959, “Renal ischemia with failed reflow”
- Cardiac no-reflow first reported in animal (dog) models of the heart, 1974
- Acute myocardial infarction no-reflow first published 1992

(Ito H et al. circulation. 1992 May;85(5):4699-705.)

No-Reflow

17.2 Definition

The no-reflow phenomenon is defined as inadequate myocardial perfusion through a given segment of the coronary circulation without angiographic evidence of mechanical obstruction [1].

- No reflow, defined as the presense of
  - ✓ (TIMI) flow grade ≤2
  - ✓ (TIMI) flow grade = 3 ,

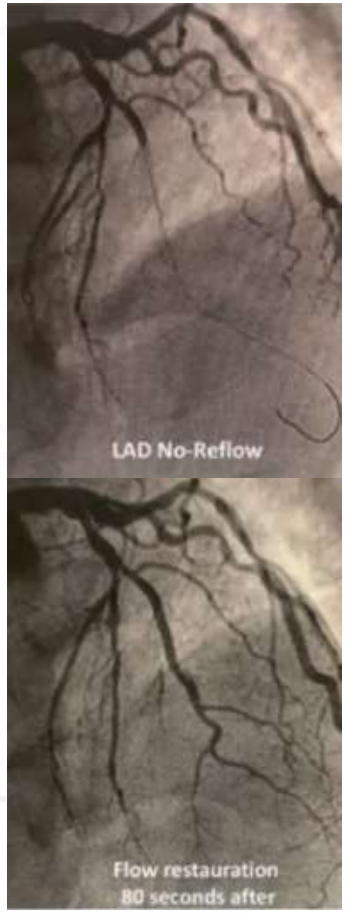
    ,but myocardial blush grade < 3

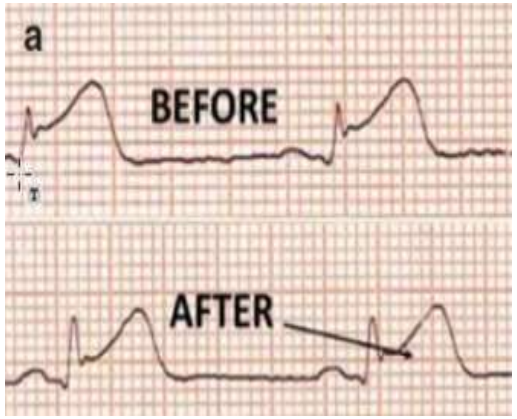
Table 1: Definition for Levels of Myocardial Blush Grade as Seen by Angiography

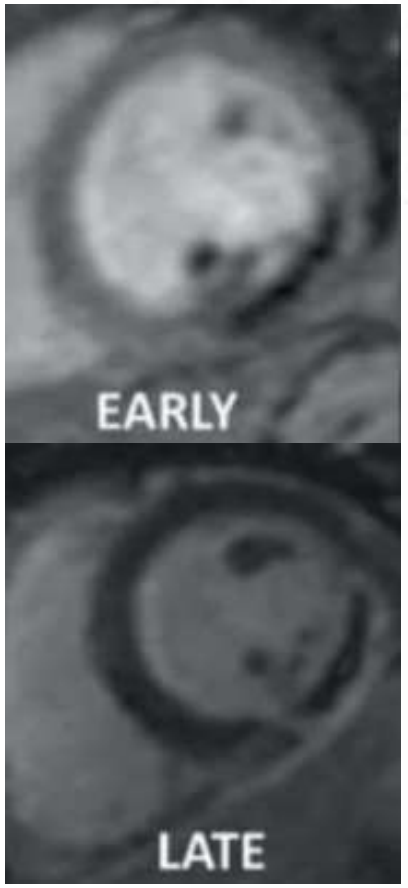
Myocardial Blush Grade	Angiographic Finding
0	Absence of myocardial blush or contrast density
1	Minimal myocardial blush or contrast density
2	Moderate myocardial blush or contrast density but less than that obtained from the ipsilateral non-infarct related coronary artery
3	Normal myocardial blush or contrast density, comparable with that obtained during angiography of a contralateral or ipsilateral non-infarct-related artery

Diagnosis ; *No reflow*

In the cath lab	In the CCU	Pre-discharge
Angiography	Electrocardiogram	Cardiac MRI

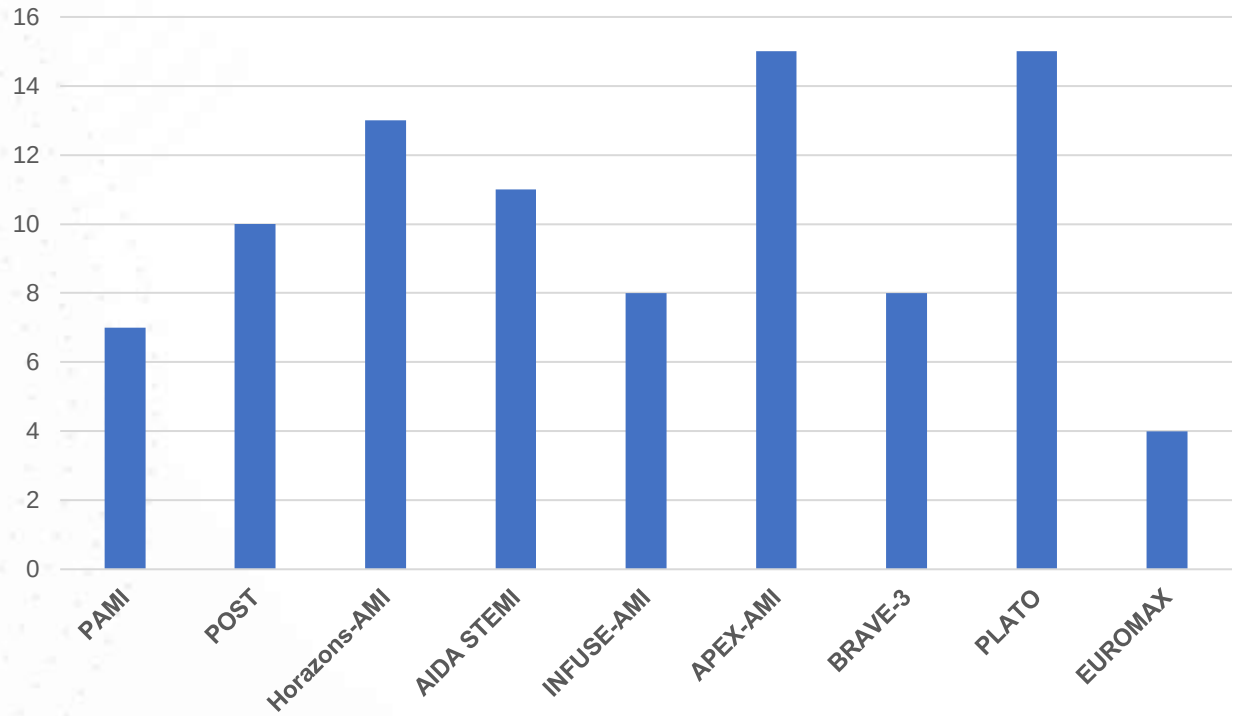




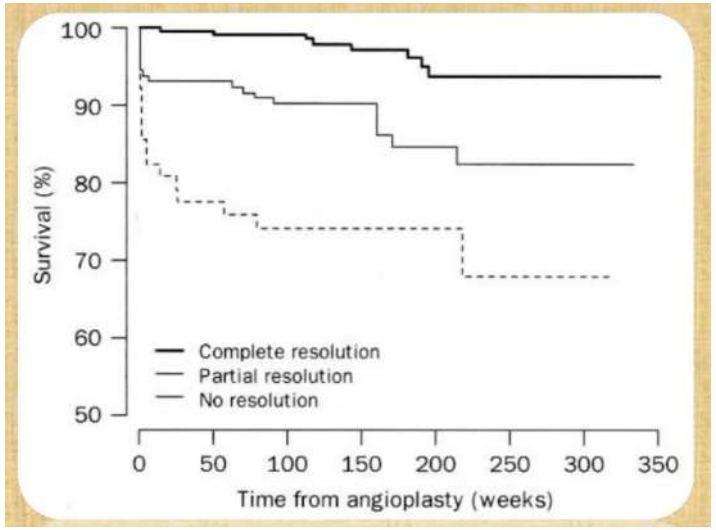


Incidence ; *No-reflow*

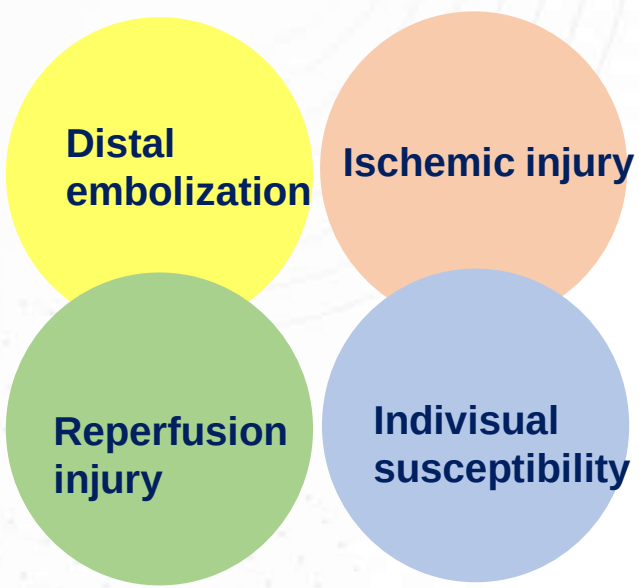
- PCI case : 0.6 to 3.2(%)
- Primary PCI : 8.8 to 11.5(%)
  - ✓ STEMI : 4~15(%)
- Rotational atherectomy up to 16(%)

