

Davos, 14<sup>th</sup> February 2012

# Stent Choice in Patients with Acute Myocardial Infarction

Stephan Windecker



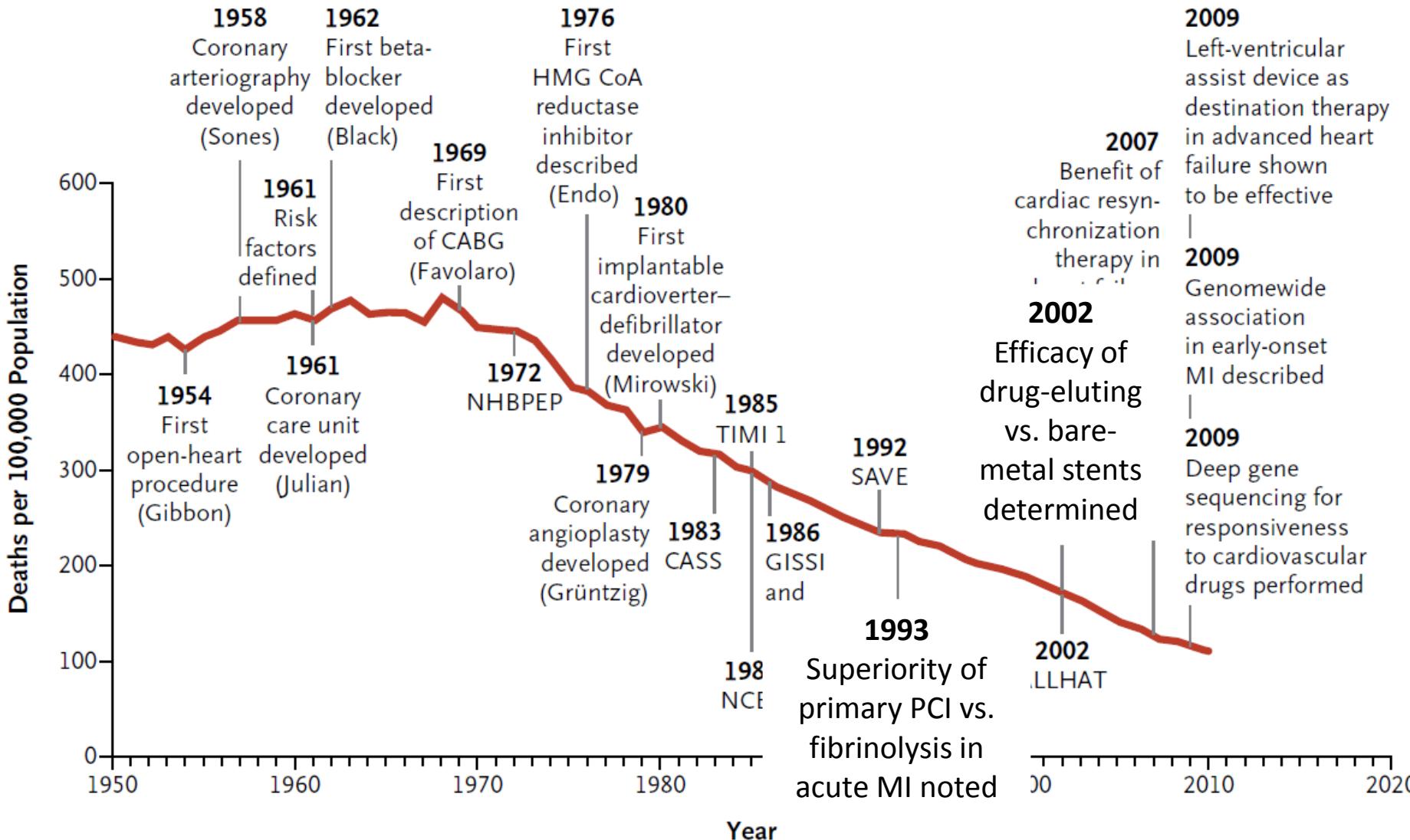
*Department of Cardiology*

***Swiss Cardiovascular Center and Clinical Trials Unit Bern***

***Bern University Hospital, Switzerland***

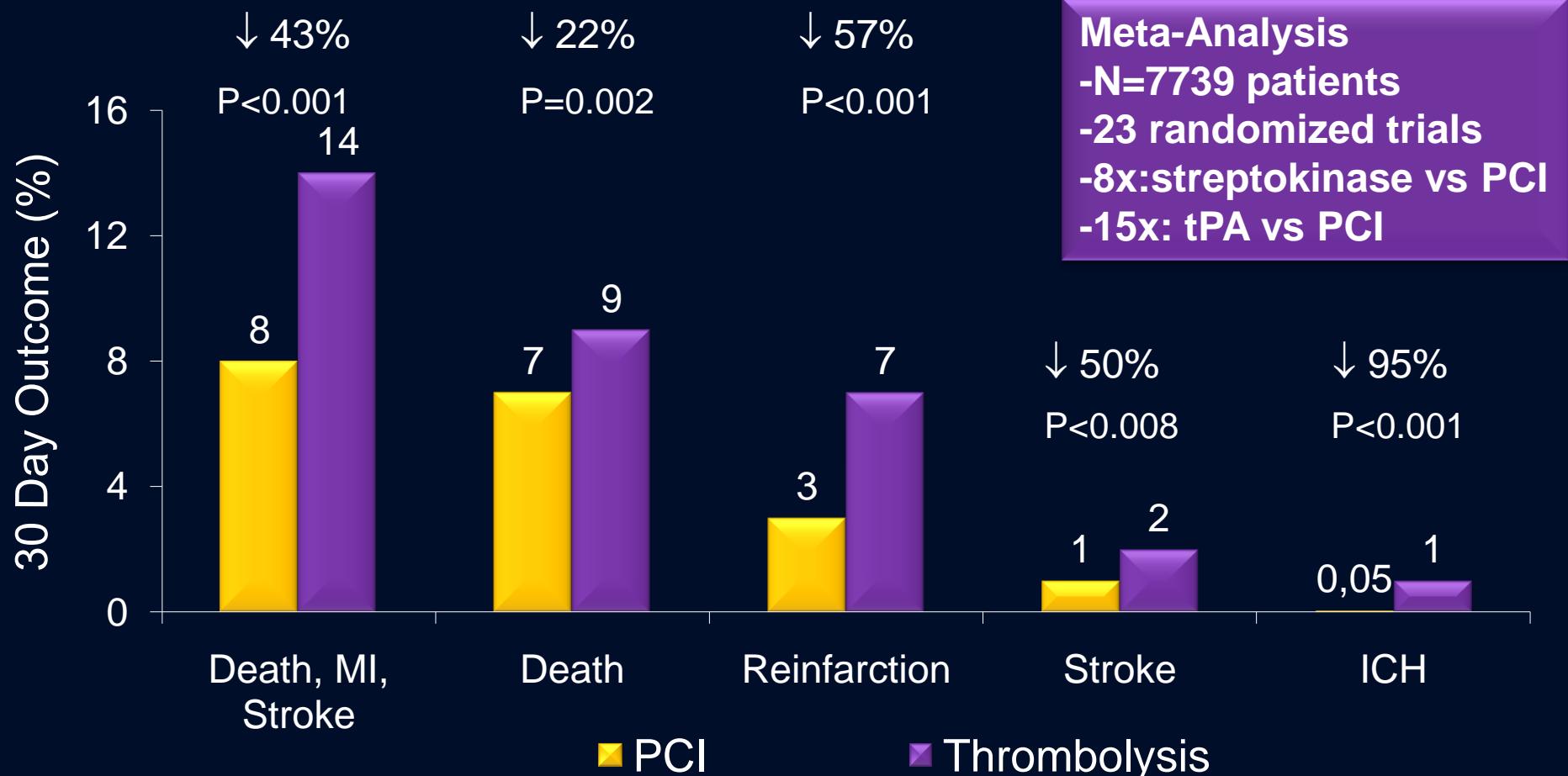
# Scientific Advances and Cardiovascular Mortality

Nabel and Braunwald. *N Engl J Med* 2012;366:54-63



# Primary PCI versus Thrombolysis in AMI

Keeley EC et al. *Lancet* 2003;361:13

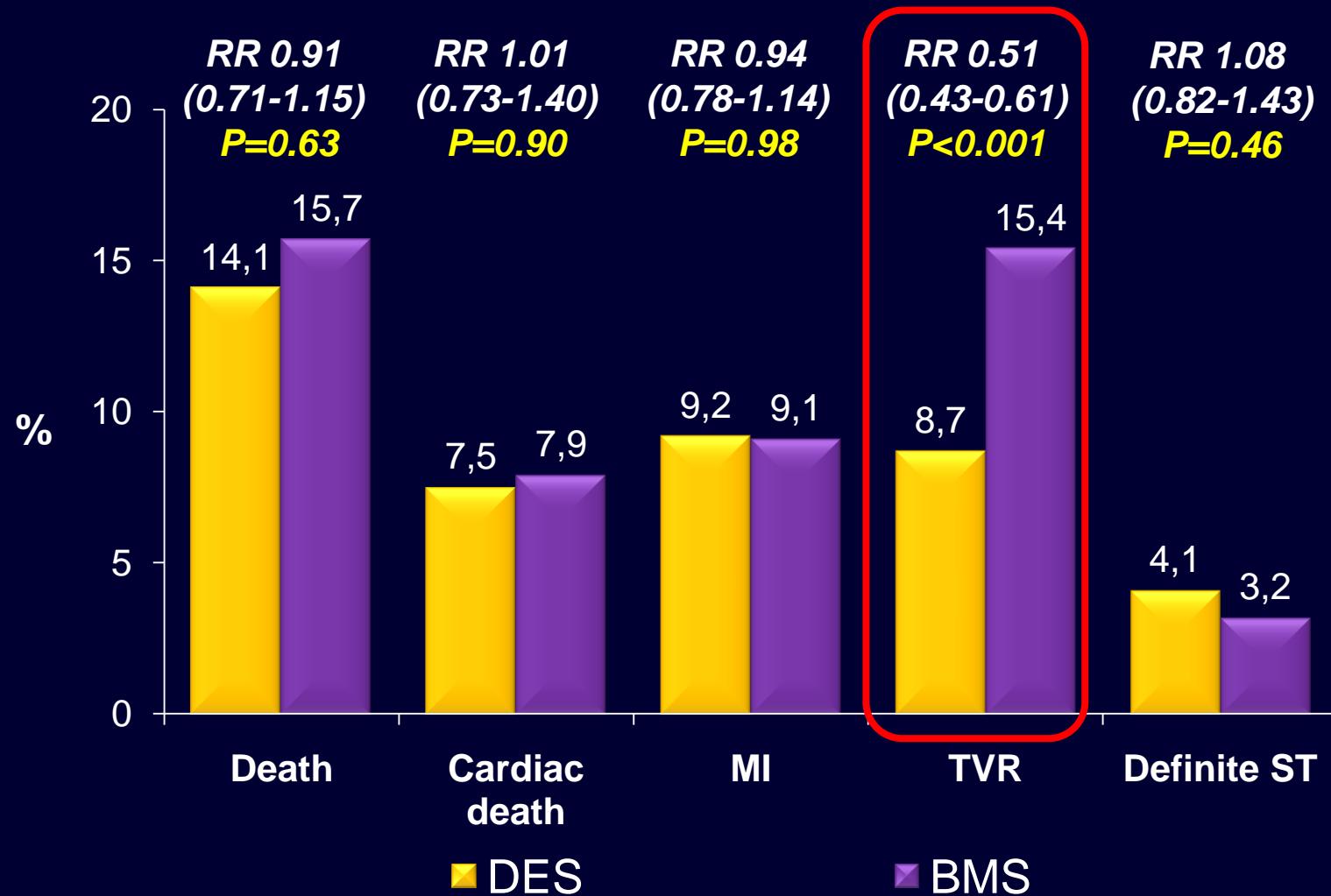


23 death prevented and 44 MI's and 11 strokes avoided for every 1000 pts treated with primary PCI instead of thrombolysis

