


# DES in Left Main Disease

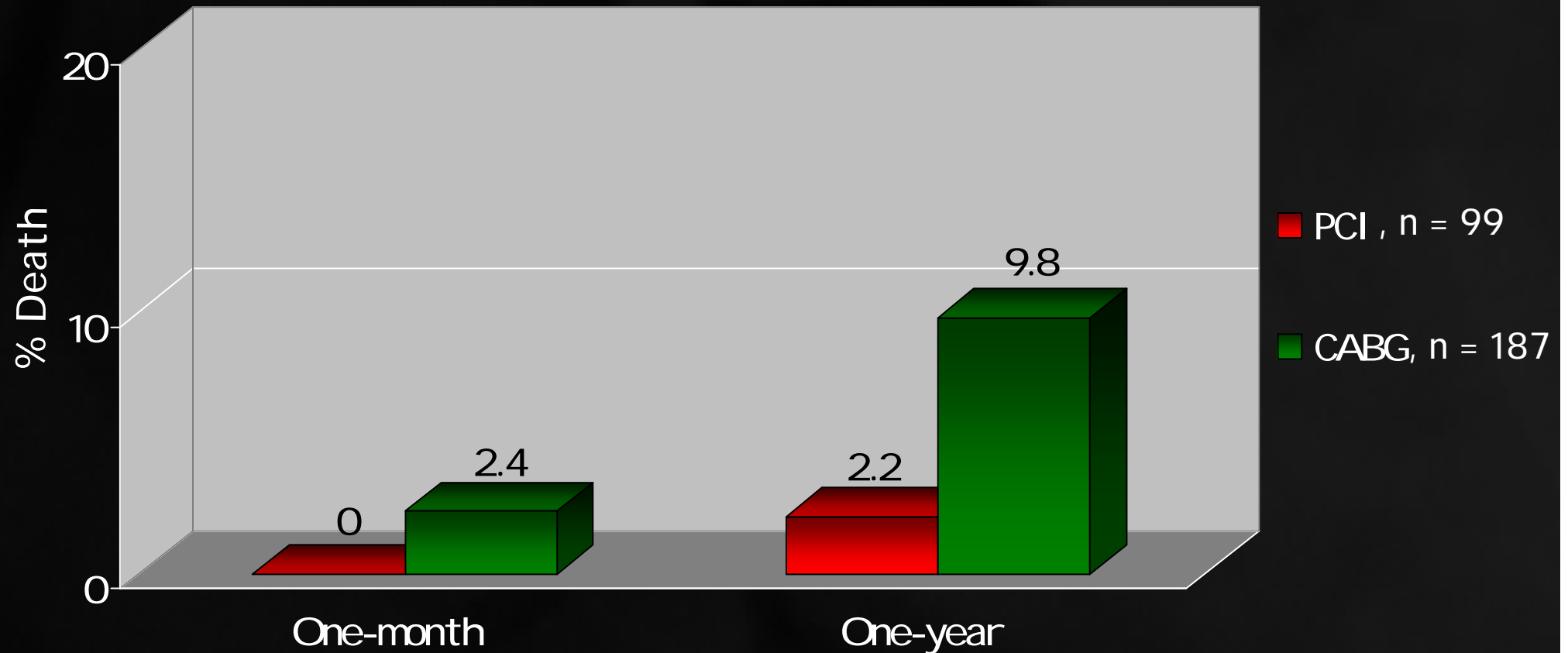
T. Lefèvre, P. Garot and the  I CPS Team

# Unprotected Left Main Stenting

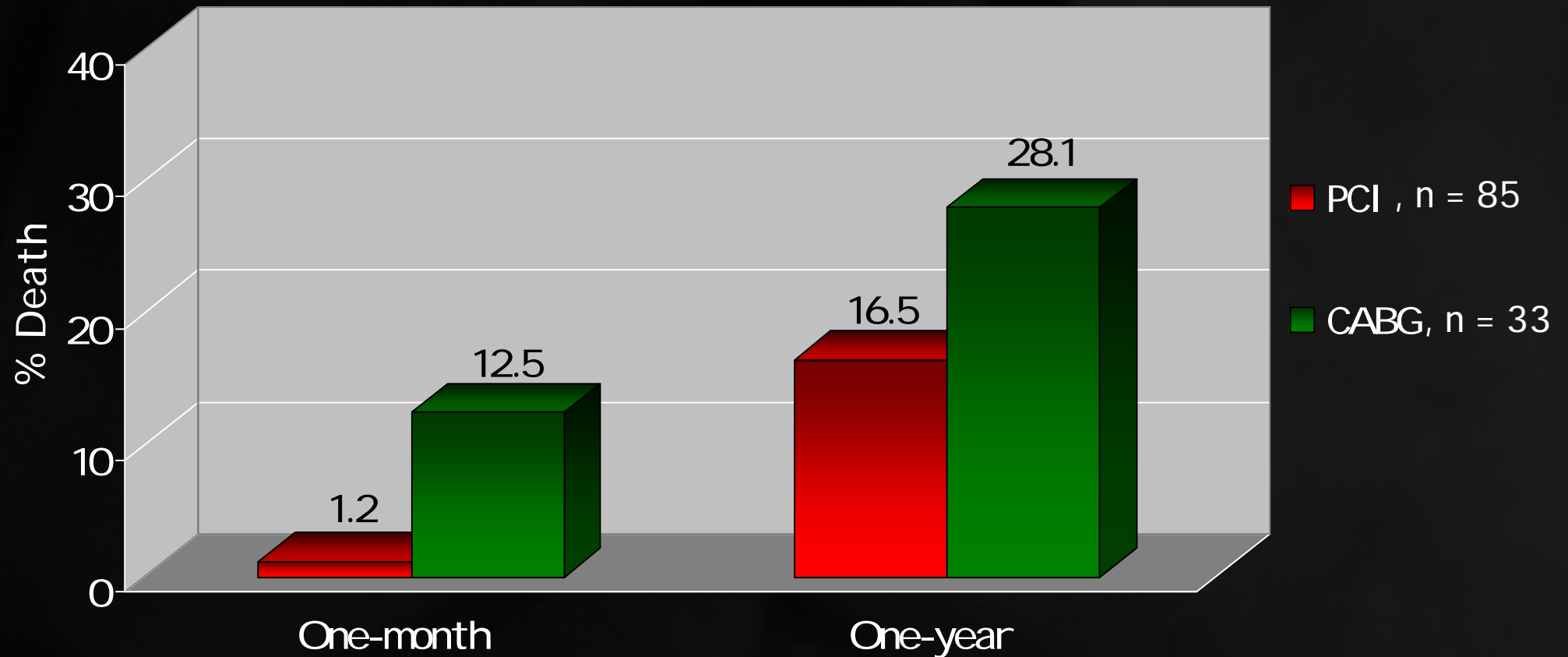
1/ What have we learned with BMS ?



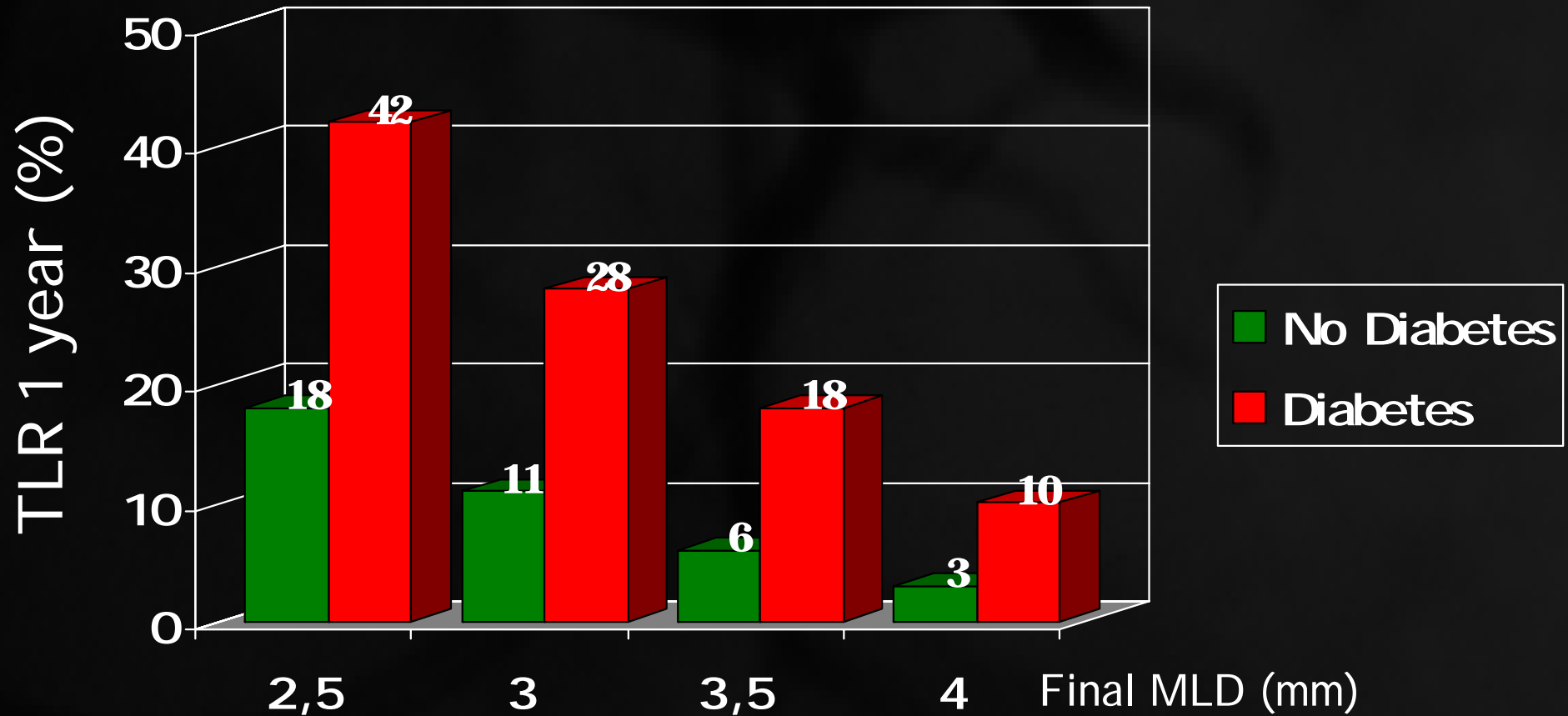
# French Left Main Registry (Low Risk)