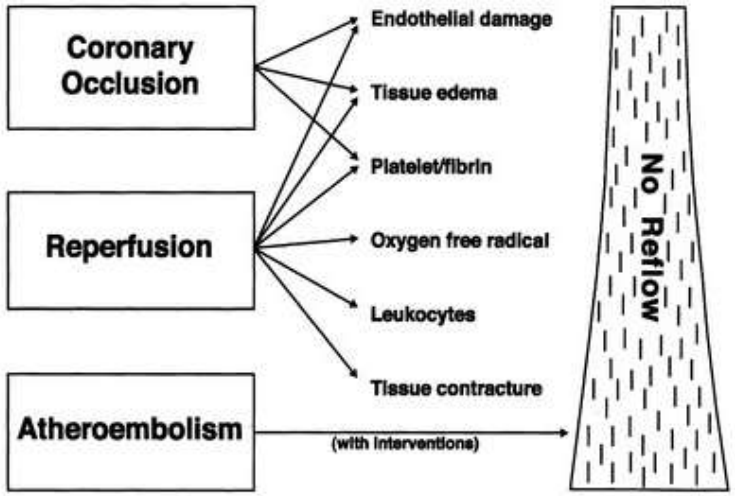


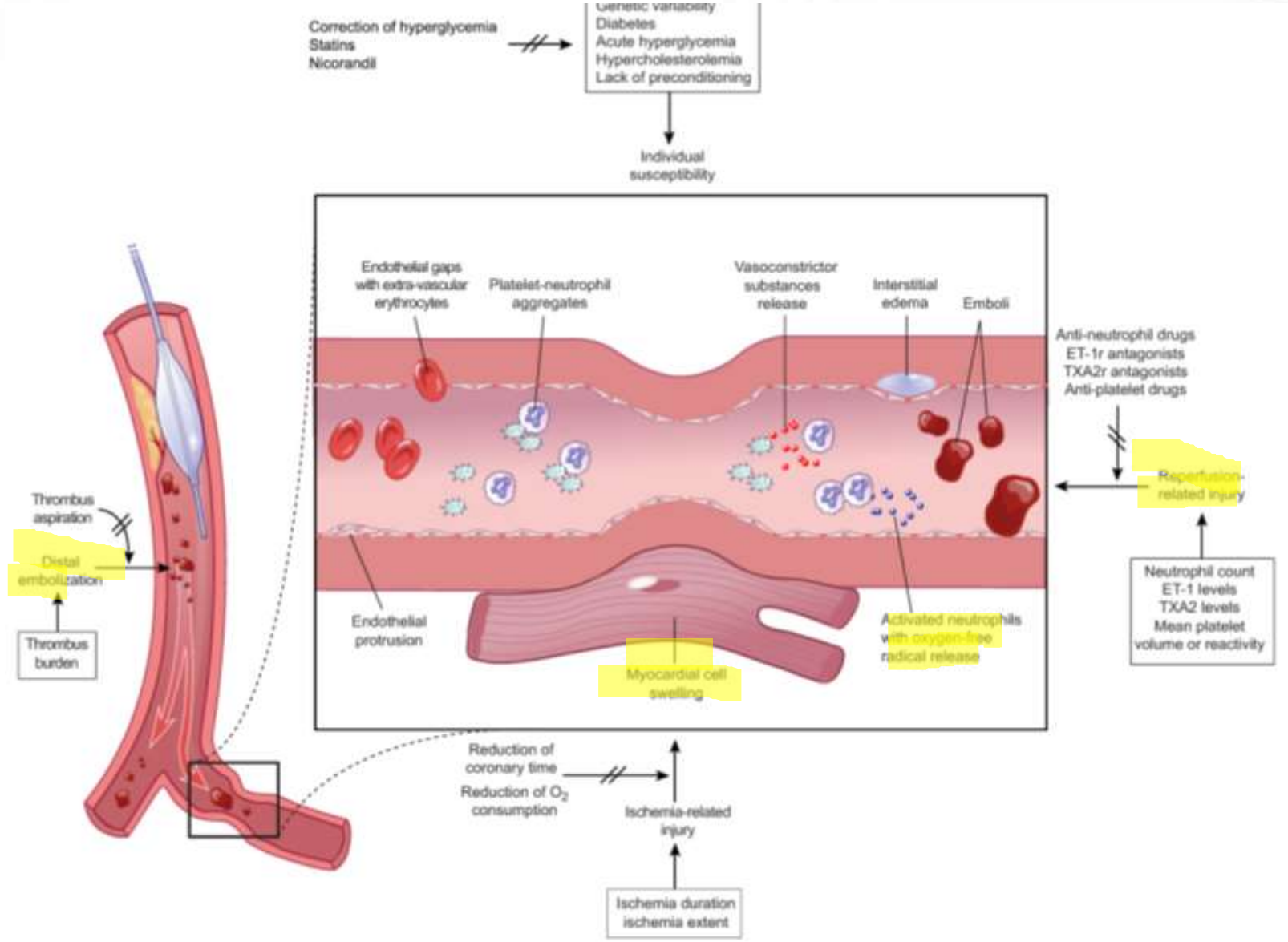
Jaffe et al. MVO and Mechanisms. Circualtion 2008.
Jaffe et al. Prevention and treatment of no reflow. JACC 2010.



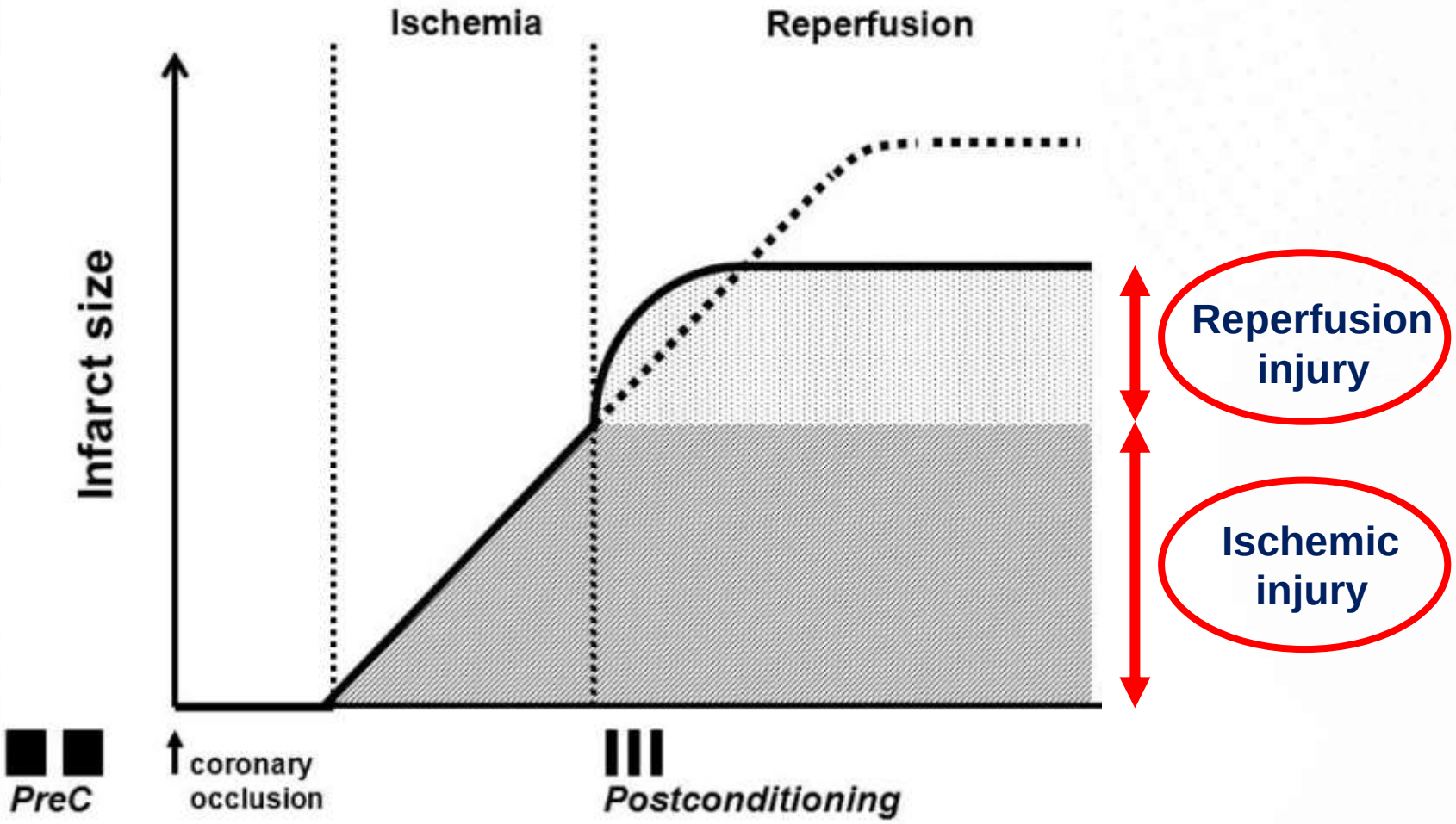
Pathophysiological Mechanisms







Infarction; a two-component damage

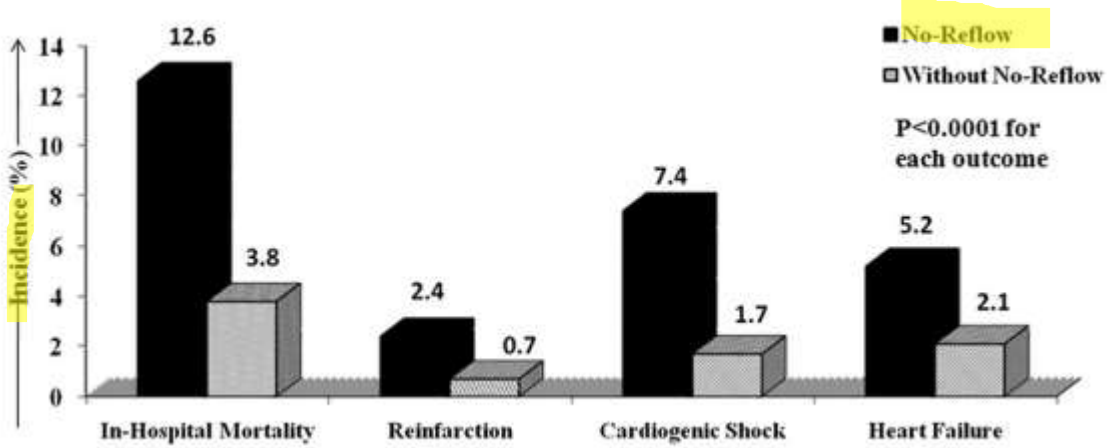


Predictors of No-reflow

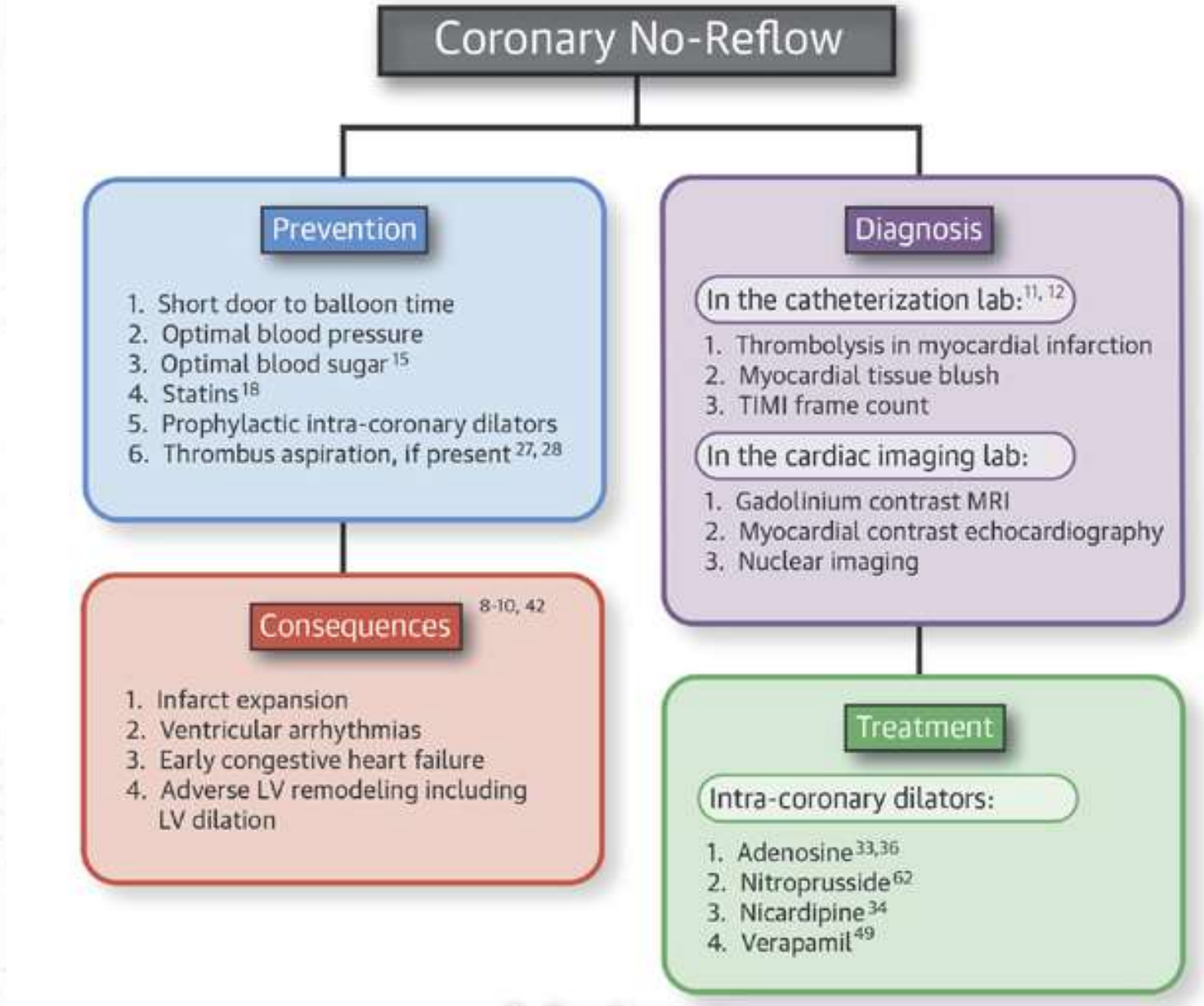
- female sex
- age > 65
- hypertension, diabetes, hyperlipidemia
- CHADS2-VASc score ≥ 3
- delayed presentation to the cath lab for STEMI patients