# Early Generation Drug-Eluting Stents versus Bare Metal Stents in Patients With STEMI

Kalesan B et al. *Eur Heart J* 2012

**15 RCTs Comparing DES and BMS in 7,843 STEMI Patients**



## **Stent Choice in AMI**

**Vessel and  
Stent Size  
in AMI**

**Discontinuation  
of Antiplatelet  
Therapy**

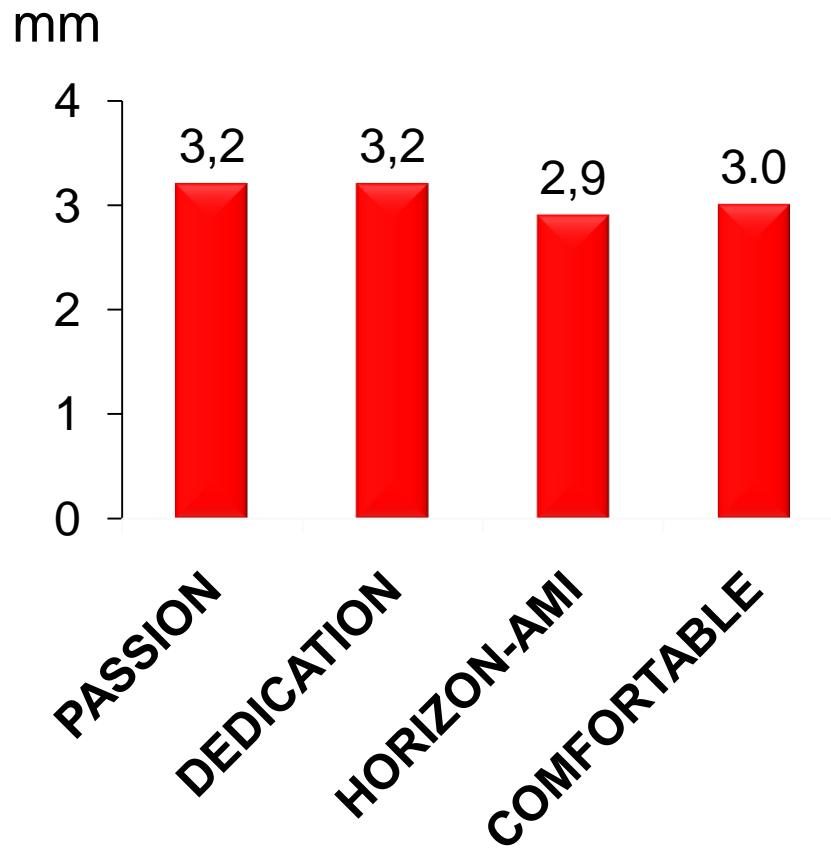
**Thrombus  
Burden and  
AMI**

**Newer  
Generation  
DES and AMI**

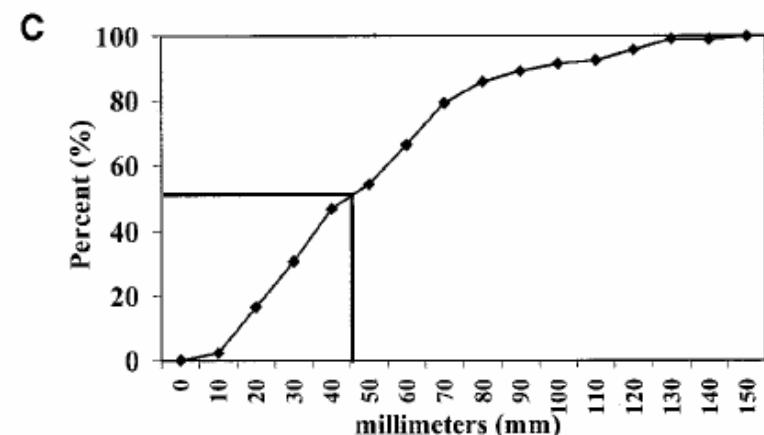
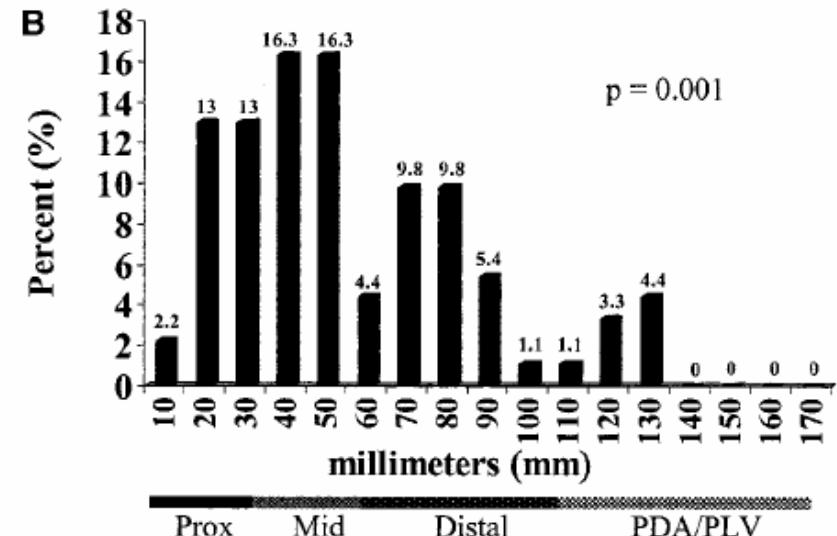
**Plaque  
Architecture  
and  
Inflammation  
in AMI**

# Vessel Size and Culprit Lesion Location in Acute Myocardial Infarction

## Reference Vessel Diameter



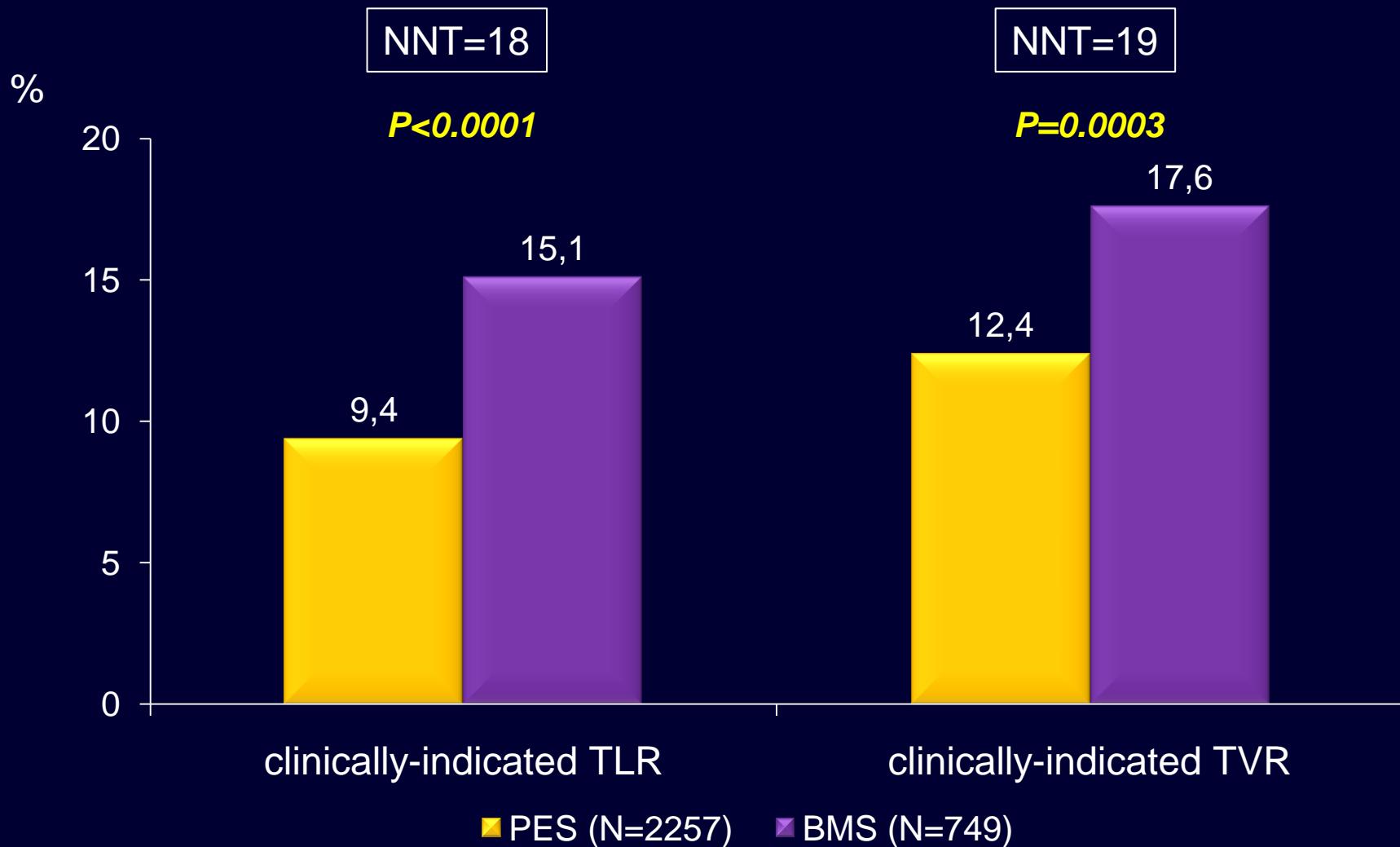
## Culprit Lesion Location



# Paclitaxel-Eluting Stents versus Bare-Metal Stents in Acute Myocardial Infarction: HORIZONS-AMI

Stone G et al. *Lancet* 2011; 377: 2193–204

## ***Repeat Revascularization @ 3 Years***

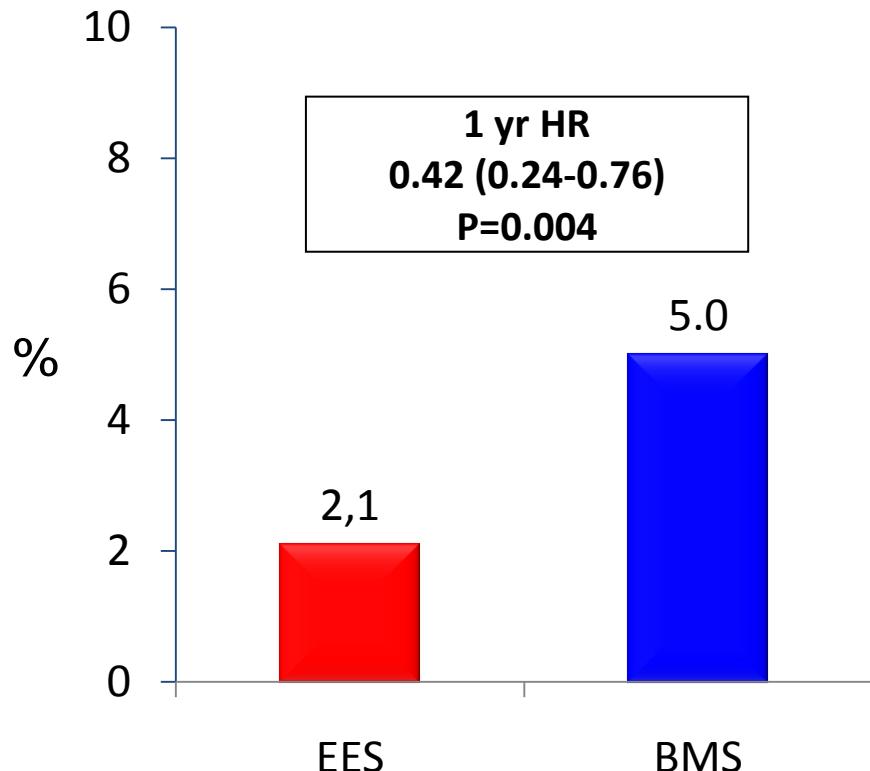


# Target-Lesion Revascularization With New Generation DES versus Bare-Metal Stents in Patients with STEMI

## *Target Lesion Revascularization*

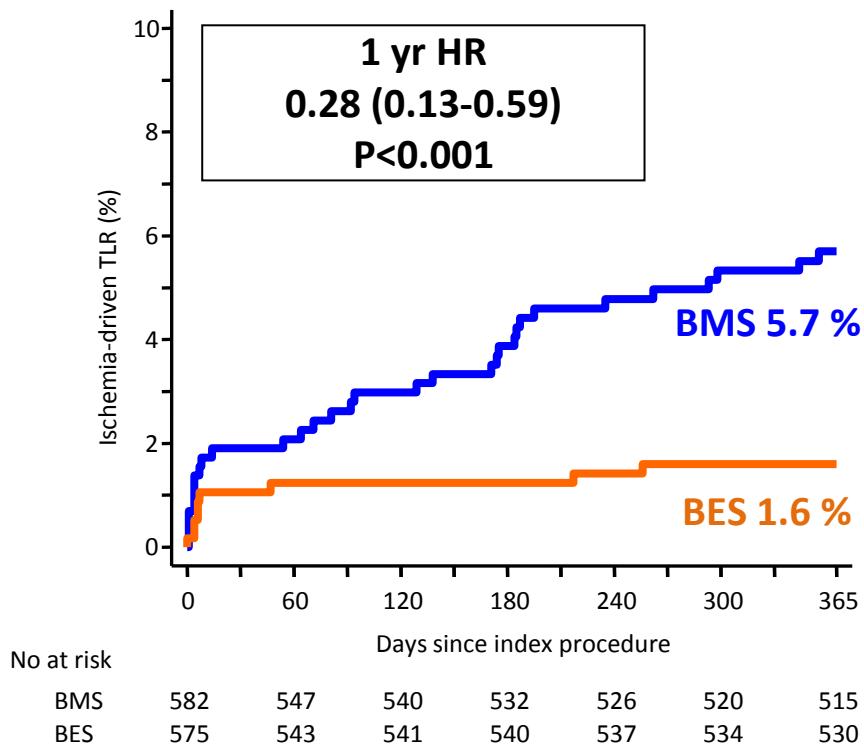
### EXAMINATION

Sabaté M et al. *Lancet* 2012



### COMFORTABLE AMI

Räber L et al. *JAMA* 2012



## **Stent Choice in AMI**

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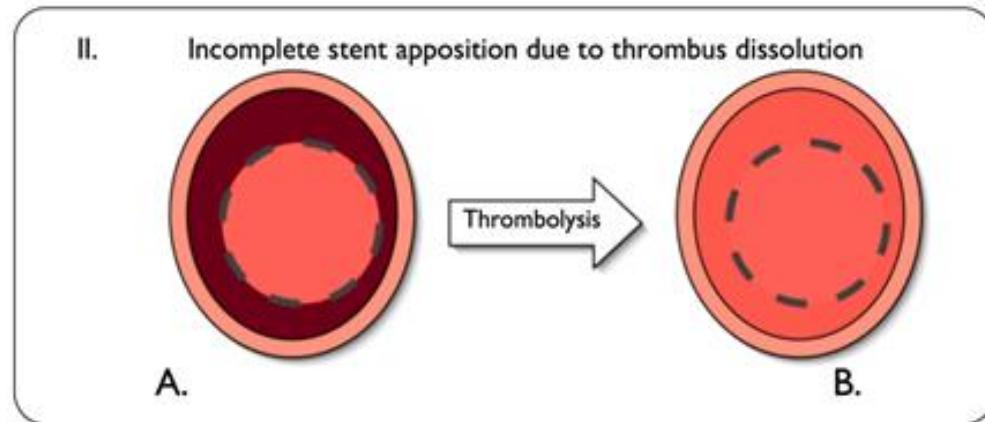
**Thrombus  
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# Issues Related to Thrombus Burden in AMI and Impact on Stent Choice

- Thrombus burden and risk of stent thrombosis
- Thrombus resolution and stent malapposition
- Distal embolization and no-reflow phenomenon