# French Left Main Registry (High Risk)

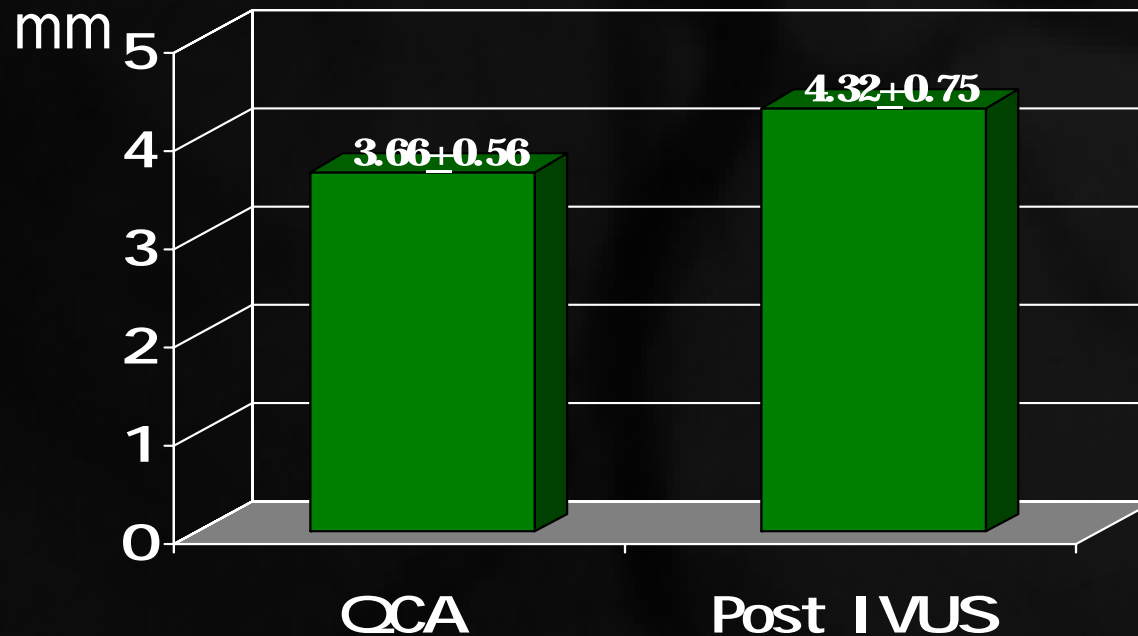


# Left Main Disease



# Role of IVUS for LM Stenting

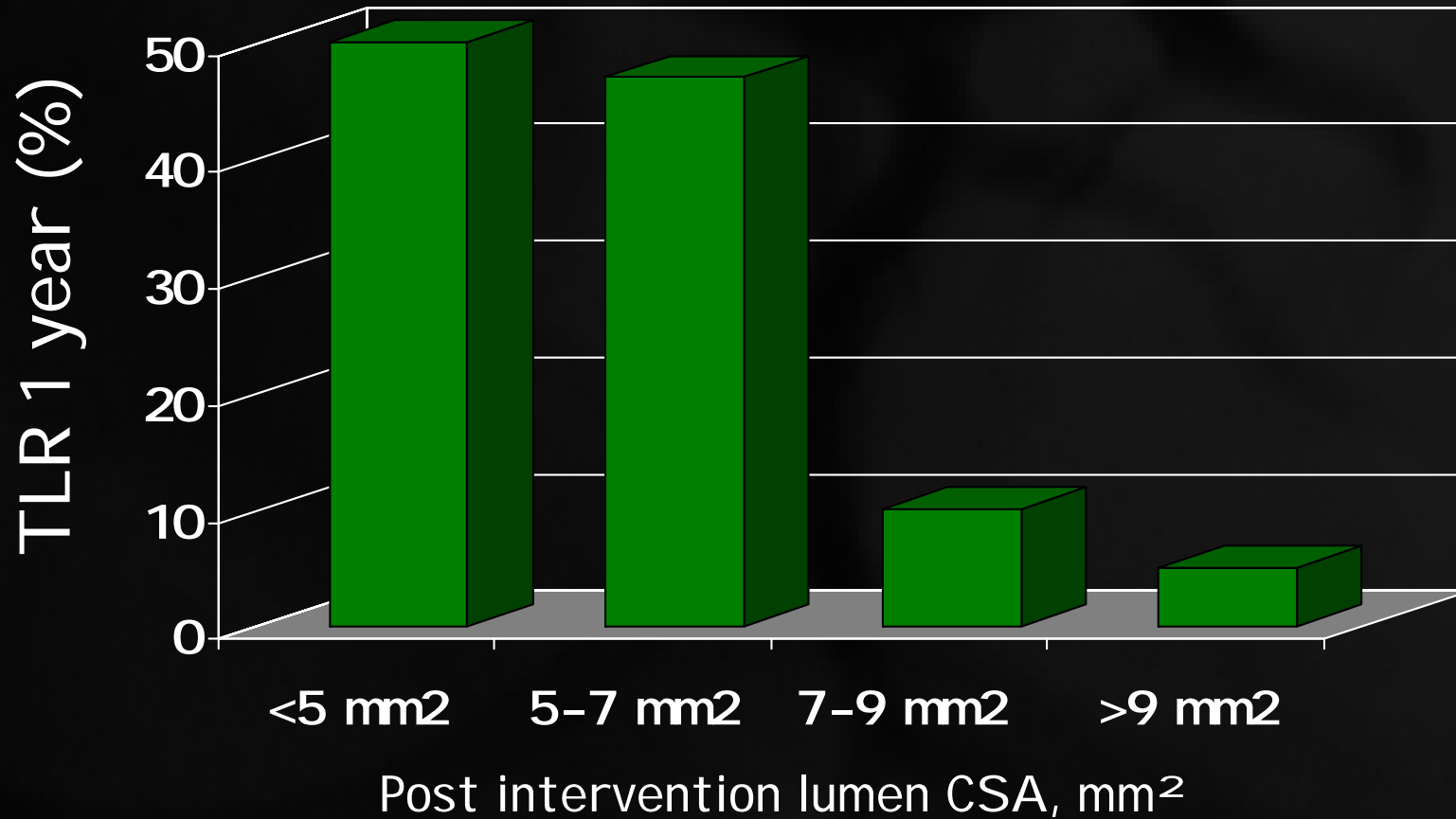
Balloon size QCA vs IVUS



➔ IVUS led to bigger balloon size in 67% of cases



# Left Main Disease



# Final results of the French Registry of Left Main Coronary Treatment

## One-year Outcome

	Stent	CABG	p value
Patients (n)	192	230	-
Poor surgical candidates (%)	44.2	14.3	<0.001
Follow-up obtained (%)	96.8	94.8	NS
MI (%)	1.6	6.9	0.017
Stroke (%)	0	2.3	0.094
Death (%)	9.6	11.4	NS
TVR left main (%)	13.4	3.7	0.001
TVR other vessel (%)	15.1	-	-





# Unprotected Left Main Stenting

2/ What can we expect with DES?



