Complex STEMI:
What Devices Make A Difference?

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No equity or IP holdings

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https://www.dcri.org/about-us/conflict-of-interest/?searchterm=coi

“Making A Difference” in STEMI

Mechanistic Goals:

- Optimal reperfusion
- Myocardial salvage
- Shock
- Complications (bleeding)

Clinical Goals

- Survival
- Functional class
- Arrhythmias
- QOL

LVAD role & concerns for STEMI

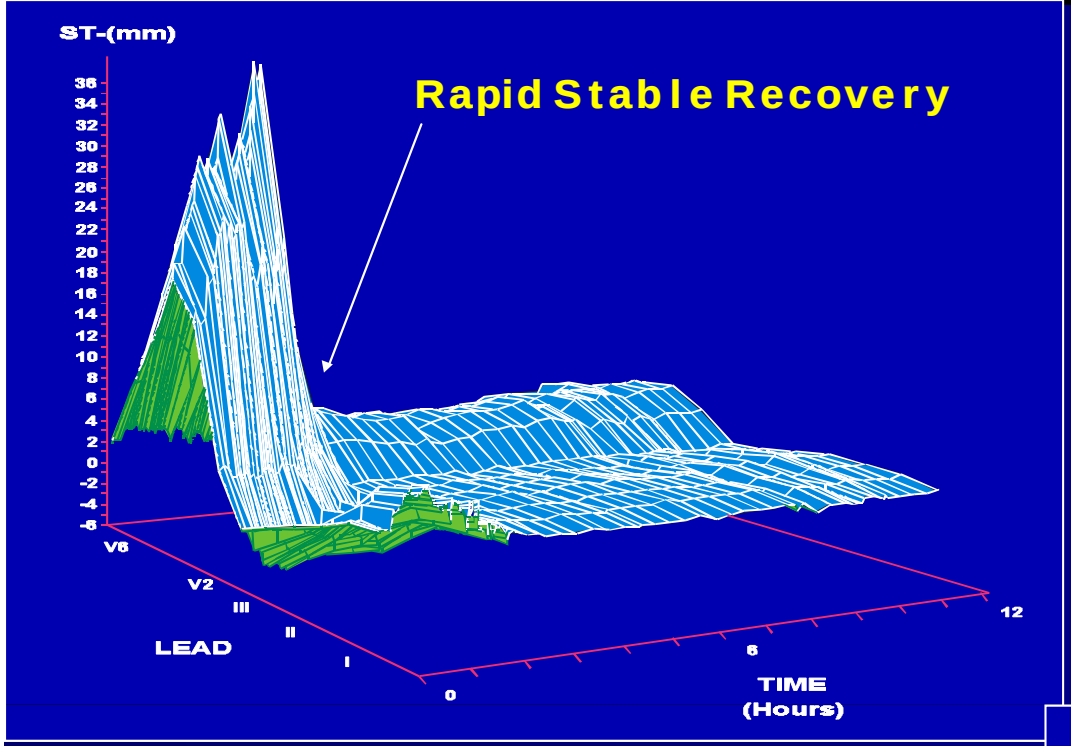
- Hemodynamic support
- Vital organ perfusion
- Reduce myocardial O_2 demand
- Coronary perfusion

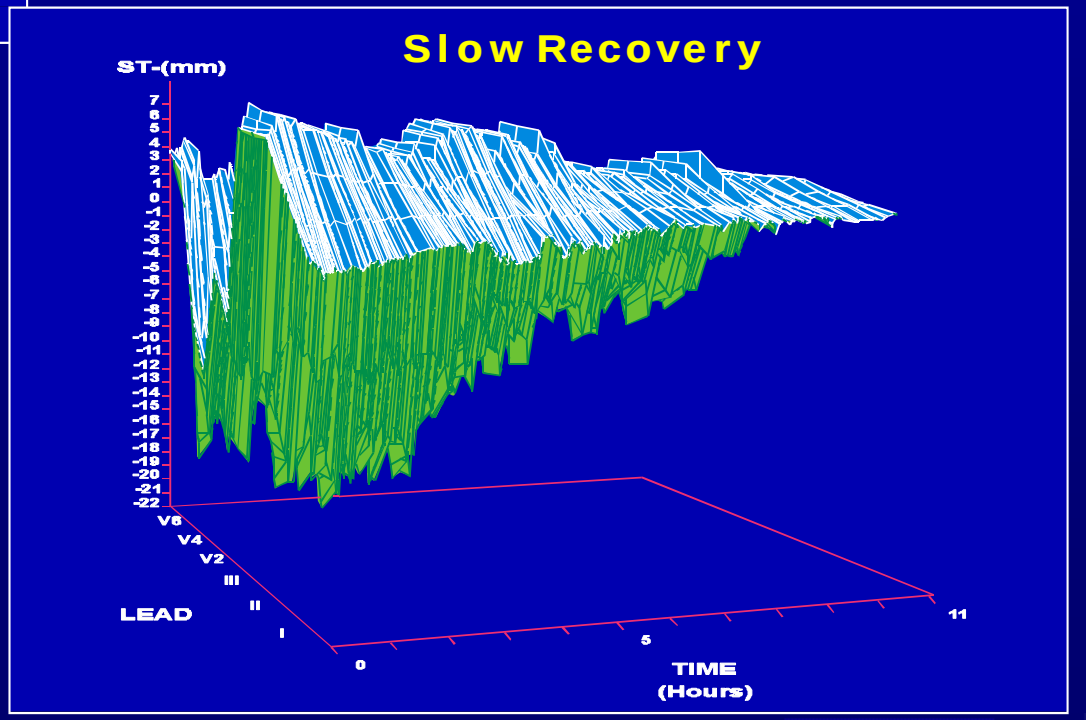
- Delay DTBT
- Vascular complications
- Access complexity