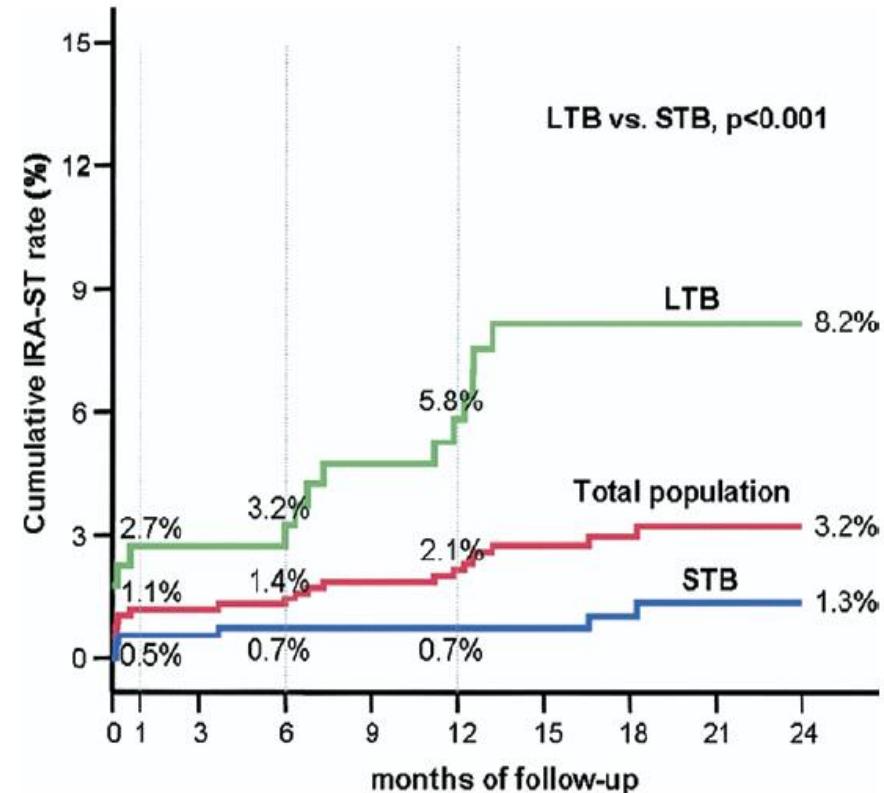
Cook S et al. *Circulation* 2007

# Impact of Thrombus Burden on Risk of Stent Thrombosis With DES in Patients With STEMI

Sianos G et al. J Am Coll Cardiol 2007;50:573-83

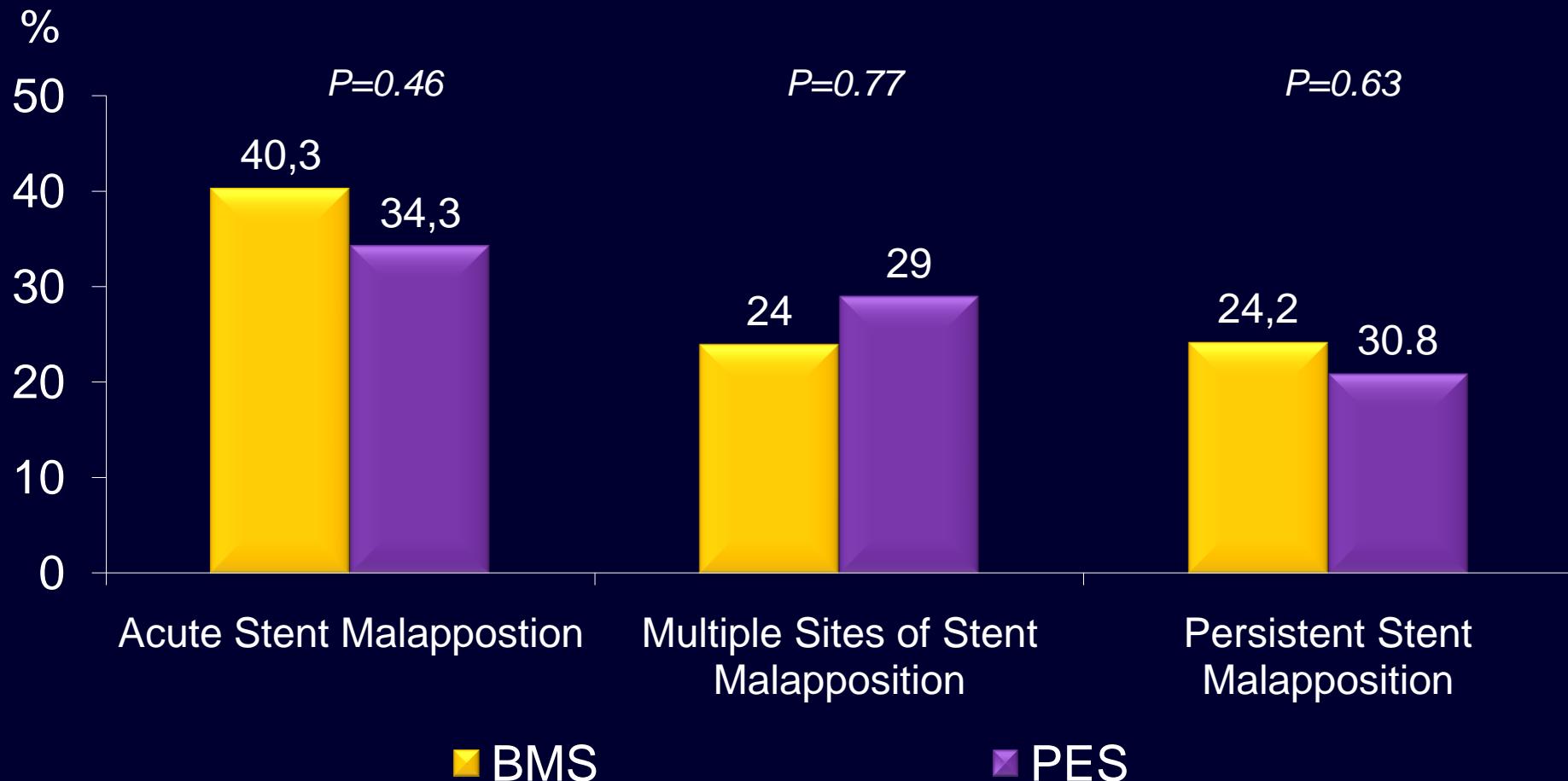
## Independent Predictors of ST

Variable	Hazard Ratio	95% CI
Age	0.6	0.4-0.8
Index ST	6.2	2.1-18.9
Bifurcation	4.1	1.6-10.0
Thrombectomy	0.1	0.01-0.8
Large thrombus	8.7	3.4-22.5