# French Left Main Taxus Pilot Study

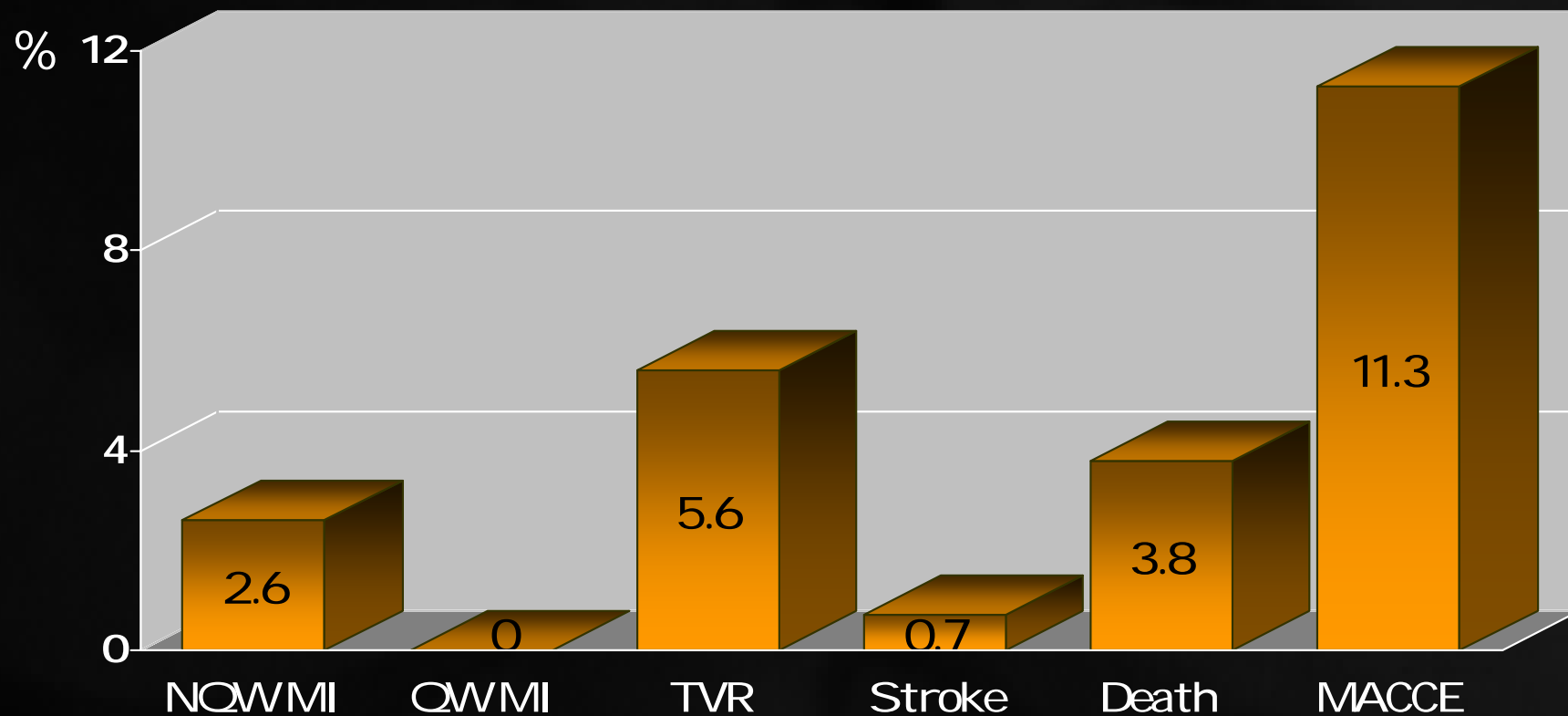
## Main Clinical Characteristics

Patients (n)	291
Age (years)	68.8 $\pm$ 11.4
Diabetes	28.7
Previous MI (%)	11.5
Previous PCI (%)	20.1
Acute coronary Syndrome (%)	44.0
3 vessel disease (%)	25.8
Distal left main (%)	77.9
Additive Euroscore	4.8 $\pm$ 3.4
<b>Estimated mortality (%)</b>	<b>6.6<math>\pm</math>10.8</b>



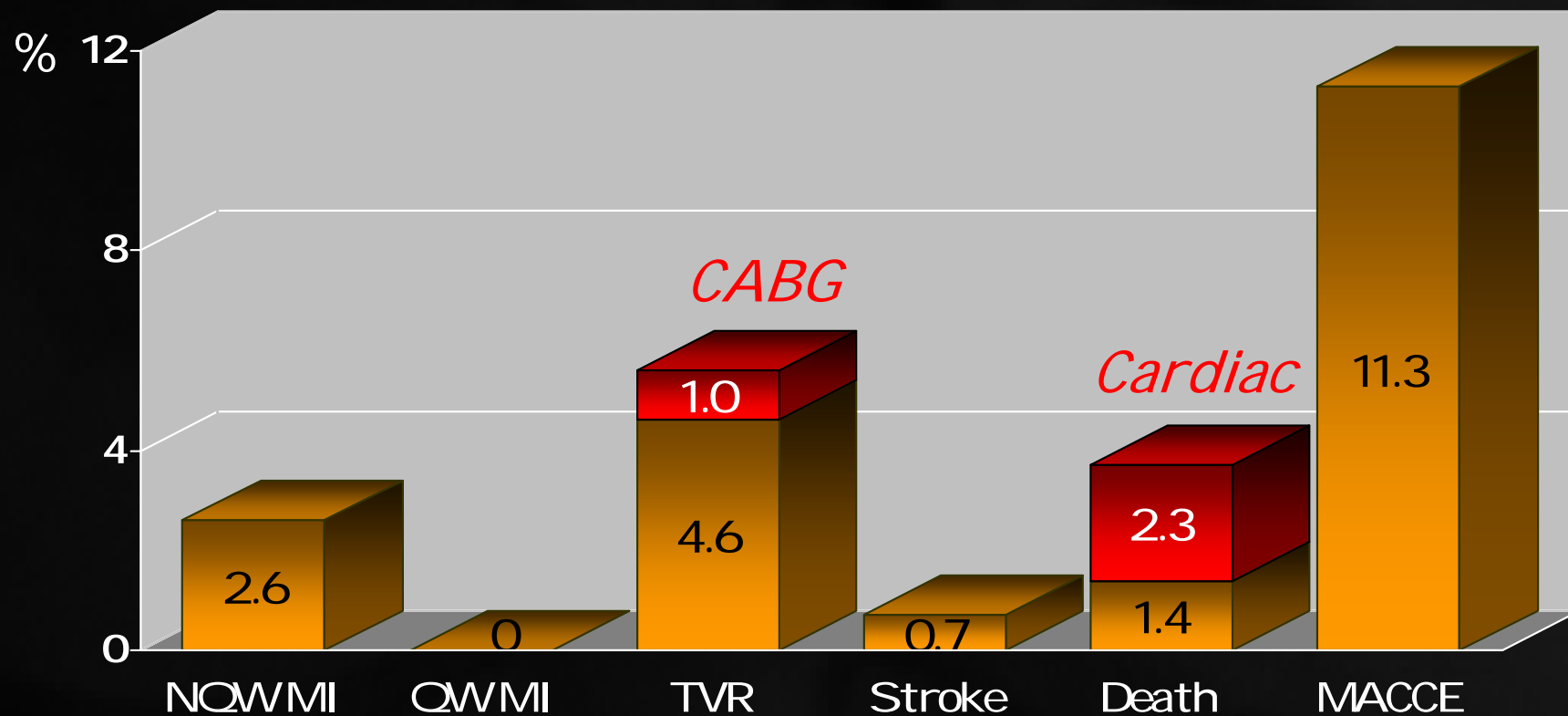
# French Left Main Taxus Pilot Study

6-12 months F-Up (287/291: 98%, 9.1±1.9 months)



# French Left Main Taxus Pilot Study

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# French Left Main Taxus Pilot Study

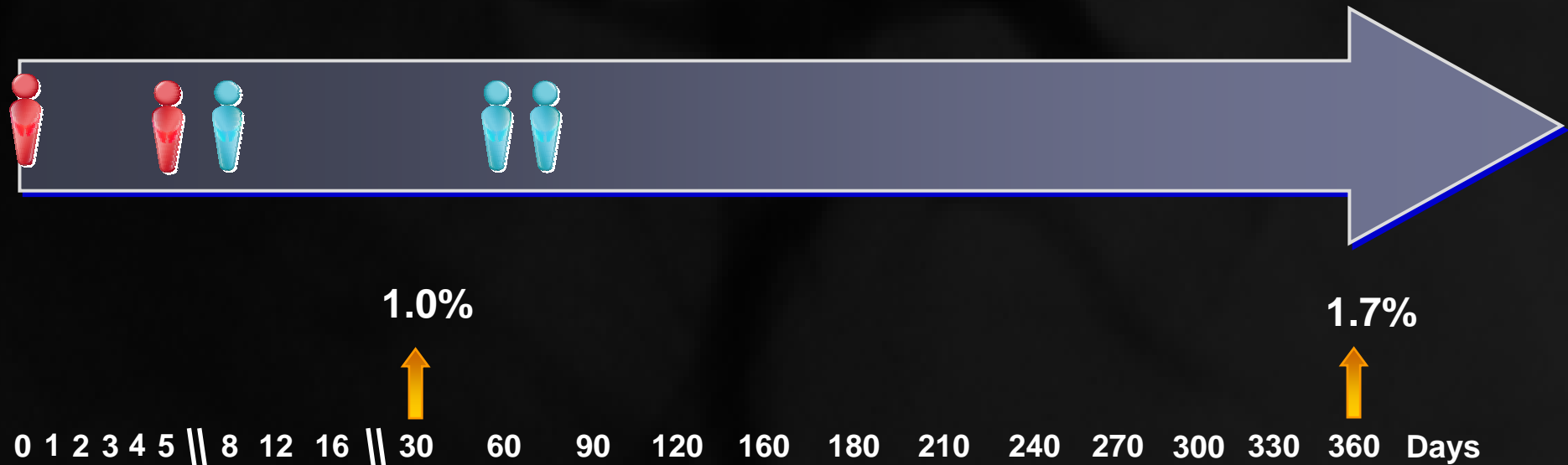
## Predictors of Death at 6-12 Months

	Death	No death	p value
Patients (n)	11	280	-
Age (years)	72.6±12.6	68.6±11.4	0.25
Euroscore	6.9±2.9	4.7±3.4	0.03
Diabetes (%)	72.7	26.8	0.001
Dialysis (%)	27.3	0.8	0.001
Ejection fraction (%)	57±10	61±13	NS
3 Vessel disease (%)	44.4	25.5	NS
Bifurcation lesion (%)	90.9	77.5	NS
Two stents in distal LM (%)	50.0	40.6	NS