Optimal Reperfusion:

A "Biosignature" of Mechanistic Steps

- **Rapid time to treatment (no delays)**
- **Epicardial recanalization (PCI)**
- **Microvascular perfusion (no MVO)**
- **Nutritive cellular response (no injury)**





Krucoff MW et al, Circulation 2004;110 (e533-539)

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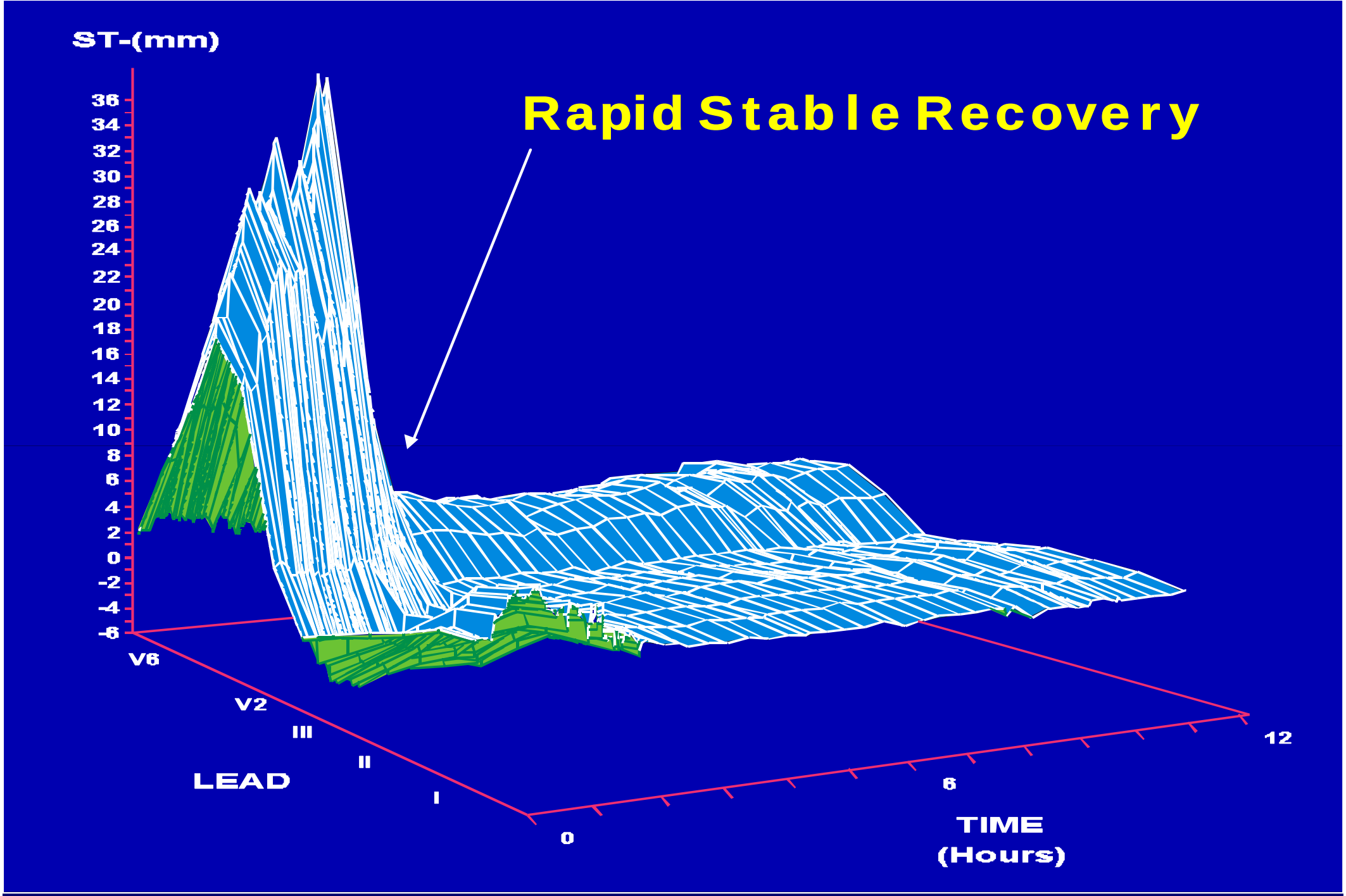