# Acute Stent Malapposition in HORIZONS-AMI

Guo N et al. *Circulation* 2010;122:1088-84



241 STEMI patients enrolled into HORIZONS-AMI  
undergoing IVUS at baseline and 13 months follow-up

# Predictors of Stent Thrombosis

van Werkum et al. *Circulation* 2009;119:828-834

## Dutch Stent Thrombosis Registry

21,009 pts

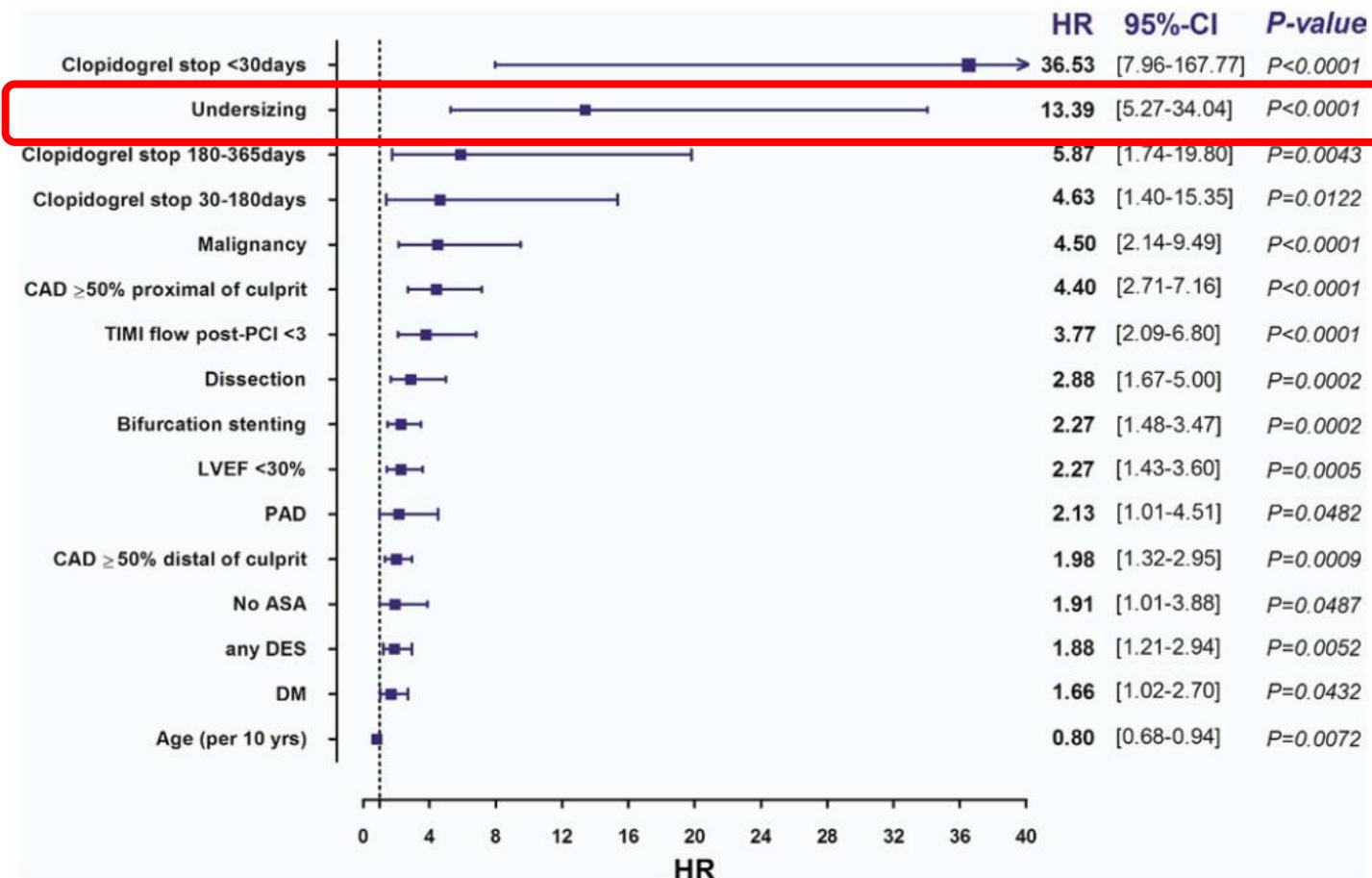
437 (2.1%) pts  
with definite ST

### Timing

- early: 74%
- late: 13%
- very late: 12%

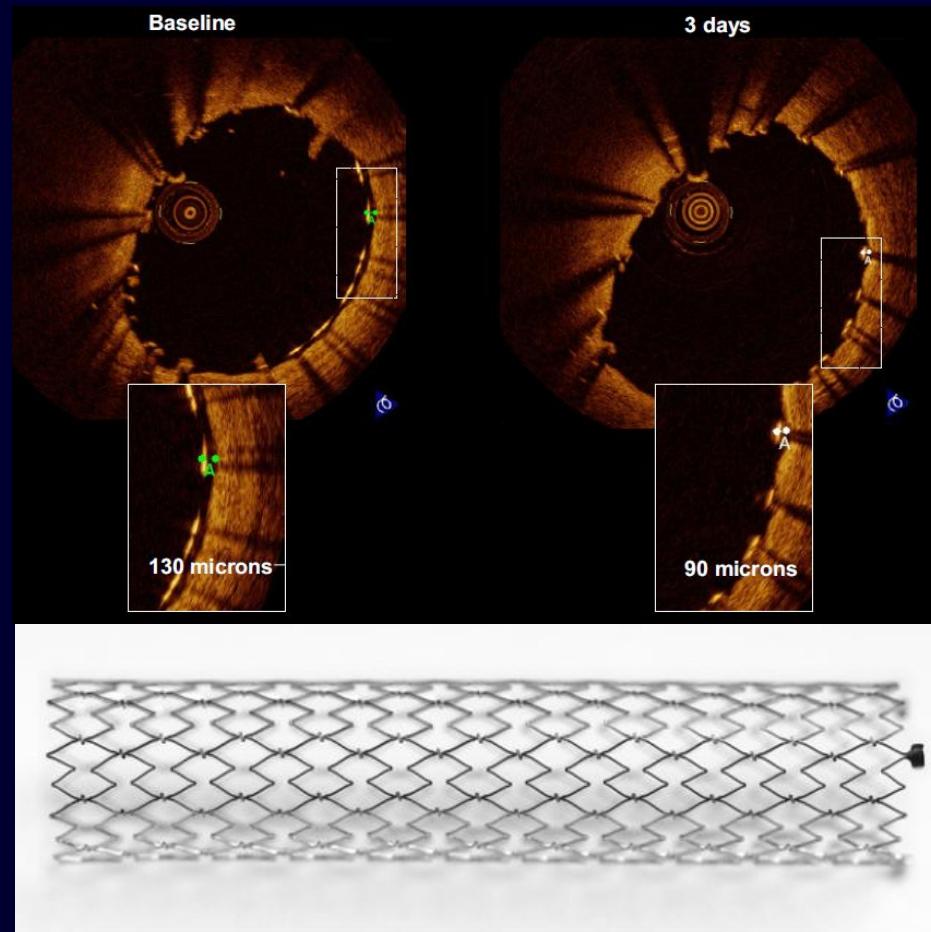
### Stent Type

- BMS: 62%
- DES: 35%
- BMS+DES: 4%

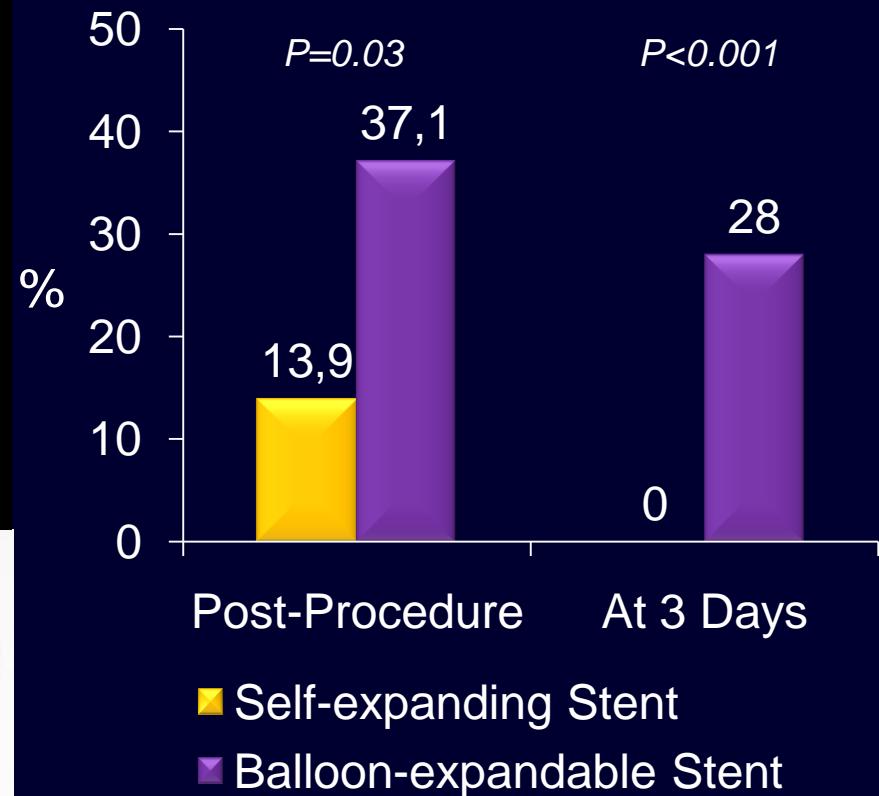


# Self-Expanding Versus Balloon-Expandable Stents in AMI: APPPOSITION II

van Geuns RJ et al. *JACC CV Interv* 2012;5:1209-19

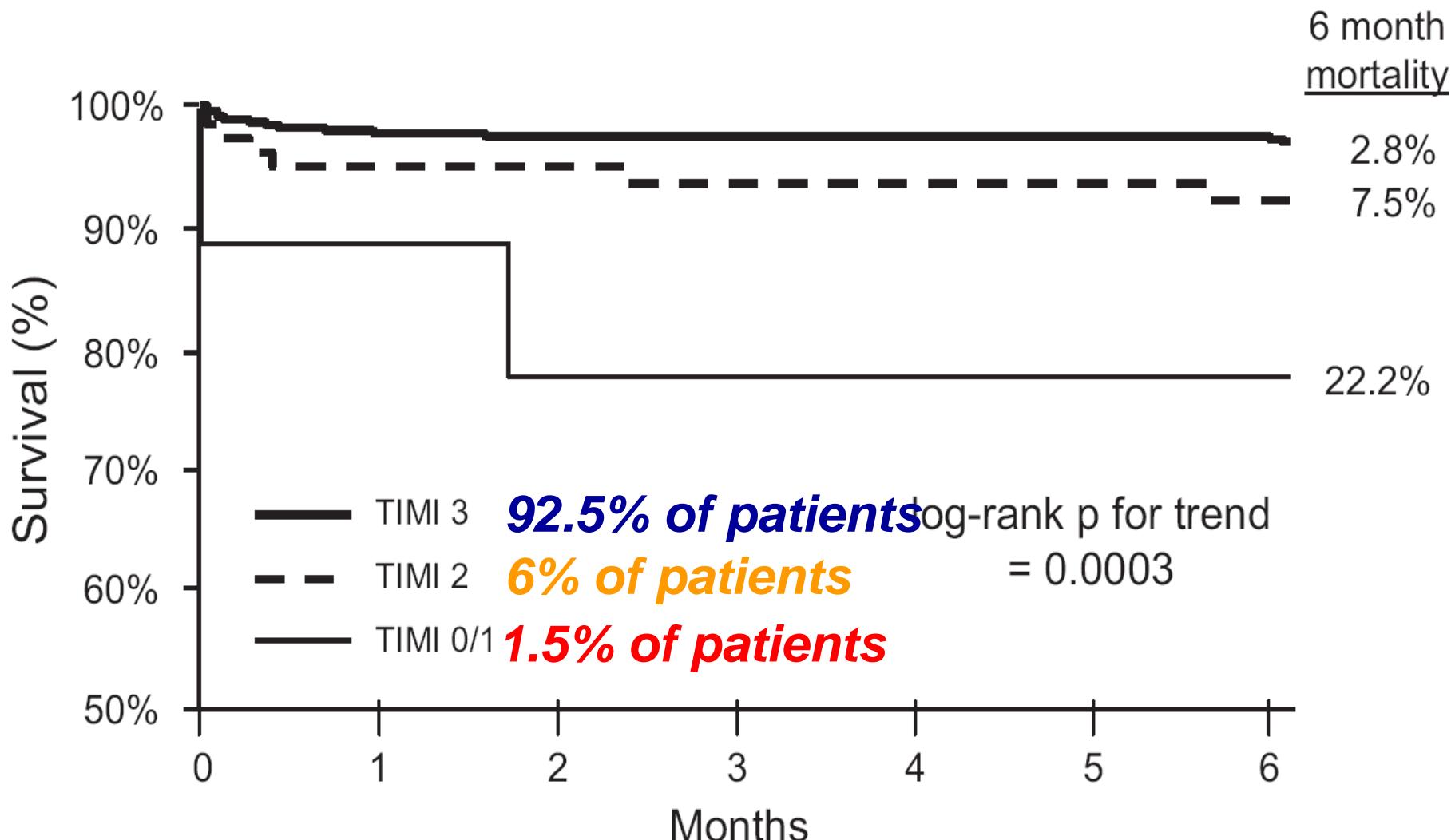


## Malapposition – Patient Level



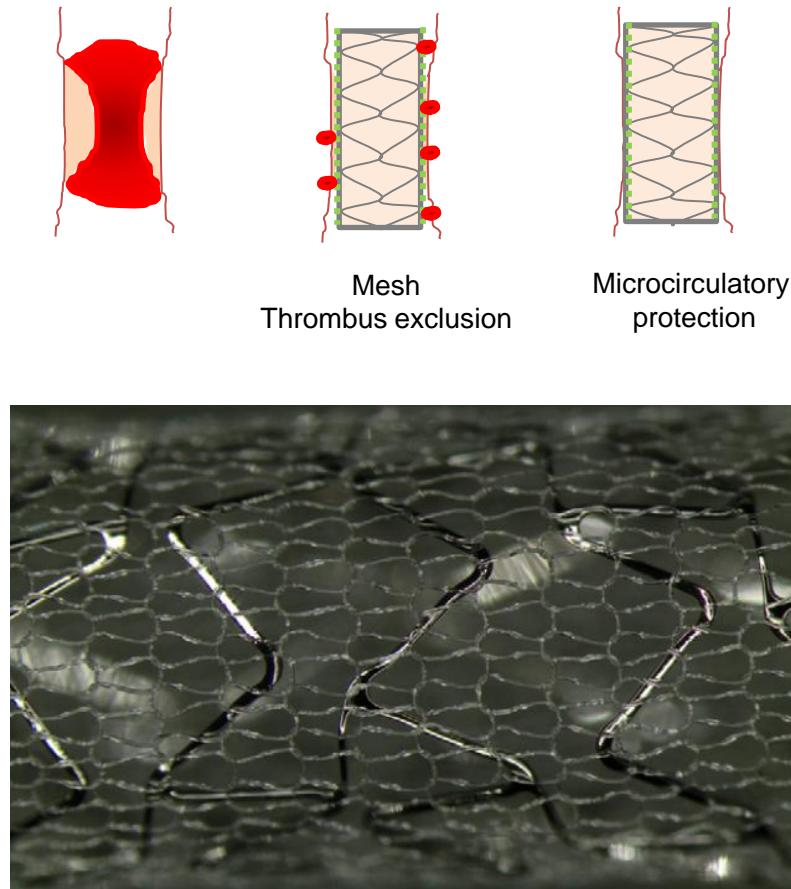
# Impact of Post-Procedure TIMI Flow on Survival

Stone G. *Circulation* 2008;118:538-51

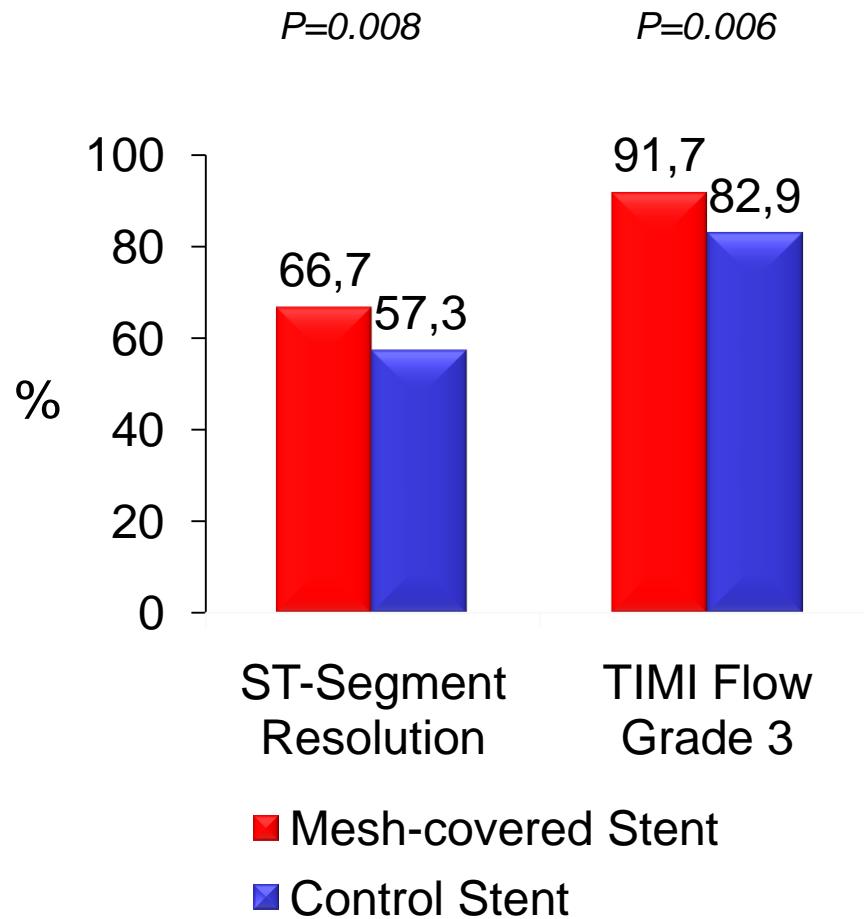


# Mesh-Covered Versus Balloon-Expandable Stents in AMI: MASTER Trial

Stone G et al. JACC 2012;60:1975-84



Polyethylene terephthalate micronet 150x180 µm



## **Stent Choice in AMI**

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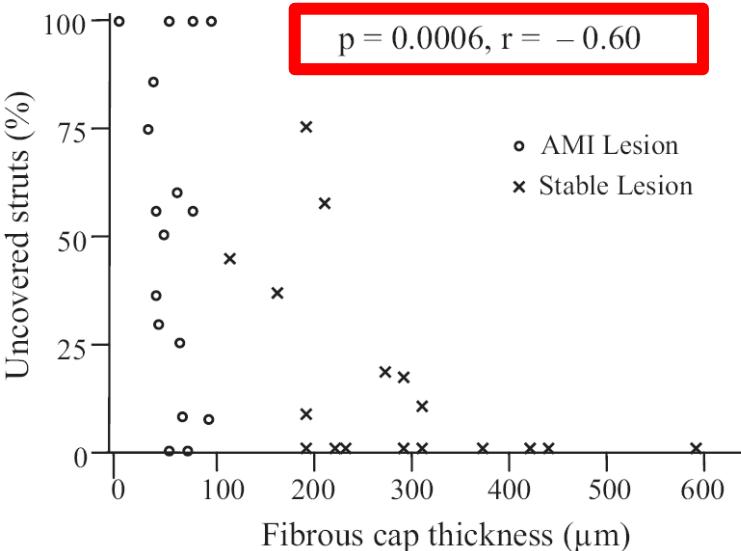
**Newer  
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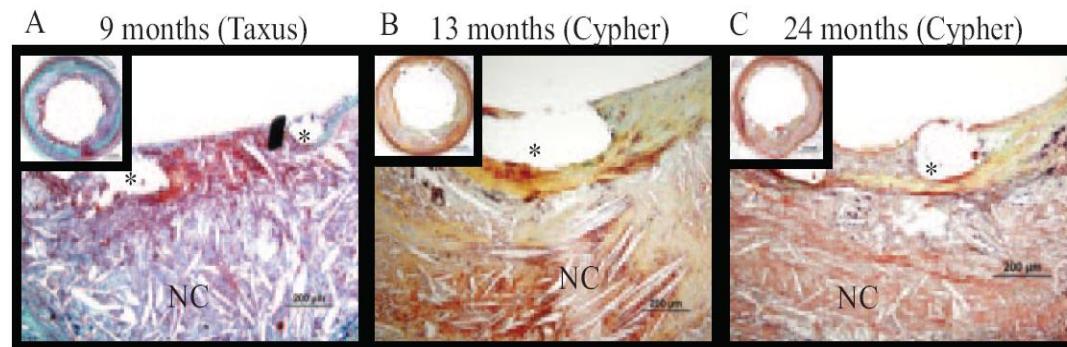
# Arterial Healing at Culprit Sites after DES Implantation in Patients with Acute MI and Stable Angina – An Autopsy Study

Nakazawa et al. *Circulation* 2008; 118:1138-1145

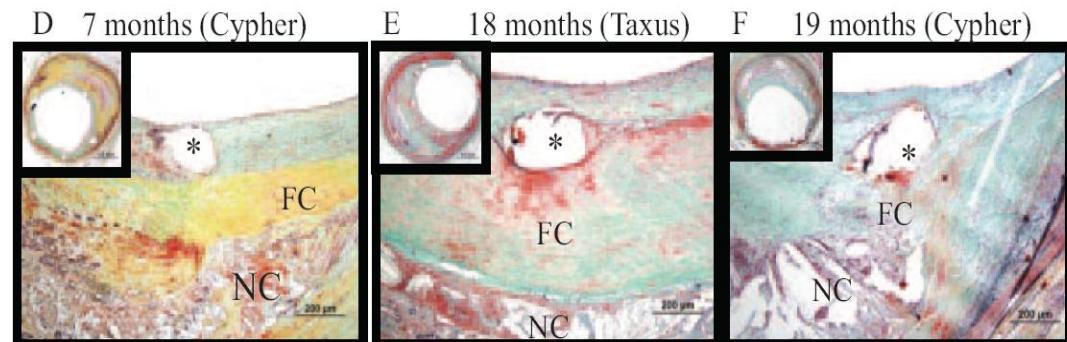
## Correlation between fibrous cap thickness and % uncovered struts



AMI lesions (with Plaque Rupture)

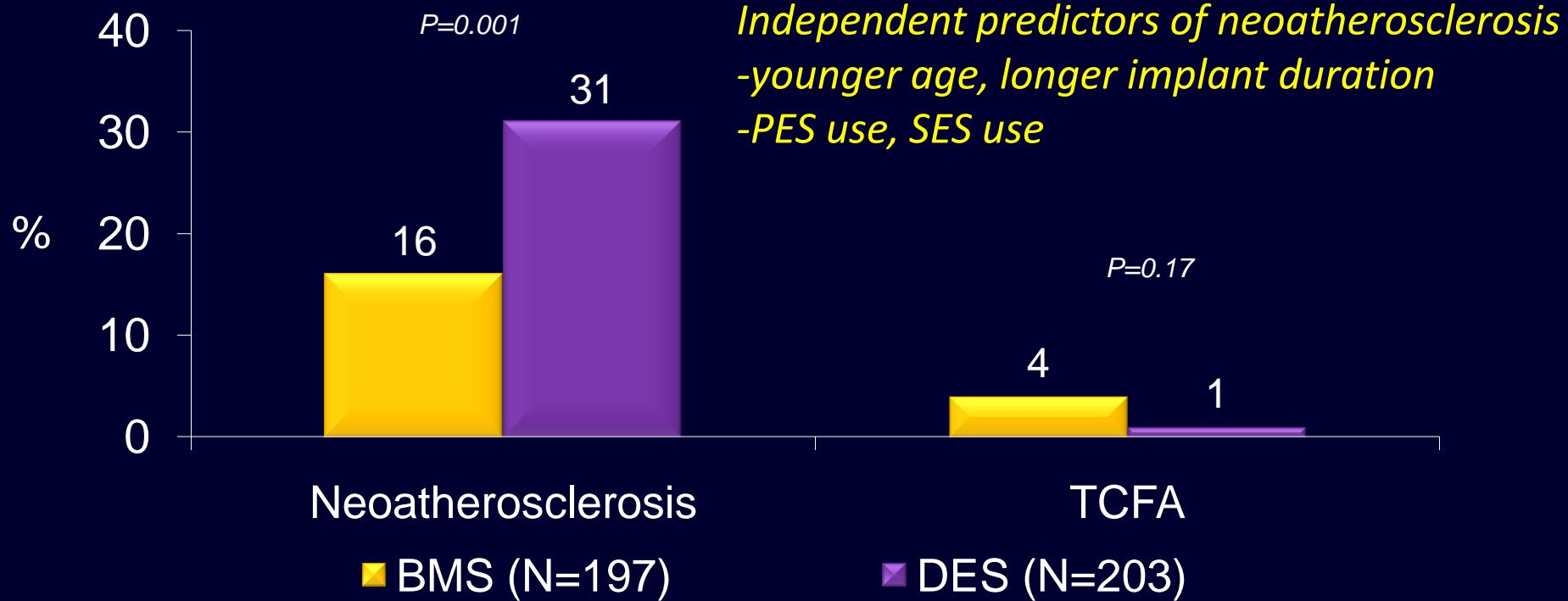
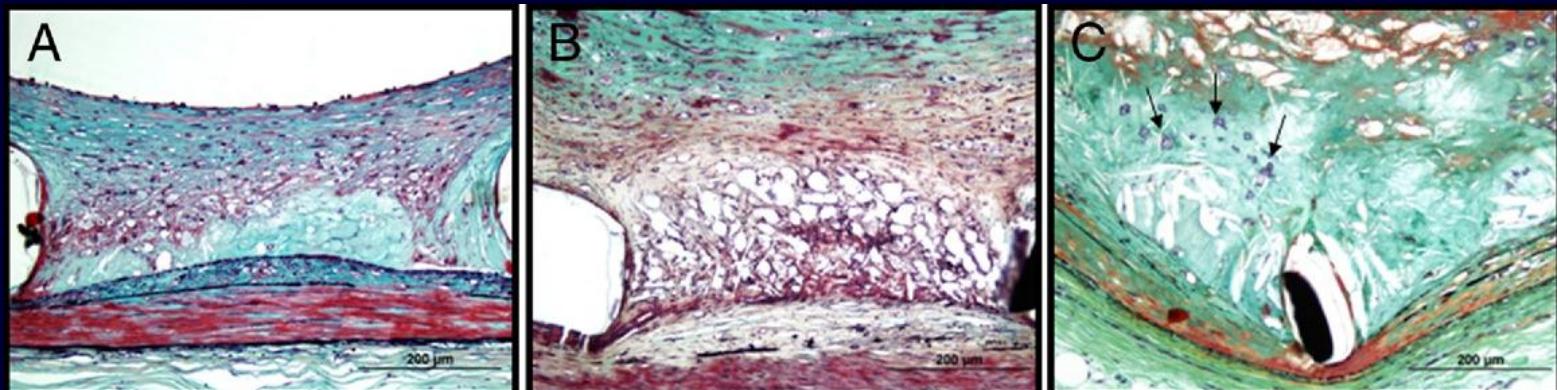