# French Left Main Taxus Pilot Study

## Safety (n=287)



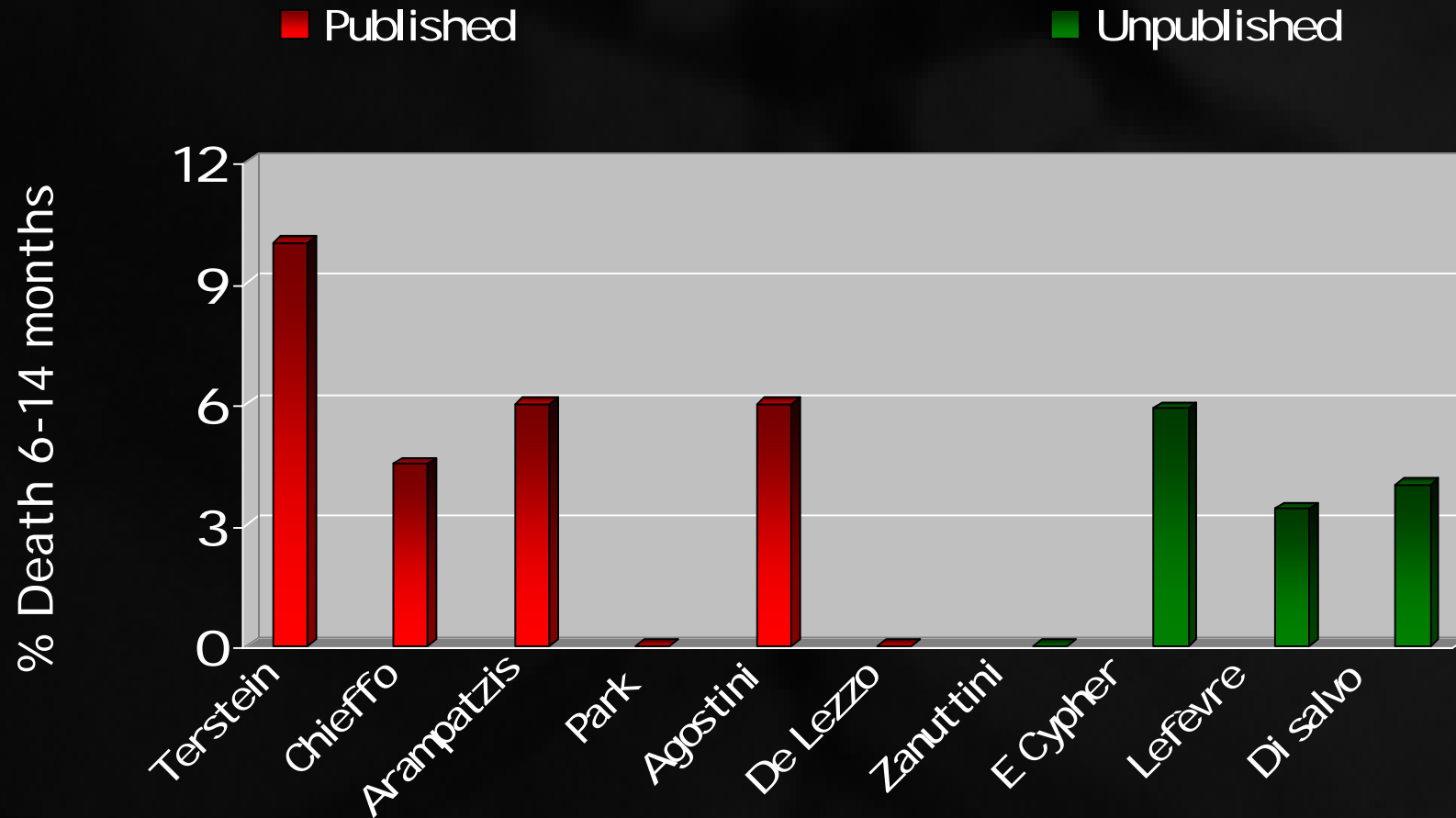
*Angiographic thrombus, acute or subacute closure within the stented vessel at the time of the clinically driven angiographic restudy*



*Any sudden death not attributed to a non-cardiac cause*



# DES for Left Main Stenting



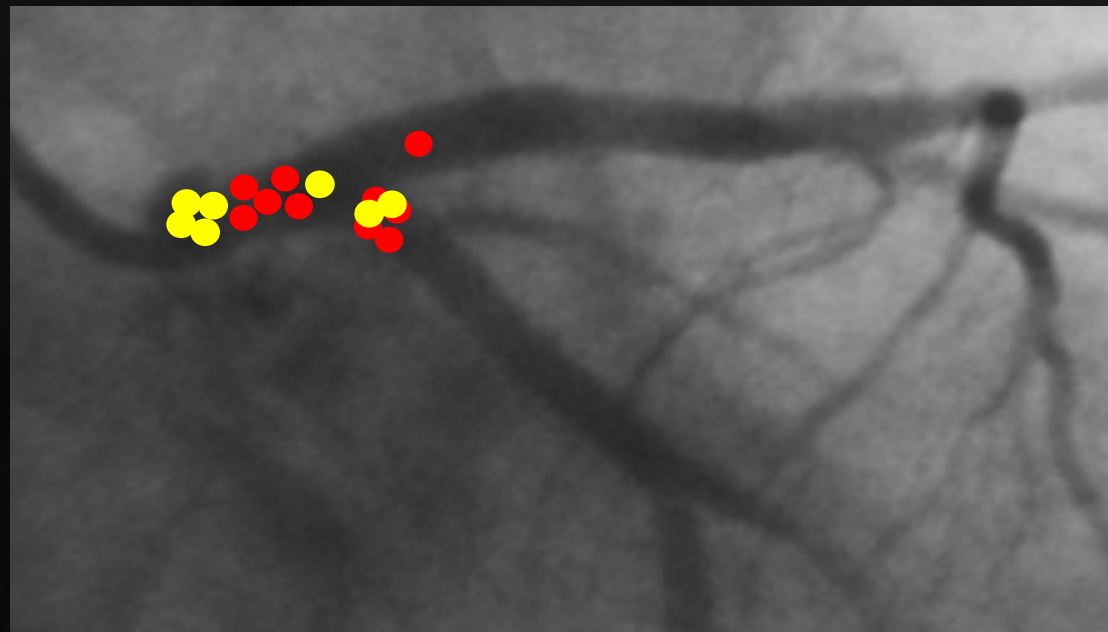
# French Left Main Taxus Pilot Study

Angiographic F-Up (178/277: 64.3%)