  : mild to moderate renal insufficiency, and increased inflammatory markers.
- Angiographic risk factors include high thrombus burden, plaque composition reperfusion time > 6 hours
- SVG PCI, and lesions longer than 15 mm.

Consequences of No-reflow



Variable	STEMI (n = 182,467)			Non–STEMI (n = 108,913)		
	No-reflow			No-reflow		
	Yes (n = 4,895)	No (n = 177,572)	p Value	Yes (n = 1,058)	No (n = 107,255)	p Value
Mortality	15%	5%	<0.0001	7%	2%	<0.0001
Myocardial infarction	2%	1%	<0.0001	4%	1%	<0.0001
Cardiogenic shock	9%	2%	<0.0001	5%	1%	<0.0001
Heart failure	6%	3%	<0.0001	3%	1%	<0.0001
Stroke	1%	0.5%	<0.0001	0.9%	0.3%	0.0004


Coronary No-Reflow
Prevention
1. Short door to balloon time
2. Optimal blood pressure
3. Optimal blood sugar [15]
4. Statins [18]
5. Prophylactic intra-coronary dilators
6. Thrombus aspiration, if present [27, 28]
Consequences [8-10, 42]
1. Infarct expansion
2. Ventricular arrhythmias
3. Early congestive heart failure
4. Adverse LV remodeling including LV dilation
Diagnosis
In the catheterization lab: [11, 12]
1. Thrombolysis in myocardial infarction
2. Myocardial tissue blush
3. TIMI frame count
In the cardiac imaging lab:
1. Gadolinium contrast MRI
2. Myocardial contrast echocardiography
3. Nuclear imaging
Treatment
Intra-coronary dilators:
1. Adenosine [33,36]
2. Nitroprusside [62]
3. Nicardipine [34]
4. Verapamil [49]

Prevention – before the procedure

1. Diabetes :

- Optimal blood sugar control before the procedure

2. Hypertension :

- control of Hypertension : animal studies suggest HTN maybe associated with increase risk of no-reflow

3. Hyperlipidemia : STATIN

- Reduction by 4.2% (meta analysis)
- Probably by the pleotronic effects (platelet adhesion inhibition and thrombosis, improvement of endotherial function)

Prevention – During the procedure

Drug	Mechanism of action	Dose
Nitroprisside	• Relaxes vascular smooth muscle of arteries and veins • Decreases venous return Preload /LVEDP & afterload • Hypotension. Dose as much as BP permit	• 50~200μg Intra coronary • 70μg/kg per min Intra Venous
Adenosine	• Endogenous, short acting, antiplatelet effect • Potent arterial smooth muscle vasodilator • Conduction AV block	• 50~200μg Intra coronary
verapamil	• Relieve small vessel spasm • improve Ca(2+) homepstasis in ischemic myocardium	• 100~250μg Intra coronary
nicorandil	• Relieve small vessel spasm • Reduce Ca(2+) overload and neutrophil activation	• 1.67μg/kg per min Intra Venous
Abciximab	• Improve TIMI flow decrease thrombus bueden. • Risk : Bleeding	

Nitroprusside

- Relaxes vascular smooth muscle of arteries and veins
- Decreases venous return Preload /LVEDP & afterload
- Hypotension. Dose as much as BP permit

Intracoronary nitroprusside for the prevention of the no-reflow phenomenon after primary percutaneous coronary intervention in acute myocardial infarction. A randomized, double-blind, placebo-controlled clinical trial

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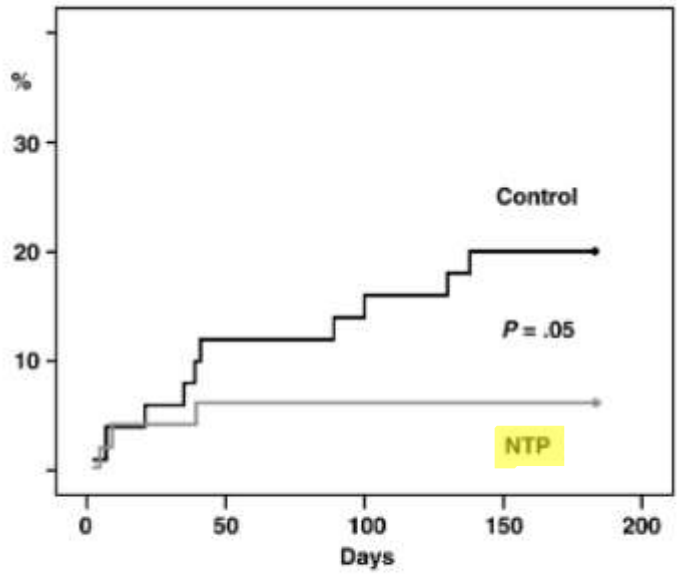
Beer-Sheva, Petach-Tikva, and Jerusalem, Israel

Background The aim of this study was to test whether nitroprusside (NTP) injected intracoronary immediately before primary angioplasty for acute ST-elevation acute myocardial infarction (STEMI) prevents no-reflow and improves vessel flow and myocardial perfusion.

Methods Ninety-eight patients presenting with STEMI were evenly randomized to receive either NTP (60 μg) or placebo. The drug was selectively injected into the infarct-related artery, distal to the occlusion, in a double-blind manner. The primary end points were postintervention angiographic corrected thrombolysis in myocardial infarction frame count and the proportion of patients with complete (>70%) ST-segment elevation resolution. Secondary end points included myocardial blush score and clinical outcome at 6 months follow-up.

Results Mean (±SD) age was 62 (±12) years, and 87% were men. Baseline characteristics (excluding sex) did not differ between groups. The corrected thrombolysis in myocardial infarction frame count after angioplasty was 20.8 (±18.6) and 20.3 (±21.3) in patients given NTP and placebo, respectively ($P = .78$). Complete ST-segment resolution was achieved in 61.7% and 61.2% of NTP and placebo subjects, respectively ($P = .96$). The distribution of myocardial blush score did not differ between groups. At 6 months, the rate of target lesion revascularization, myocardial infarction, or death occurred in 6.3% of the NTP group and 20.0% of the placebo group ($P = .05$).

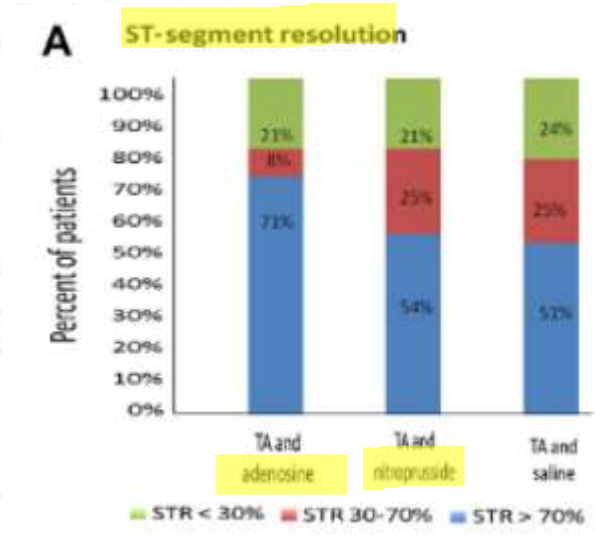
Conclusions In patients with STEMI, selective intracoronary administration of a fixed dose of NTP failed to improve coronary flow and myocardial tissue reperfusion but improved clinical outcomes at 6 months. (Am Heart J 2006;152:887.e9-887.e14.)



Kaplan-Meier curves of the cumulative percentage of the first event of target vessel revascularization, MI, or death.

Adenosine ; REOPEN AMI Trial

- Endogenous, short acting
- Vasodilator + antiplatelet effect
- Potent arterial smooth muscle vasodilator
- Conduction AV block



Open-Label, Randomized, Placebo-Controlled Evaluation of Intracoronary Adenosine or Nitroprusside After Thrombus Aspiration During Primary Percutaneous Coronary Intervention for the Prevention of Microvascular Obstruction in Acute Myocardial Infarction

The REOPEN-AMI Study (Intracoronary Nitroprusside Versus Adenosine in Acute Myocardial Infarction)

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Rome, Forlì, Ferrara, Milan, and Pisa, Italy

Objectives This study sought to assess whether intracoronary adenosine or nitroprusside following thrombus aspiration (TA) is superior to TA alone for the prevention of microvascular obstruction (MVO) in ST-segment elevation myocardial infarction (STEMI) patients undergoing percutaneous coronary intervention (PCI).

Background MVO, due to its multifactorial pathogenesis, still occurs after TA in a sizeable portion of patients.

