



## 4-year Outcomes of SYNTAX Left Main

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# THE AIM OF THE SYNTAX TRIAL



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VOL. 360 NO. 10

Percutaneous Coronary Intervention versus Coronary-Artery  
Bypass Grafting for Severe Coronary Artery Disease

Patrick W. Serruys, M.D., Ph.D., Marie-Claude Morice, M.D., A. Pieter Kappetein, M.D., Ph.D.,  
Antonio Colombo, M.D., David R. Holmes, M.D., Michael J. Mack, M.D., Elisabeth Stähle, M.D.,  
Ted E. Feldman, M.D., Marcel van den Brand, M.D., Eric J. Bass, B.A., Nic Van Dyck, R.N., Katrin Leadley, M.D.,  
Keith D. Dawkins, M.D., and Friedrich W. Mohr, M.D., Ph.D., for the SYNTAX Investigators\*

- Assessment the optimal revascularization strategy for patients with previously untreated three-vessel or left main coronary artery disease

# SYNTAX TRIAL DESIGN



SYNTAX

62 EU Sites + 23 US Sites

Heart Team (surgeon & interventional cardiologist)

Amenable for both treatment options

Amenable for only one treatment approach

Stratification:  
LM and Diabetes

Randomized Arms  
N=1800

Two Registry Arms  
N=1275

CABG  
n=897

vs

TAXUS\*  
n=903

CABG  
n=1077

PCI  
n=198

3VD  
n=549  
(66.3%)

LM  
n=348  
(33.7%)

3VD  
n=546  
(65.4%)

LM  
n=357  
(34.6%)

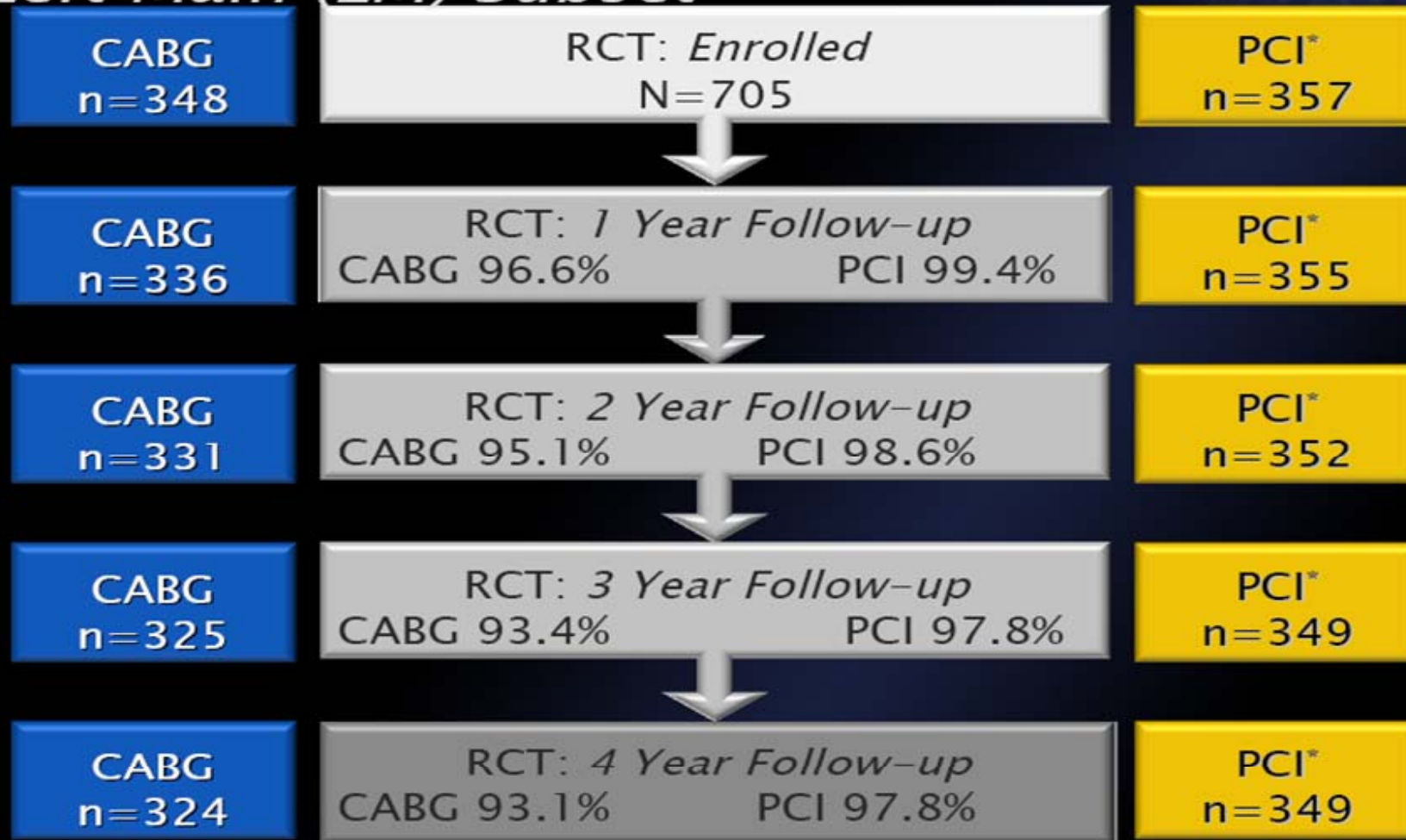
The LM subgroup was  
prestratified and powered

# PATIENTS IN SYNTAX TRIAL



## Left Main (LM) Subset

SYNTAX

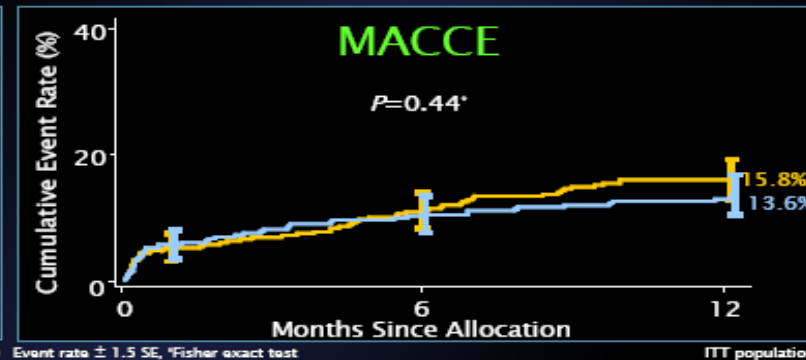
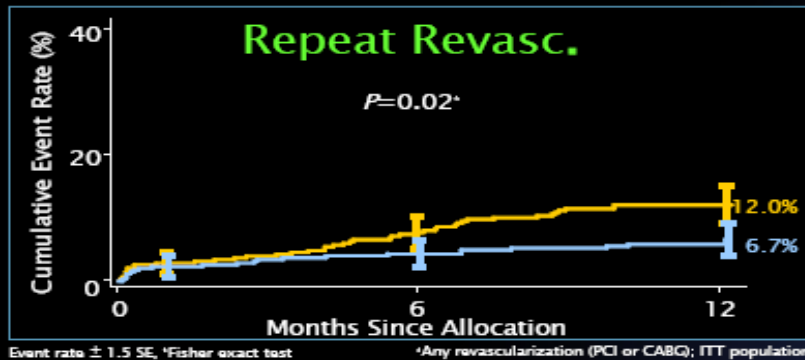
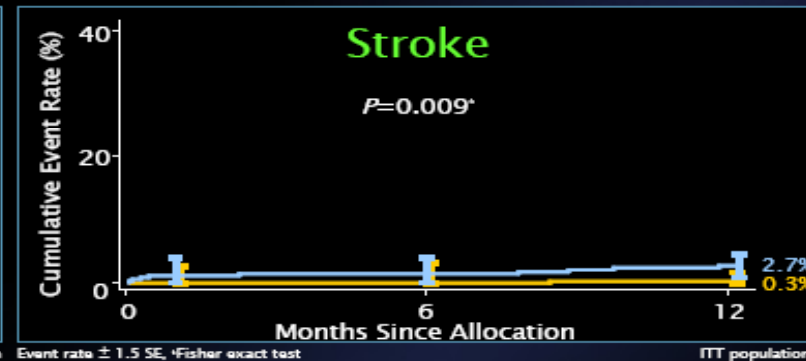
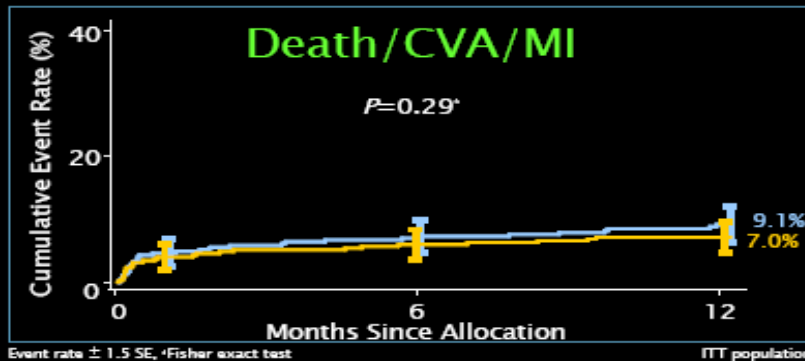


# SYNTAX 1-YEAR; LM SUBSET



## Summary of 1-Year Results LM Subset

SYNTAX



- 
- Death/Stroke/MI and MACCE rates were similar between groups
  - Stroke was significantly increased in CABG and revascularization in PCI

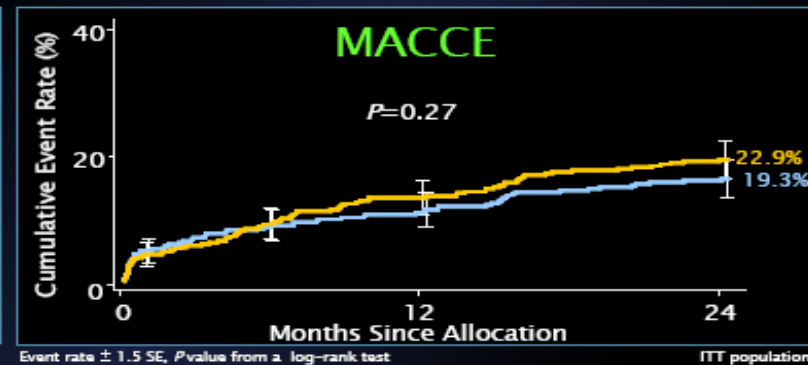
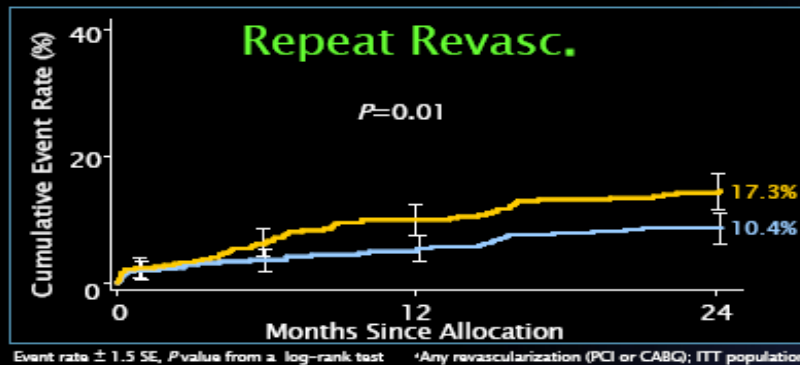
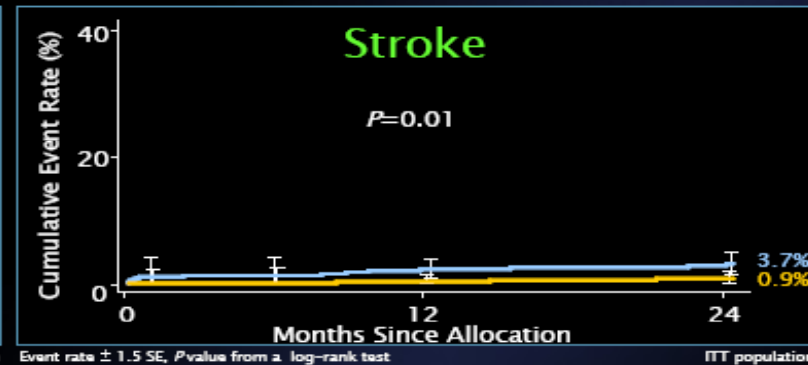
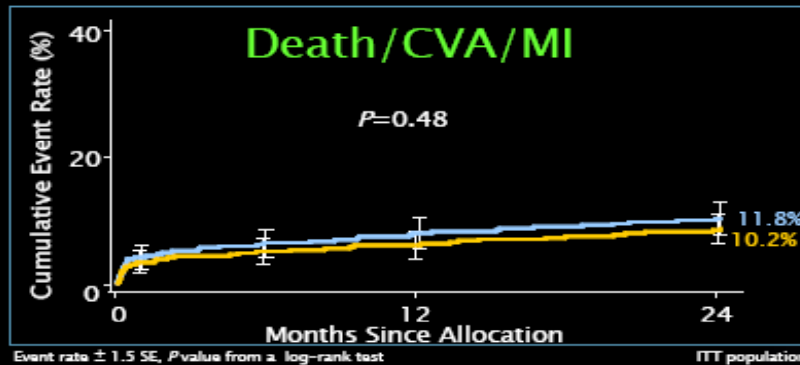
■ CABG (N=348) ■ PCI (N=357)

# SYNTAX 2-YEARS; LM SUBSET



## Summary of 2-Year Results LM Subset

SYNTAX



- 
- Death/Stroke/MI and MACCE rates were similar between groups
  - Stroke was significantly increased in CABG and revascularization in PCI

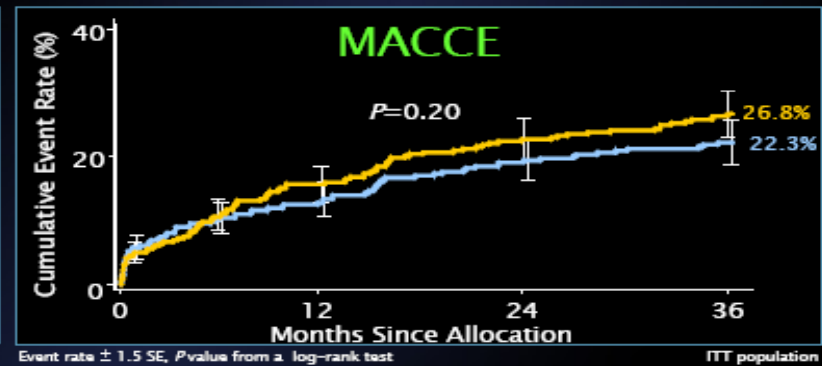
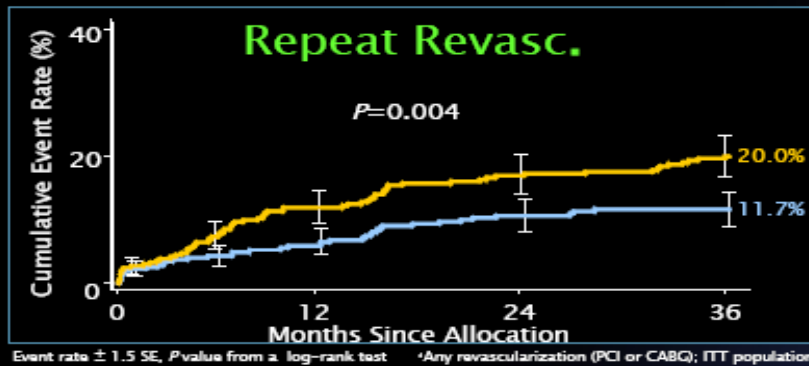
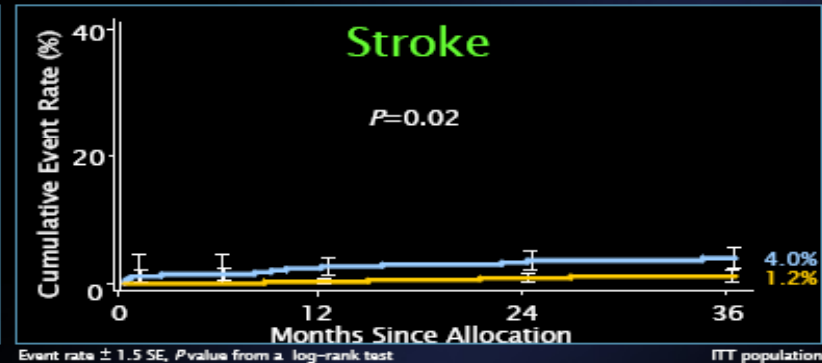
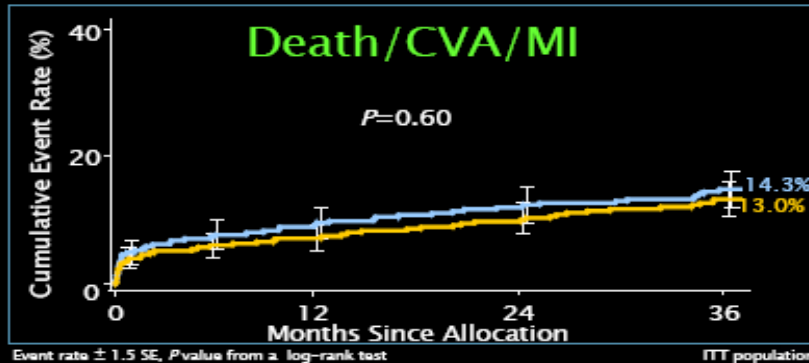
■ CABG (N=348) ■ PCI (N=357)