Stable Lesions (with Fibroatheroma and thick cap)

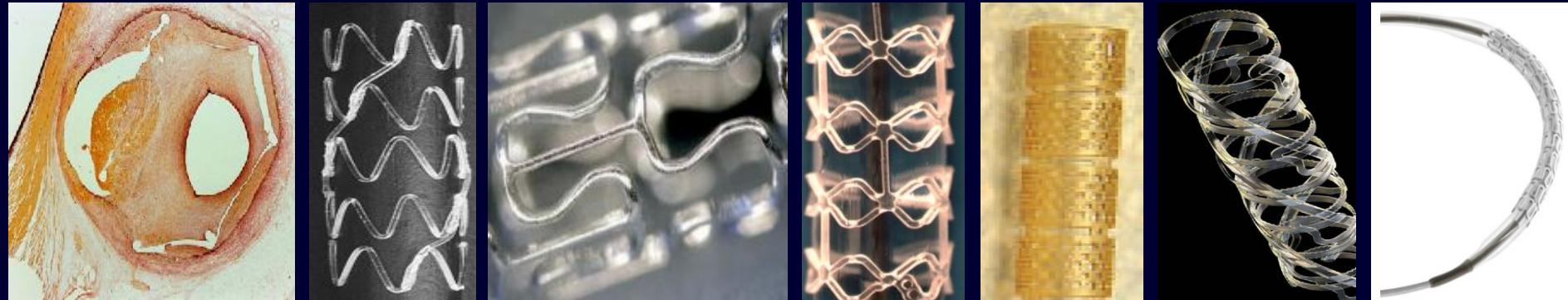


# Neoatherosclerosis of Coronary Artery Stents

Nakazawa G et al. J Am Coll Cardiol 2011;57:1314-22



# Fully Biodegradable Stent Platforms



Van der Giessen *Circulation* Tamai *Circulation* Erbel *Lancet* Ormiston *Lancet* Jabara *PCR 2009* Abizaid *TCT 2009* Haude *PCR 2011*

1996

2000

2007

2008

2009

2011

Animal studies  
polymeric scaffolds  
revealing excessive  
inflammatory reactions

Igaki Tamai  
First fully  
biodegradable non  
drug eluting scaffold  
N=15

AMS-1  
first bioabsorbable  
metallic non drug-  
eluting scaffold  
N=64

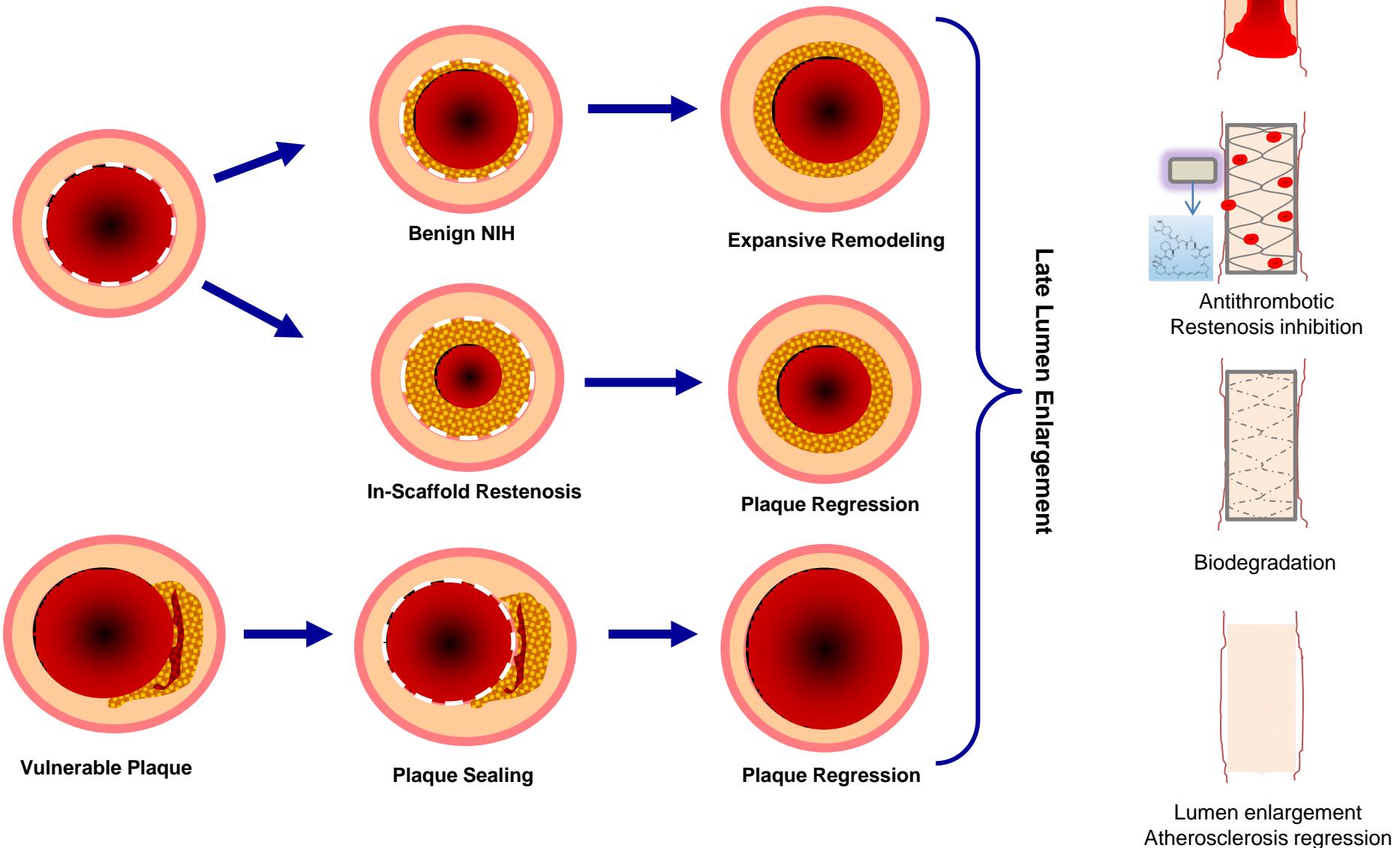
Bioresorbable  
vascular scaffold  
first bioabsorbable drug  
eluting scaffold  
N=31

IDEAL BDS  
Polyanhydride  
ester and salicylic acid,  
drug-eluting scaffold  
N=11

REVA  
Polycarbonate stent,  
radiopaque, non drug-  
eluting scaffold  
N=31

DREAMS  
first drug-eluting  
bioabsorbable  
metallic scaffold  
N=22

# Potential of Fully Bioresorbable Vascular Scaffolds in STEMI



## **Stent Choice in AMI**

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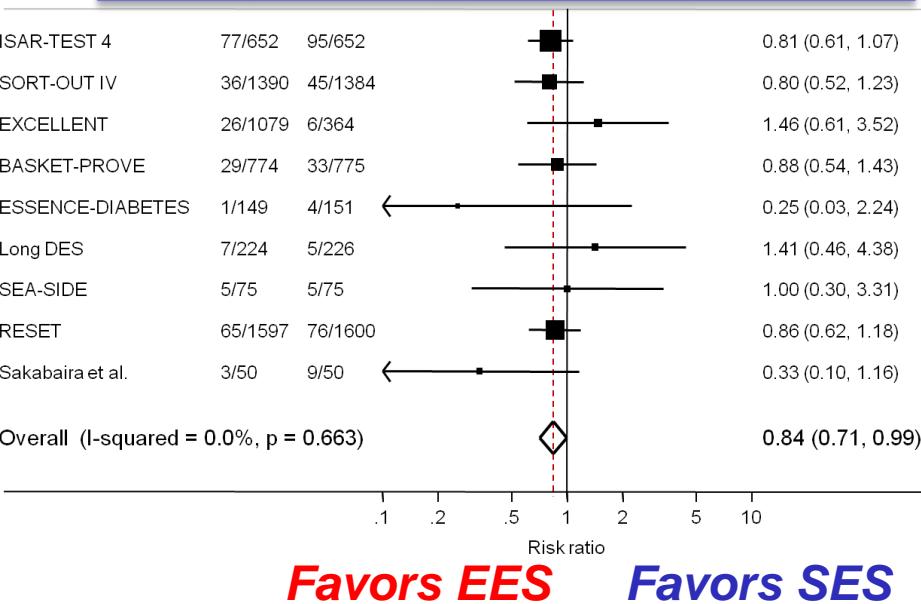
**Plaque  
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# Progress With Newer Generation Drug-Eluting Stents

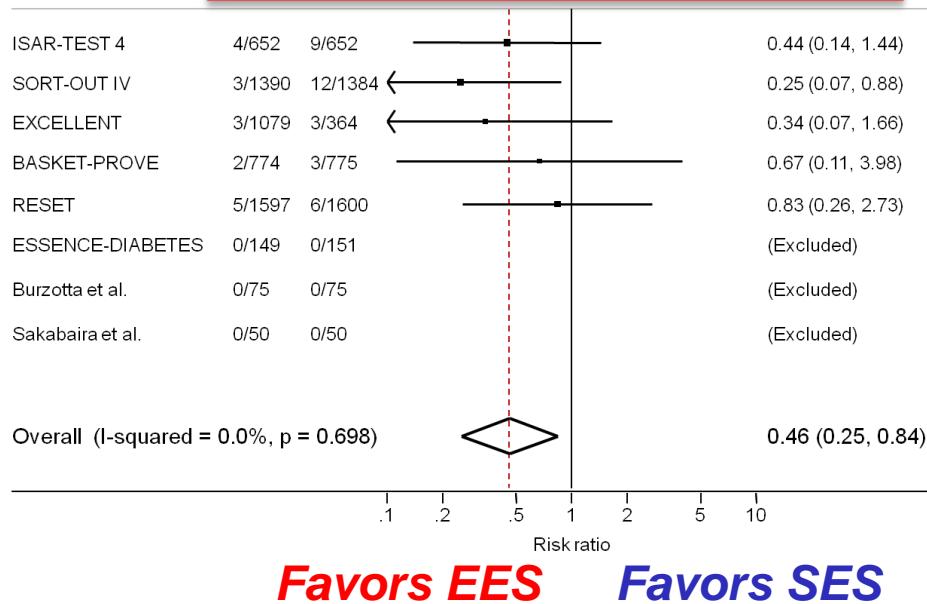
## Newer Generation DES Efficacy and Safety