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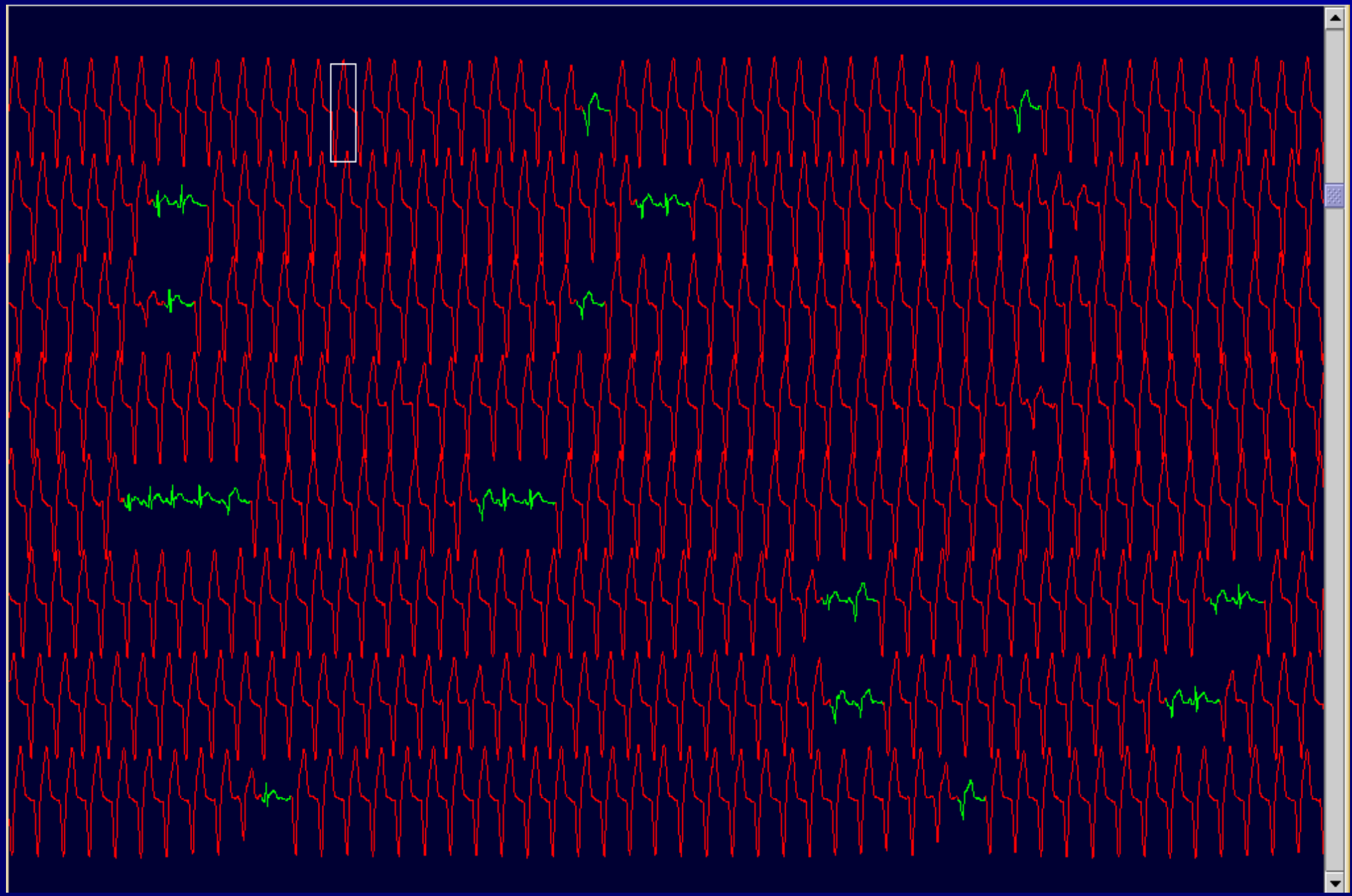

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Reperfusion "Burst" Arrhythmias

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Europace
doi:10.1093/europace/eun123

Reperfusion ventricular arrhythmia 'bursts' in TIMI 3 flow restoration with primary angioplasty for anterior ST-elevation myocardial infarction: a more precise definition of reperfusion arrhythmias

Mohamed Majidi[1,2], Andrzej S. Kosinski[1,3], Sana M. Al-Khatib[1,4], Miguel E. Lemmert[2], Lilian Smolders[2], Anton van Weert[5], Johan H.C. Reiber[5,6], Dan Tzivoni[7], Frits W.H.M. Be... Hein J.J. Wellens[8], Anton P.M. Gorgels[2,8], and Mitchell W. Krucoff[1,4*]

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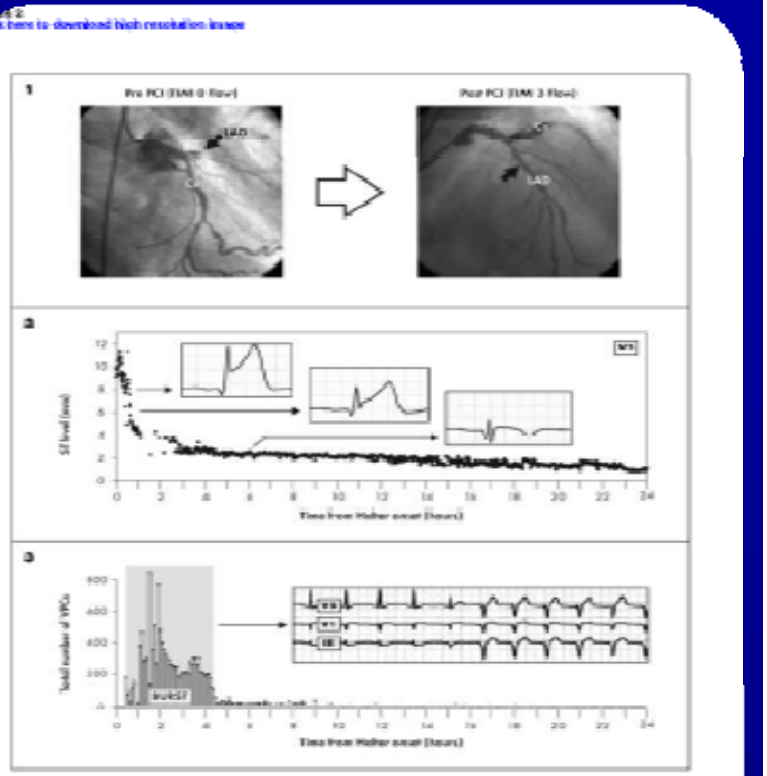