# SYNTAX 3-YEARS; LM SUBSET



## Summary of 3-Year Results LM Subset

SYNTAX



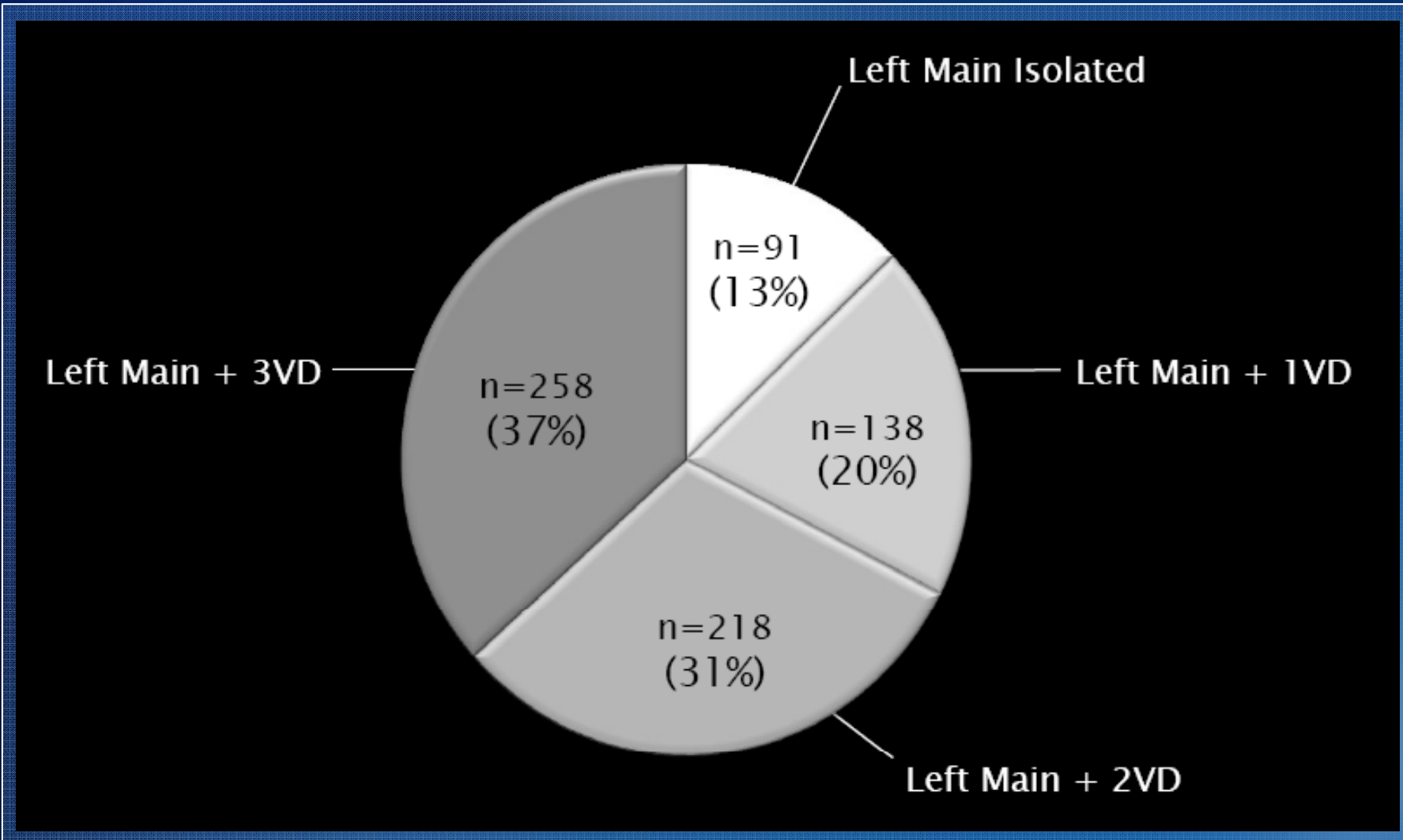
- Death/Stroke/MI and MACCE rates were similar between groups
- Stroke was significantly increased in CABG and revascularization in PCI

■ CABG (N=348) ■ PCI (N=357)

# SYNTAX 4-YEARS



## Heterogeneity in the Left Main Group



Source: M.C.Morice on behalf of the SYNTAX investigators, TCT 2011



# SYNTAX 4-YEARS

## Patient Characteristics; LM Subset



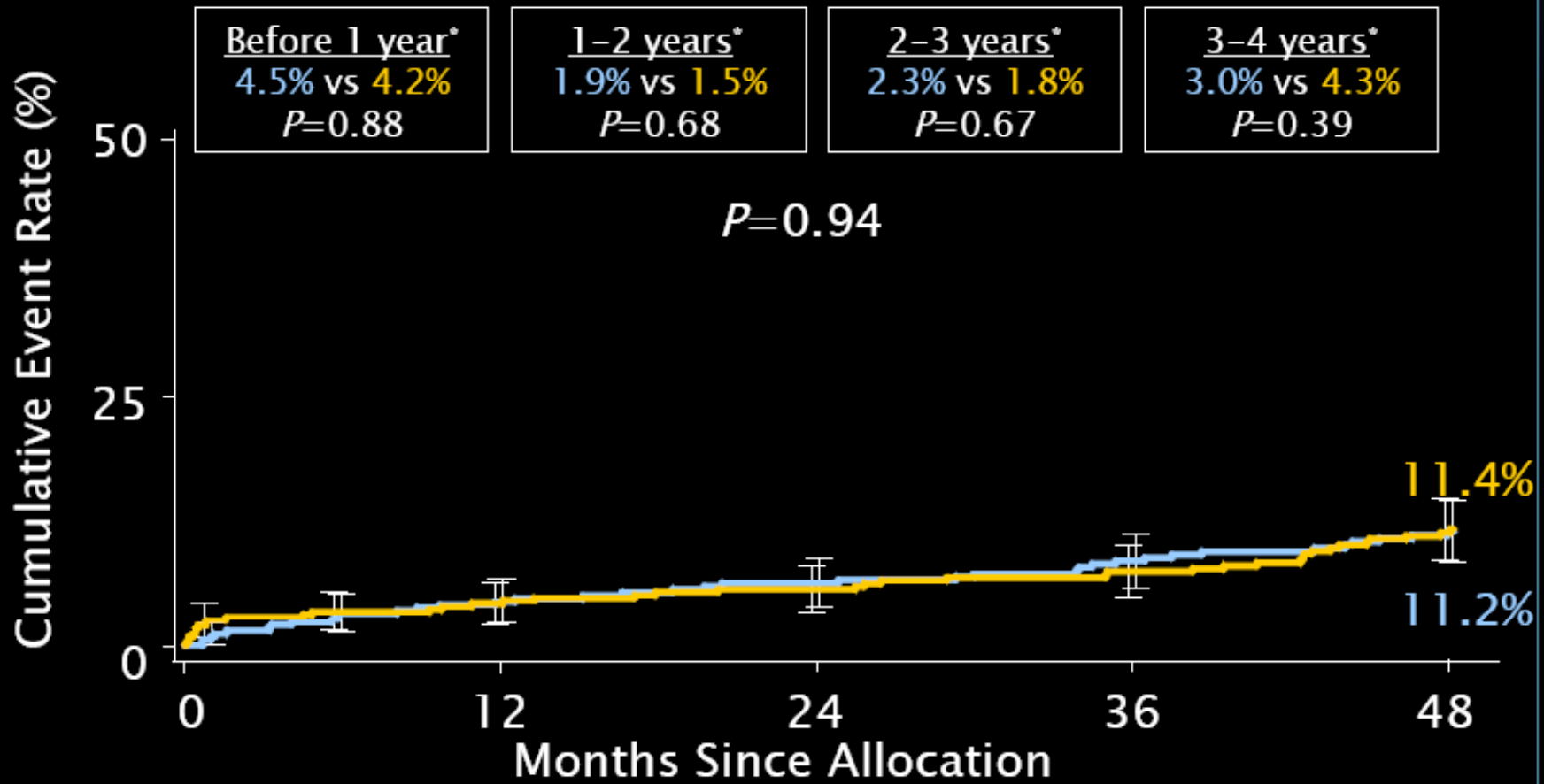
	CABG N=348	TAXUS N=357	P value
Age*, mean $\pm$ SD (y)	65.6 $\pm$ 10.1	65.4 $\pm$ 9.8	0.78
Medically treated diabetes*, %	22.4	21.8	0.86
BMI, mean $\pm$ SD	27.7 $\pm$ 5.0	28.2 $\pm$ 4.9	0.24
Additive euroSCORE*, mean $\pm$ SD	3.9 $\pm$ 2.9	3.9 $\pm$ 2.8	0.91
Total Parsonnet score*, mean $\pm$ SD	9.1 $\pm$ 7.4	8.9 $\pm$ 7.8	0.77
Total SYNTAX Score, mean $\pm$ SD	26.7 $\pm$ 11.5	28.1 $\pm$ 12.4	0.13
No. lesions, mean $\pm$ SD	3.2 $\pm$ 1.9	3.3 $\pm$ 1.8	0.89

# SYNTAX 4-YEARS

## All-Cause Death; LM Subset



■ CABG (N=348)      ■ TAXUS (N=357)



Cumulative KM Event Rate  $\pm$  1.5 SE; log-rank *P* value; \*Binary rates

ITT population

the LM Subgroup - TCT 2011 - November 2011 - Serruys - Slide 11

Source: M.C.Morice on behalf of the SYNTAX investigators, TCT 2011

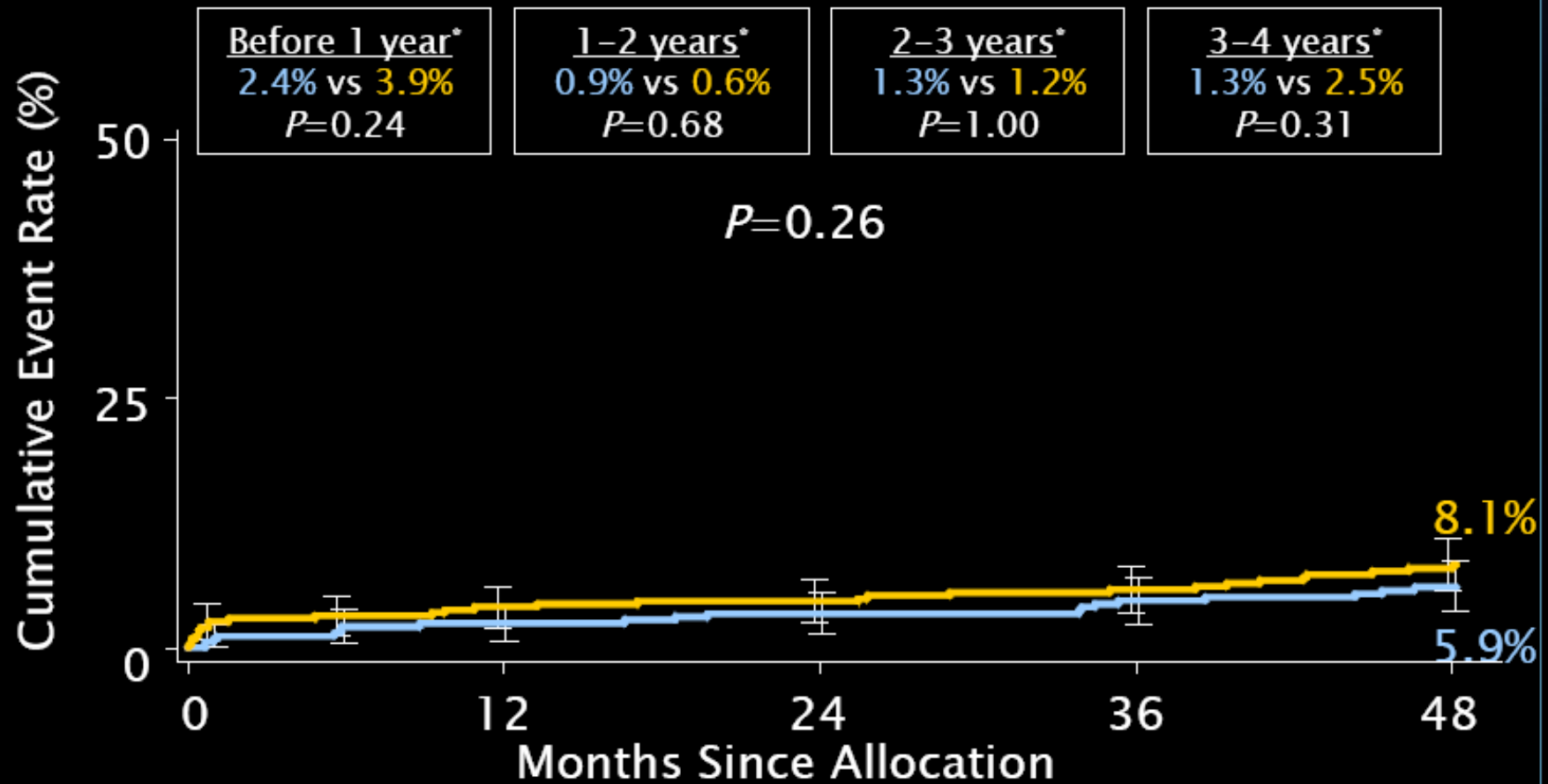
# SYNTAX 4-YEARS

## Cardiac Death; LM Subset



■ CABG (N=348)

■ TAXUS (N=357)