Verapamil

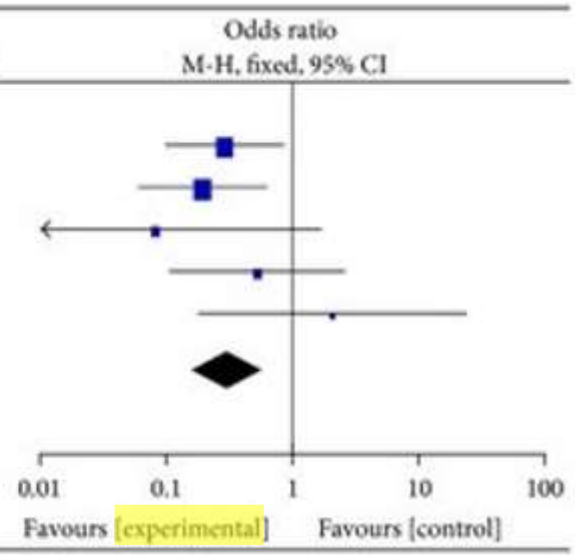
- Calcium channel blocker, smooth muscle dilator
- Relieve small vessel spasm
- improve Ca(2+) homepstasis in ischemic myocardium
- Not able to demonstrate clinical benefit

Short-Term Effects of Verapamil and Diltiazem in the Treatment of No Reflow Phenomenon: A Meta-Analysis of Randomized Controlled Trials

Study or subgroup	Experimental Events	Experimental Total	Control Events	Control Total	Weight	Odds ratio M-H, fixed, 95% CI
Hendler et al. 2006	0	10	0	10		Not estimable
Huang et al. diltiazem 2012	7	34	16	34	35.4%	0.29 [0.10, 0.85]
Huang et al. verapamil 2012	5	34	16	34	38.0%	0.19 [0.06, 0.62]
Akturk et al. 2014	11	15	15	15	12.1%	0.08 [0.00, 1.69]
Taniyama et al. 1997	3	20	5	20	11.8%	0.53 [0.11, 2.60]
Vijayalakshmi et al. 2006	2	49	1	50	2.6%	2.09 [0.18, 23.77]
Total (95% CI)		**162**		**163**	**100.0%**	**0.30 [0.16, 0.57]**
Total events	28		53			

Heterogeneity: $\chi^2 = 4.17$, df = 4 ($P = 0.38$); $I^2 = 4\%$

Test for overall effect: $Z = 3.67$ ($P = 0.0002$)



GP IIb/IIIa inhibitors : Abciximab

- Mechanism : inhibit platelet aggregation
- Improve TIMI flow decrease thrombus burden.
- The potential benefit observed with intracoronary abciximab in DM patients but requires further studies

✓ Risk : Bleeding

Intacoronary vs Intravenous

Intracoronary versus intravenous bolus abciximab during primary percutaneous coronary intervention in patients with acute ST-elevation myocardial infarction: a randomised trial

Holger Thiele, Jochen Wöhrle, Rainer Hambrecht, Harald Rittger, Ralf Birkemeyer, Bernward Lauer, Petra Neuhaus, Oana Brosteanu, Peter Sick, Marcus Wiemer, Sebastian Kerber, Klaus Kleinertz, Ingo Eitel, Steffen Desch, Gerhard Schuler**

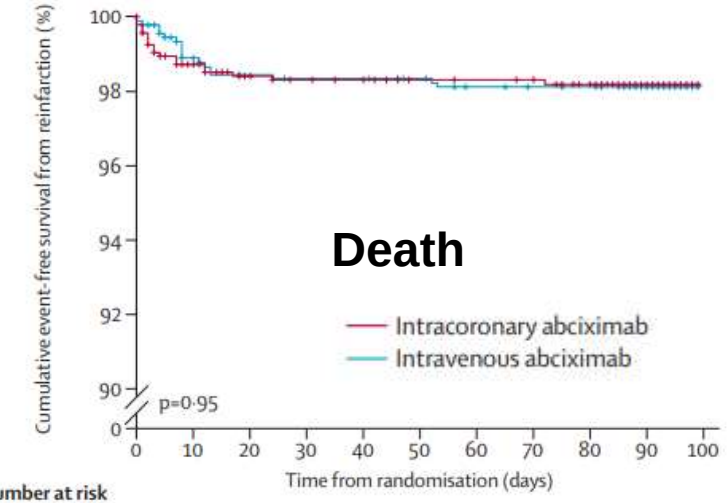
Summary

Background Intracoronary administration of an abciximab bolus during a primary percutaneous coronary intervention results in a high local drug concentration, improved perfusion, and reduction of infarct size compared with intravenous bolus application. However, the safety and efficacy of intracoronary versus standard intravenous bolus application in patients with ST-elevation myocardial infarction (STEMI) undergoing this intervention has not been tested in a large-scale clinical trial.

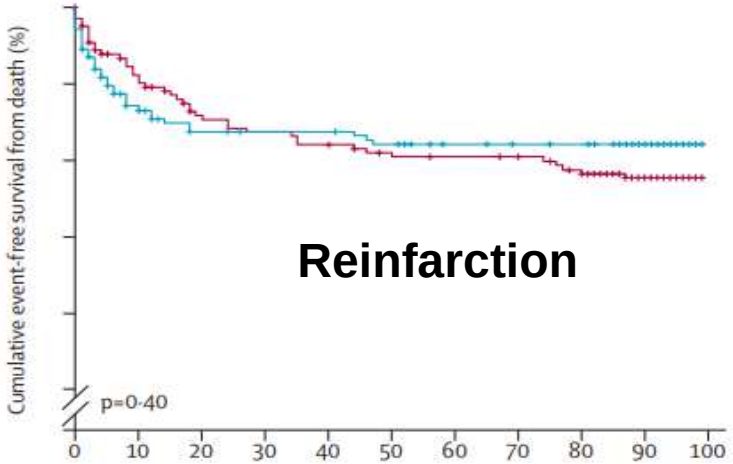
Lancet 2012; 379: 923–31

Published Online February 21, 2012 DOI:10.1016/S0140-6736(11)61872-2

See Comment page 875



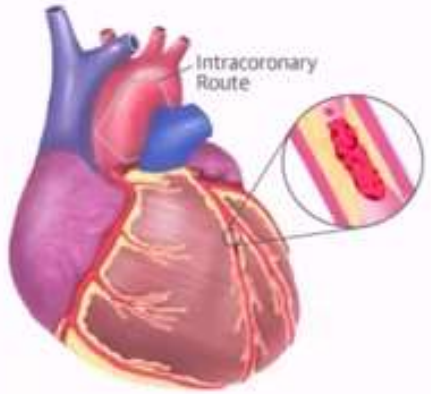
Number at risk				
Intracoronary abciximab	1032	896	887	860
Intravenous abciximab	1033	877	869	852



	1032	897	887	860
	1033	878	869	852

Infusion ; Inta-coronary Route

Proximal



Guiding catheter

- Inexpensive
- Less selective
- Systemic effects

Intralesional

Perforated balloon Catheter

- Additional cost
- Cotrolled and targeted drug delivery

Distal

Microcatheter

- Thrombectomy devices
- Infusion in microcircuratory bed

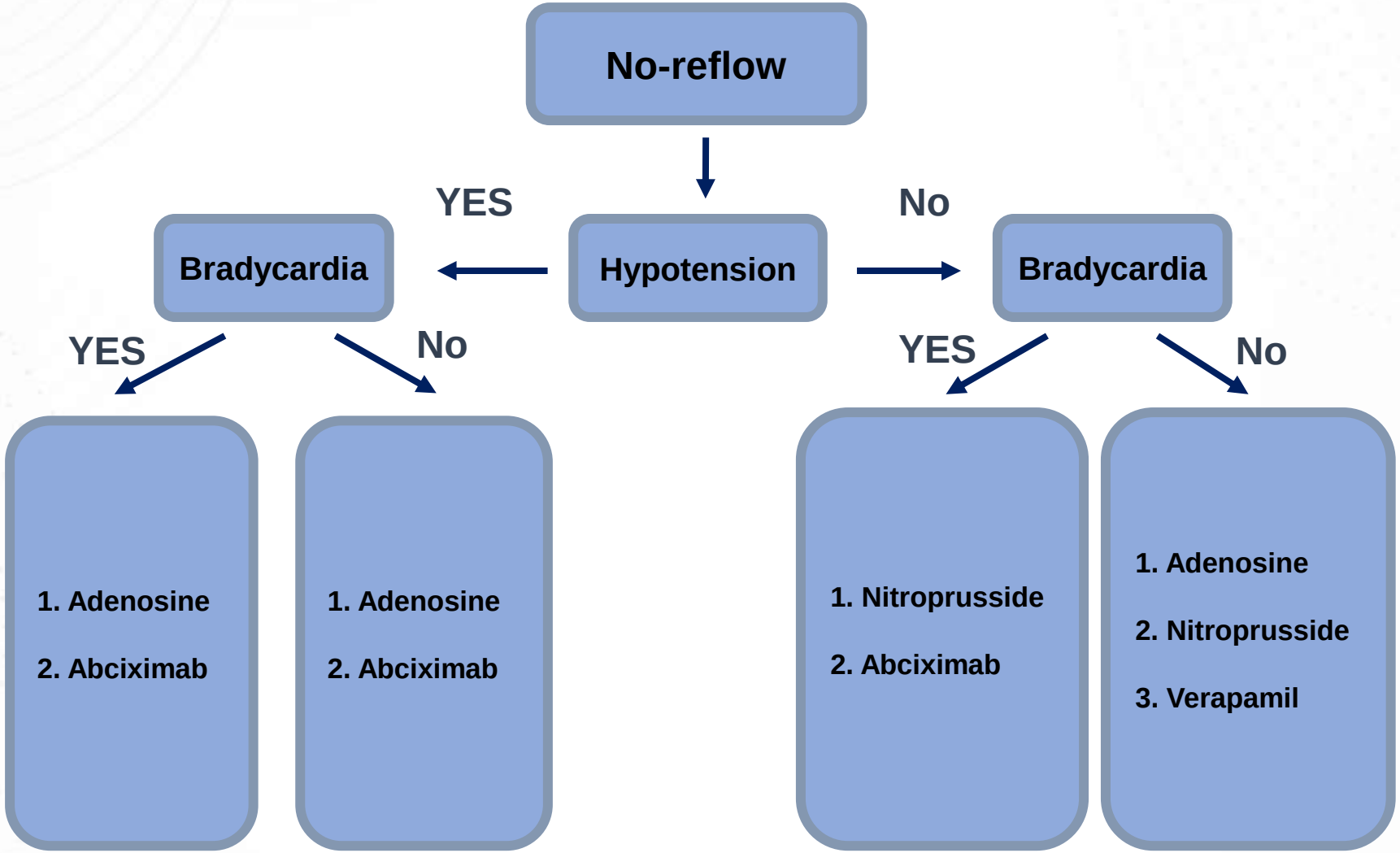
2020 ESC Guidelines for the management of acute coronary syndromes in patients presenting without persistent ST-segment elevation

GP IIb/IIIa antagonists should be considered for bail-out if there is evidence of no-reflow or a thrombotic complication.	IIa	C

Main drugs treatment of No-Reflow

Medication	Dosage	Side Effects
Adenosine	Intravenous: 70 μg/kg/min infusion Intracoronary: 100–200 μg bolus	Bradycardia, hypotension, chest pain, dyspnea
Sodium Nitroprusside	Intracoronary: 60–100 μg bolus	Bradycardia and hypotension
Verapamil	Intracoronary: 100–500 μg bolus (max 1 mg)	Bradycardia, transient heart block
Diltiazem	Intracoronary: 400 μg bolus (max 5 mg)	Bradycardia, hypotension
Nicardipine	Intracoronary: 200 μg (max 1 mg)	Bradycardia, hypotension
Epinephrine	Intracoronary: 80–100 μg bolus	Malignant arrhythmias
Nicorandil	500 μg (max: 5 mg)	Malignant arrhythmias
Streptokinase	250 kU over 3 min	Bleeding
Tenecteplase	5 mg (max: 25 mg)	Bleeding
Tissue plasminogen activator (tPA)	0.025–0.5 mg/kg/h	Bleeding
Abciximab	0.25 mg/kg bolus, then 0.125 μg/kg/min (max 10 μg/min) infusion for 12 h	Bleeding
Eptifibatide	180 μg/kg bolus, then further 180 μg/kg bolus 10 min later, then 2 μg/kg/min infusion for up to 18 h. If CrCl < 50 mL/min, reduce infusion by 50%	Bleeding
Tirofiban	25 μg/kg over 3 min, then 0.15 μg/kg/min infusion for up to 18 h If CrCl < 30 mL/min, reduce infusion by 50%	Bleeding