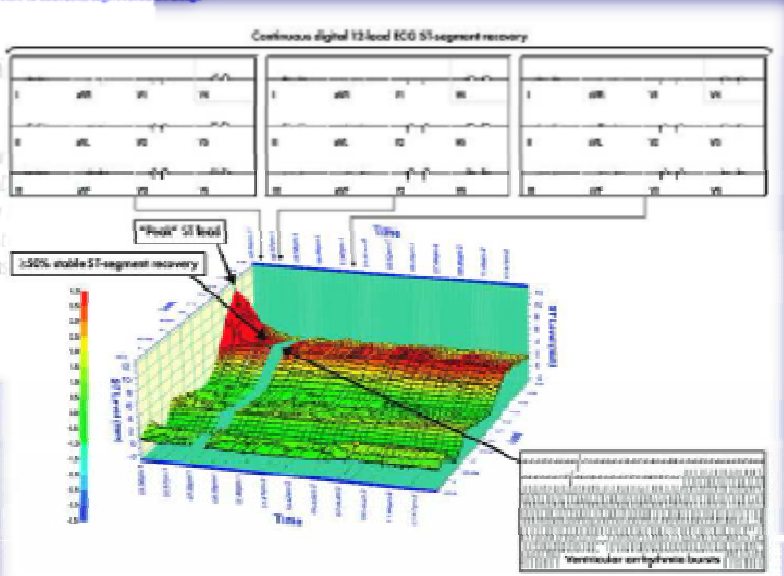

Majidi M et al, Europace 2008

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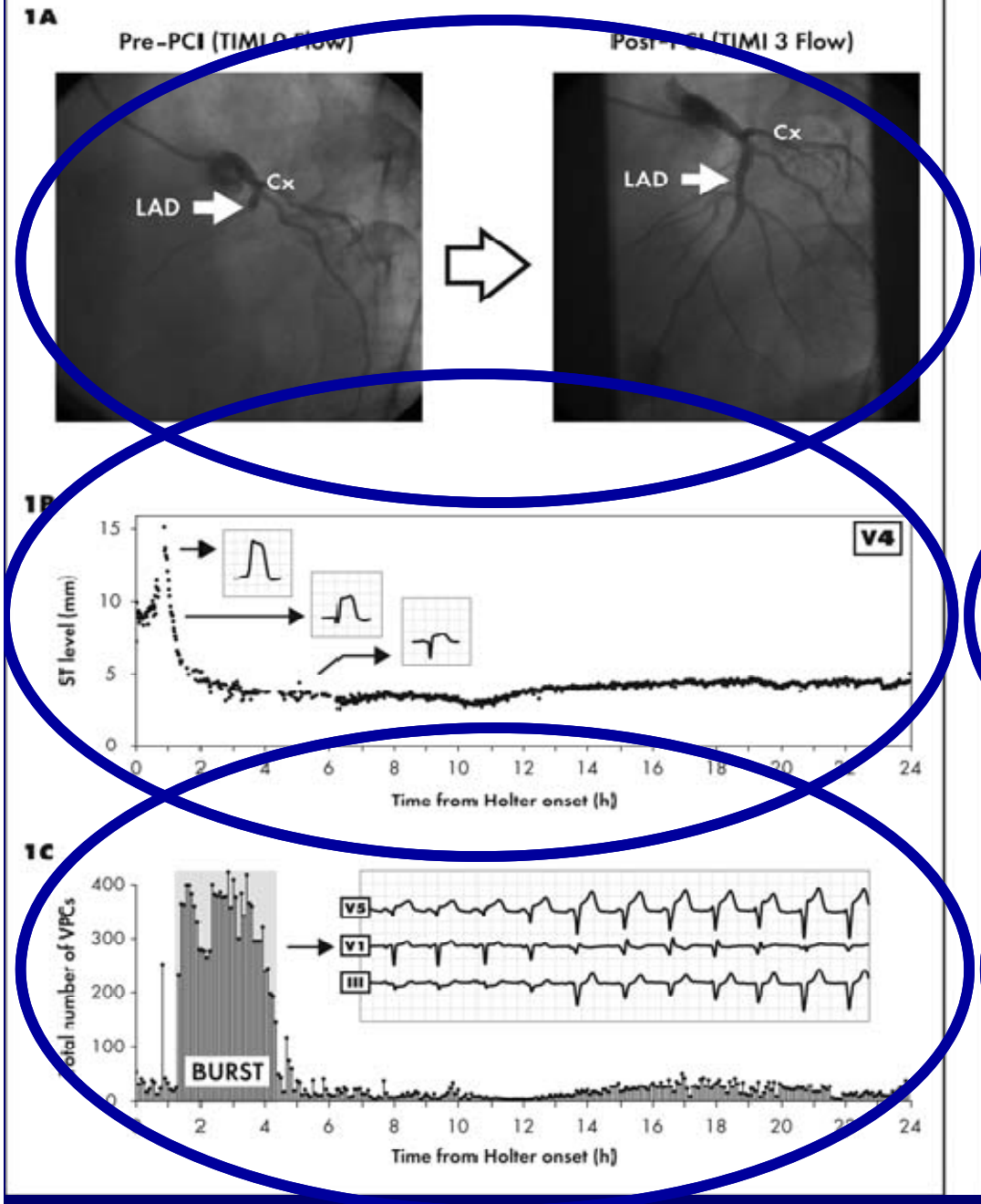
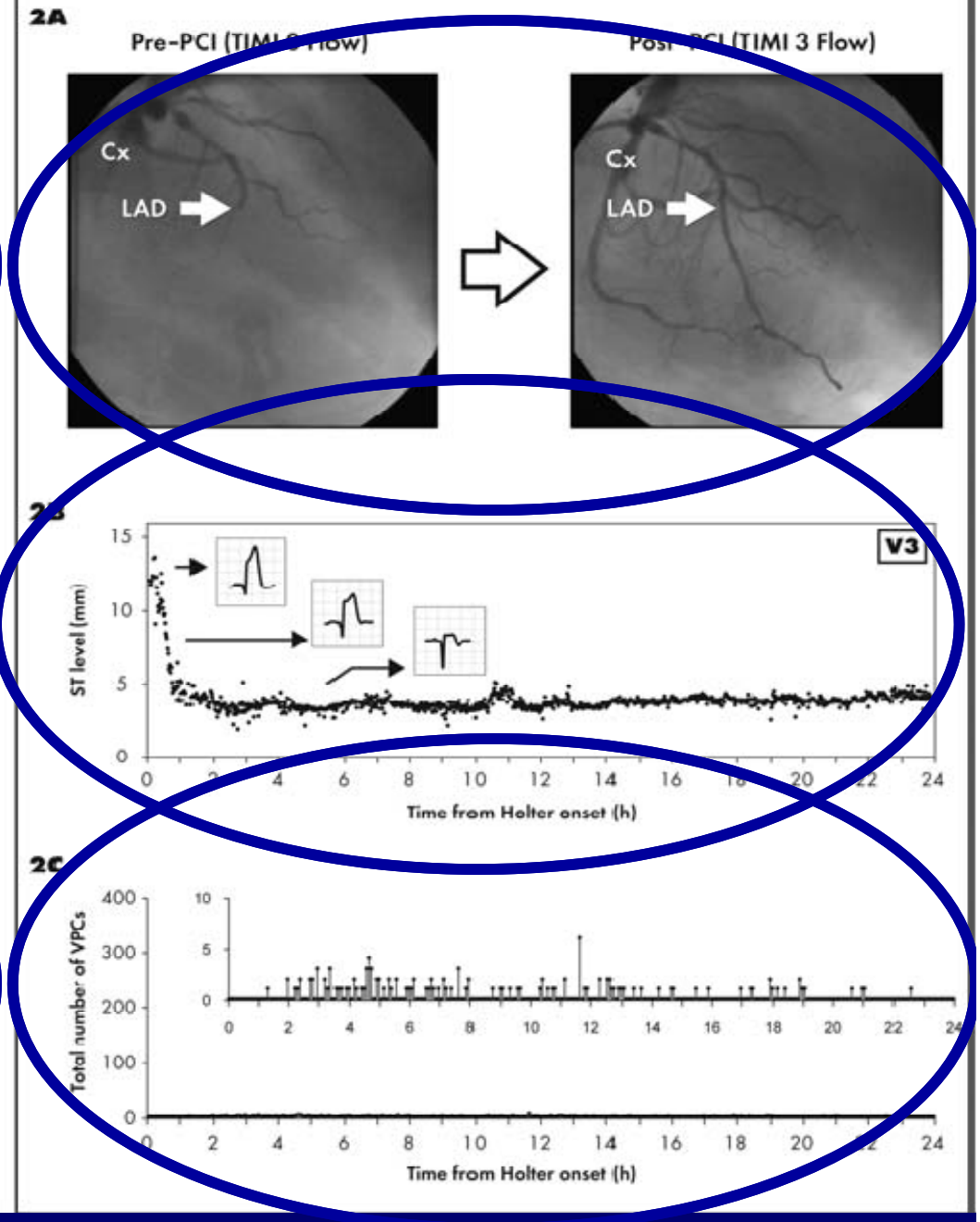
Reperfusion VA Burst



No Reperfusion VA Burst



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Majidi M et al, Europace 2008

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Reperfusion Burst, TIMI 3 flow & MI Size

European Heart Journal Advance Access published February 7, 2009

European Heart Journal
doi:10.1093/eurheartj/ehp005

CLINICAL RESEARCH

Reperfusion ventricular arrhythmia 'bursts' predict larger infarct size despite TIMI 3 flow restoration with primary angioplasty for anterior ST-elevation myocardial infarction