Cumulative KM Event Rate  $\pm$  1.5 SE; log-rank P value; \*Binary rates

ITT population

the LM Subaroun - TCT 2011 - November 2011 - Serruys - Slide 12

Source: M.C.Morice on behalf of the SYNTAX investigators, TCT 2011

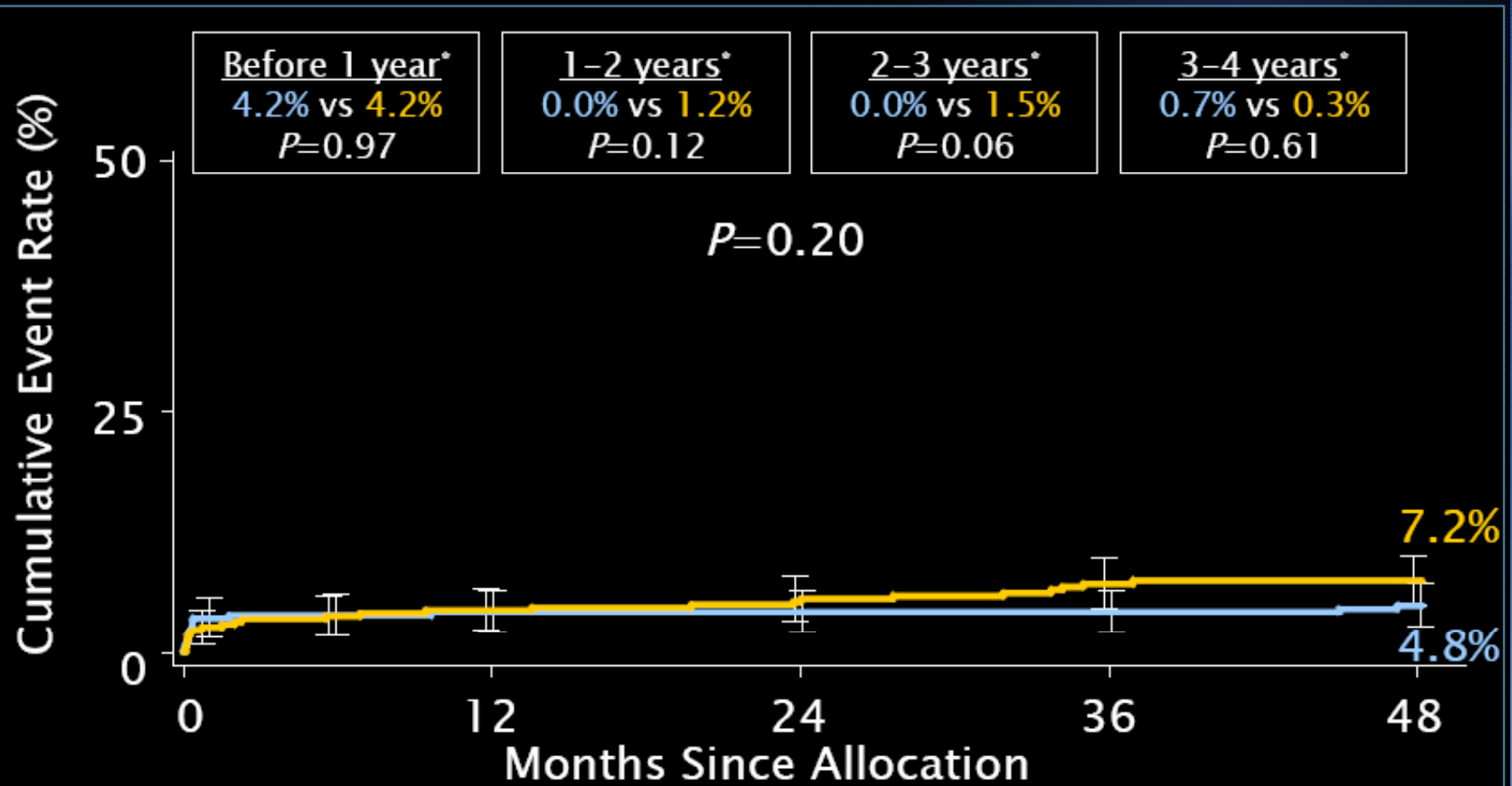
# SYNTAX 4-YEARS

## Myocardial Infarction; LM Subset



■ CABG (N=348)

■ TAXUS (N=357)



Cumulative KM Event Rate  $\pm$  1.5 SE; log-rank P value; \*Binary rates

ITT population

the LM Subgroup • TCT 2011 • November 2011 • Serruys • Slide 13

Source: M.C.Morice on behalf of the SYNTAX investigators, TCT 2011

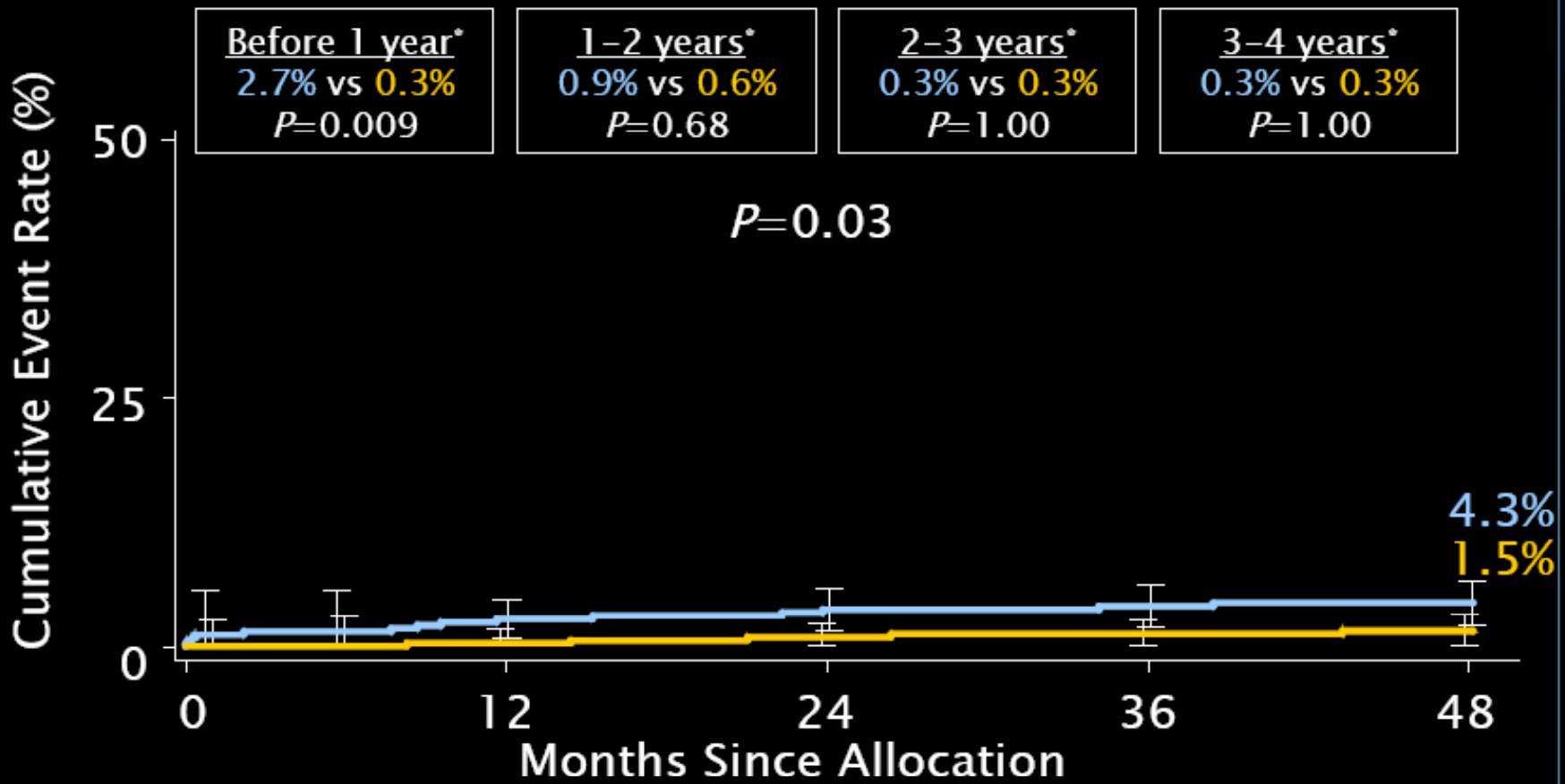
# SYNTAX 4-YEARS

## CVA; LM Subset



■ CABG (N=348)

■ TAXUS (N=357)



Cumulative KM Event Rate  $\pm$  1.5 SE; log-rank P value; \*Binary rates

ITT population

the LM Subgroup - TCT 2011 - November 2011 - Serruys - Slide 14

Source: M.C.Morice on behalf of the SYNTAX investigators, TCT 2011

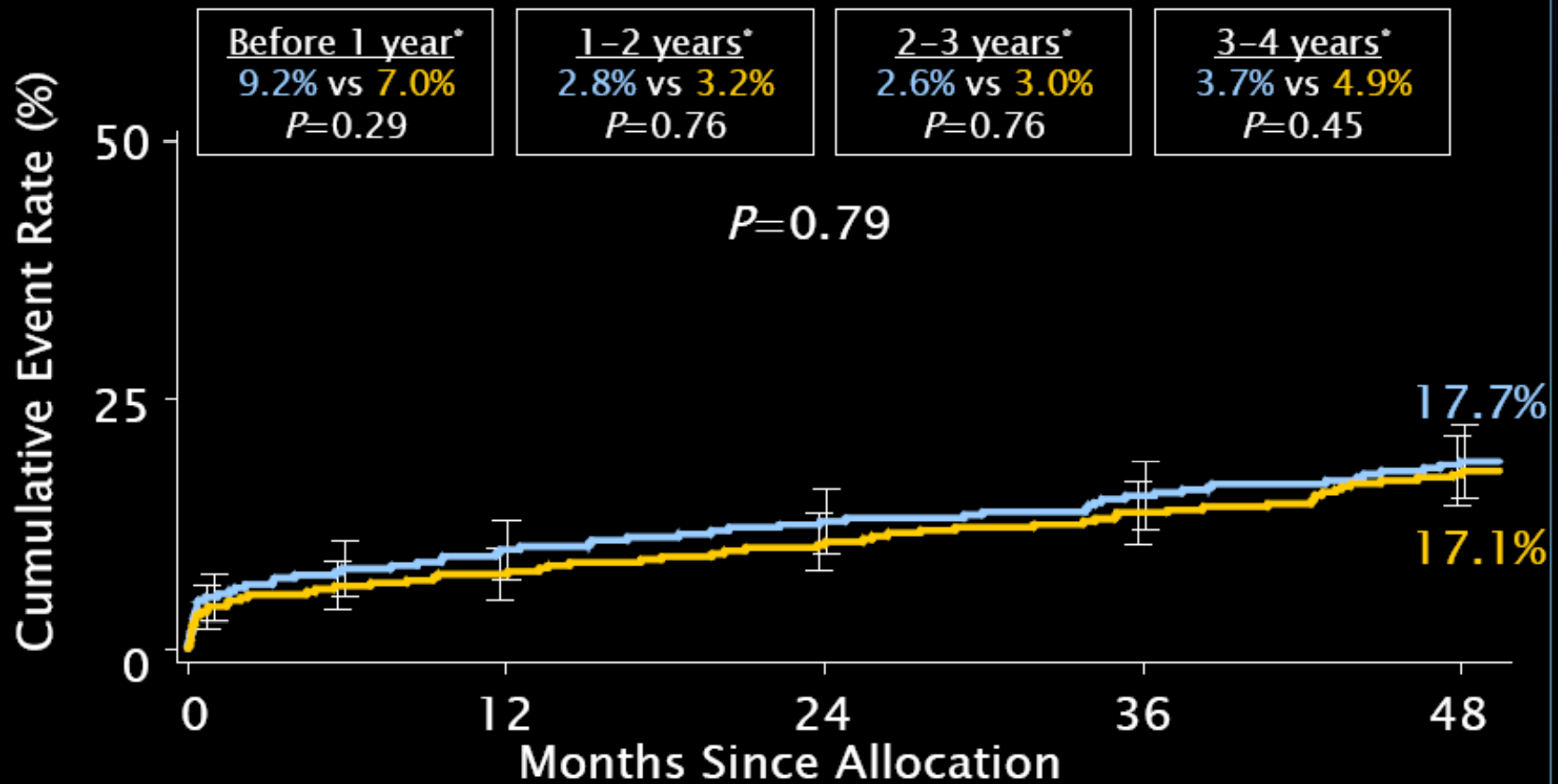
# SYNTAX 4-YEARS

## All-Cause Death/CVA/MI; LM Subset



■ CABG (N=348)

■ TAXUS (N=357)



Cumulative KM Event Rate  $\pm$  1.5 SE; log-rank *P* value; \*Binary rates

ITT population

the LM Subgroup • TCT 2011 • November 2011 • Serruys • Slide 15

Source: M.C.Morice on behalf of the SYNTAX investigators, TCT 2011

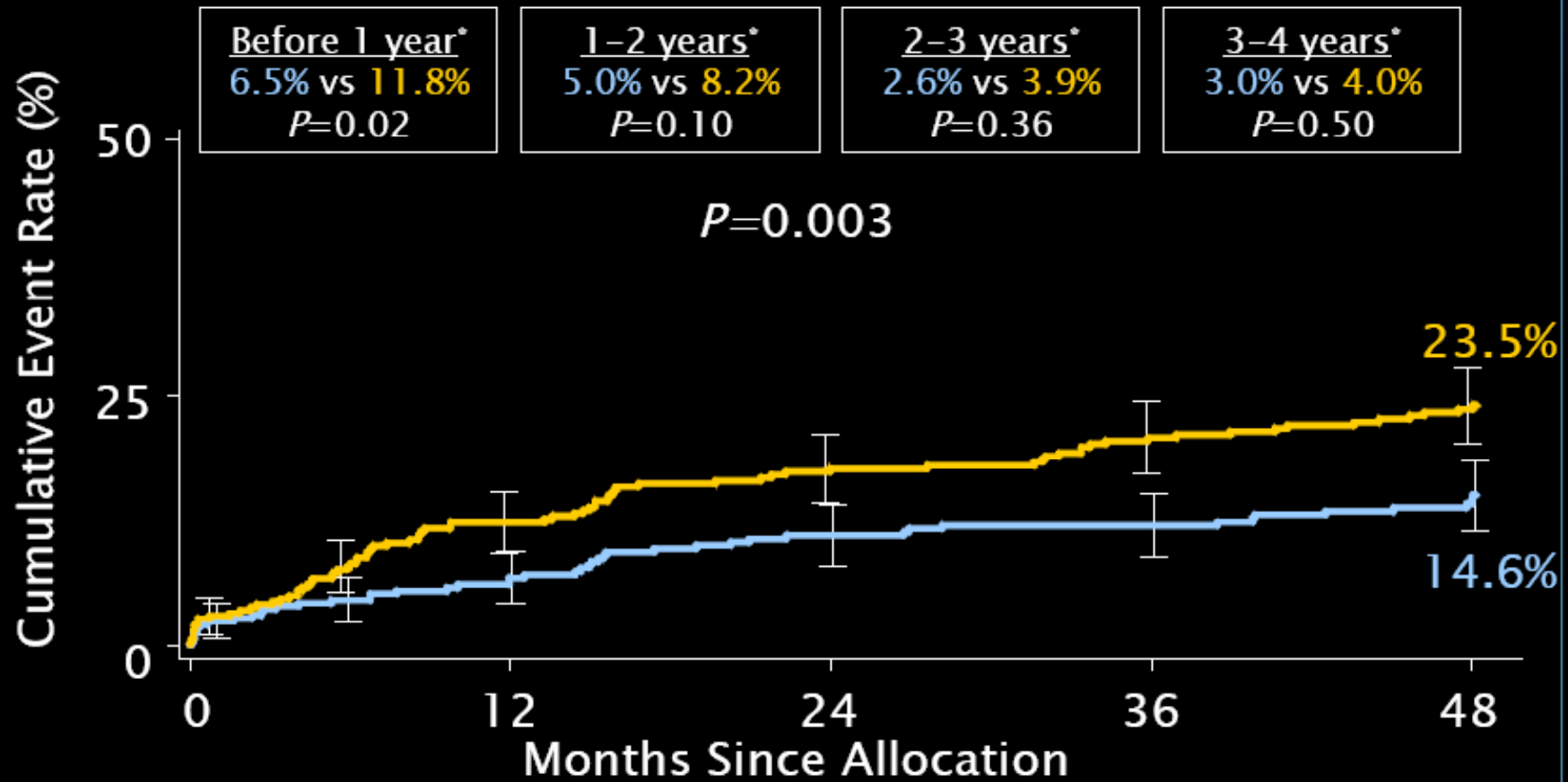
# SYNTAX 4-YEARS

## Repeat Revascularization; LM Subset



■ CABG (N=348)