Algorithm of management and treatment of the no-reflow phenomenon

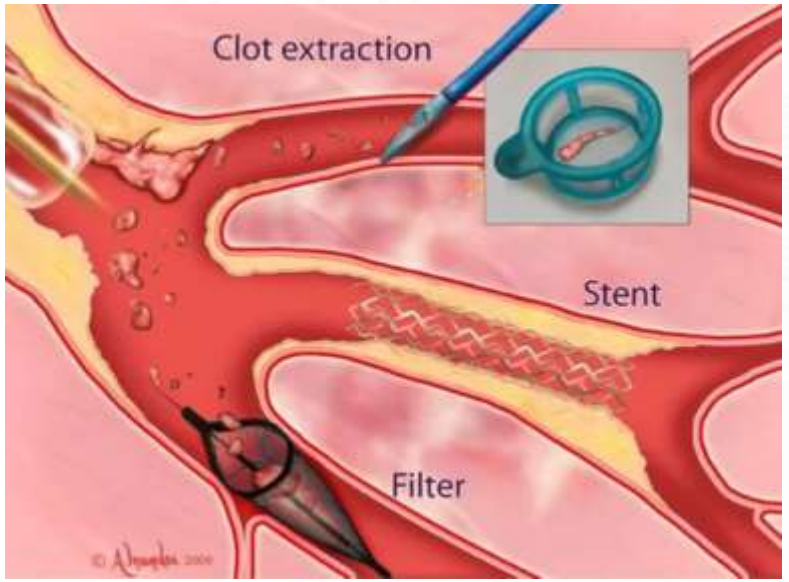


Prevention – During the procedure

✓ **Adjunctive strategies**

- **Mechanical intervention**
  1. **Thrombus aspiration**
  2. **Distal Protection device**
  3. **Direct stenting vs Defferred stenting**

     (% Avoid high pressure stenting / post dilation)
  4. **Hemodynamic support**



1. Thrombus aspiration

The NEW ENGLAND JOURNAL of MEDICINE

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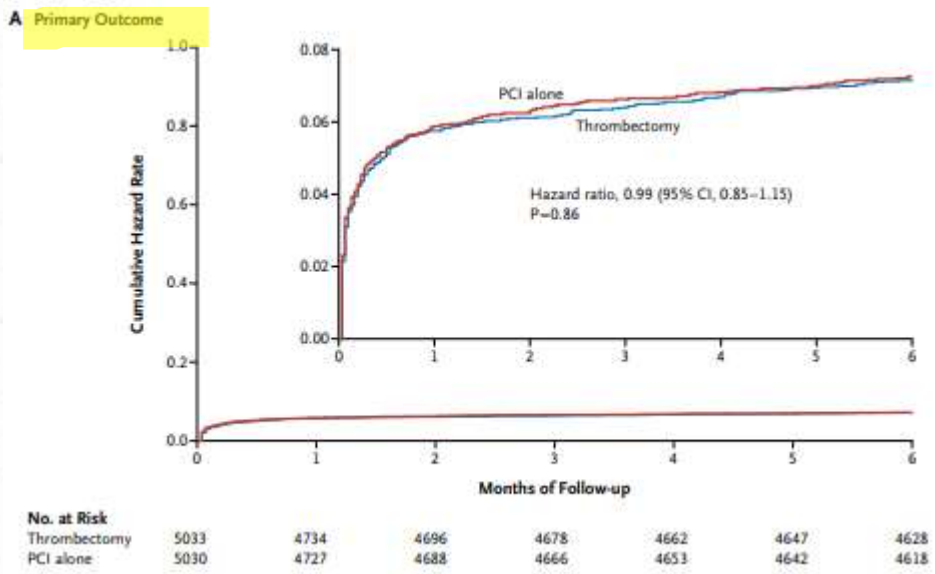
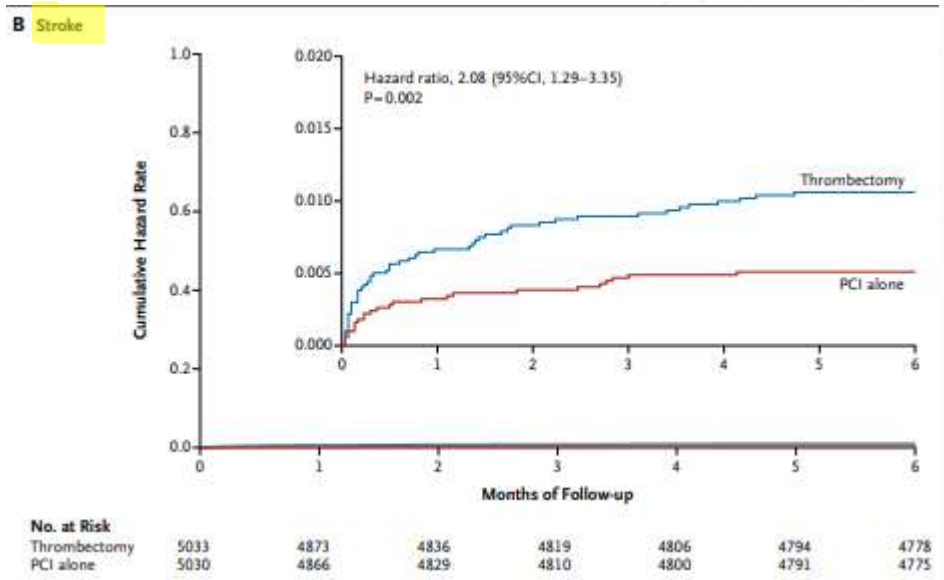
Randomized Trial of Primary PCI with or without Routine Manual Thrombectomy

S.S. Jolly, J.A. Cairns, S. Yusuf, B. Meeks, J. Pogue, M.J. Rokoss, S. Kedev, L. Thabane, G. Stankovic, R. Moreno, A. Gershlick, S. Chowdhary, S. Lavi, K. Niemelä, P.G. Steg, I. Bernat, Y. Xu, W.J. Cantor, C.B. Overgaard, C.K. Naber, A.N. Cheema, R.C. Welsh, O.F. Bertrand, A. Avezum, R. Bhindi, S. Pancholy, S.V. Rao, M.K. Natarajan, J.M. ten Berg, O. Shestakovska, P. Gao, P. Widimsky, and V. Džavík, for the TOTAL Investigators*

Primary PCI with or Without Manual Thrombectomy





1. Thrombus aspiration

FOCUSED UPDATE

2015 ACC/AHA/SCAI Focused Update on Primary Percutaneous Coronary Intervention for Patients With ST-Elevation Myocardial Infarction

Manual aspiration

Thrombectomy

2011/2013 Recommendation	2015 Focused Update Recommendations	Comments
Class IIa	Class IIb	
Manual aspiration thrombectomy is reasonable for patients undergoing primary PCI. (Level of Evidence: B)	The usefulness of selective and bailout aspiration thrombectomy in patients undergoing primary PCI is not well established. (Level of Evidence: C-LD)	Modified recommendation (Class changed from "IIa" to "IIb" for selective and bailout aspiration thrombectomy before PCI).
	Class III: No Benefit Routine aspiration thrombectomy before primary PCI is not useful (Level of Evidence: A)	New recommendation ("Class III: No Benefit" added for routine aspiration thrombectomy before PCI).

Circulation
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https://doi.org/10.1161/CIR.0000000000001038

ACC/AHA/SCAI CLINICAL PRACTICE GUIDELINE

2021 ACC/AHA/SCAI Guideline for Coronary Artery Revascularization: A Report of the American College of Cardiology/American Heart Association Joint Committee on Clinical Practice Guidelines

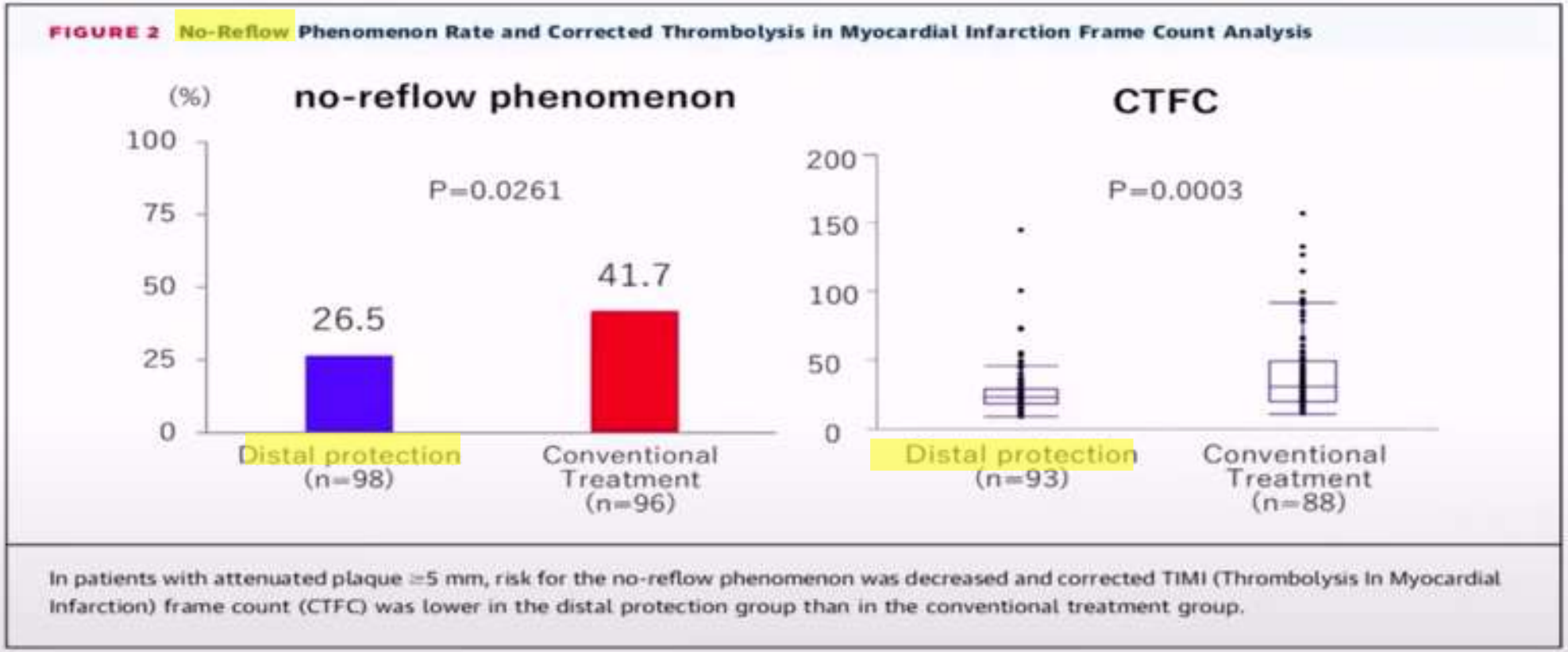
10.4. Thrombectomy

Recommendation for Thrombectomy
Referenced studies that support the recommendation are summarized in Online Data Supplement 26.