Delay (months)  $6.9 \pm 2.6$

LM restenosis (%)  $9.6^*$

- In stent
- Not in stent





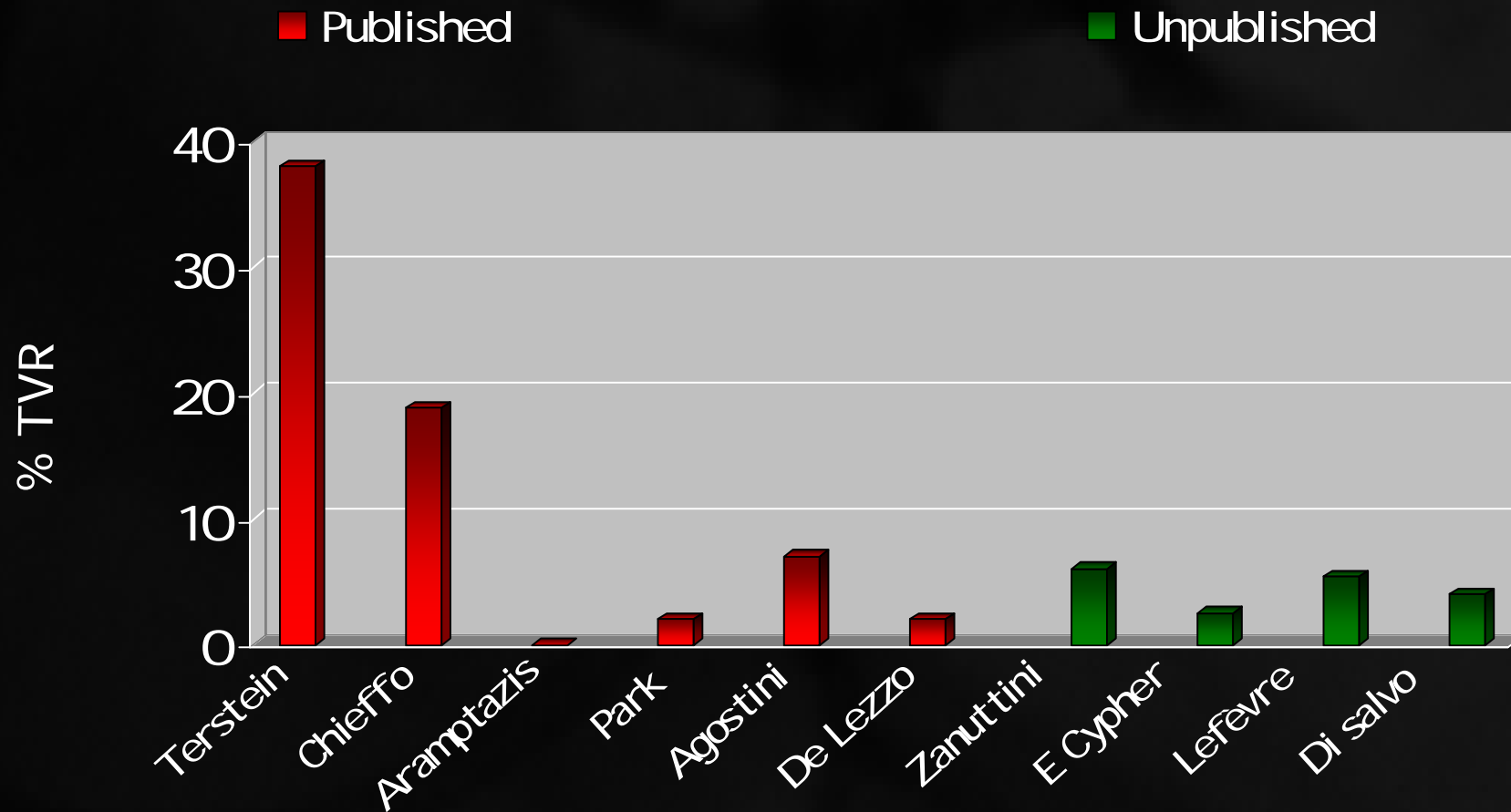
# French Left Main Taxus Pilot Study

## Predictors of Restenosis at 6-8 Months

	Restenosis	No Restenosis	<i>P</i> value
Patients (n)	13	137	-
Age (years)	66.1±9.9	68.8±11.2	NS
Euroscore	4.9±3.4	4.1±3.2	NS
Diabetes (%)	57.1	27.2	<0.05
3 Vessel disease (%)	41.2	30.1	NS
Distal left main (%)	85.7	76.3	NS



# DES for Left Main Stenting



# Unprotected Left Main Stenting

## Remaining Issues

### Prevention of stent thrombosis

One stent better than 2

Final kissing balloon

Optimal Antiplatelet treatment duration ?

Systematic angiographic F-up ?

Final IVUS ?

Dedicated stent ?



# Conclusion

- ✓ In experienced hands, PCI with DES is feasible and safe and associated with a relatively low rate of re-intervention.
- ✓ Optimal approach in distal left main remains to be determined.
- ✓ Current stent designs are probably suboptimal for distal left main lesions
- ✓ The current randomized trials will help to define the respective roles of PCI and CABG in this setting.



# Left Main Stem PCI in the Real World

## Key Issues

- ✓ Optimal view
- ✓ Pre defined strategy
- ✓ Consider I ABB
- ✓ Optimal antiplatelet treatment
- ✓ Optimal anticoagulation (ACT)
- ✓ Optimal stent positioning
- ✓ Consider final IVUS
- ✓ Follow-up



# Trends in Coronary Revascularization 1989 to 1997: The Bypass Angioplasty Revascularization Investigation (BARI)

TABLE II Patient Characteristics by Year of Survey for All Patients

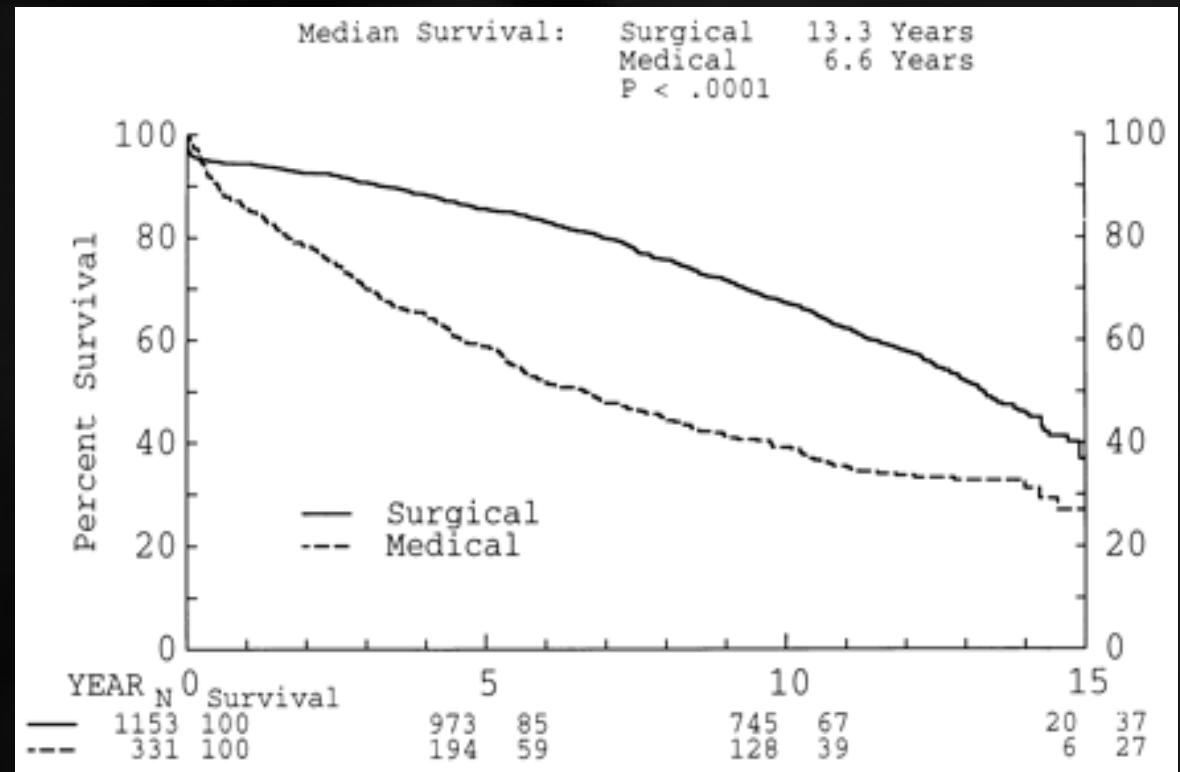
Characteristics	Year of Survey							
	1989-1990 (n = 1,865)	1991 (n = 961)	1992 (n = 1,016)	1993 (n = 1,006)	1994 (n = 566)	1995 (n = 577)	1996 (n = 504)	1997 (n = 597)
Mean age (yrs)	61.9	62.2	62.2	62.1	62.2	62.4	61.8	62.8
Women (%)	28.2	28.4	28.7	28.5	28.8	26.9	31.2	30.0
Non-White (%) <sup>†</sup>	—	6.7	7.8	8.0	8.5	10.9	10.9	11.1
No. of coronary arteries narrowed ≥50% in diameter <sup>‡</sup>								
1 (%)	27.9	27.4	25.8	27.4	31.4	27.7	28.0	29.1
2 (%)	27.2	28.1	30.9	30.4	31.1	33.3	30.8	26.8
3 (%)	44.9	44.5	43.3	42.1	37.5	39.0	41.3	44.1
Left main disease (%)	10.2	10.5	11.6	10.9	11.3	11.8	12.1	10.6
Prior PTCA (%) <sup>*</sup>	20.6	23.8	23.5	24.3	25.1	23.2	24.0	24.3
Prior CABG (%)	14.9	15.3	14.8	15.4	12.7	14.4	14.1	15.7
Myocardial infarction within 24 hrs before procedure (%) <sup>†</sup>	2.0	3.6	2.7	3.6	4.6	4.2	4.2	7.0
Catheter-based intervention (%) <sup>†</sup>	52.1	56.8	57.7	56.8	59.7	57.9	59.9	62.0

\*p <0.05; †p <0.001 for Cochran-Armitage test of trend; ‡p <0.05 for trend over time by Jonckheere-Terpstra test.