■ TAXUS (N=357)



Cumulative KM Event Rate  $\pm$  1.5 SE; log-rank P value; Binary rates

ITT population

the LM Subgroup • TCT 2011 • November 2011 • Serruys • Slide 16

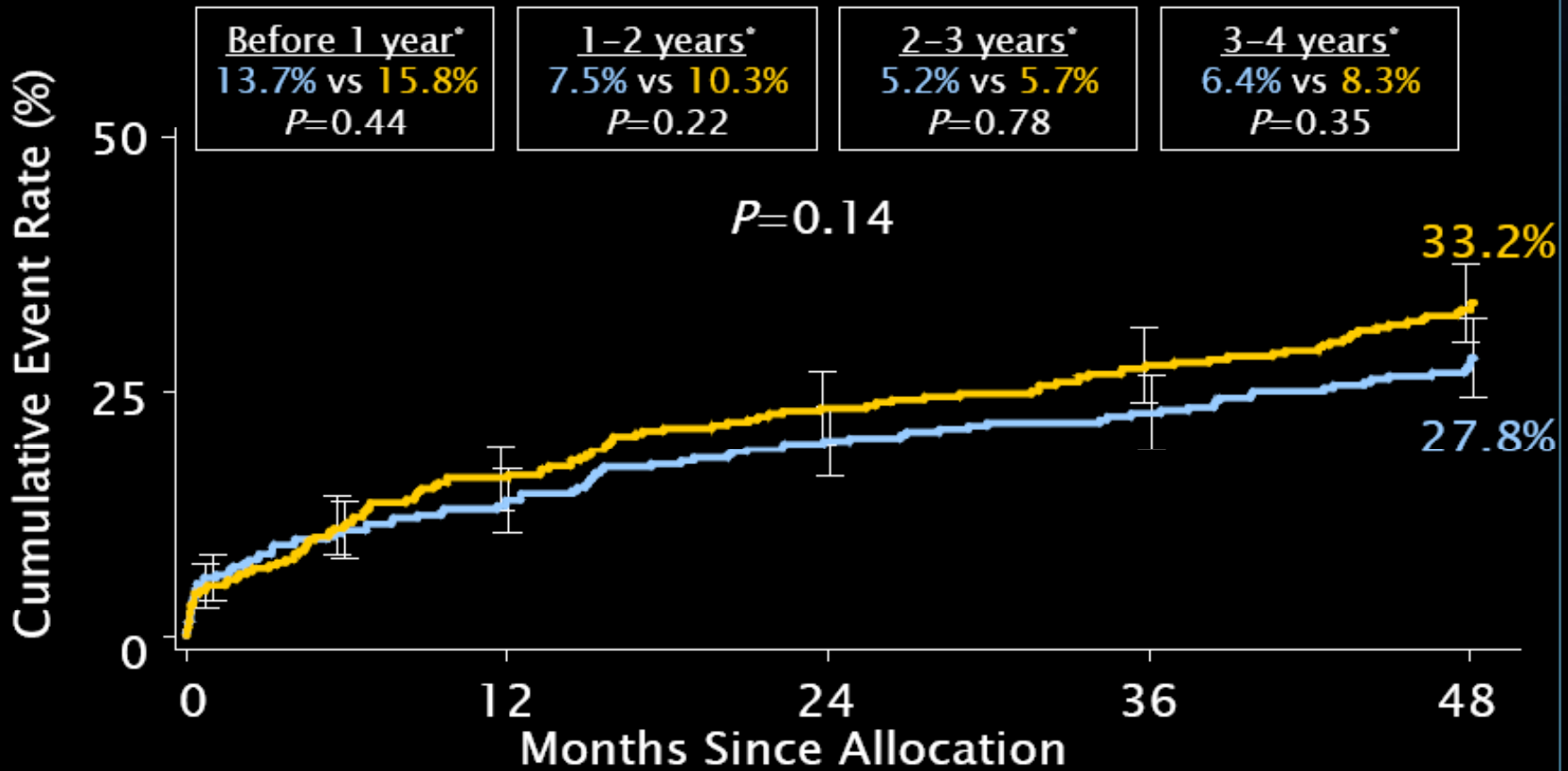
Source: M.C.Morice on behalf of the SYNTAX investigators, TCT 2011

# SYNTAX 4-YEARS

## MACCE; LM Subset



■ CABG (N=348)      ■ TAXUS (N=357)



Cumulative KM Event Rate  $\pm$  1.5 SE; log-rank P value; \*Binary rates

ITT population

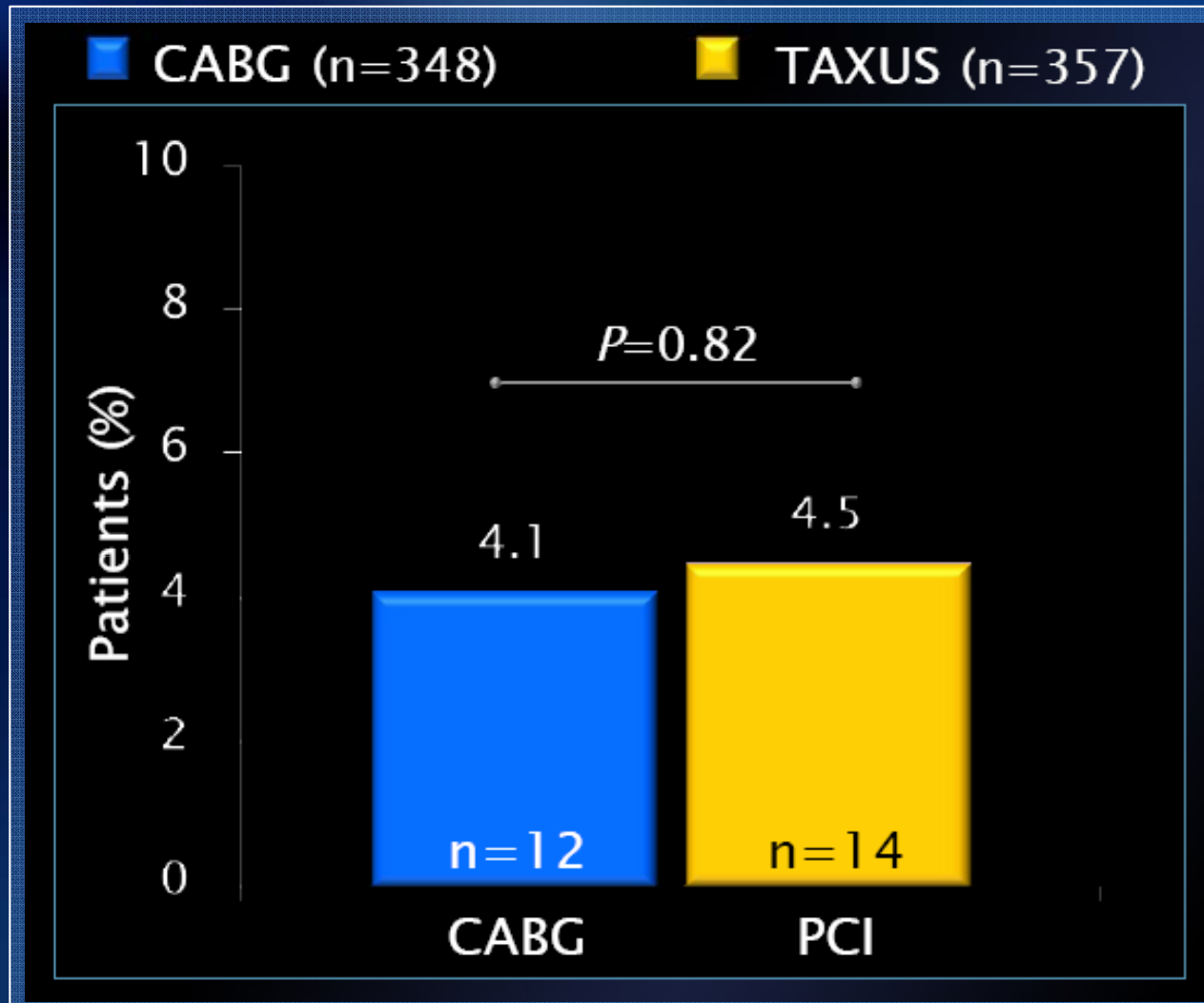
the LM Subgroup • TCT 2011 • November 2011 • Serruys • Slide 17

Source: M.C.Morice on behalf of the SYNTAX investigators, TCT 2011



# SYNTAX 4-YEARS

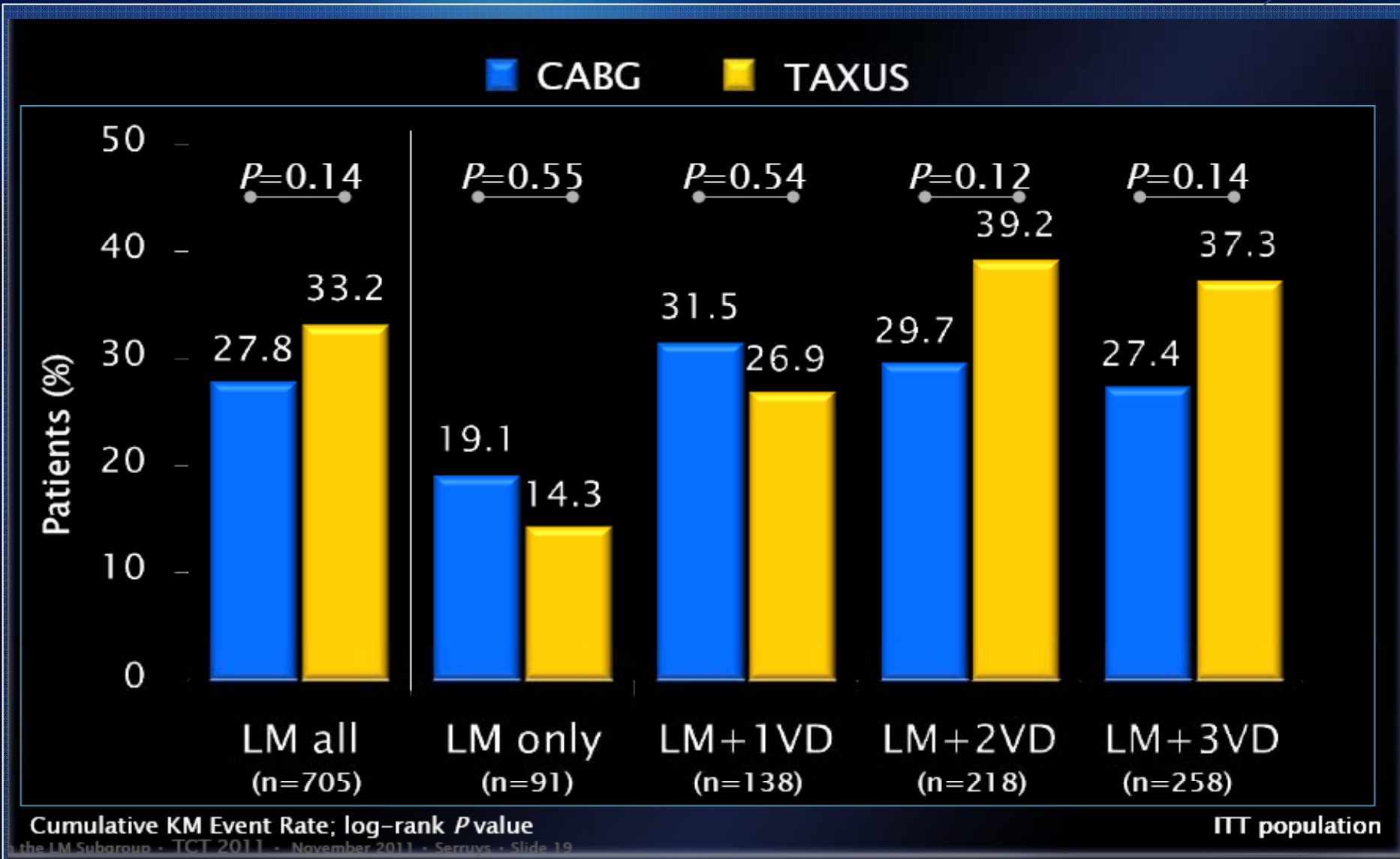
## Symptomatic Graft Occlusion & ST; LM Subset



Source: M.C.Morice on behalf of the SYNTAX investigators, TCT 2011

# SYNTAX 4-YEARS

## MACCE; LM Subsets



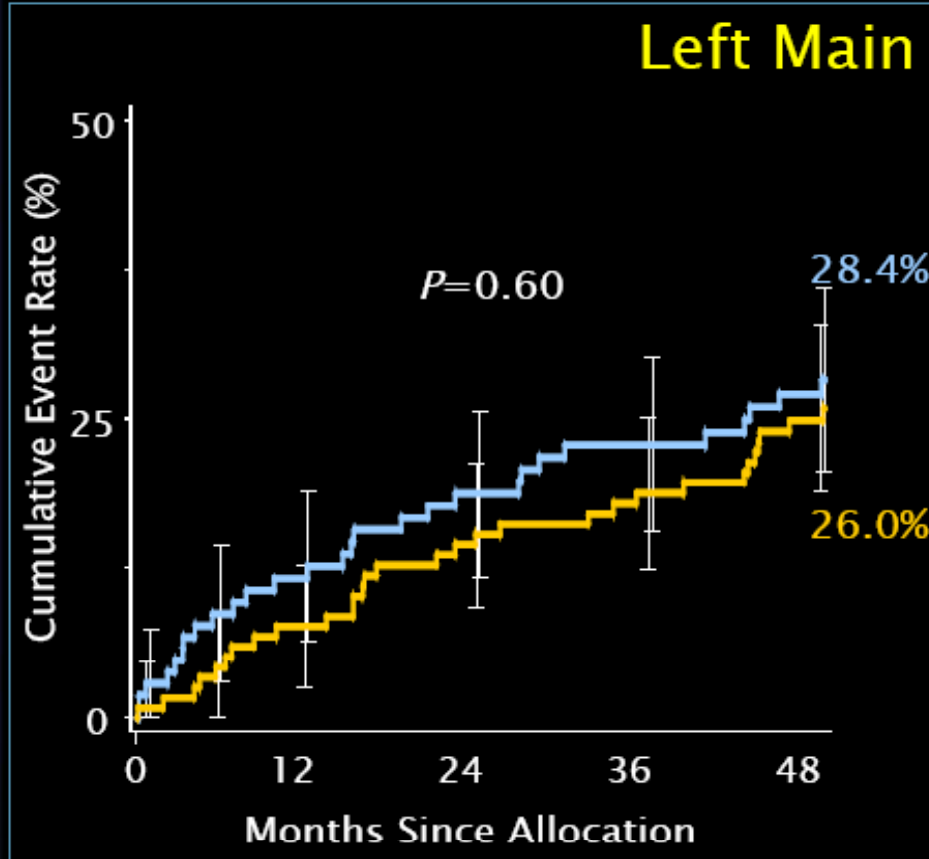
Source: M.C.Morice on behalf of the SYNTAX investigators, TCT 2011

# SYNTAX 4-YEARS

## MACCE by SYNTAX Score; Low Scores (0-22)



■ CABG (N=104)  
■ TAXUS (N=118)



	CABG	PCI	P value
Death	9.2%	7.1%	0.54
CVA	4.1%	1.8%	0.28
MI	3.1%	4.3%	0.64
Death, CVA or MI	14.2%	12.3%	0.60
Revasc.	16.8%	18.2%	0.64