COR	LOE	Recommendation
3: No Benefit	A	1. In patients with STEMI, routine aspiration thrombectomy before primary PCI is not useful.[1-5]

Synopsis Many patients with STEMI will have thrombotic occlusion of the infarct artery on the initial angiogram. Therefore, it is natural to consider the use of a device that would decrease thrombus burden to decrease the risk of distal embolization and the no-reflow phenomenon. However, patients in trials with STEMI undergoing primary PCI did not derive any clinical benefit from routine rheolytic thrombectomy.[6,7] Additionally, although the initial studies of aspiration thrombectomy in STEMI demonstrated an improvement in myocardial blush grades and rates of ST-segment–elevation resolution,[8-10] larger studies have not demonstrated improved cardiovascular outcomes with thrombus aspiration.[1-5]

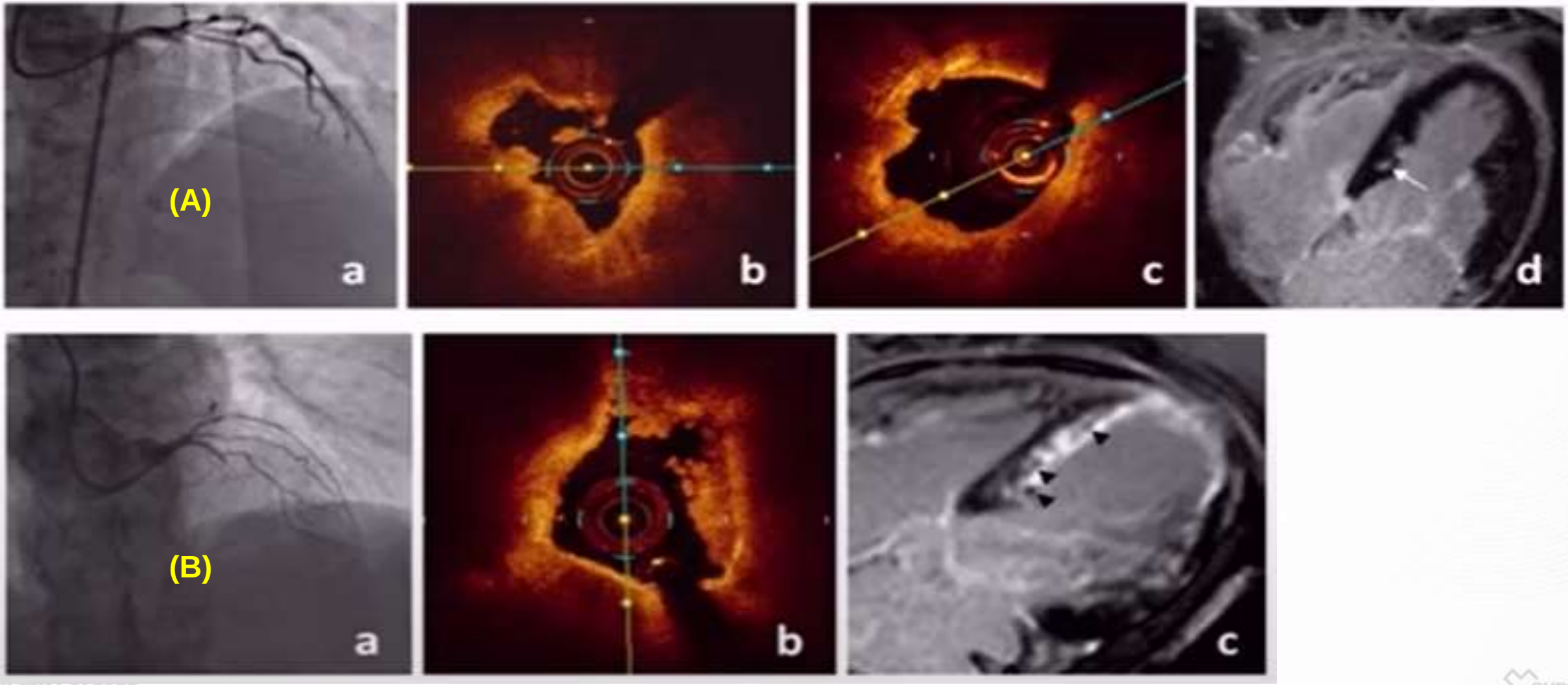
2. Distal Protection in ACS



Filtrap, Nipro, Tokyo, Japan

Hibi et al. J Am Coll Cardiol Intv 2018;11:1545–55)

3. Defferred stenting(A) vs Direct stenting(B)



3. Direct stenting vs Defferred stenting

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A Randomized Trial of Deferred Stenting Versus Immediate Stenting to Prevent No- or Slow-Reflow in Acute ST-Segment Elevation Myocardial Infarction (DEFER-STEMI)

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Objectives The aim of this study was to assess whether deferred stenting might reduce no-reflow and salvage myocardium in primary percutaneous coronary intervention (PCI) for ST-segment elevation myocardial infarction (STEMI).

Background No-reflow is associated with adverse outcomes in STEMI.

Methods This was a prospective, single-center, randomized, controlled, proof-of-concept trial in reperfused STEMI patients with ≥1 risk factors for no-reflow. Randomization was to deferred stenting with an intention-to-stent 4 to 16 h later or conventional treatment with immediate stenting. The primary outcome was the incidence of no-/slow-reflow (Thrombolysis In Myocardial Infarction <2). Cardiac magnetic resonance imaging was performed 2 days and 6 months after myocardial infarction. Myocardial salvage was the final infarct size indexed to the initial area at risk.

Results Of 411 STEMI patients (March 11, 2012 to November 21, 2012), 101 patients (mean age, 60 years; 69% male) were randomized (52 to the deferred stenting group, 49 to the immediate stenting). The median (interquartile range [IQR]) time to the second procedure in the deferred stenting group was 9 h (IQR: 6 to 12 h). Fewer patients in the deferred stenting group had no-/slow-reflow (14 [29%] vs. 3 [6%]; p = 0.006), no reflow (7 [14%] vs. 1 [2%]; p = 0.052) and intraprocedural thrombotic events (16 [33%] vs. 5 [10%]; p = 0.010). Thrombolysis In Myocardial Infarction coronary flow grades at the end of PCI were higher in the deferred stenting group (p = 0.018). Recurrent STEMI occurred in 2 patients in the deferred stenting group before the second procedure. Myocardial salvage index at 6 months was greater in the deferred stenting group (68 [IQR: 54% to 82%] vs. 56 [IQR: 31% to 72%]; p = 0.031).

Conclusions In high-risk STEMI patients, deferred stenting in primary PCI reduced no-reflow and increased myocardial salvage. (Deferred Stent Trial in STEMI; NCT01717573) (J Am Coll Cardiol 2014;63:2088–98) © 2014 by the American College of Cardiology Foundation

Deferred versus conventional stent implantation in patients with ST-segment elevation myocardial infarction (DANAMI 3-DEFER): an open-label, randomised controlled trial

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Summary

Background Despite successful treatment of the culprit artery lesion by primary percutaneous coronary intervention (PCI) with stent implantation, thrombotic embolisation occurs in some cases, which impairs the prognosis of patients with ST-segment elevation myocardial infarction (STEMI). We aimed to assess the clinical outcomes of deferred stent implantation versus standard PCI in patients with STEMI.

Methods We did this open-label, randomised controlled trial at four primary PCI centres in Denmark. Eligible patients (aged >18 years) had acute onset symptoms lasting 12 h or less, and ST-segment elevation of 0·1 mV or more in at least two or more contiguous electrocardiographic leads or newly developed left bundle branch block. Patients were randomly assigned (1:1), via an electronic web-based system with permuted block sizes of two to six, to receive either standard primary PCI with immediate stent implantation or deferred stent implantation 48 h after the index procedure if a stabilised flow could be obtained in the infarct-related artery. The primary endpoint was a composite of all-cause mortality, hospital admission for heart failure, recurrent infarction, and any unplanned revascularisation of the target vessel within 2 years' follow-up. Patients, investigators, and treating clinicians were not masked to treatment allocation. We did analysis by intention to treat. This trial is registered with ClinicalTrials.gov, number NCT01435408.

Findings Between March 1, 2011, and Feb 28, 2014, we randomly assigned 1215 patients to receive either standard PCI (n=612) or deferred stent implantation (n=603). Median follow-up time was 42 months (IQR 33–49). Events comprising the primary endpoint occurred in 109 (18%) patients who had standard PCI and in 105 (17%) patients who had deferred stent implantation (hazard ratio 0·99, 95% CI 0·76–1·29; p=0·92). Procedure-related myocardial infarction, bleeding requiring transfusion or surgery, contrast-induced nephropathy, or stroke occurred in 28 (5%) patients in the conventional PCI group versus 27 (4%) patients in the deferred stent implantation group, with no significant differences between groups.

Interpretation In patients with STEMI, routine deferred stent implantation did not reduce the occurrence of death, heart failure, myocardial infarction, or repeat revascularisation compared with conventional PCI. Results from ongoing randomised trials might shed further light on the concept of deferred stenting in this patient population.

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3. Direct stenting vs Defferred stenting

Myocardial Infarction

Comparison of Immediate With Delayed Stenting Using the Minimalist Immediate Mechanical Intervention Approach in Acute ST-Segment–Elevation Myocardial Infarction

The MIMI Study

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Background—Delayed stent implantation after restoration of normal epicardial flow by a minimalist immediate mechanical intervention aims to decrease the rate of distal embolization and impaired myocardial reperfusion after percutaneous coronary intervention. We sought to confirm whether a delayed stenting (DS) approach (24–48 hours) improves myocardial reperfusion, versus immediate stenting, in patients with acute ST-segment–elevation myocardial infarction undergoing primary percutaneous coronary intervention.

Methods and Results—In the prospective, randomized, open-label minimalist immediate mechanical intervention (MIMI) trial, patients (n=140) with ST-segment–elevation myocardial infarction ≤12 hours were randomized to immediate stenting (n=73) or DS (n=67) after Thrombolysis In Myocardial Infarction 3 flow restoration by thrombus aspiration. Patients in the DS group underwent a second coronary arteriography for stent implantation a median of 36 hours (interquartile range 29–46) after randomization. The primary end point was microvascular obstruction (% left ventricular mass) on cardiac magnetic resonance imaging performed 5 days (interquartile range 4–6) after the first procedure. There was a nonsignificant trend toward lower microvascular obstruction in the immediate stenting group compared with DS group (1.88% versus 3.96%; P=0.051), which became significant after adjustment for the area at risk (P=0.049). Median infarct weight, left ventricular ejection fraction, and infarct size did not differ between groups. No difference in 6-month outcomes was apparent for the rate of major cardiovascular and cerebral events.

Conclusions—The present findings do not support a strategy of DS versus immediate stenting in patients with ST-segment–elevation infarction undergoing primary percutaneous coronary intervention and even suggested a deleterious effect of DS on microvascular obstruction size.

Clinical Trial Registration—URL: http://www.clinicaltrials.gov. Unique identifier: NCT01360242.

(*Circ Cardiovasc Interv*. 2016;9:e003388. DOI: 10.1161/CIRCINTERVENTIONS.115.003388.)

Randomized Controlled Trial › Circ Cardiovasc Interv. 2016 Dec;9(12):e004101.
doi: 10.1161/CIRCINTERVENTIONS.116.004101.