# Left Main Disease

Cumulative survival estimates in 1484 CASS Registry patients with 50% LM coronary artery stenosis who were initially treated with CABG surgery or non surgical therapy.



*Long-term CASS Experience*  
*Caracciolo & al Circulation 1995;91:2325-2334.*



# LM CABG : Mortality at 12 Months

Year	Study	N	CABG	Mortality
2001-02	French LM	230	40% AR	11.4%
2001-03	Buszman	61	47% LIMA	4.9%
1997-03	Lu	1197	On/Off	5%
1999-02	Beauford	234	On Pump	14%
1999-02	Beauford	420	Off Pump	6%





1	<b>Patient factors</b>	
2	<b>Age</b>	<b>65yr</b>
3	<b>Sex</b>	<input checked="" type="checkbox"/> femelle
4	<b>Pulmonary disease</b>	<input type="checkbox"/> Oui
5	<b>Peripheral vascular disease</b>	<input type="checkbox"/> Oui
6	<b>Neurologic disorder</b>	<input type="checkbox"/> Oui
7	<b>Previous cardiac surgery</b>	<input type="checkbox"/> Oui
8	<b>Creatinine pre surgery &gt; 200 µmol/ L</b>	<input type="checkbox"/> Oui
9	<b>Endocarditis</b>	<input type="checkbox"/> Oui
10	<b>Critical status pre surgery</b>	<input type="checkbox"/> Oui
11	<b>Cardiac factors</b>	
12	<b>Unstable angina</b>	<input checked="" type="checkbox"/> Oui
13	<b>Ejection fraction 30-50%</b>	<input checked="" type="checkbox"/> 30-50%
14	<b>Ejection fraction &lt;30</b>	<input type="checkbox"/> <30%
15	<b>Recent MI</b>	<input type="checkbox"/> Oui
16	<b>sPAP &gt; 60 mmHg</b>	<input type="checkbox"/> Oui
17	<b>Surgical factors</b>	
18	<b>Emergency</b>	<input type="checkbox"/> Oui
19	<b>Associated cardiac surgery</b>	<input type="checkbox"/> Oui
20	<b>Associated thoracic aorta surgery</b>	<input type="checkbox"/> Oui
21	<b>Associated septal rupture treatment</b>	<input type="checkbox"/> Oui
22		
23	<b>Additive EuroSCORE</b>	<b>6</b>
24	<b>Mortality</b>	<b>4,72%</b>
25		
26	<b>For the latest information on EuroSCORE visit <a href="http://www.euroscore.org">http://www.euroscore.org</a></b>	

$\Phi$	$\beta_i$	$X_i$
2	0,0666354	7
1	<b>0,3304052</b>	VRAI
1	0,4931341	FAUX
2	0,6558917	FAUX
2	0,841626	FAUX
3	1,002625	FAUX
2	0,6521653	FAUX
3	1,101265	FAUX
3	0,9058132	FAUX
2	<b>0,5677075</b>	VRAI
1	<b>0,4191643</b>	VRAI
3	1,094443	FAUX
2	0,5460218	FAUX
2	0,7676924	FAUX
2	0,7127953	FAUX
2	0,5420364	FAUX
3	1,159787	FAUX
4	1,462009	FAUX

**Additive euroSCORE =  $\sum \Phi$**   
**Logistic euroSCORE =**  

$$e^{(-4.789594 + \sum \beta_i X_i)} / 1 + e^{(-4.789594 + \sum \beta_i X_i)}$$

1	<b>Patient factors</b>	
2	<b>Age</b>	78yr
3	<b>Sex</b>	<input checked="" type="checkbox"/> femelle
4	<b>Pulmonary disease</b>	<input type="checkbox"/> Oui
5	<b>Peripheral vascular disease</b>	<input type="checkbox"/> Oui
6	<b>Neurologic disorder</b>	<input type="checkbox"/> Oui
7	<b>Previous cardiac surgery</b>	<input type="checkbox"/> Oui
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10	<b>Critical status pre surgery</b>	<input type="checkbox"/> Oui
11	<b>Cardiac factors</b>	
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21	<b>Associated septal rupture treatment</b>	<input type="checkbox"/> Oui
22		
23	<b>Additive EuroSCORE</b>	8
24	<b>Mortality</b>	10,53%
25		
26	<b>For the latest information on EuroSCORE visit <a href="http://www.euroscore.org">http://www.euroscore.org</a></b>	

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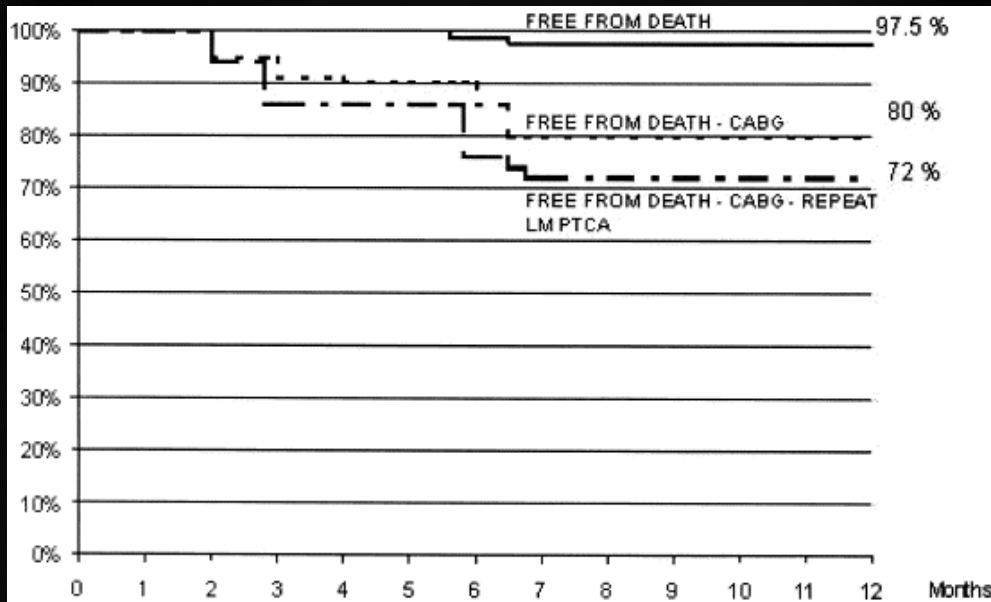
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2	Age	78yr
3	Sex	<input checked="" type="checkbox"/> femelle
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13	Ejection fraction 30-50%	<input checked="" type="checkbox"/> 30-50%
14	Ejection fraction <30	<input type="checkbox"/> <30%
15	Recent MI	<input type="checkbox"/> Oui
16	sPAP > 60 mmHg	<input type="checkbox"/> Oui
17	<b>Surgical factors</b>	
18	Emergency	<input type="checkbox"/> Oui
19	Associated cardiac surgery	<input type="checkbox"/> Oui
20	Associated thoracic aorta surgery	<input type="checkbox"/> Oui
21	Associated septal rupture treatment	<input type="checkbox"/> Oui
22		
23	Additive EuroSCORE	10
24	Mortality	18,49%
25		
26	For the latest information on EuroSCORE visit <a href="http://www.euroscore.org">http://www.euroscore.org</a>	

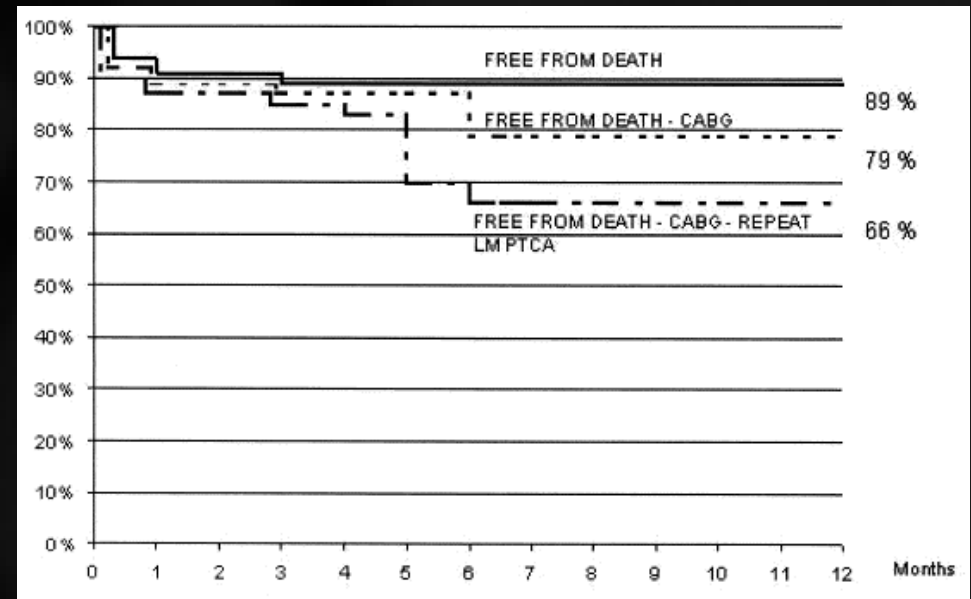
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# Stenting of Unprotected Left Main