Cumulative KM Event Rate  $\pm$  1.5 SE; log-rank P value

Site-reported Data; ITT population

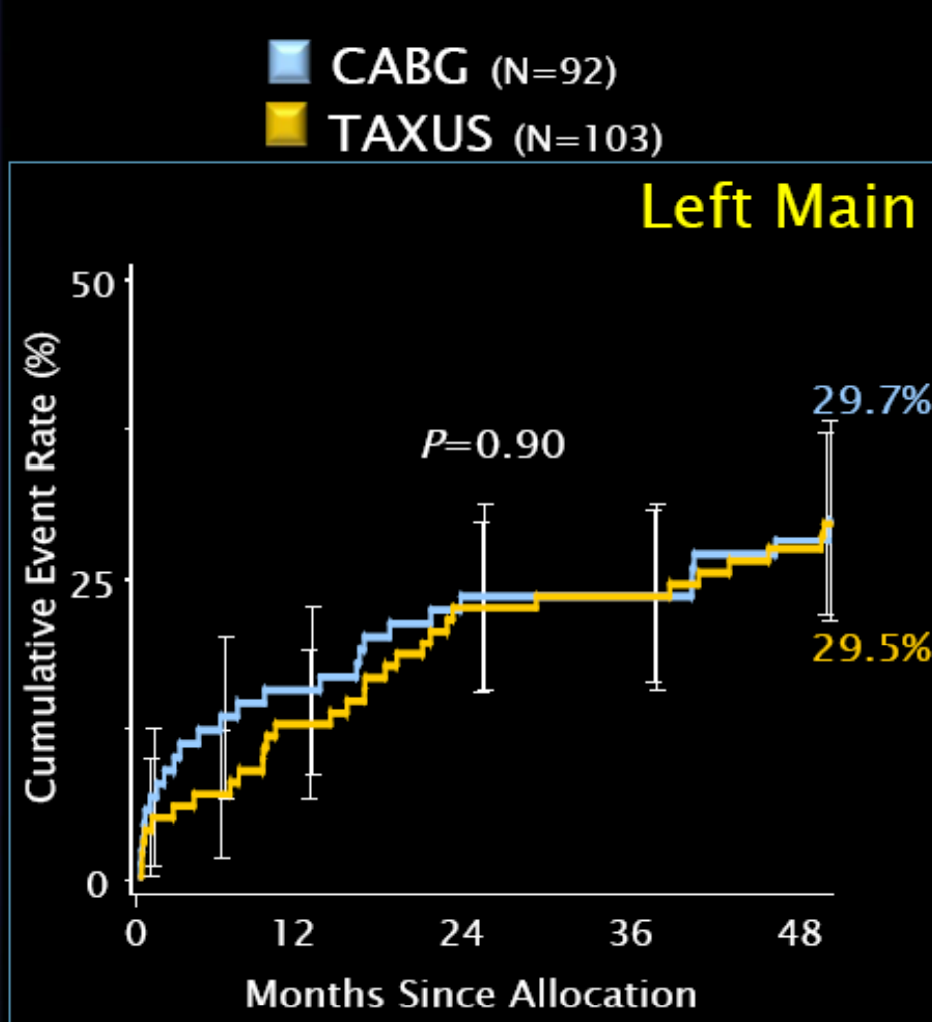
the LM Subgroup - TCT 2011 - November 2011 - Serruys - Slide 20

Source: M.C.Morice on behalf of the SYNTAX investigators, TCT 2011

# SYNTAX 4-YEARS



## MACCE by SYNTAX Score; Intermediate Scores



	CABG	PCI	P value
Death	14.7%	8.0%	0.12
CVA	3.6%	1.0%	0.23
MI	4.6%	6.0%	0.71
Death, CVA or MI	20.3%	14.8%	0.28
Revasc.	17.0%	20.2%	0.60

Cumulative KM Event Rate  $\pm$  1.5 SE; log-rank P value

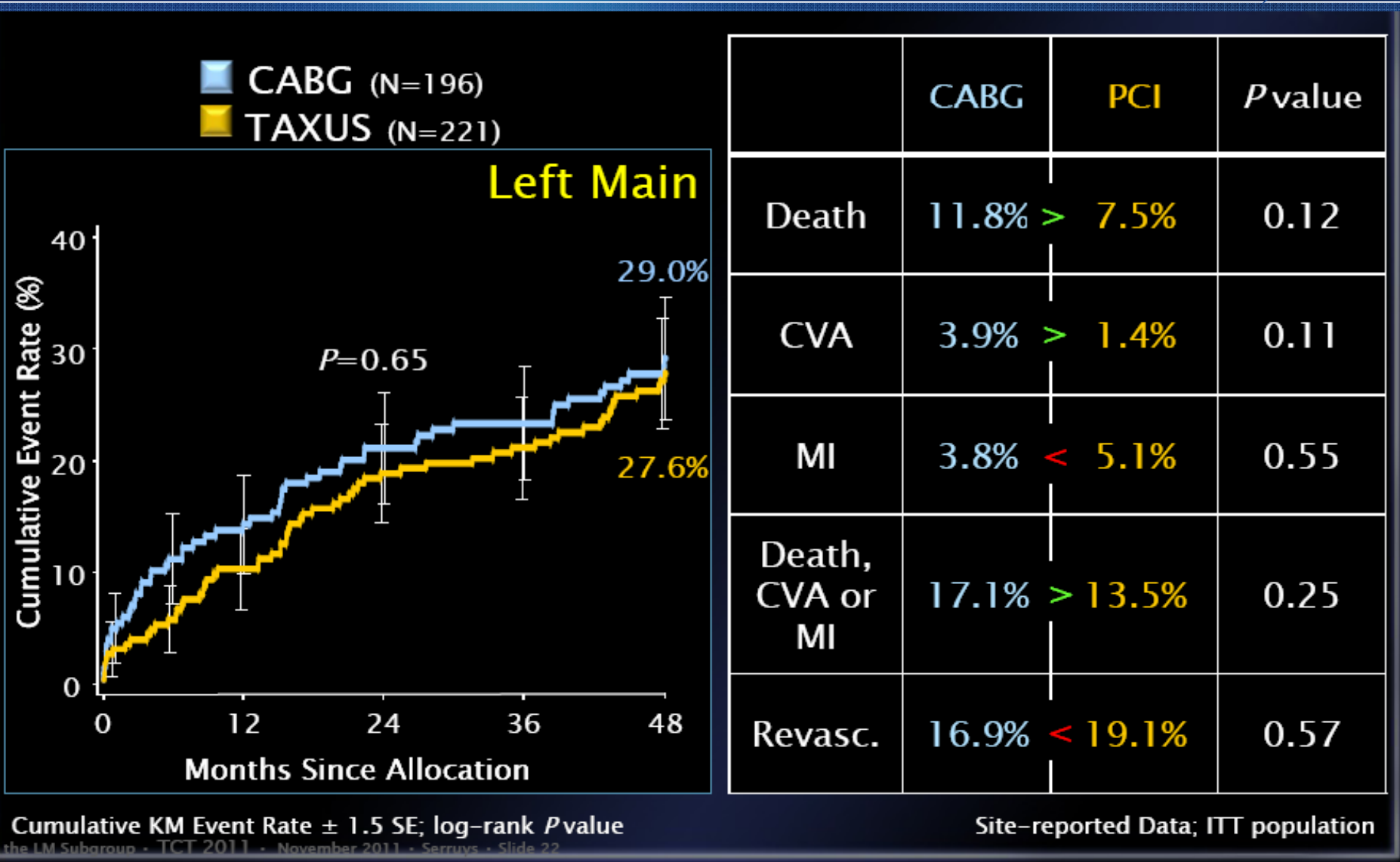
Site-reported Data; ITT population

the LM Subgroup - TCT 2011 - November 2011 - Serruys - Slide 21

Source: M.C.Morice on behalf of the SYNTAX investigators, TCT 2011

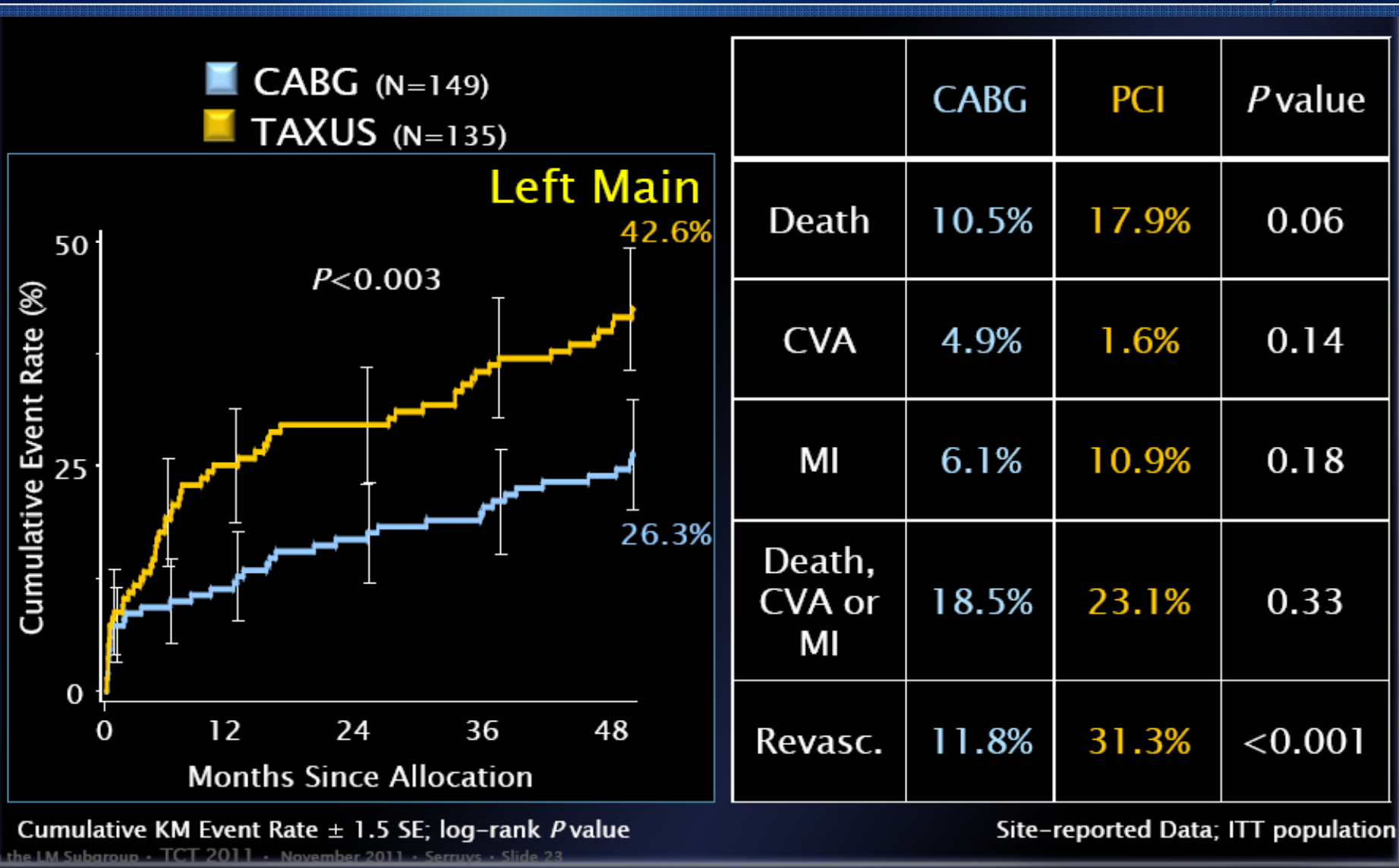
# SYNTAX 4-YEARS

## MACCE by SYNTAX Score; Low to Intermediate



# SYNTAX 4-YEARS

## MACCE by SYNTAX Score; High Scores ( $\geq 33$ )



Source: M.C.Morice on behalf of the SYNTAX investigators, TCT 2011

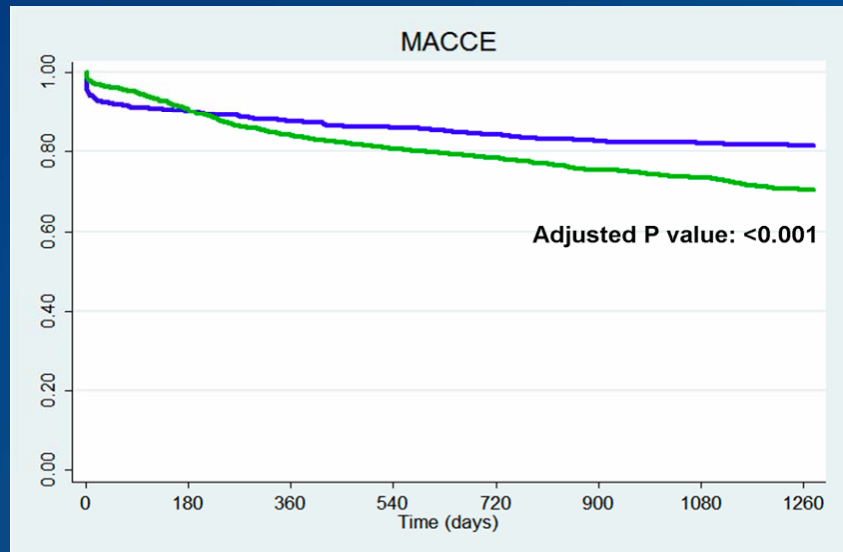
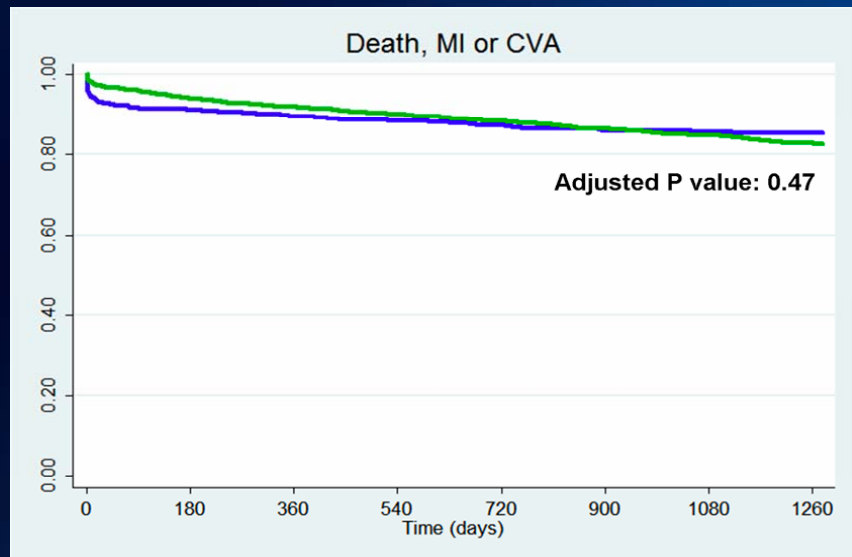
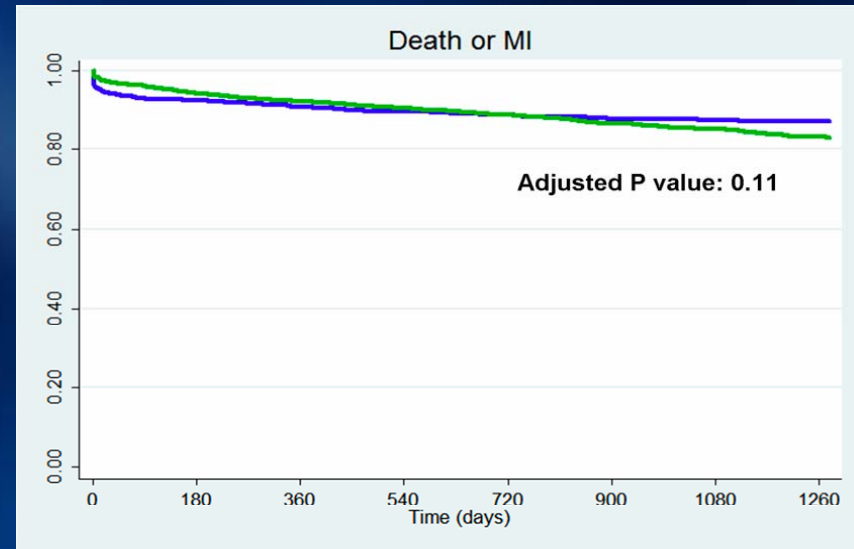
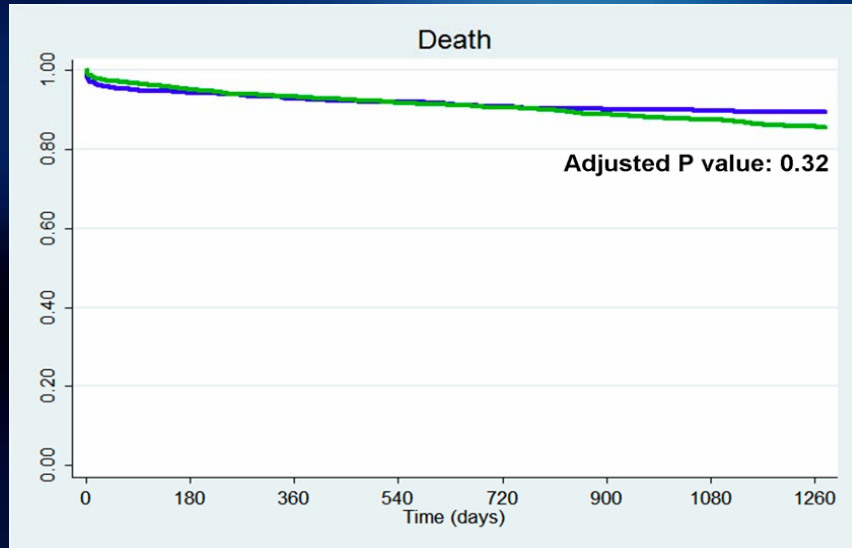
# SYNTAX 4-years: Left Main Disease