INNOVATION Study (Impact of Immediate Stent Implantation Versus Deferred Stent Implantation on Infarct Size and Microvascular Perfusion in Patients With ST-Segment-Elevation Myocardial Infarction)

Je Sang Kim [1], Hyun Jong Lee [1], Cheol Woong Yu [2], Yang Min Kim [1], Soon Jun Hong [1], Jae Hyung Park [1], Rak Kyeong Choi [1], Young Jin Choi [1], Jin Sik Park [1], Tae Hoon Kim [1], Ho-Jun Jang [1], Hyung Joon Joo [1], Sang-A Cho [1], Young Moo Ro [1], Do-Sun Lim [1]

Affiliations + expand

PMID: 27965296 DOI: 10.1161/CIRCINTERVENTIONS.116.004101

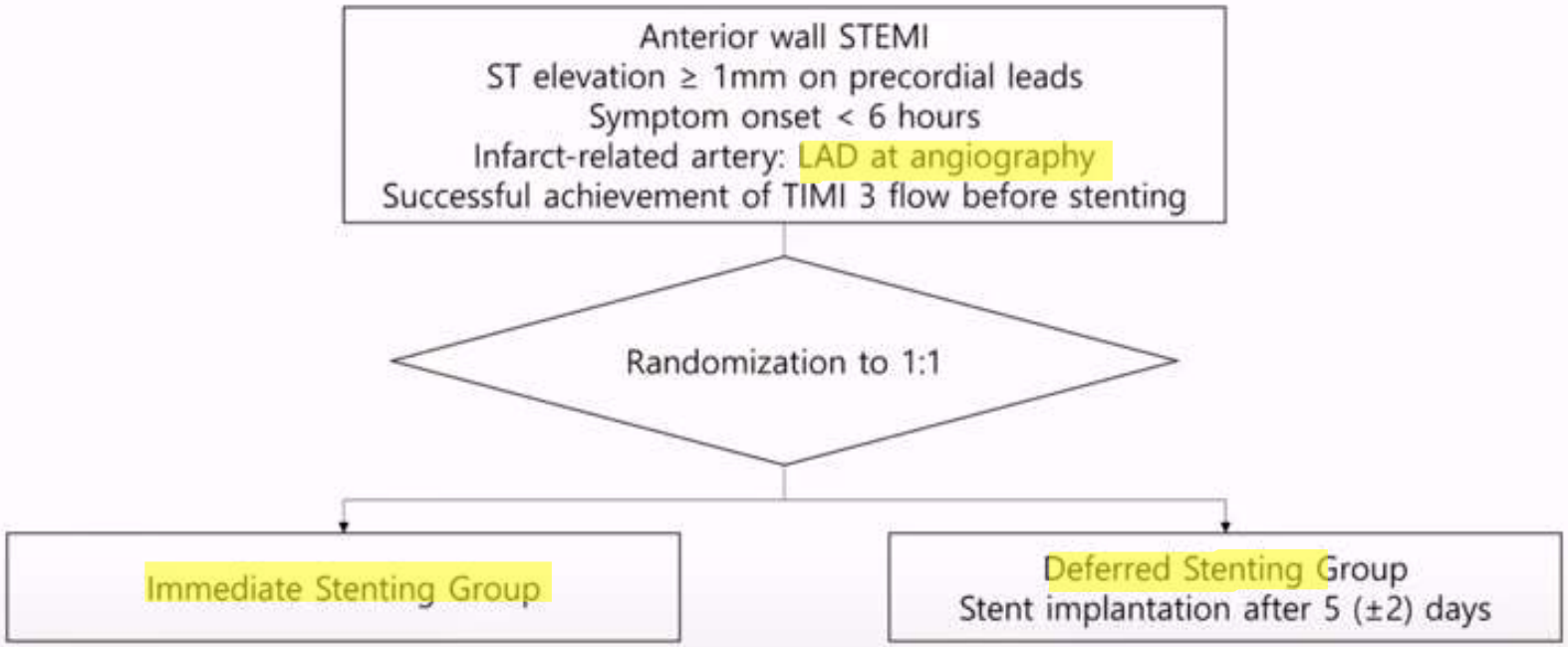
Abstract

Background: The aim of this study was to assess whether deferred stenting (DS) reduces infarct size and microvascular obstruction (MVO) compared with immediate stenting (IS) in primary percutaneous coronary intervention for ST-segment-elevation myocardial infarction.

Methods and results: From February 2013 to August 2015, 114 patients (mean age: 69 years) were randomized into the following 2 groups: DS with an intention to stent 3 to 7 days later or IS after primary reperfusion in 2 centers. The primary and secondary end points were infarct size and the incidence of MVO, respectively, assessed by cardiac magnetic resonance imaging at 30 days after primary reperfusion. The median time to the second procedure in the DS was 72.8 hours. Six patients in the DS group were crossed over to the IS group because of progression of dissection or safety concerns after randomization. In the intention-to-treat analysis, DS did not significantly reduce infarct

3. Direct stenting vs Defferred stenting

INNOVATION-CORE trial ongoing: 26.3% (N=121/460)



Primary endpoint : composite of all-cause death, hospitalization due to HF, recurrent MI, TVR

Secondary endpoint:

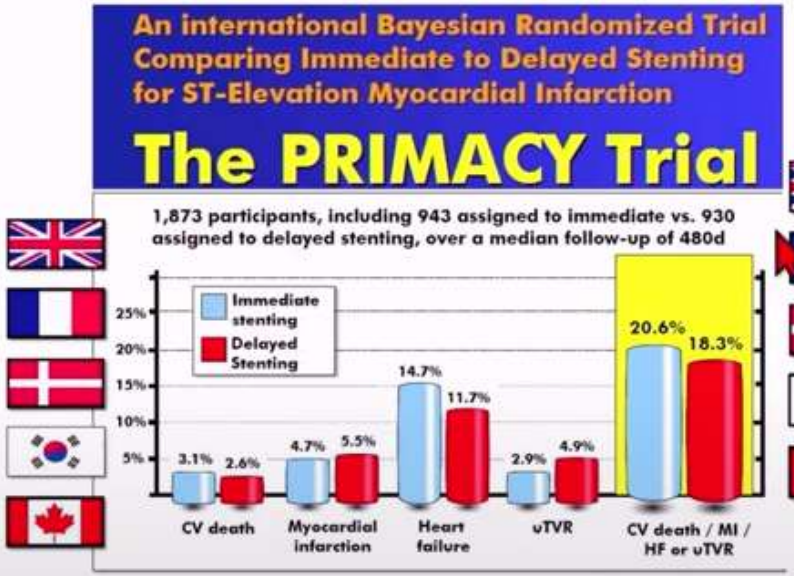
- ✓ All-cause death / Cardiac death / Hospitalization due to HF / recurrent MI / TVR / Stent thrombosis
- ✓ 2-d echocardiographic parameter : LV remodeling index / %LV strain / regional wall motion abnormality
- ✓ Cardiac MR parameter : Infarct size / MVO size / MVO incidence / MVO to infarct ratio

3. Direct stenting vs Defferred stenting

Canadian Journal of Cardiology 36 (2020) 1805–1814

Methods in Cardiovascular Research

Immediate vs Delayed Stenting in ST-Elevation Myocardial Infarction: Rationale and Design of the International PRIMACY Bayesian Randomized Controlled Trial

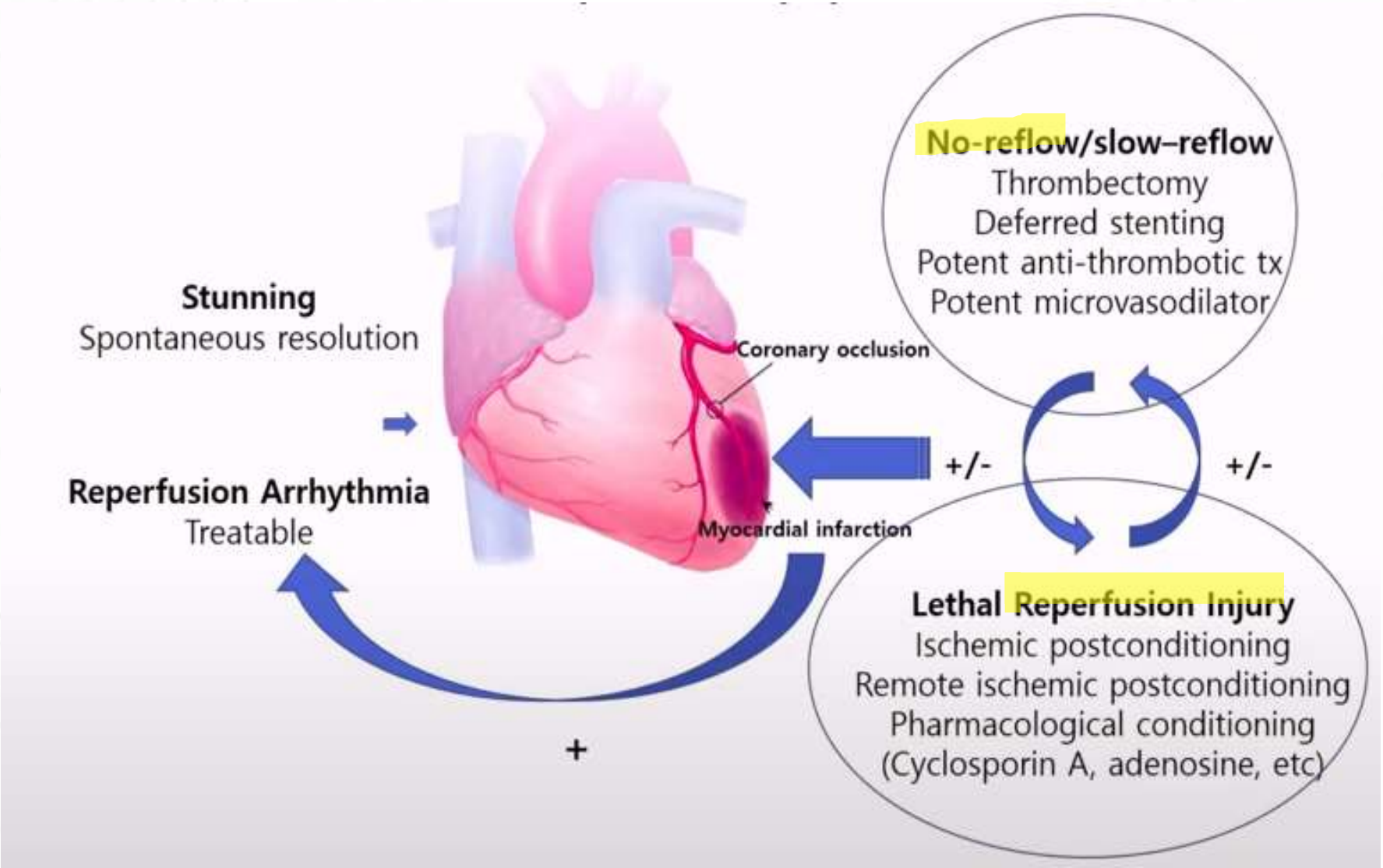


Specified endpoints (meta-regression)

	Delayed stenting (n = 930)	Immediate stenting (n = 943)	Δ	Relative Risk (95% CrI) Fixed effect	Relative Risk (95% CrI) Random effect meta-regression*	Prob. DS > IS
Endpoint – no. (%)						
Primary efficacy endpoint						
Cardiovascular death, heart failure, non-fatal MI and urgent target vessel revascularization	170 (18.3%)	194 (20.6%)	2.3%	0.89 (0.74-1.06)	0.91 (0.76-1.09)	89%
Primary safety end point						
Major BARC bleeding	16 (1.7%)	10 (1.1%)	-0.7%	1.38 (0.69-2.75)	1.44 (0.71-3.01)	11%
Key additional endpoints						
CV death + HF + MI	155 (16.7%)	186 (19.6%)	3.0%	0.85 (0.71-1.02)	0.93 (0.78-1.09)	98%
All-cause death + HF	139 (14.9%)	180 (19.1%)	4.1%	0.78 (0.64-0.95)	0.84 (0.69-1.00)	99%
CV death + HF	130 (13.9%)	166 (16.8%)	3.0%	0.78 (0.63-0.96)	0.82 (0.67-1.02)	99%
uTVR	46 (4.9%)	27 (2.9%)	-2.1%	1.65 (1.08-2.64)	1.84 (0.98-3.41)	1%
CV death + HF (per protocol)	89/794 (11.2%)	155/954 (16.4%)	5.2%	0.70 (0.56-0.88)	0.79 (0.63-0.97)	99%

*Random effects modeled for the following pre-randomization covariates: age, sex, body weight, systolic blood pressure and heart rate, diabetes mellitus, time from onset of symptoms to intervention, inaugural TIMI flow, and creatinine.