### Everolimus-Eluting versus Sirolimus-Eluting Stents

#### Target Lesion Revasc



#### Definite ST



Updated Meta-Analysis N = 11,167

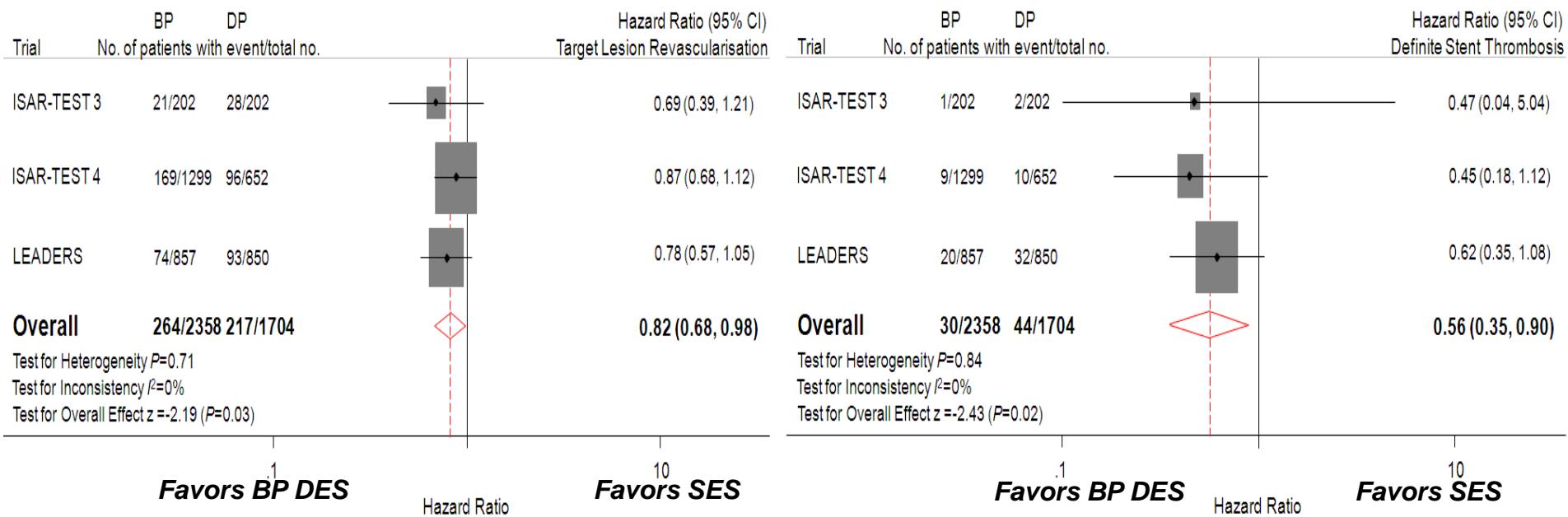
Stefanini, Windecker

# Biodegradable Polymer DES Versus Durable Polymer SES

Stefanini G et al. *Eur Heart J* 2012; 33, 1214–1222

## Target-Lesion Revasc @ 4 Years

## Definite ST @ 4 Years

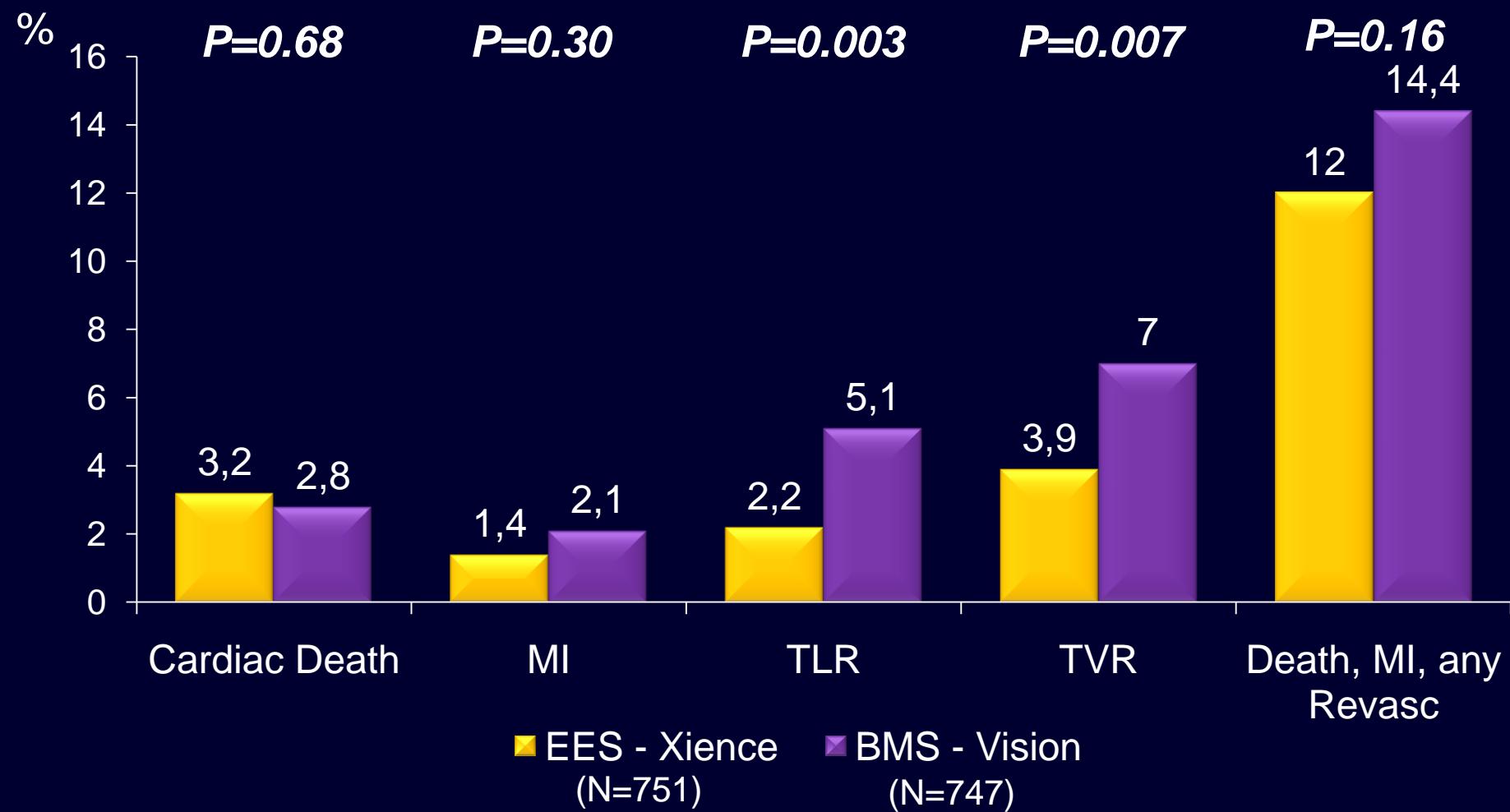


***N = 4,062 – IPD Pooled Analysis of LEADERS, ISAR-TEST 3 and 4***

# Everolimus-Eluting Stent versus Bare Metal Stent in ST-Elevation MI

Sabaté M et al. *Lancet* 2012; 380:1482-90

## ***Clinical Outcomes @ 12 Months***

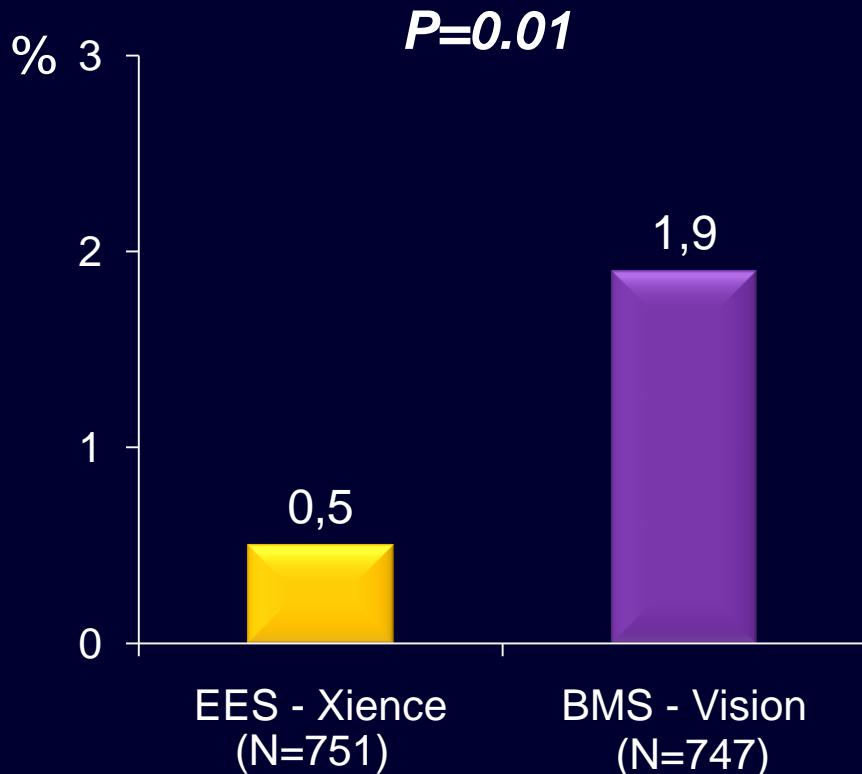


# Everolimus-Eluting Stent versus Bare Metal Stent in ST-Elevation MI

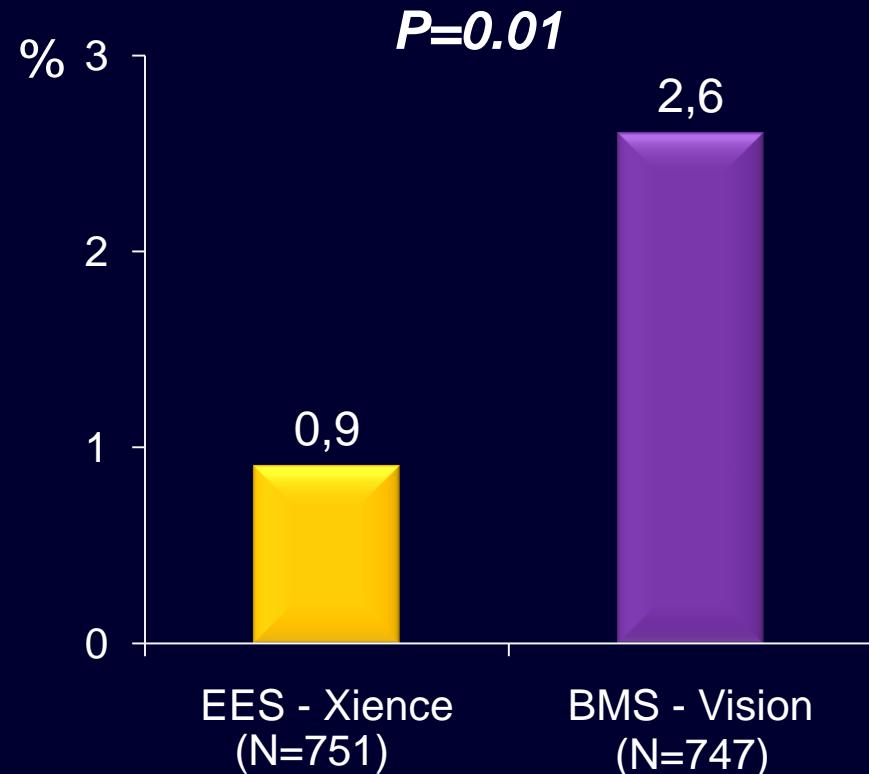
Sabaté M et al. *Lancet* 2012; 380:1482-90

## ***Stent Thrombosis @ 12 Months***

***Definite***



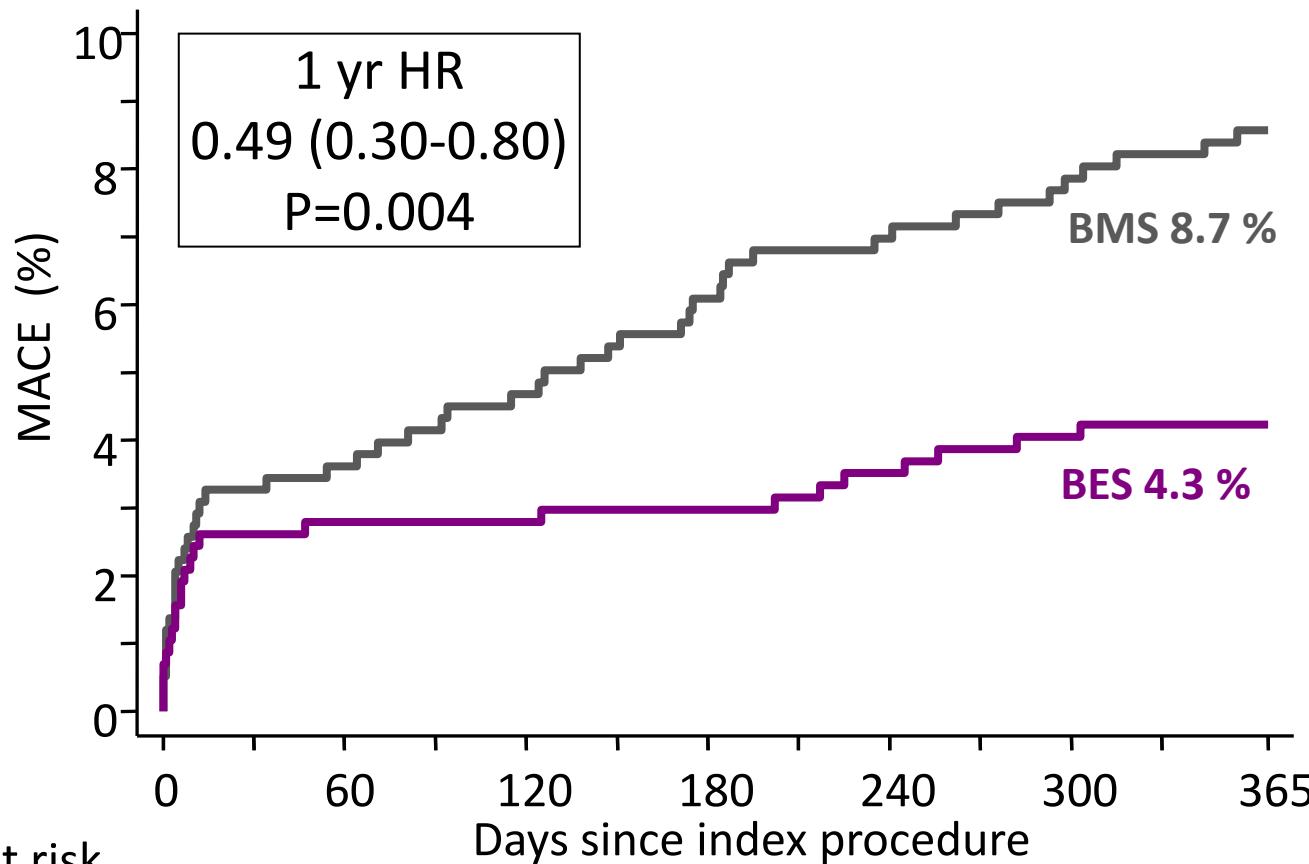
***Definite or Probable***



# Biodegradable Polymer BES versus Bare Metal Stents in STEMI – COMFORTABLE AMI

Räber L et al. JAMA 2012;308:777-87

1° EP – Cardiac Death, TV-MI or ci-TLR @ 1 Year



No at risk

BMS 582  
BES 575

546  
543

539  
541

531  
540

525  
537

519  
534

514  
530

Days since index procedure

# Biodegradable Polymer BES versus Bare Metal Stents in STEMI – COMFORTABLE AMI

Räber L et al. JAMA 2012;308:777-87

## *Individual Components of Primary Endpoint*

Cardiac Death (%)