	CABG (n=348)	PCI (n=357)	P value
MACCE	27.8%	33.2%	0.14
Death	11.2%	11.4%	0.94
Stroke	4.3%	1.5%	0.03
MI	4.8%	7.2%	0.2
Repeat revascularization	14.6%	23.5%	0.003

**in patients with left main disease, both treatments remain equally safe and effective over the same period**

# DELTA REGISTRY





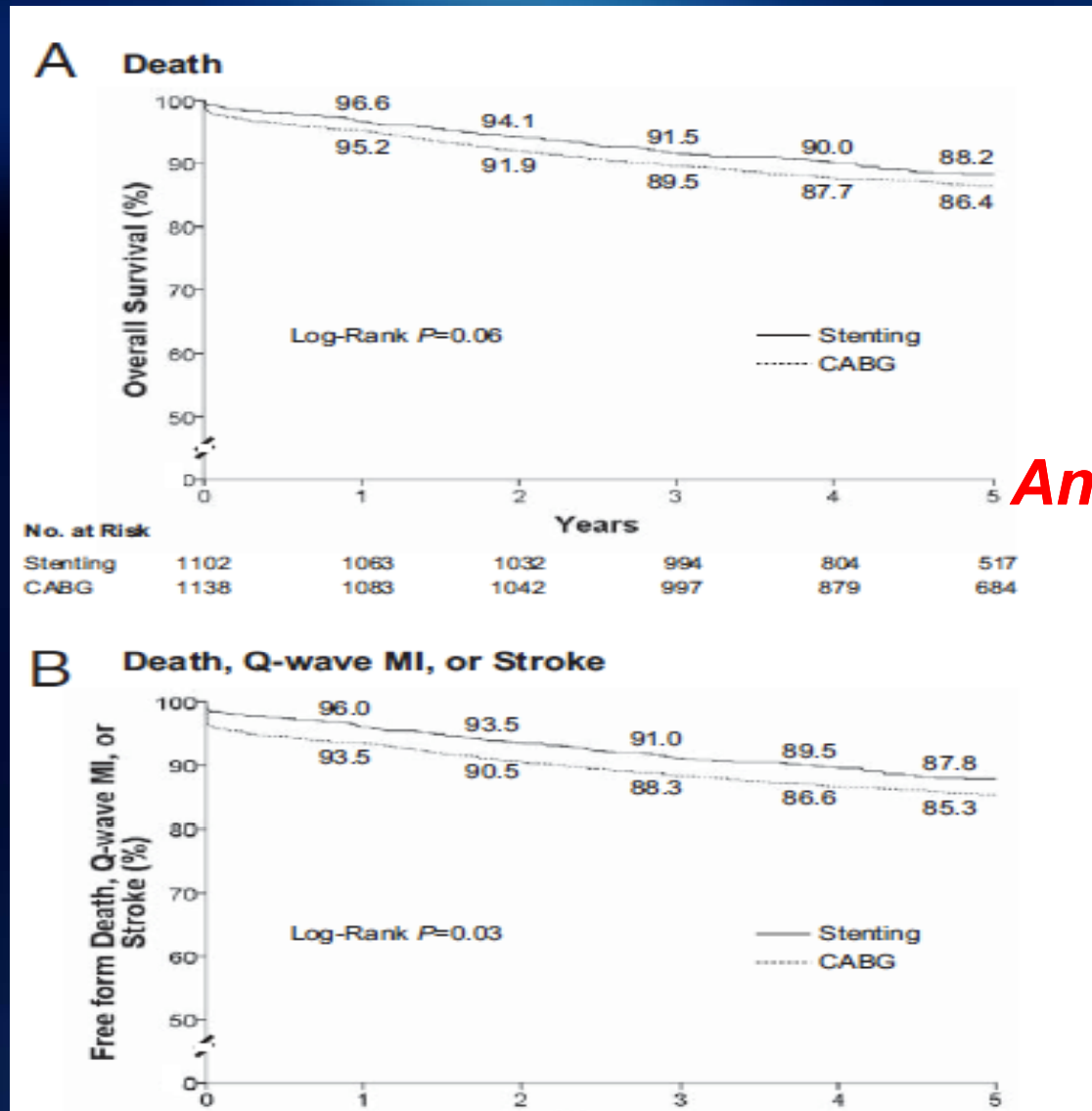
# MAIN-COMPARE 5 Years Outcome

**Long-Term Safety and Efficacy of Stenting Versus Coronary Artery Bypass Grafting for Unprotected Left Main Coronary Artery Disease: 5-Year Results From the MAIN-COMPARE (Revascularization for Unprotected Left Main Coronary Artery Stenosis: Comparison of Percutaneous Coronary Angioplasty Versus Surgical Revascularization) Registry**

Duk-Woo Park, Ki Bae Seung, Young-Hak Kim, Jong-Young Lee, Won-Jang Kim, Soo-Jin Kang, Seung-Whan Lee, Cheol Whan Lee, Seong-Wook Park, Sung-Cheol Yun, Hyeon-Cheol Gwon, Myung-Ho Jeong, Yang-Soo Jang, Hyo-Soo Kim, Pum Joon Kim, In-Whan Seong, Hun Sik Park, Taehoon Ahn, In-Ho Chae, Seung-Jea Tahk, Wook-Sung Chung, and Seung-Jung Park

*J. Am. Coll. Cardiol.* 2010;56:117-124; originally published online May 5, 2010;  
doi:10.1016/j.jacc.2010.04.004

# 5 years outcome: MAIN COMPARE



*Annual mortality: 2.4%*

# PCI vs CABG – long term outcome

**Long-Term Outcomes After Stenting Versus Coronary Artery Bypass Grafting for Unprotected Left Main Coronary Artery Disease: 10-Year Results of Bare-Metal Stents and 5-Year Results of Drug-Eluting Stents From the ASAN MAIN (ASAN Medical Center Left MAIN Revascularization) Registry**

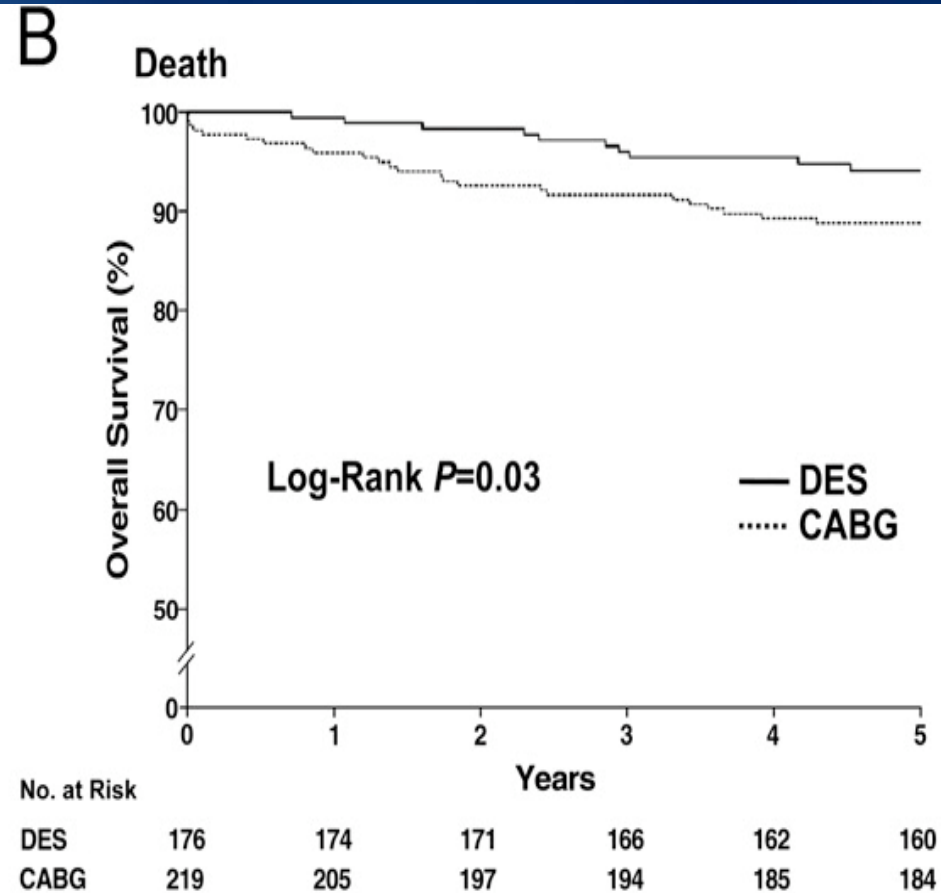
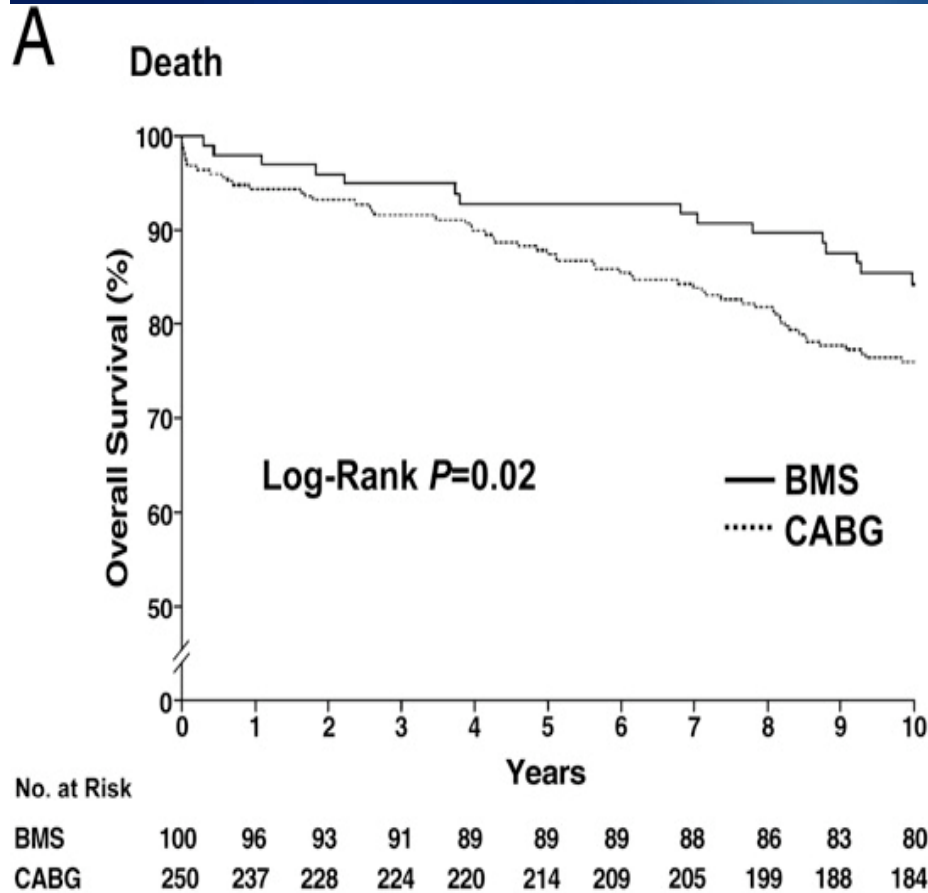
Duk-Woo Park, Young-Hak Kim, Sung-Cheol Yun, Jong-Young Lee, Won-Jang Kim, Soo-Jin Kang, Seung-Whan Lee, Cheol-Whan Lee, Jae-Joong Kim, Suk-Jung Choo, Cheol-Hyun Chung, Jae-Won Lee, Seong-Wook Park, and Seung-Jung Park

*J. Am. Coll. Cardiol.* 2010;56:1366-1375

doi:10.1016/j.jacc.2010.03.097

# BMS vs CABG: 10 years

## DES vs CABG: 5 years



**Annual mortality:**  
**BMS 1,7%**  
**CABG 2,6%**

**Annual mortality:**  
**DES 0,5%**  
**CABG 1,1%**

# Meta-Analysis of Randomized Clinical Data



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## Interventional Cardiology

### Percutaneous Coronary Intervention Versus Coronary Artery Bypass Graft Surgery in Left Main Coronary Artery Disease

A Meta-Analysis of Randomized Clinical Data

Davide Capodanno, MD,\* Gregg W. Stone, MD,† Marie C. Morice, MD,‡ Theodore A. Bass, MD,§ Corrado Tamburino, MD, PHD\*

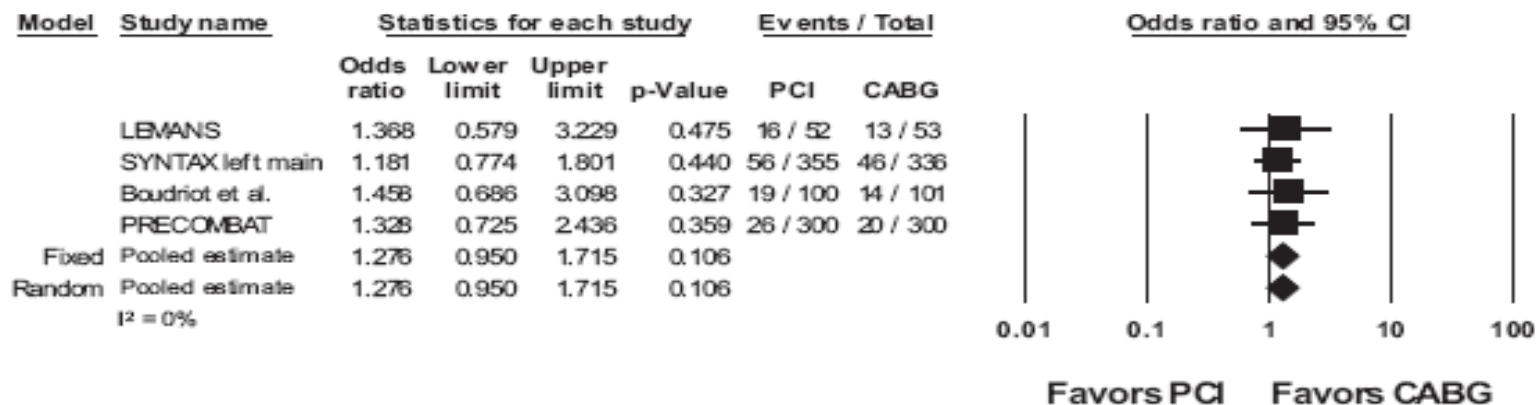
*Catania, Italy; New York, New York; Massy, France; and Jacksonville, Florida*