Mohamed Majidi[1,2], Andrzej S. Kosinski[1,3], Sana M. Al-Khatib[1,4], Miguel E. Lemmert[2], Lilian Smolders[2], Anton van Weert[5], Johan H.C. Reiber[3,6], Dan Tzivoni[7], Frits W.H.M. Bär[2], Hein J.J. Wellens[8], Anton P.M. Gorgels[2,8], and Mitchell W. Krucoff[1,4]*

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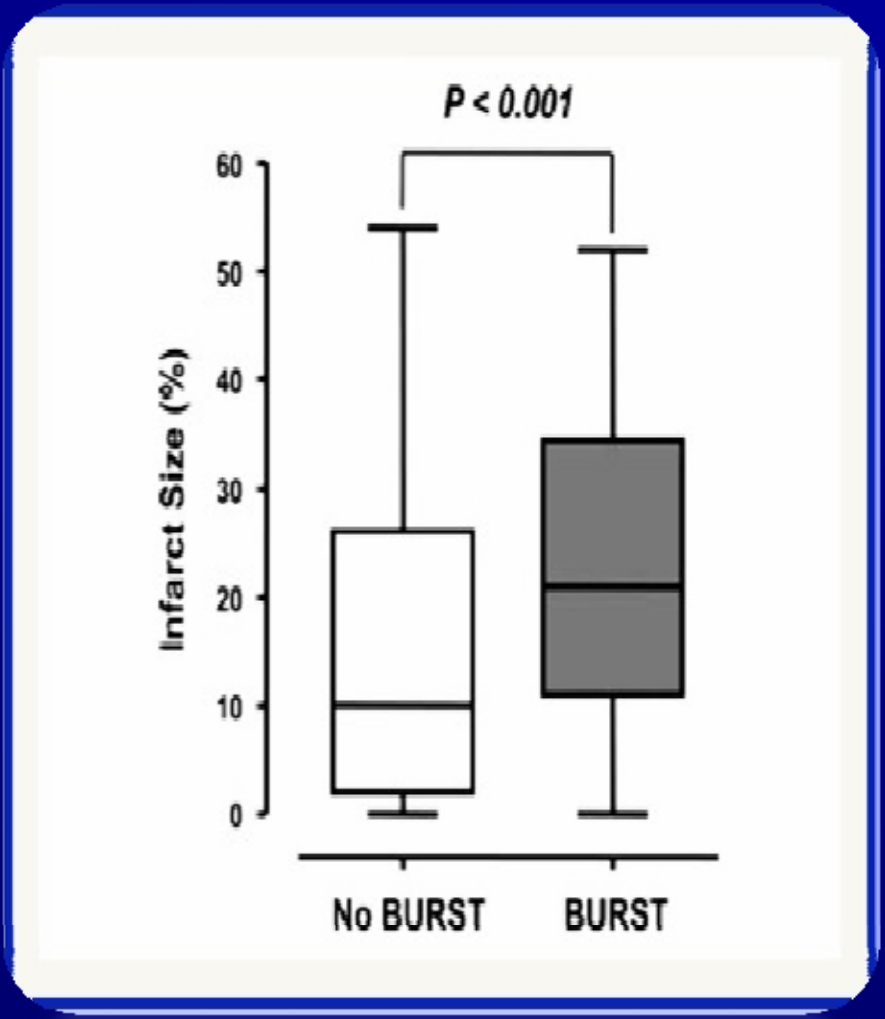