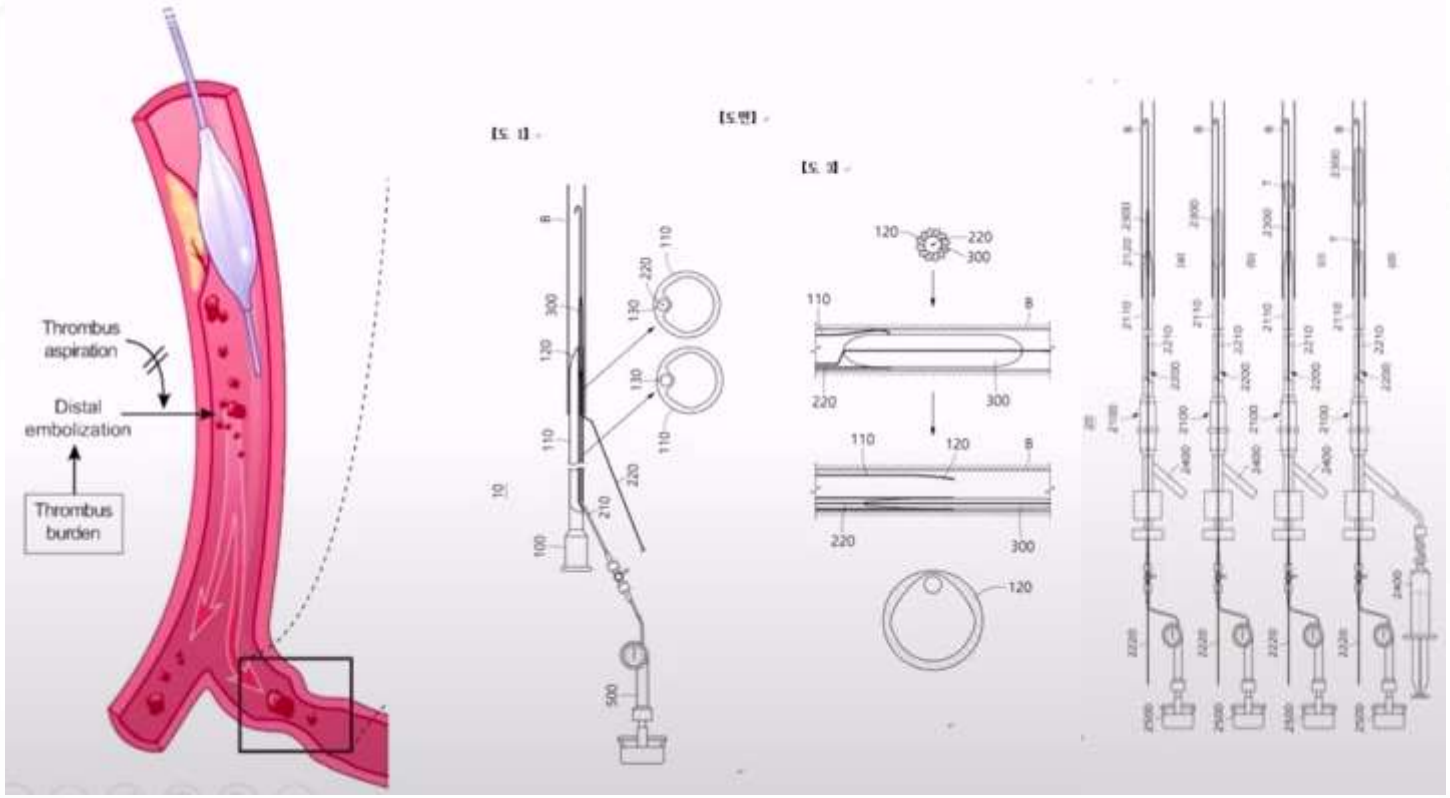
3. Direct stenting vs Defferred stenting



3. Direct stenting vs Defferred stenting

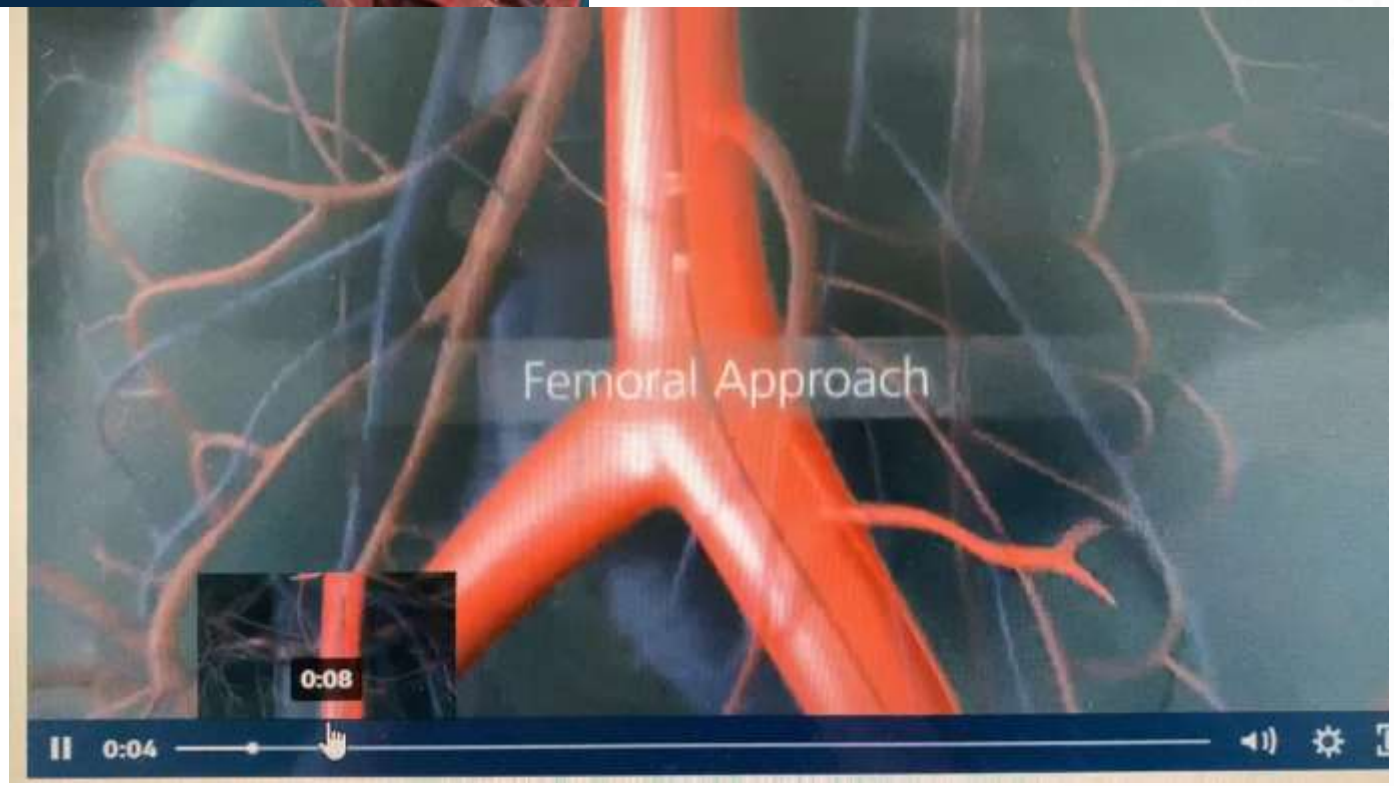
ST 분절 상승 급성 심근경색증 환자에서 표적 병변 풍선 확장 술, 허혈성 조건화와 혈전제거술 동시 시행 카테터 개발

***Si**multaneously **b**alloon **a**ngioplasty, **I**schemic **P**ostconditioning and **T**hrombosuction-performing catheter (SIBAPOTO catheter) for patient with STEMI*



4. Hemodynamic support

Perfusion improvement



4. Hemodynamic support

존슨앤드존슨, 심장펌프 제조사 아비오메드 인수

의약뉴스 이한기 기자 | 승인 2022.11.02 07:29 | 댓글 0

아비오메드는 관상동맥질환과 심부전 치료를 위한 동종 최초의 포트폴리오와 생명을 살리는 기술의 광범위한 혁신 파이프라인, 지난 18년 동안 지속된 수익을 창출하는 성장 등을 보유한 심혈관 의료 기술 선도기업이다. 아비오메드는 적응증, 지리, 제품 분야에서 상당한 확장 기회를 가진 가장 빠르게 성장하는 의료기술 부문 중 하나에서 운영되고 있다.

아비오메드의 임펠라(Impella) 심장 펌프는 고위험 관상동맥 중재술(PCI)이 필요한 중증 관상동맥질환 환자, 급성 심근경색(AMI) 심인성 쇼크 치료, 우심부전 치료에 FDA 승인된 혁신 기술이다. 이는 선도적인 전기생리 사업을 포함하는 존슨앤드존슨 메드테크의 포트폴리오를 보완하고 고성장 시장으로의 전환을 더욱 가속화할 수 있다.

- Impella와 ECMO를 결합하여 치료하는 방법인 ECpella의 안전성과 효과는 FDA에서 간행된 다양한 학술연구에 의해 뒷받침되고 있음

Potential strategy

1. Prevention : Optimal BP, glucose control, Statin
2. Open blood vessel however possible
    - Consider mechanical aspiration
3. As soon as some flow
    - If hypertensive, consider nitroprusside
    - If borderline BP, consider adenosine
        - Place temp wire before RCA administration
        - Might avoid nitroprusside
    - If bradycardia, Might avoid adenosine
4. Consider deffered stenting in STEMI setting

Conclusion

1. In patient undergoing CHIP PCI, an unmet needed exist for the prevention and treatment of No-reflow
2. No-reflow is associated with larger infarc size, reduced EF, and higher mortality in patients with CHIP, especially in STEMI setting
3. Evidence on the treatment of no-reflow remains limited
   - Intracoronary vasodilators are preferred
   - The potential benefit observed with intracoronary abciximab in DM patients but requires further studies
   - May consider thrombectomy
   - Treat the patient and manage hemodynamic instability
4. Future perspectives