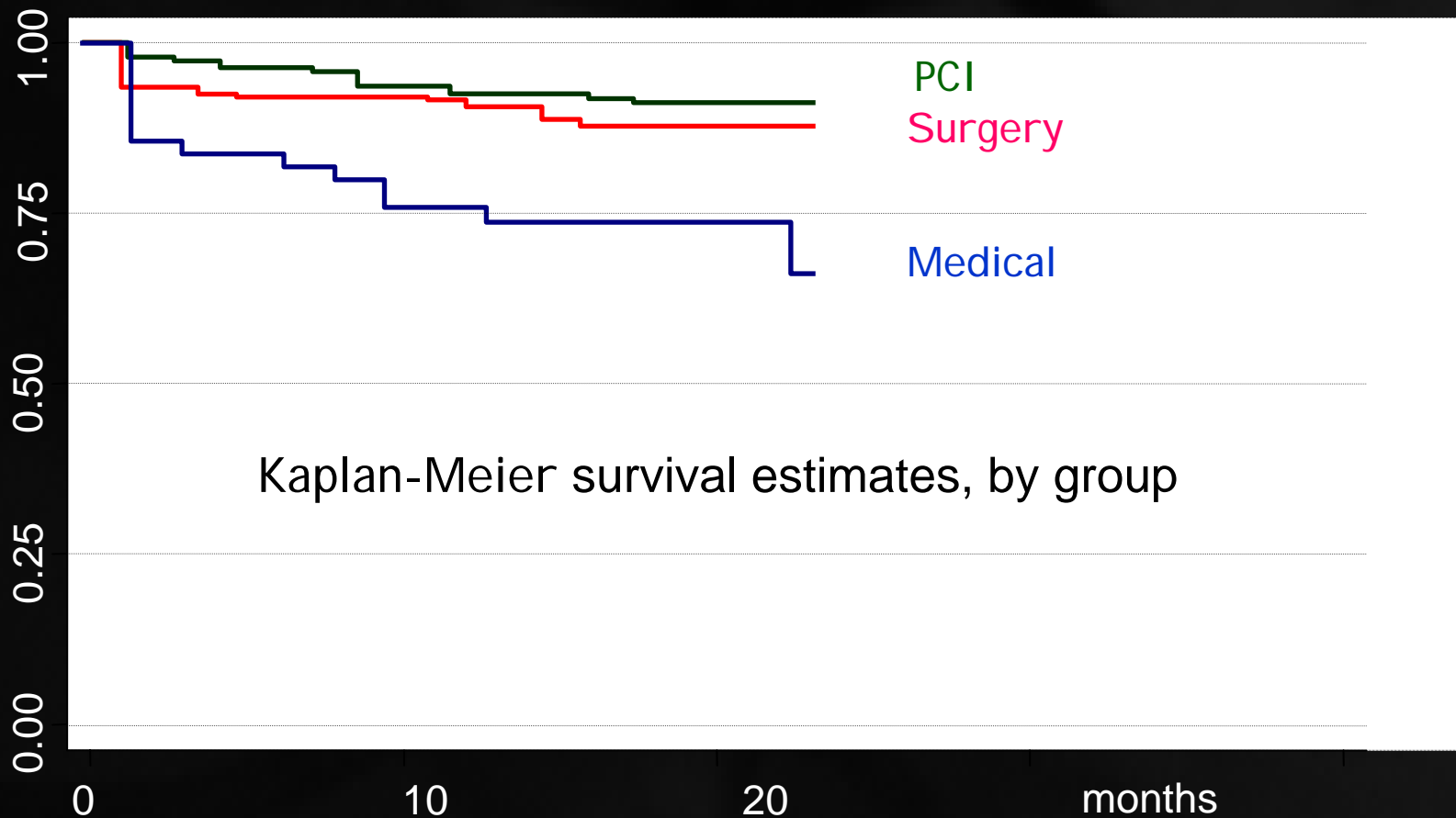
63 "good" surgical candidates



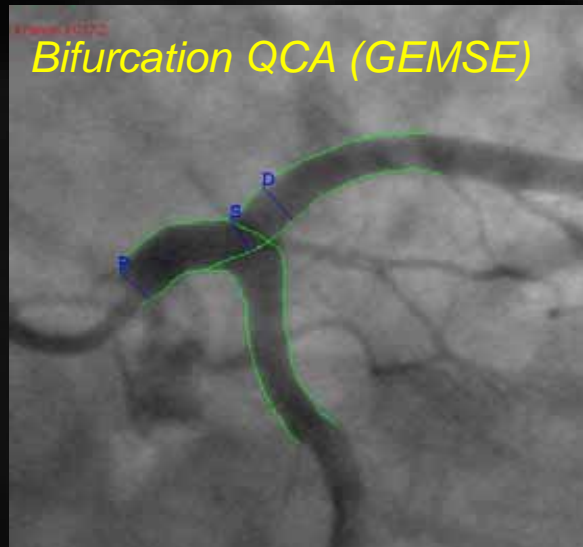
29 "poor" surgical candidates



# Final results of the French Registry of Left Main Coronary Treatment



# Fractals and self-similarity of the coronary tree



214 coronary bifurcations

$$R = \frac{D_{\text{mother}}}{D_{\text{daughter 1}} + D_{\text{daughter 2}}}$$

**Ratio = 0.670**

D > 4.5 mm   D [4.5-4.0]   D [4.0-3.5]   D [3.5-3.0]   D [3.0-2.5]   D < 2.5 mm

Ratio      **0.66**      **0.67**      **0.66**      **0.69**      **0.66**      **0.66**