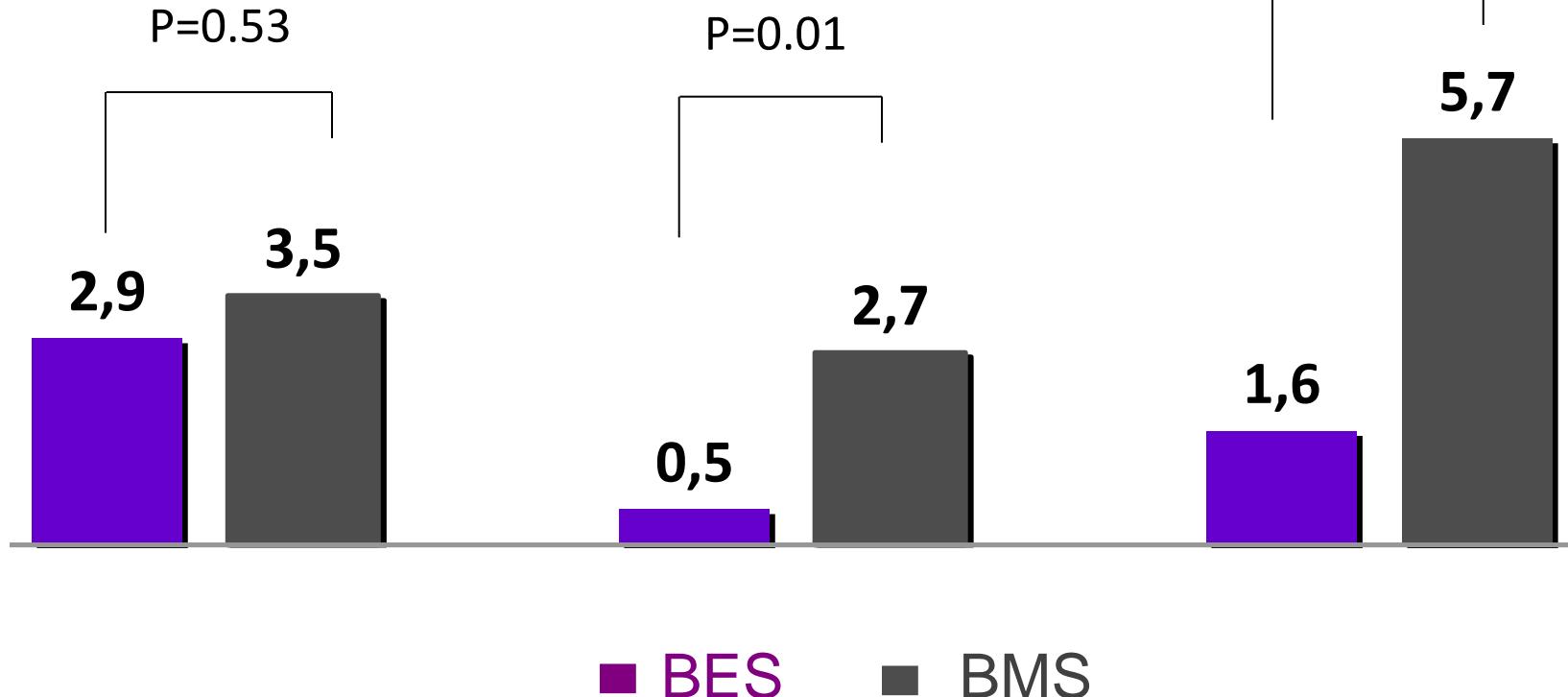
TV-MI (%)

TLR (%)

P=0.53

P=0.01

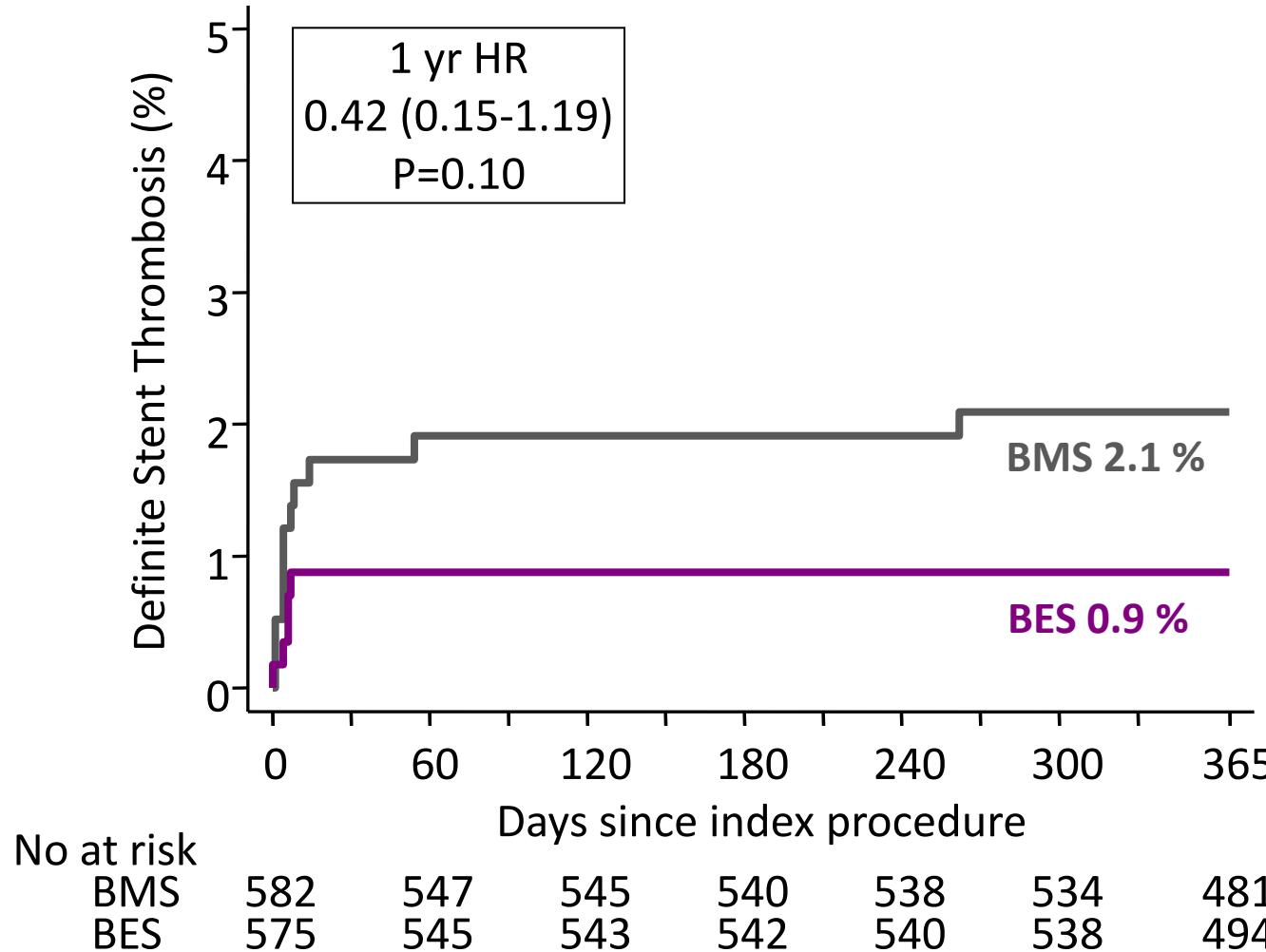
P<0.001



# Biodegradable Polymer BES versus Bare Metal Stents in STEMI – COMFORTABLE AMI

Räber L et al. JAMA 2012;308:777-87

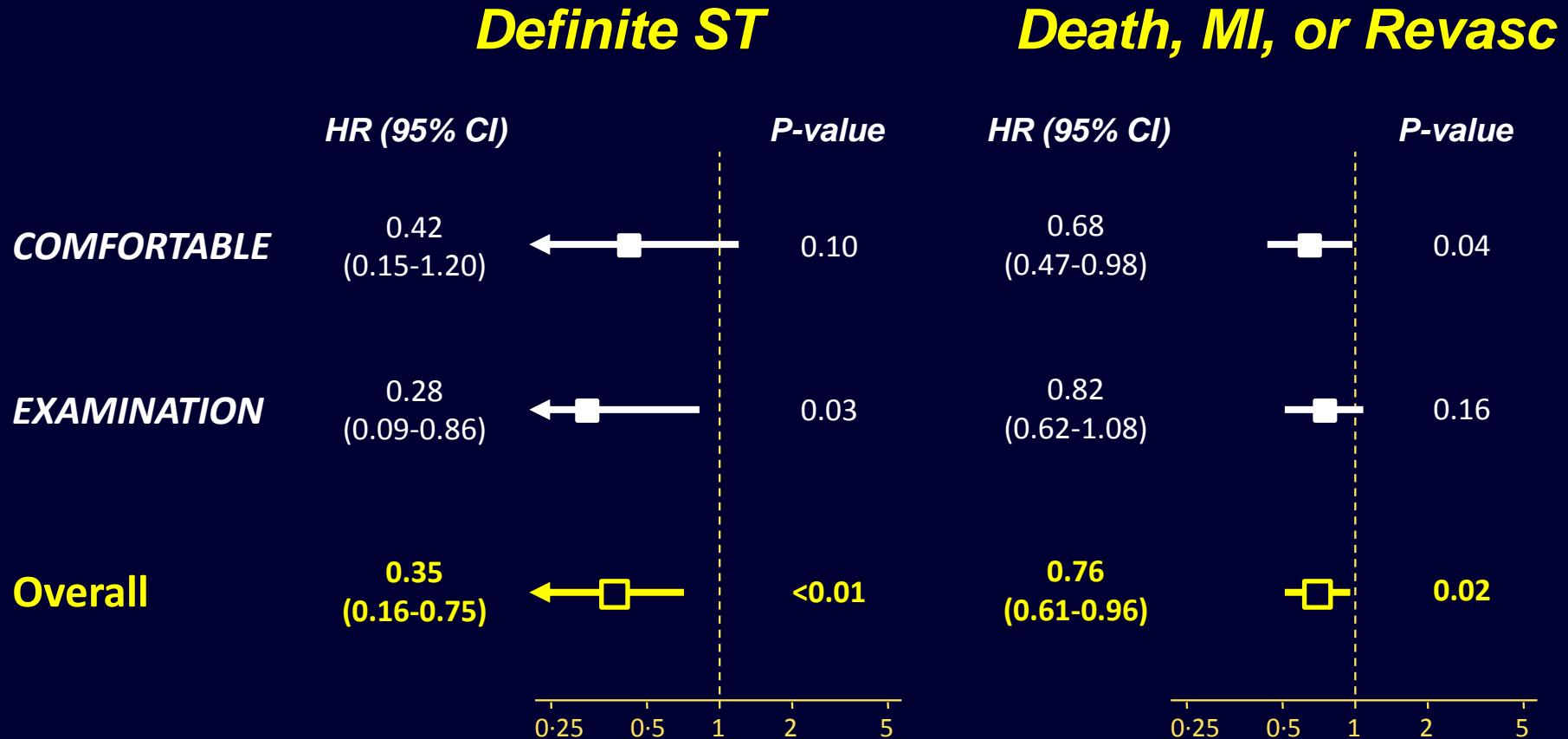
## *Definite Stent Thrombosis*



# Risk of Adverse Events With New Generation DES versus BMS in STEMI

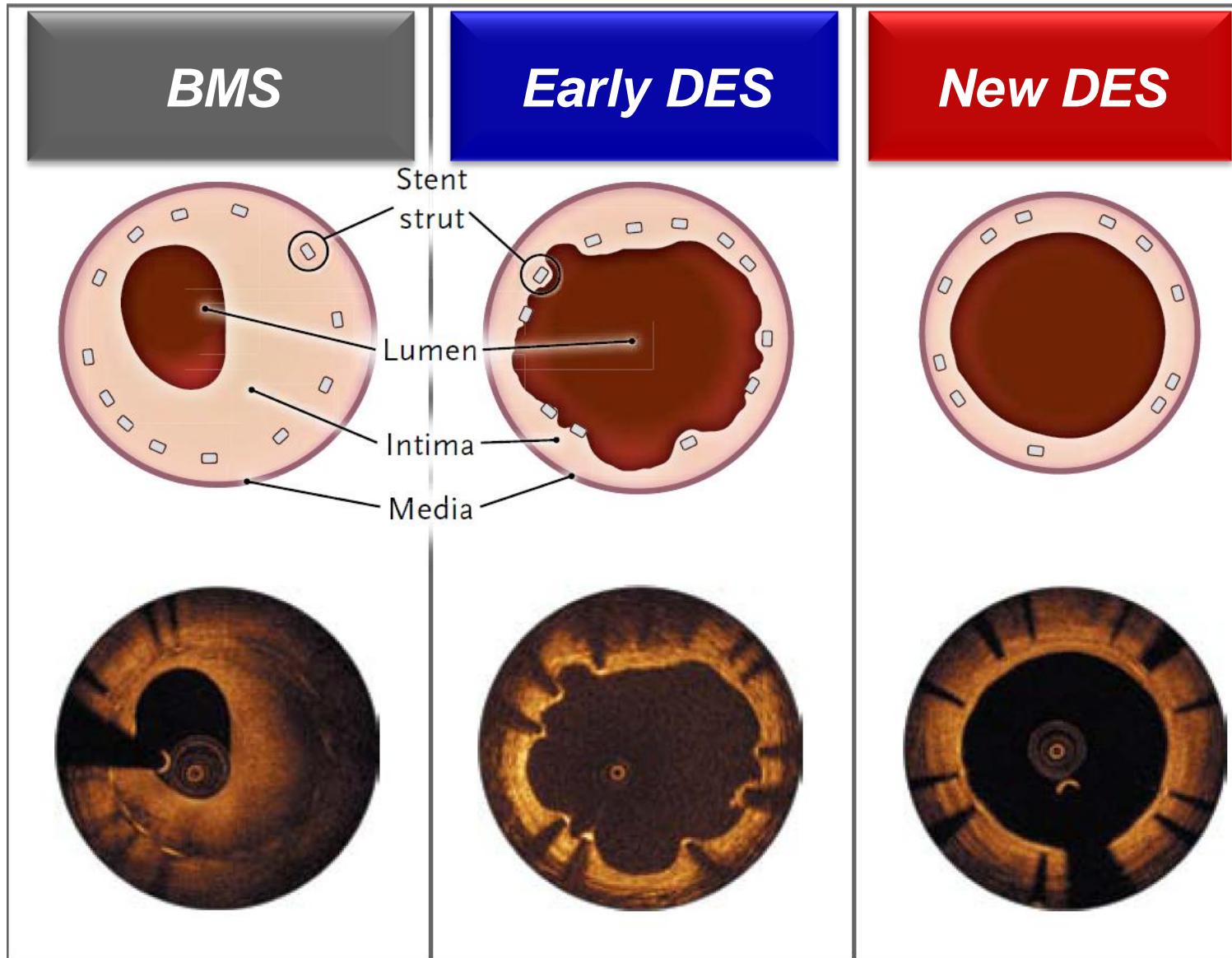
## A Pooled Analysis of *COMFORTABLE* and *EXAMINATION*