Study/First Author (Ref. #)	Year	Design	N	PCI, n	DES, %	CABG, n	LIMA to LAD, %	Primary Outcome
LEMANS (4)	2008	RCT	105	52	35	53	81	Cardiac death, MI, CVA, repeat revascularization, and/or acute/subacute in-stent thrombosis
SYNTAX Left Main (5)	2009	Pre-specified subanalysis from RCT	705	357	100	348	97	All-cause death, CVA, MI, and repeat revascularization
Boudriot et al. (8)	2010	RCT	201	100	100	101	99	All-cause death, MI, and repeat revascularization
PRECOMBAT (9)	2011	RCT	600	300	100	300	94	All-cause death, CVA, MI, and repeat revascularization

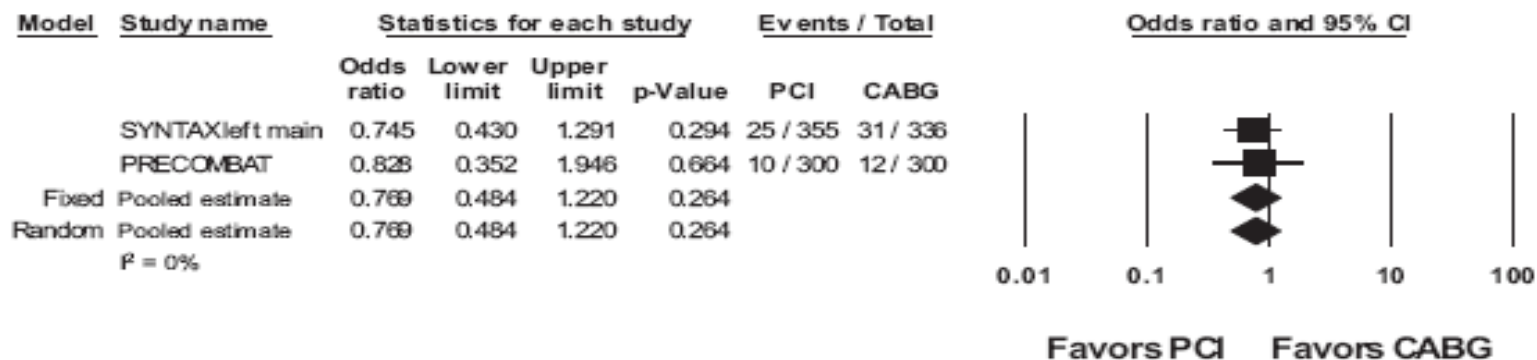
# Meta-Analysis of Randomized Trials: 1 year follow-up



## Major Adverse Cardiac and Cerebrovascular Events



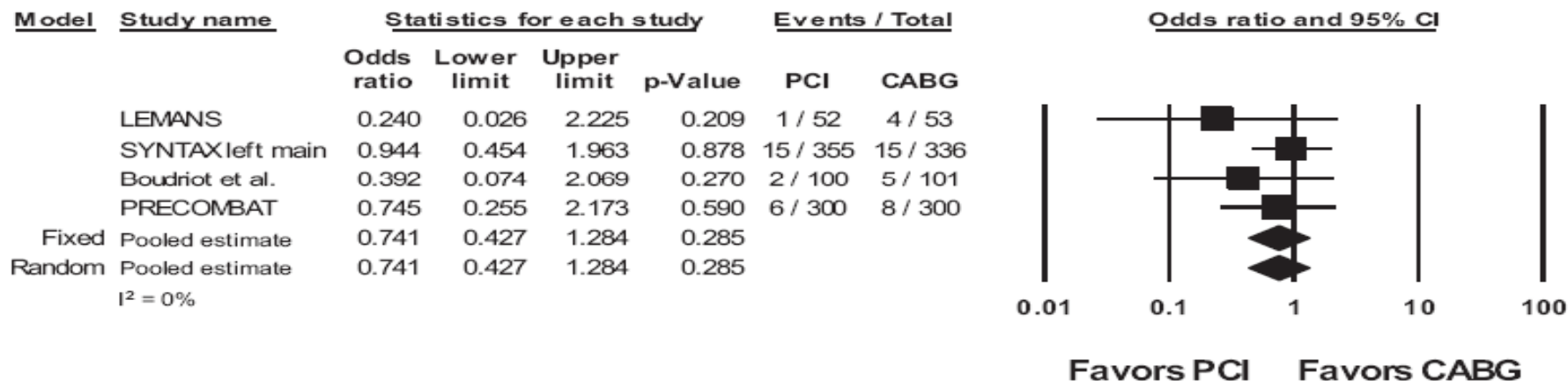
## Death, Myocardial Infarction or Stroke



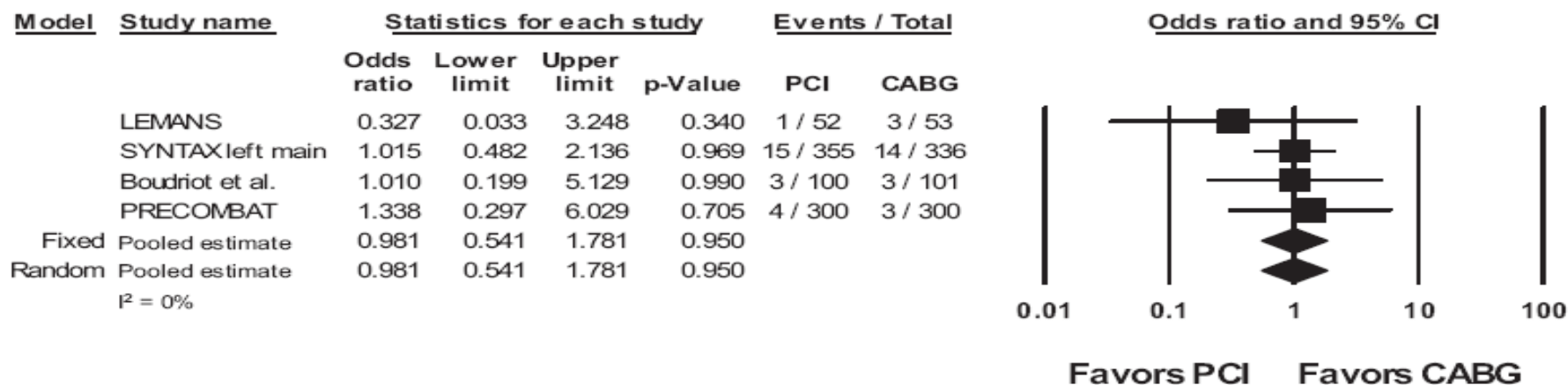
# Meta-Analysis of Randomized Trials: 1 year follow-up



## Death



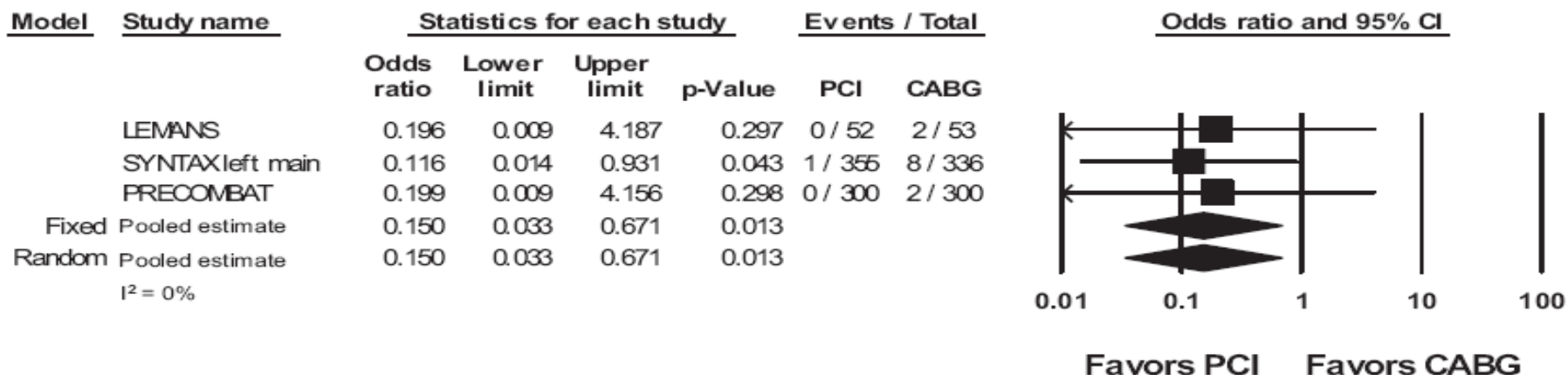
## Myocardial Infarction



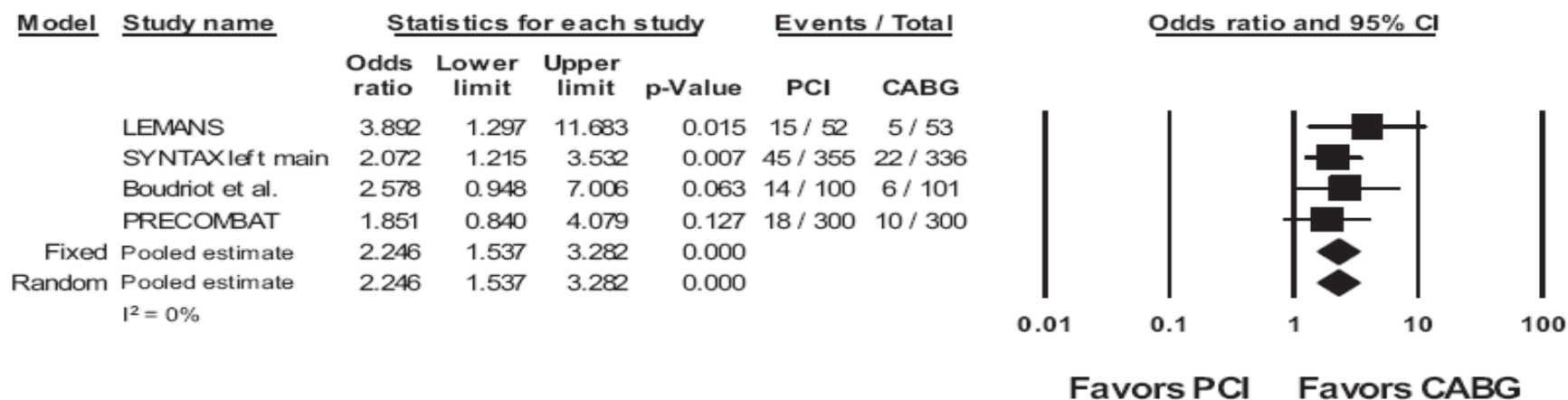
# Meta-Analysis of Randomized Trials: 1 year follow-up



## Stroke



## Repeat Revascularization





# Meta-Analysis of Randomized Trials: 1 year follow-up



## Percutaneous coronary intervention versus bypass surgery for left main coronary artery disease: a meta-analysis of randomised trials

Giuseppe Ferrante<sup>1\*</sup>, MD, PhD; Patrizia Presbitero<sup>1</sup>, MD; Marco Valgimigli<sup>2</sup>, MD, PhD; Marie-Claude Morice<sup>3</sup>, MD; Paolo Pagnotta<sup>1</sup>, MD; Guido Belli<sup>1</sup>, MD; Elena Corrada<sup>1</sup>, MD; Yoshinobu Onuma<sup>4</sup>, MD, PhD; Peter Barlis<sup>5</sup>, MBBS, MPH, PhD; Didier Locca<sup>6</sup>, MD; Eric Eeckhout<sup>6</sup>, MD, PhD; Carlo Di Mario<sup>7</sup>, MD, PhD; Patrick W. Serruys<sup>4</sup>, MD, PhD

**EuroIntervention** The Official Journal of EuroPCR and the European Association of Percutaneous Cardiovascular Interventions (EAPCI)

**Table 1. Main clinical and angiographic characteristics of the included studies.**

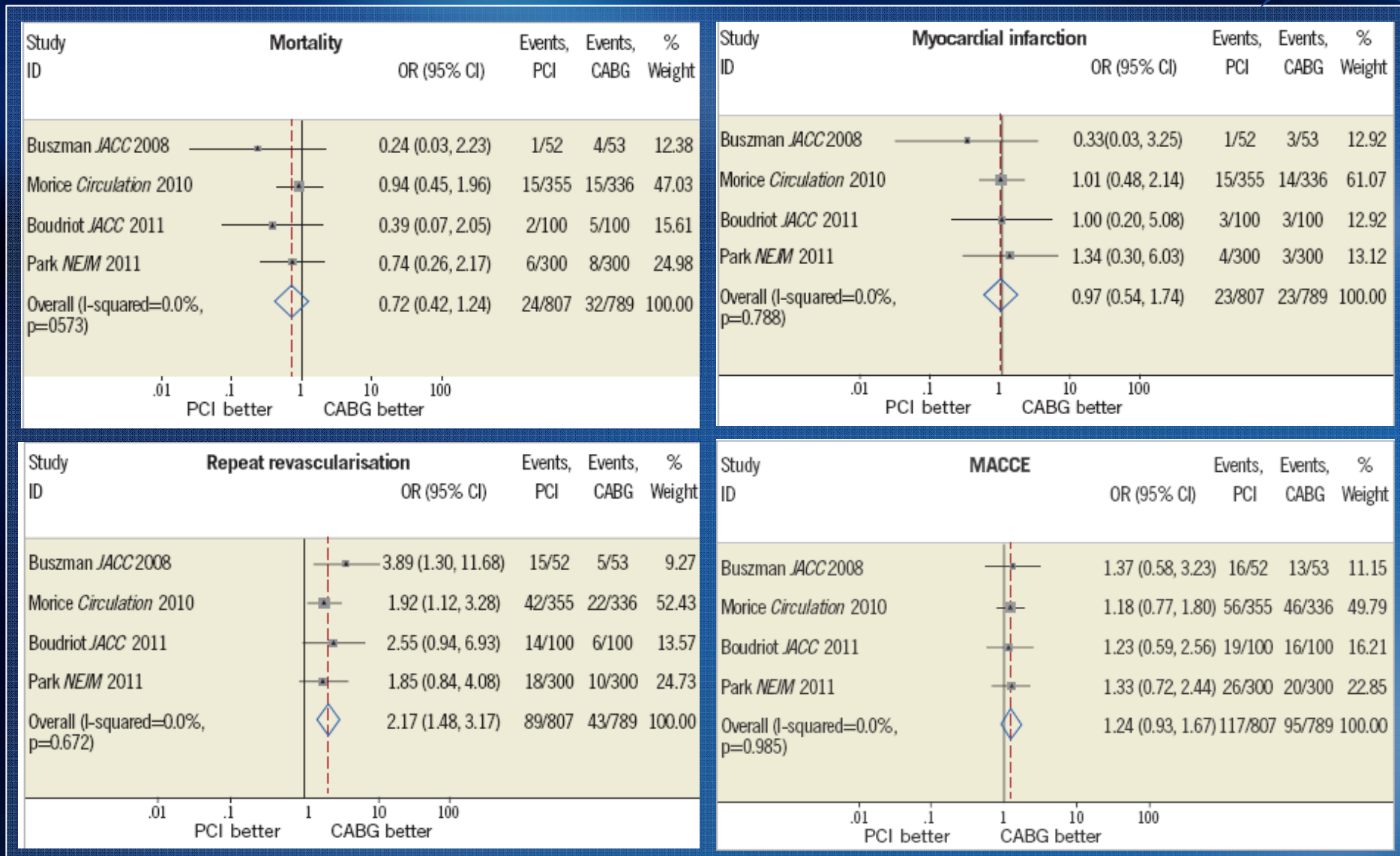
	PCI (n)	DES (%)	DES type	CABG (n)	LIMA to LAD (%)	Off pump (%)	Follow-up (months)	Crossover (%)	SYNTAX score CABG vs. PCI
Boutriot et al	100	100	SES	101	99	46	36.5	0	23.0 (14.8-28.0) vs. 24.0 (19.0-29.0)
Buszman et al	52	35	NA	53	81	NA	28	0	24.7±6.8 vs. 25.2±8.7
Morice et al	357	100	Taxus	348	NA	NA	12	NA	30.2±12.7 vs. 29.6±13.5
Park et al	300	100	SES	300	93.6	63.8	24	8.25	25.8±10.5 vs. 24.4±9.4