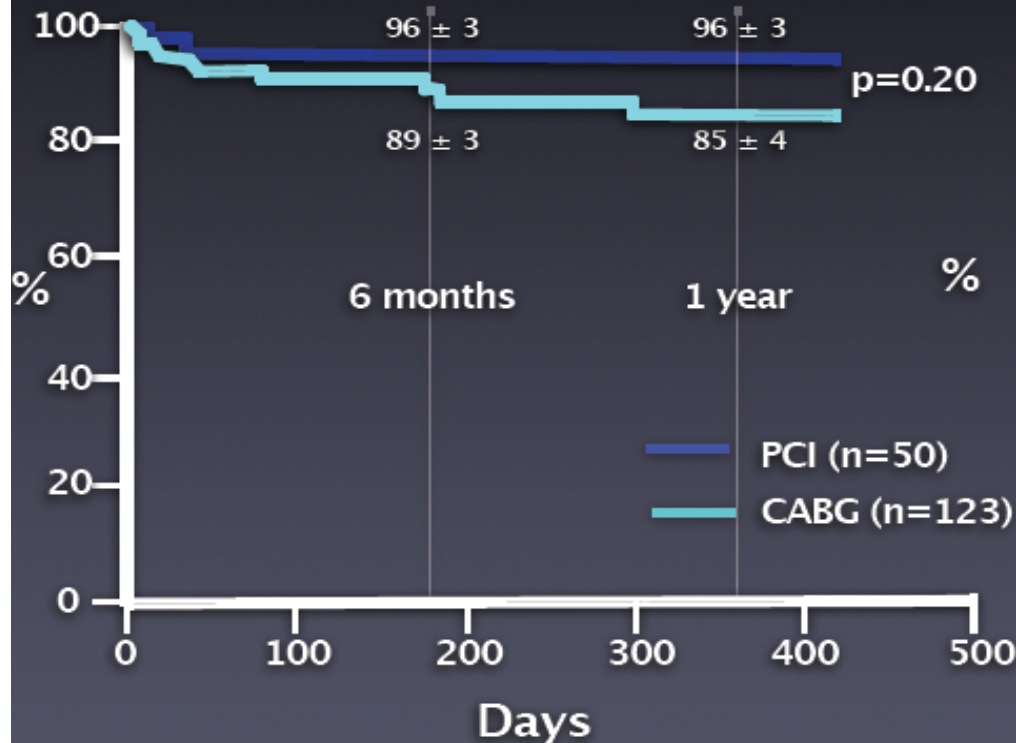


# PCI vs. CABG

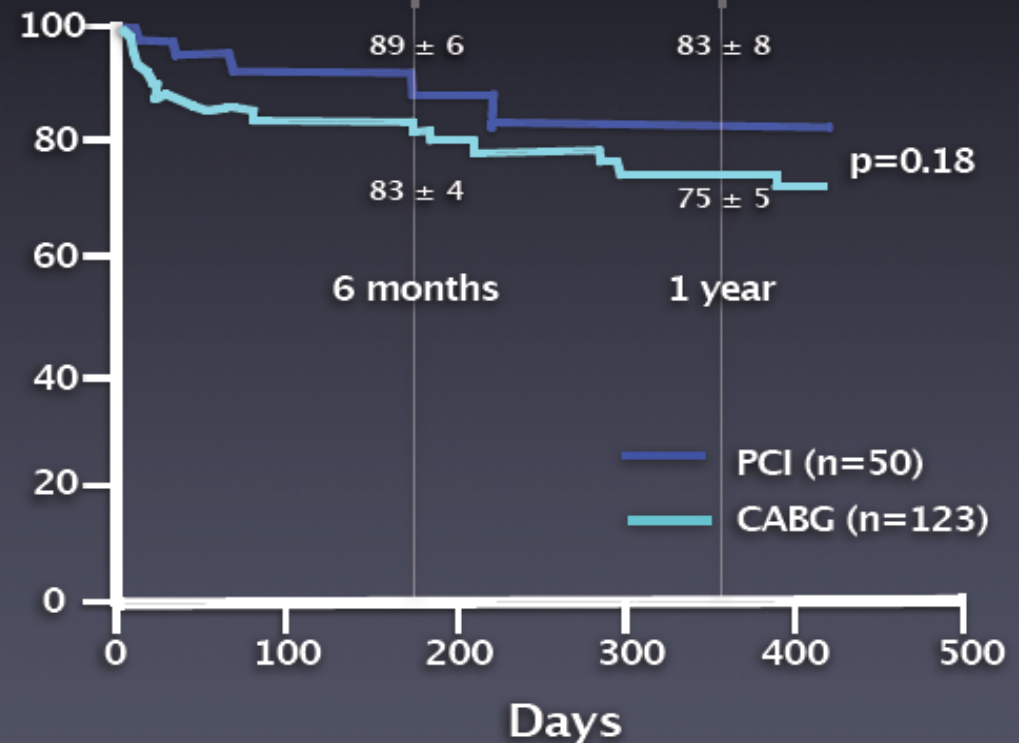
Registry Comparison  
Since April 2003  
DES-Implantation (n=50 pts)  
vs. CABG (n=123 pts)

More female (50 vs 26%,  $p < 0.01$ ) and higher Parsonnet's Score (14 vs 18 pts,  $p < 0.01$ ) in PCI Group.

Freedom from death

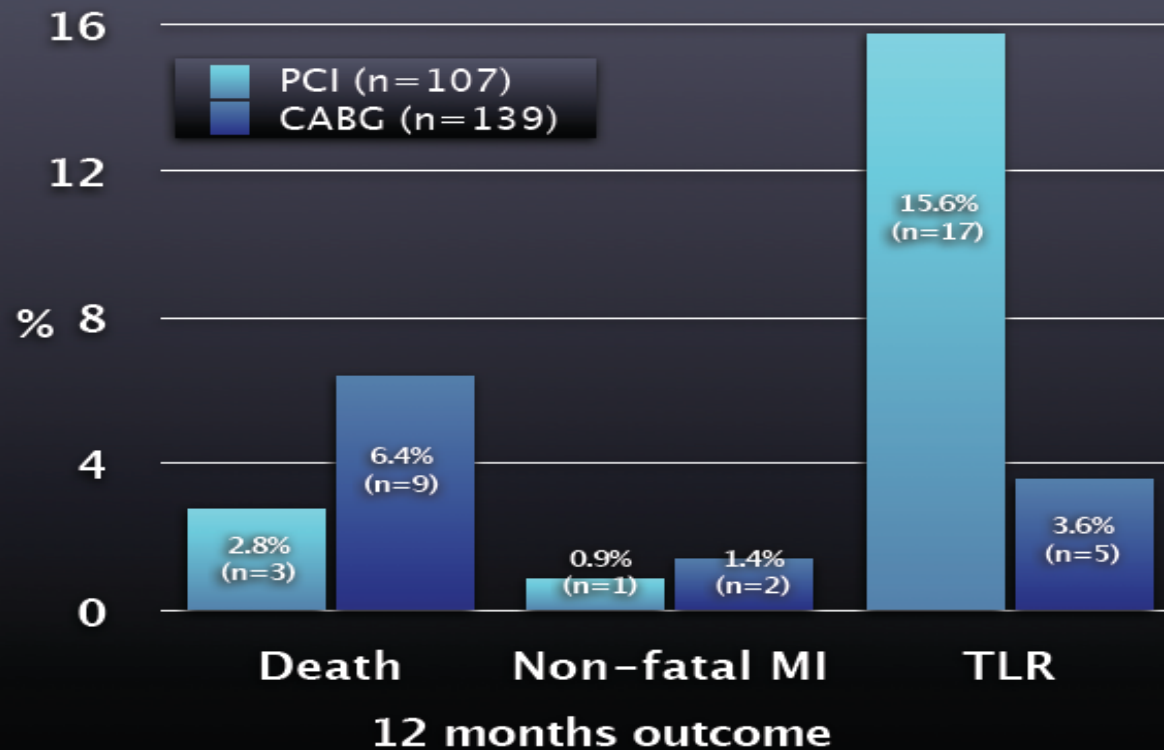


MACCE-free survival  
(including death, myocardial infarction,  
cerebrovascular events, and target vessel  
revascularization)



# PCI vs. CABG

Registry Comparison  
DES-Implantation (n=107  
pts) vs. CABG (n=139 pts)

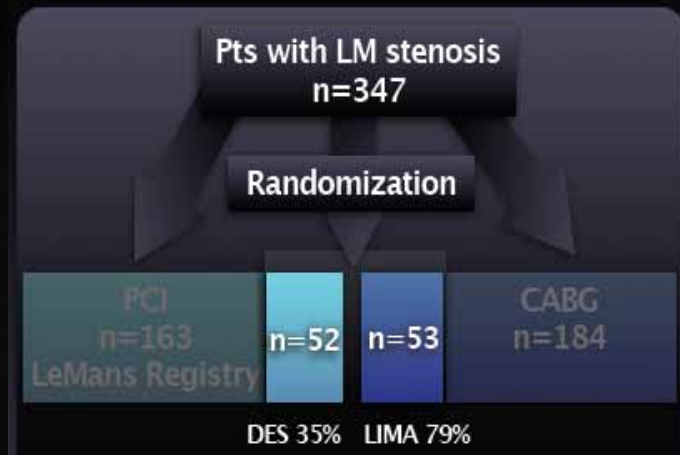


Airoldi et al., JACC, 2006, 47: Suppl. B, 2907-77  
Colombo et al., i2-Summit 2006, 2608-5  
Chieffo et al., Circulation, 2006, in press

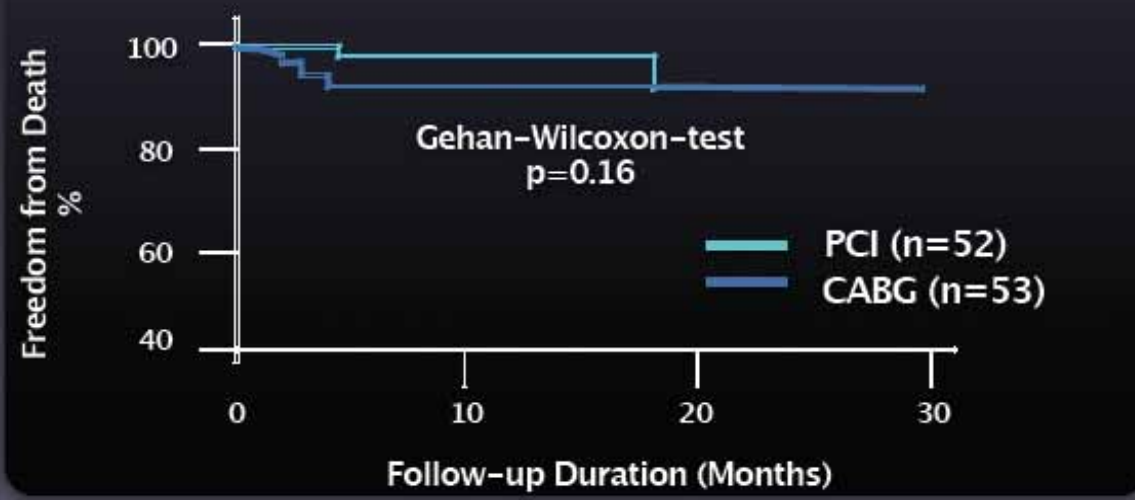




**LE MANS – Study**  
**Acute and late outcome of unprotected left main stenting in comparison with surgical revascularization**



Outcomes	PCI, n (%)	CABG, n (%)	p
Hospitalization	6.8 ±3.8	12.0 ±9.6	<0.001
Any MAE (<30 d)	3 (5.8)	19 (35.8)	0.0001
Any MACE (<30 d)	2 (3.8)	9 (20.7)	0.028
Any MACE (30 d-12 mo)	11 (21)	11 (20)	NS



Buszman et al. TCT 2005

# Role of IVUS for LM Stenting

## Follow-up 12 months (n=30)

Coronary angiogram (%)	73.3
Q-wave MI (%)	0
Non Q-wave-MI (%)	3.3
Death (%)	3.3
Cardiac death (%)	0
TVR (%)	13.3
CABG (%)	3.3
PTCA (%)	10.0



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