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Majidi M et al, EHJ 2009

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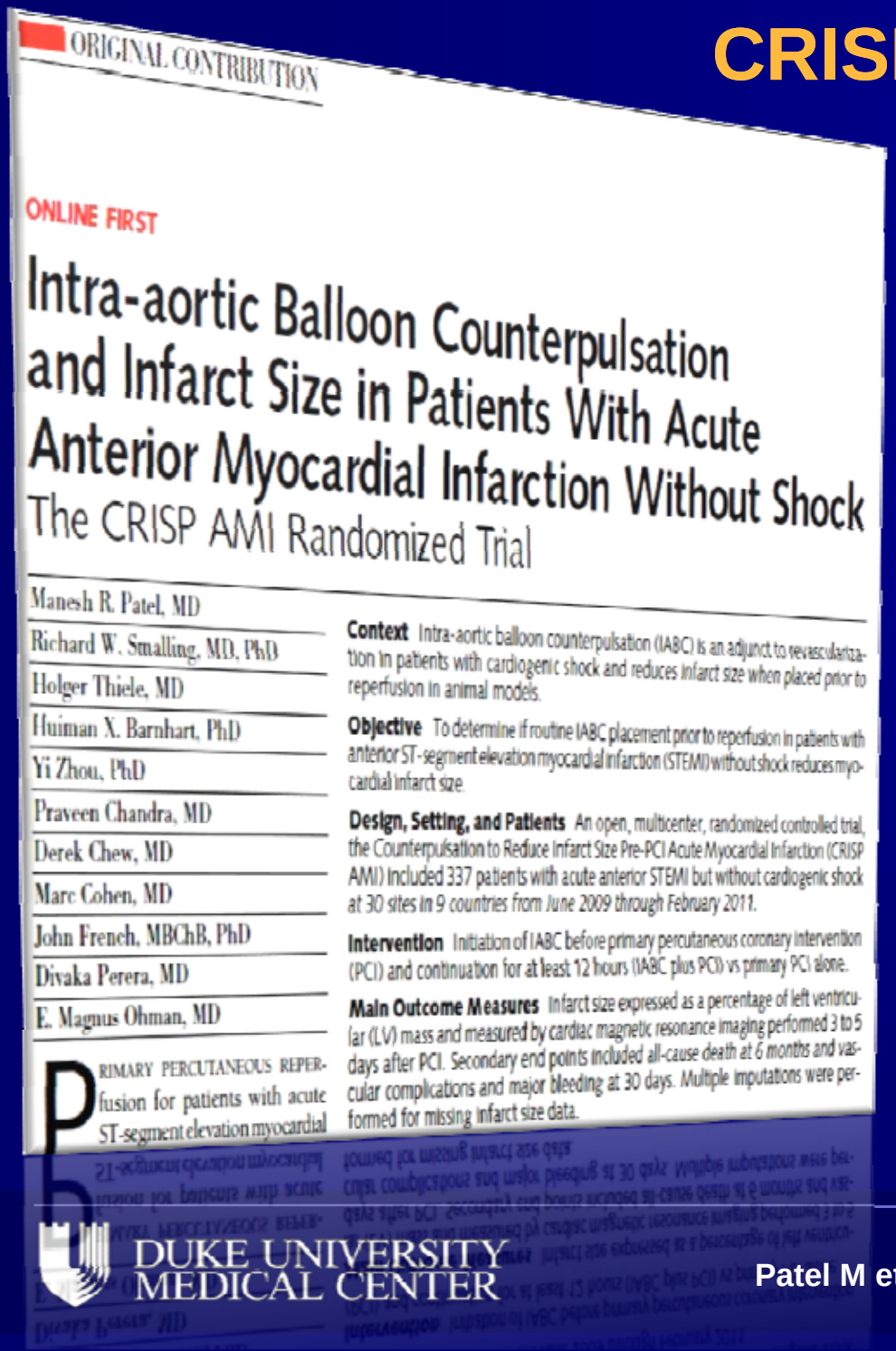
CRISP-AMI



ORIGINAL CONTRIBUTION

ONLINE FIRST

Intra-aortic Balloon Counterpulsation and Infarct Size in Patients With Acute Anterior Myocardial Infarction Without Shock

The CRISP AMI Randomized Trial

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Richard W. Smalling, MD, PhD
Holger Thiele, MD
Huiman X. Barnhart, PhD
Yi Zhou, PhD
Praveen Chandra, MD
Derek Chew, MD
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Divaka Perera, MD
E. Magnus Ohman, MD

Context Intra-aortic balloon counterpulsation (IABC) is an adjunct to revascularization in patients with cardiogenic shock and reduces infarct size when placed prior to reperfusion in animal models.

Objective To determine if routine IABC placement prior to reperfusion in patients with anterior ST-segment elevation myocardial infarction (STEMI) without shock reduces myocardial infarct size.

Design, Setting, and Patients An open, multicenter, randomized controlled trial, the Counterpulsation to Reduce Infarct Size Pre-PCI Acute Myocardial Infarction (CRISP AMI) included 337 patients with acute anterior STEMI but without cardiogenic shock at 30 sites in 9 countries from June 2009 through February 2011.

Intervention Initiation of IABC before primary percutaneous coronary intervention (PCI) and continuation for at least 12 hours (IABC plus PCI) vs primary PCI alone.

Main Outcome Measures Infarct size expressed as a percentage of left ventricular (LV) mass and measured by cardiac magnetic resonance imaging performed 3 to 5 days after PCI. Secondary end points included all-cause death at 6 months and vascular complications and major bleeding at 30 days. Multiple imputations were performed for missing infarct size data.

PRIMARY PERCUTANEOUS REPERfusion for patients with acute ST-segment elevation myocardial

337 Ant STEMI

No shock

IABP pre-PCI vs PCI alone

1º: MI Size by CMRI

2º: 6 mos mortality

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Patel M et al, JAMA, 2011—Vol 306, No. 12