DES: drug eluting stent; LIMA: left internal mammary artery; LAD: left anterior descending; LM: left main; SES: sirolimus-eluting stent; NA: not available

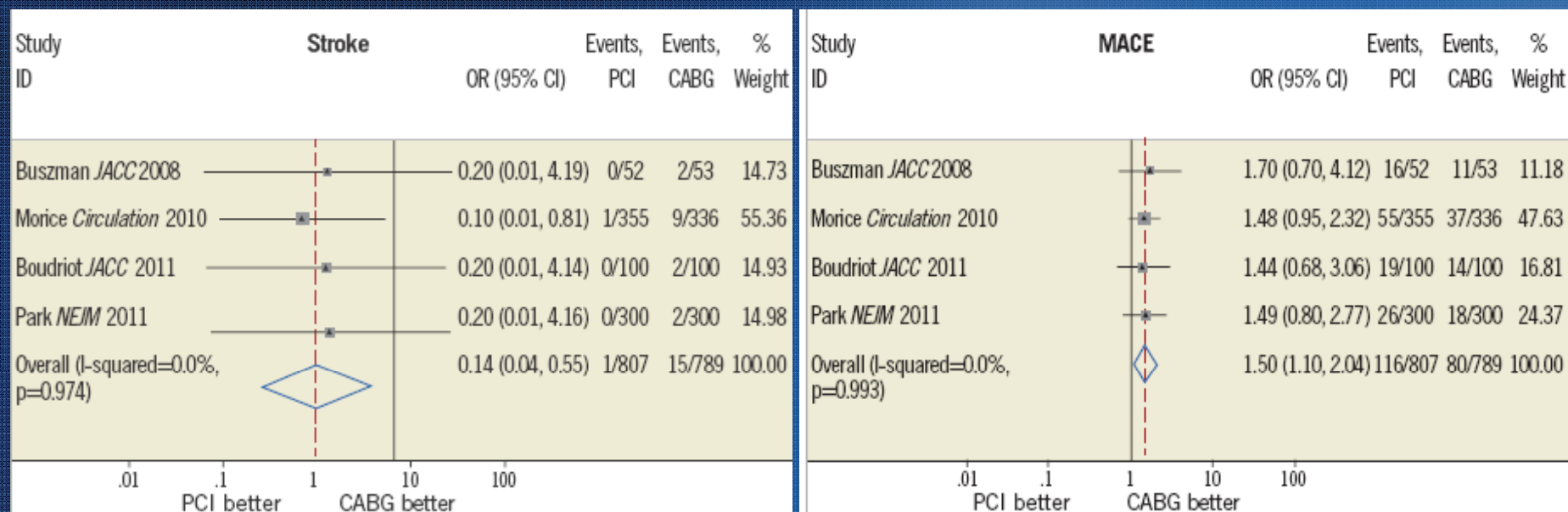
	Distal LM (%)		LM + 1 vessel (%)		LM + 2 vessels (%)		LM + 3 vessels (%)	
	CABG	PCI	CABG	PCI	CABG	PCI	CABG	PCI
Boutriot et al	69	74	27	35	28	26	17	11
Buszman et al	60	56	6	13	19	27	75	60
Morice et al	58.3	64.1	20.4	18.8	30.5	31.4	35.1	38.1
Park et al	62.2	66.9	17.7	16.7	30	33.7	41	40.7

DES: drug eluting stent; LIMA: left internal mammary artery; LAD: left anterior descending; LM: left main; SES: sirolimus-eluting stent; NA: not available

# Meta-Analysis of Randomized Trials: 1 year follow-up



# Meta-Analysis of Randomized Trials: 1 year follow-up



# Meta-Analysis of Randomized Trials: 1 - 2 years follow-up



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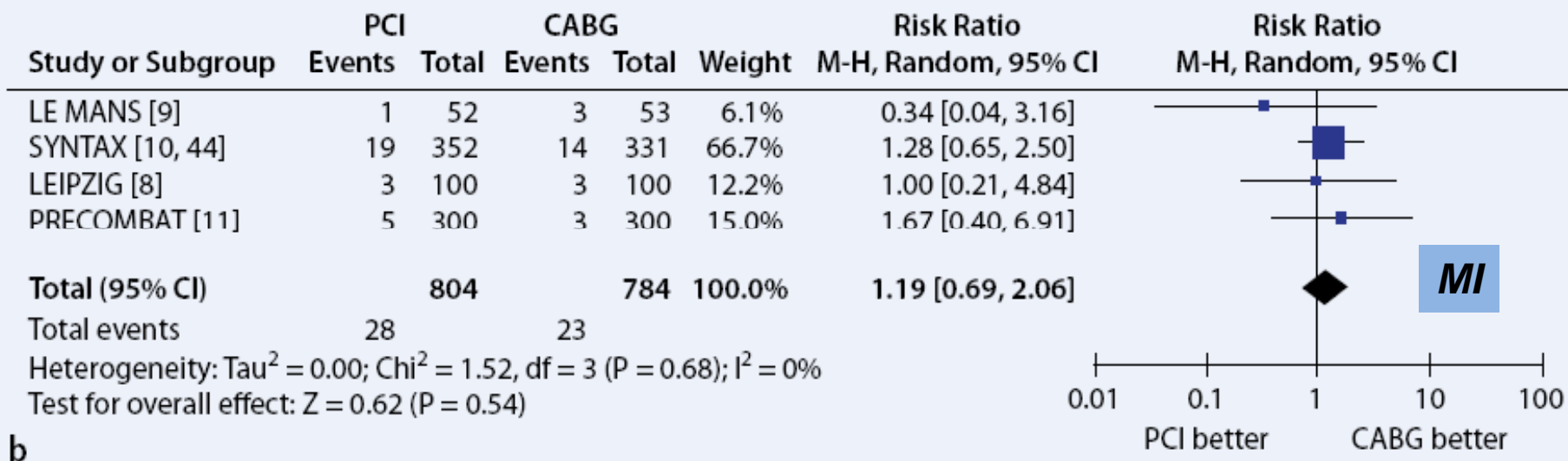
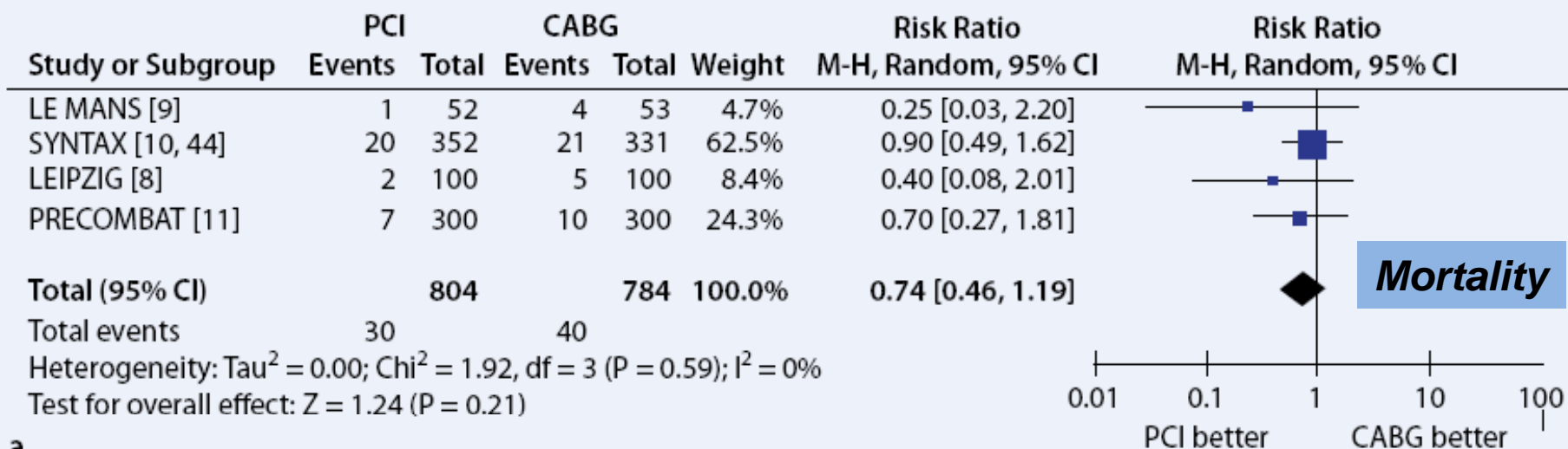
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## Bypass surgery versus percutaneous coronary intervention for the treatment of unprotected left main disease

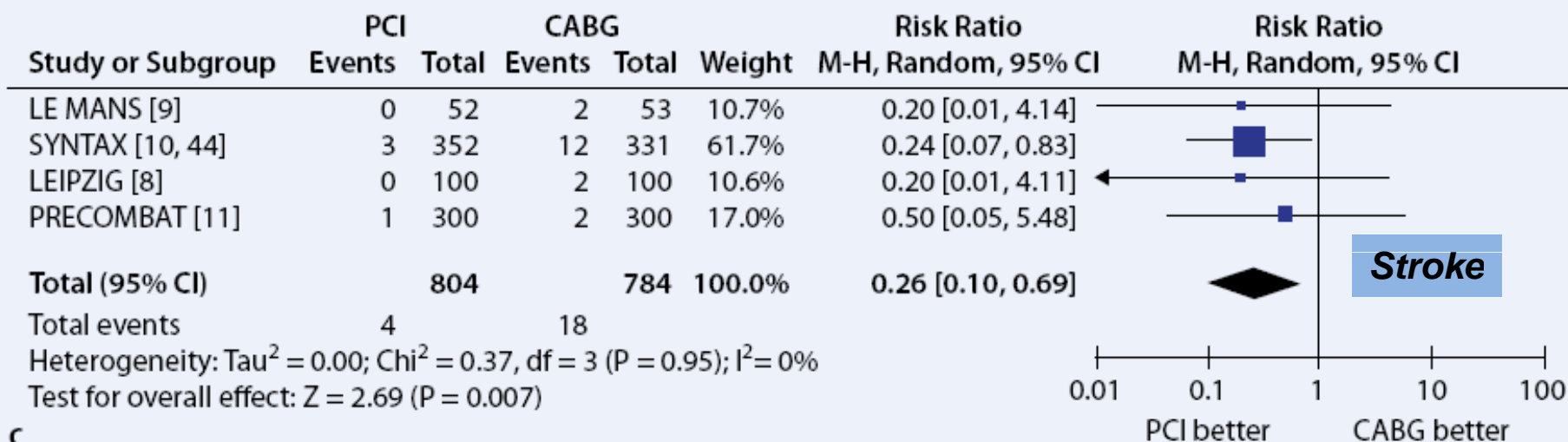
A meta-analysis of randomized controlled trials

	Random sequence generation (selection bias)	Allocation concealment (selection bias)	Blinding (performance bias and detection bias)	Incomplete outcome data (attrition bias)	Selective reporting (reporting bias)	Other bias
LE MANS [9]	+	+	-	+	+	+
LEIPZIG [8]	+	+	-	+	+	+
PRECOMBAT [11]	+	+	-	+	+	+
SYNTAX [10, 44]	+	+	-	+	+	+

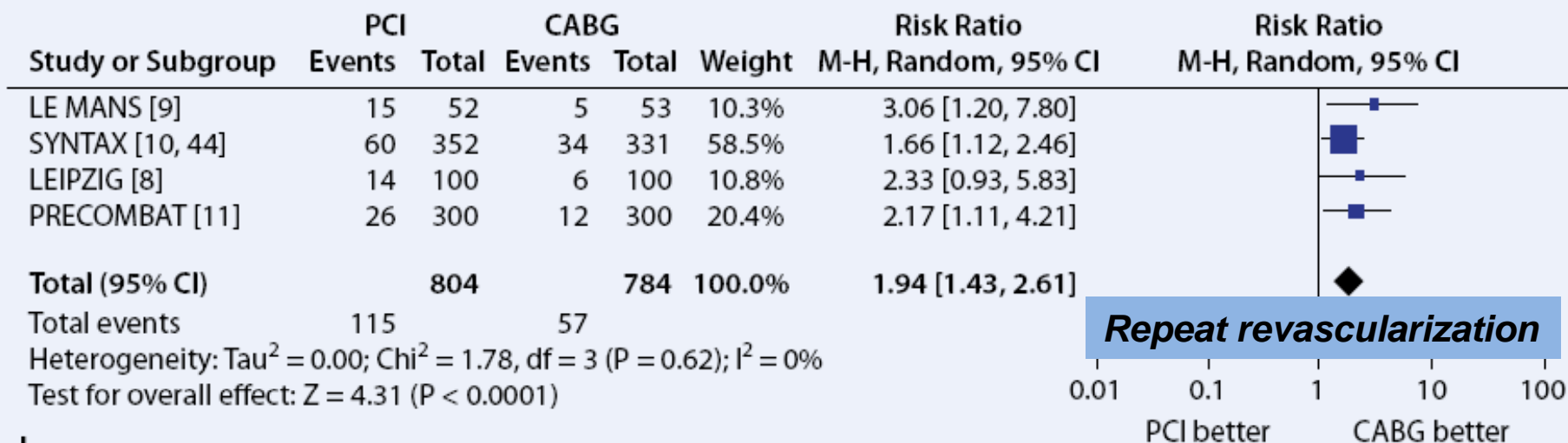
# Meta-Analysis of Randomized Trials: 1 - 2 years follow-up



# Meta-Analysis of Randomized Trials: 1 - 2 years follow-up



c



d

# CURRENT GUIDELINES



European Heart Journal (2010) 31, 2501–2555  
doi:10.1093/eurheartj/ehq277

ESC/EACTS GUIDELINES



## Guidelines on myocardial revascularization

The Task Force on Myocardial Revascularization of the European Society of Cardiology (ESC) and the European Association for Cardio-Thoracic Surgery (EACTS)

Developed with the special contribution of the European Association for Percutaneous Cardiovascular Interventions (EAPCI)<sup>†</sup>

Left main (isolated or IVD, ostium/shaft)	<b>I A</b>	<b>IIa B</b>
Left main (isolated or IVD, distal bifurcation)	<b>I A</b>	<b>IIb B</b>
Left main + 2VD or 3VD, SYNTAX score $\leq 32$	<b>I A</b>	<b>IIb B</b>
Left main + 2VD or 3VD, SYNTAX score $\geq 33$	<b>I A</b>	<b>III B</b>



# JACC



JOURNAL *of the* AMERICAN COLLEGE *of* CARDIOLOGY



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## FOCUSED UPDATE

### **2009 Focused Updates: ACC/AHA Guidelines for the Management of Patients With ST-Elevation Myocardial Infarction (Updating the 2004 Guideline and 2007 Focused Update) and ACC/AHA/SCAI Guidelines on Percutaneous Coronary Intervention (Updating the 2005 Guideline and 2007 Focused Update)**

A Report of the American College of Cardiology Foundation/American Heart Association Task Force on Practice Guidelines

### **Class IIb:**

**PCI of the left main coronary artery with stents** as an alternative to CABG may be considered in patients with anatomic conditions that are associated with a low risk of PCI procedural complications and clinical conditions that predict an increased risk of adverse surgical outcomes (21,138,139).\*(**Level of Evidence: B**)



# CONCLUSIONS



- Mid term outcome after revascularization in patients with LM coronary artery disease is similar after CABG and stenting.
- The risk of CVA is lower, while risk of repeat revascularization is higher after PCI.
- Based on meta-analysis of RT PCI for LM disease should obtain level of recommendation/evidence I A.
- The outcome of the RTs comparing Taxus and Xcience stents suggest that EXCEL study may show better results after PCI in comparison to CABG.