Räber L et al. *JAMA* 2012 – Sabaté M et al. *Lancet* 2012



# Arterial Healing After Coronary Stents Implantation

Stefanini G, Holmes D. *N Eng J Med* 2013;368:254-65



## **Stent Choice in AMI**

**Vessel and  
Stent Size  
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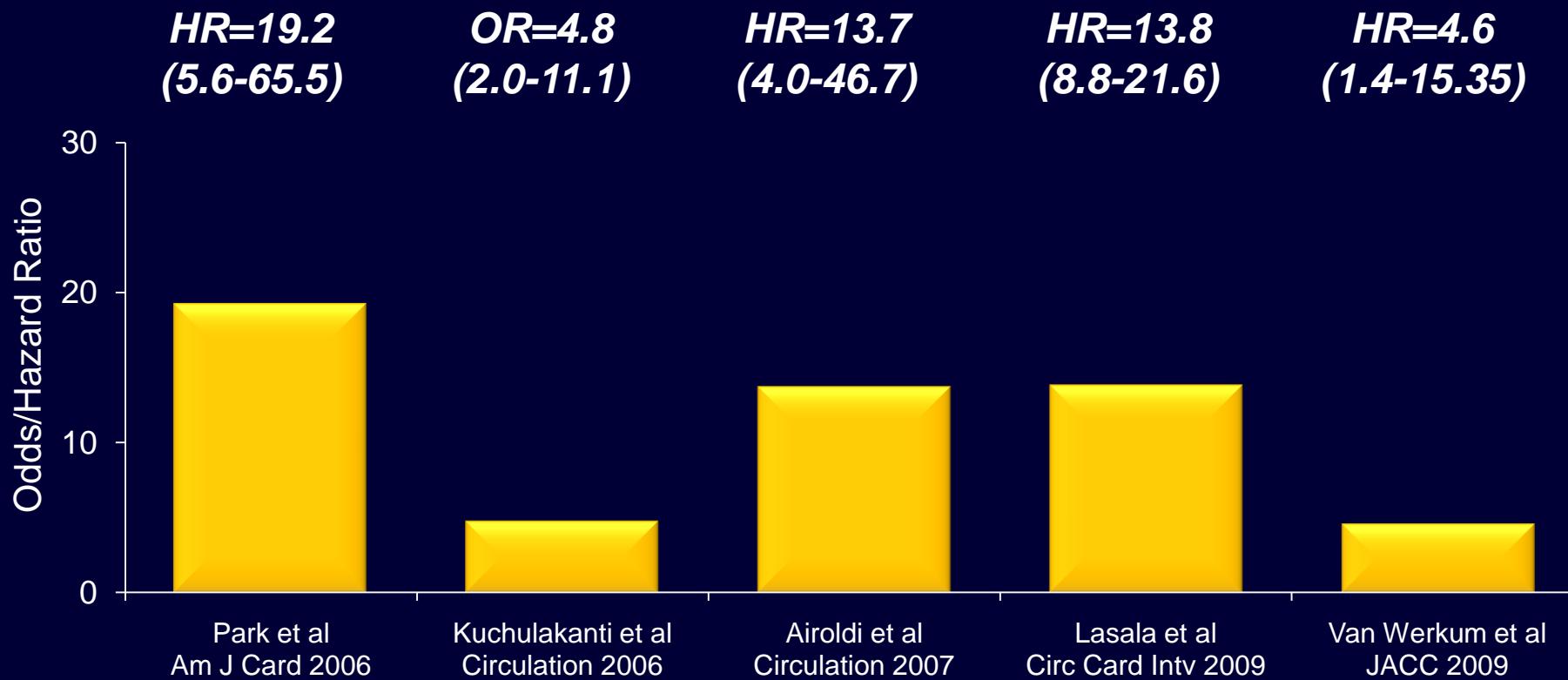
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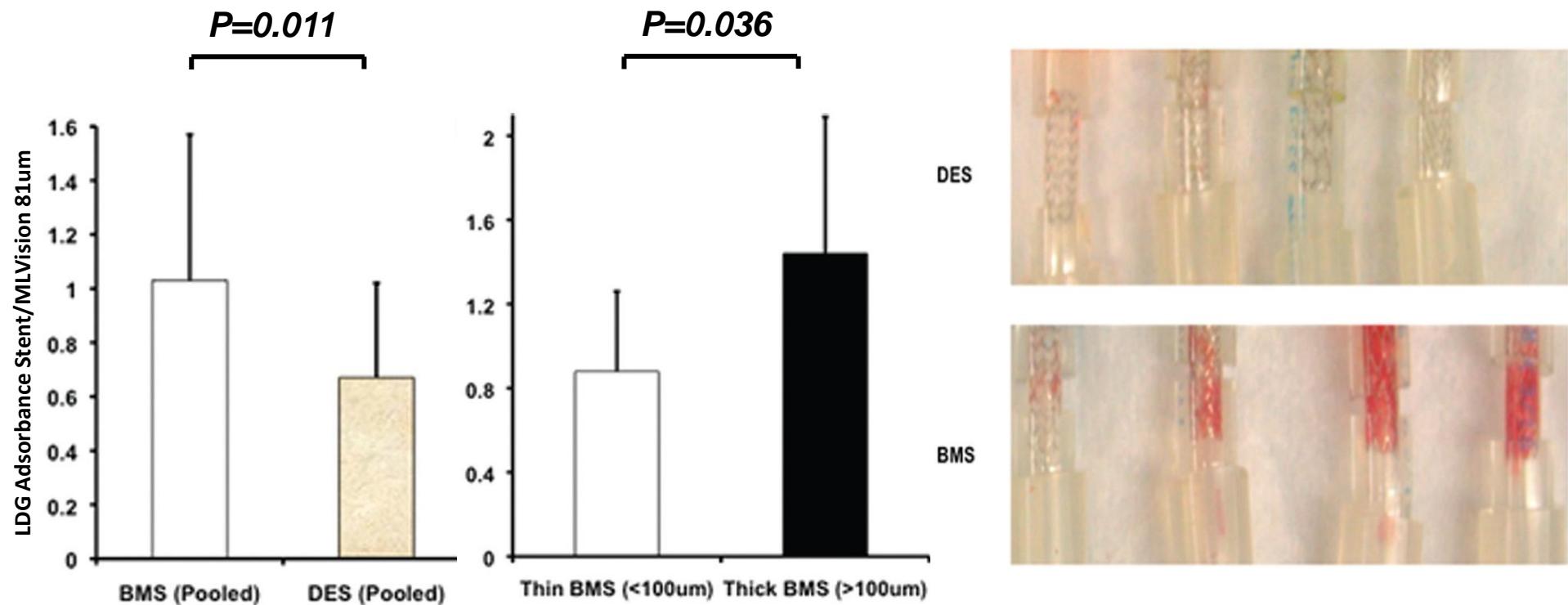
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# Discontinuation of Antiplatelet Therapy as Predictor of Stent Thrombosis



# Impact of Polymer-Drug Coating and Platform Design on Early Stent Thrombogenicity

Kolandaivelu K et al. *Circulation* 2011;123:1400-1409.

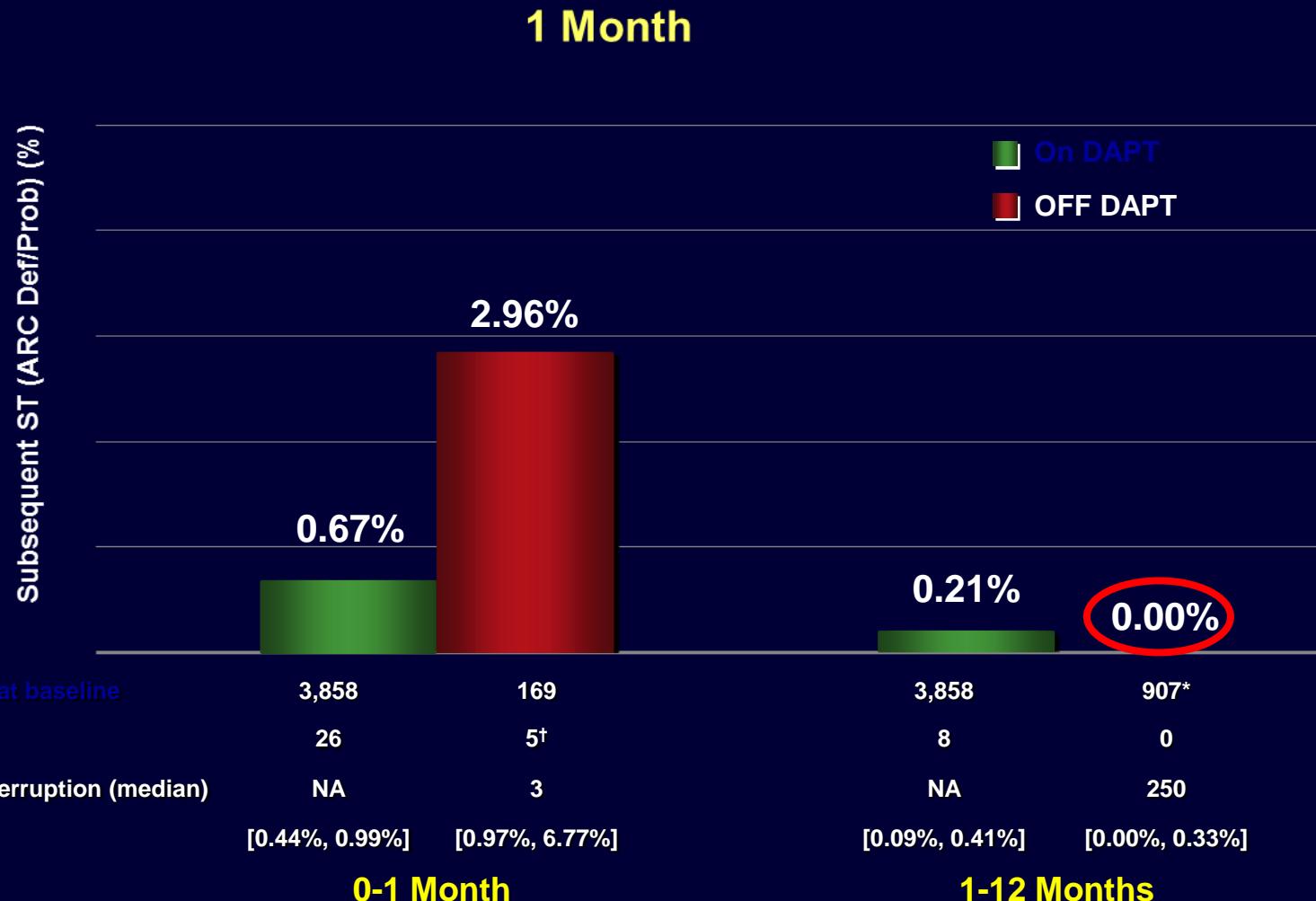


Pooled BMS: ML Vision, Driver, Taxus, Bx Velocity

Pooled DES: Xience V, Endeavor, Taxus Libertè, Cypher

# RESOLUTE Pooled On DAPT Analysis

## *Timing of ST Events On and Off DAPT Through 1 Year*



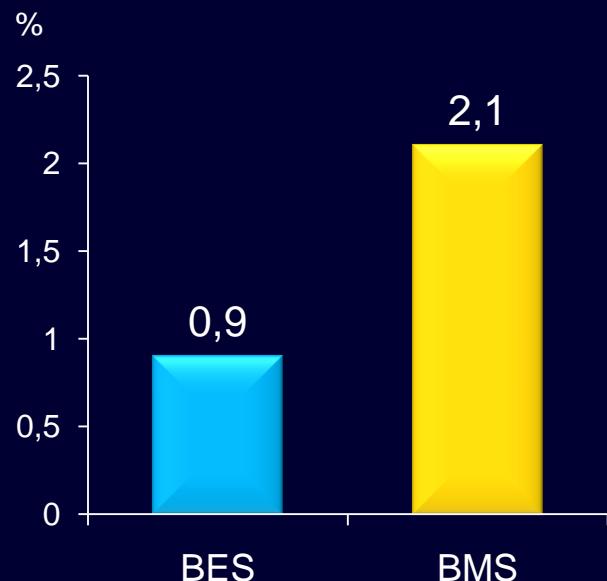
\* of which 617 patients discontinued (did not restart) and 219 patients temporarily stopped DAPT

† 4 of the events involved discontinuation within 1<sup>st</sup> 2 days – all probable ST (unexplained/cardiac death within 30 days). 1 event followed interruption at day 3 – definite ST at day 22.

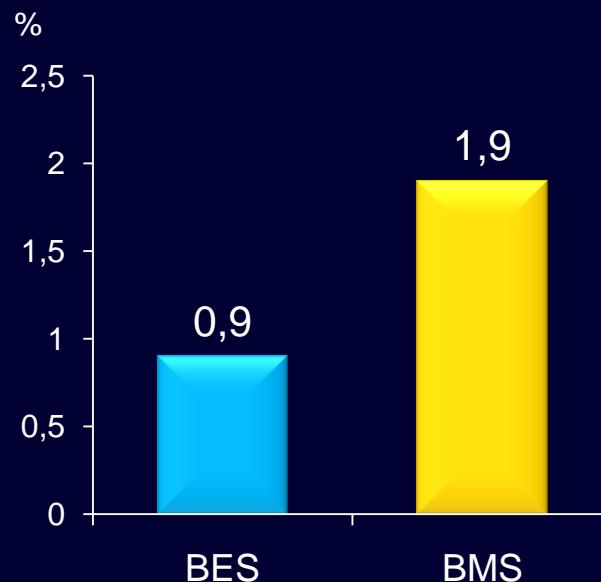
# Definite ST According to Discontinuation of DAPT in the COMFORTABLE-AMI Trial

Räber L et al. JAMA 2012;308:777-87

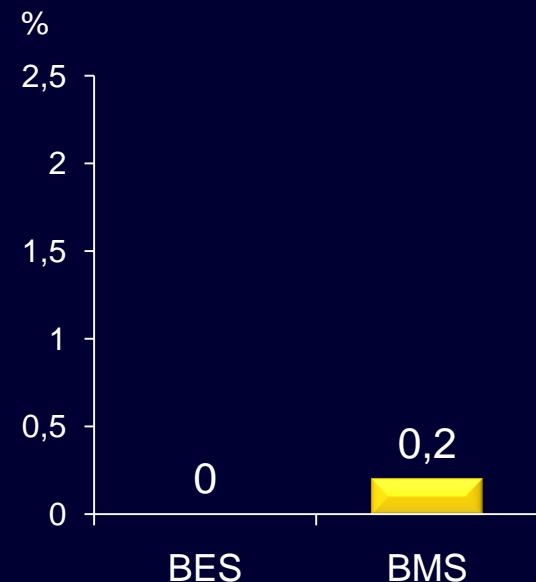
*Overall*



*On DAPT*



*Off DAPT*



# Efficacy and Safety of DES, BMS, and CABG According to Clinical Indication

Stefanini G, Holmes D. *N Eng J Med* 2013;368:254-65

Outcome and Intervention	Stable Coronary Artery Disease	Acute Myocardial Infarction	Diabetes	Multivessel Disease	Left Main Coronary Artery Disease
<b>Restenosis</b>					
Implantation of bare-metal stent	+	+	+	+	+
Implantation of drug-eluting stent					
Early-generation	++	++	++	++	++
New-generation	+++	+++	++	++ [+]	++ [+]
CABG	+++	-	+++	+++	+++
<b>Cardiac death, myocardial infarction, or stent thrombosis</b>					
Implantation of bare-metal stent	+	+	+	+	+
Implantation of drug-eluting stent					
Early-generation	+	+/-	+	+	+
New-generation	+ [+]	+ [+]	+	+ [+]	++ [+]
CABG	+	-	++	++	++

# Recommendations for the Use of DES in Acute Coronary Syndromes

- **No safety concerns**
- **Consistent reduction in repeat revascularization procedures with the use of DES**

## **NSTE-ACS**

Hamm C et al. *Eur Heart J* 2011

- **DES** are indicated based on an individual basis taking into account baseline characteristics, coronary anatomy, and bleeding risk

I A

## **STEMI**

Steg PG et al. *Eur Heart J* 2012

- **Stenting** is recommended for primary PCI
- **DES** should be preferred over BMS if the patient has no contraindications to prolonged DAPT and is likely to be compliant

I A

IIa A