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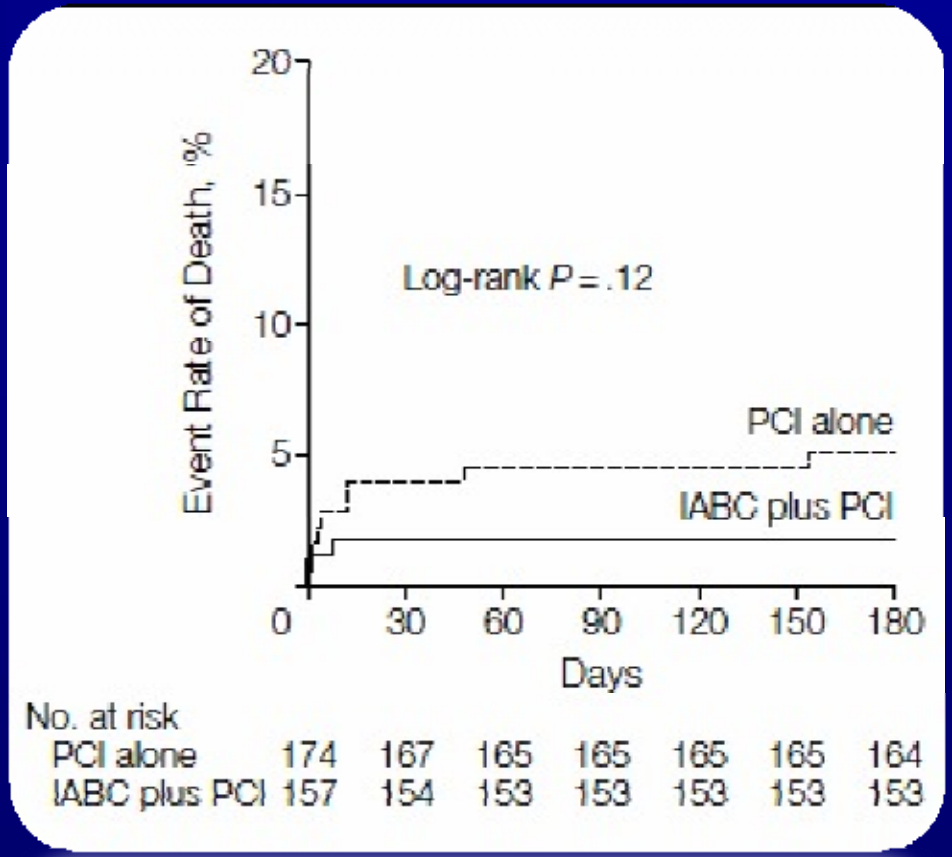
CRISP-AMI: Results

Primary End Point	PCI	IABP & PCI	
Infarct size, % of left ventricular mass			
Per-protocol analysis, No. (%)	275 (81.6)	133 (82.6)	142 (80.7)	
Mean (95% CI)	39.8 (37.4-42.1)	42.1 (38.7-45.6)	37.5 (34.3-40.8)	.06
Median (IQR)	38.8 (26.0-52.2)	42.8 (27.2-54.7)	36.2 (25.9-49.4)	

- ***DTBT:***
  77 vs 68 min (p<0.04)
- ***Major vascular complications:***
  4.3 vs. 1.1% (p=0.09)
- ***Major bleeding:***
  3.1 vs. 1.7% (p=0.49)



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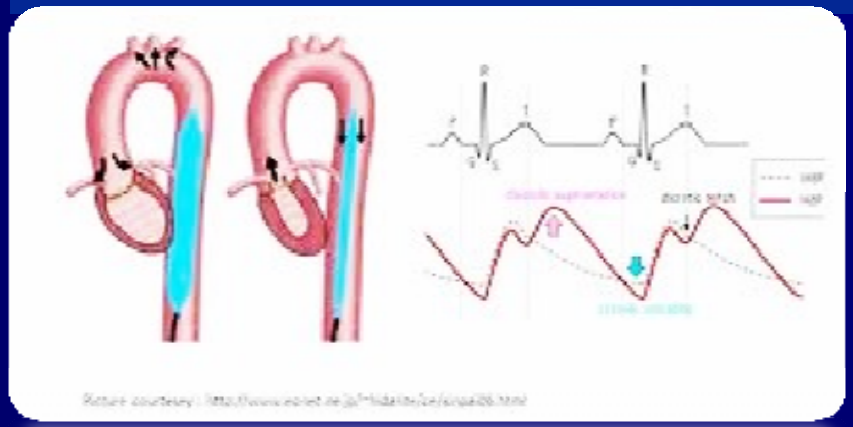
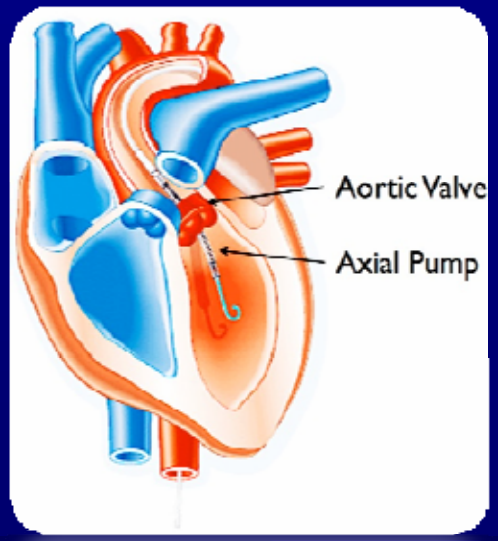
Intra-aortic Balloon Pump & Impella

- Smaller size
- Descending Ao
- Rhythm dependent
- Pre-systolic & diastolic augmentation
- Low C.O.

- Larger size
- Across AoV
- Rhythm independent
- Non-pulsatile
- High C.O.





Randomized Trials of Impella vs IABP for STEMI or Shock

Support Devices & Complex STEMI: *Conclusions*

Optimal reperfusion & outcomes from STEMI mediated by multiple mechanisms

Shock:

- **is a systemic disorder which warrants support (guidelines)**
- **IABP vs. Impella risk/benefit uncertain**

Complex STEMI without shock:

- **Delays, technical complexities & complications notable**
- **Optimal patient selection may be the biggest challenge to understanding risks/benefits**

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