Long lesions, diffuse disease, MVD

What can we do? What should we do?

Bernard Chevalier & Jean Fajadet

Clinique Pasteur & CCN, France

Long lesions, diffuse disease, MVD
What can we do? What should we do?

- **What can we do?**

What is technically feasible, what is doable

- **What should we do?**

What is reasonable, what is recommended

Long lesions

Long lesions

- **What have we learned with BMS ?**

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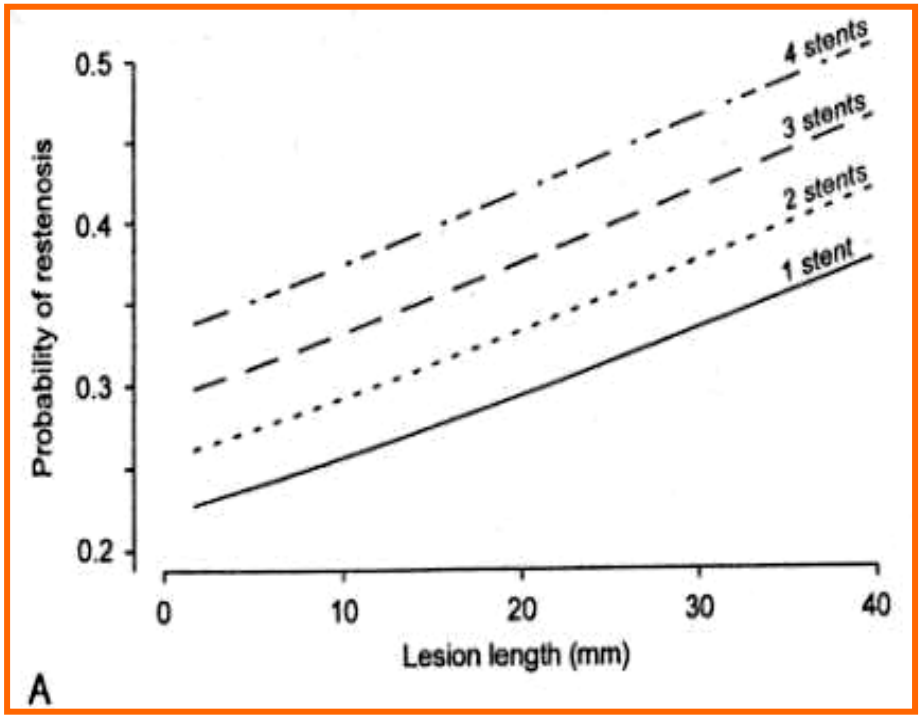
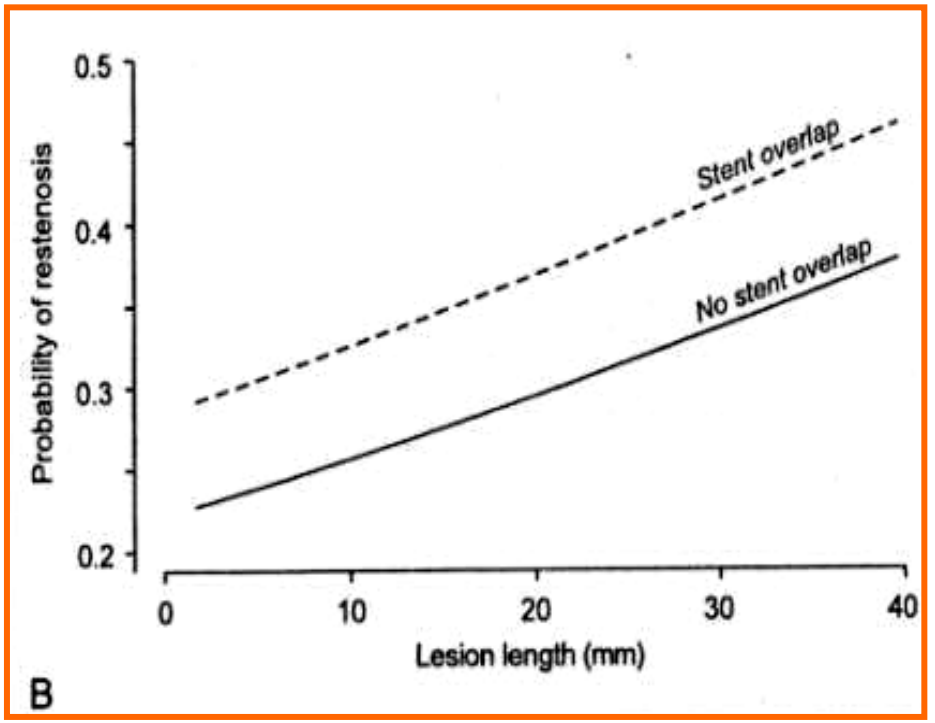
Influence of Lesion Length on Restenosis After Coronary Stent Placement

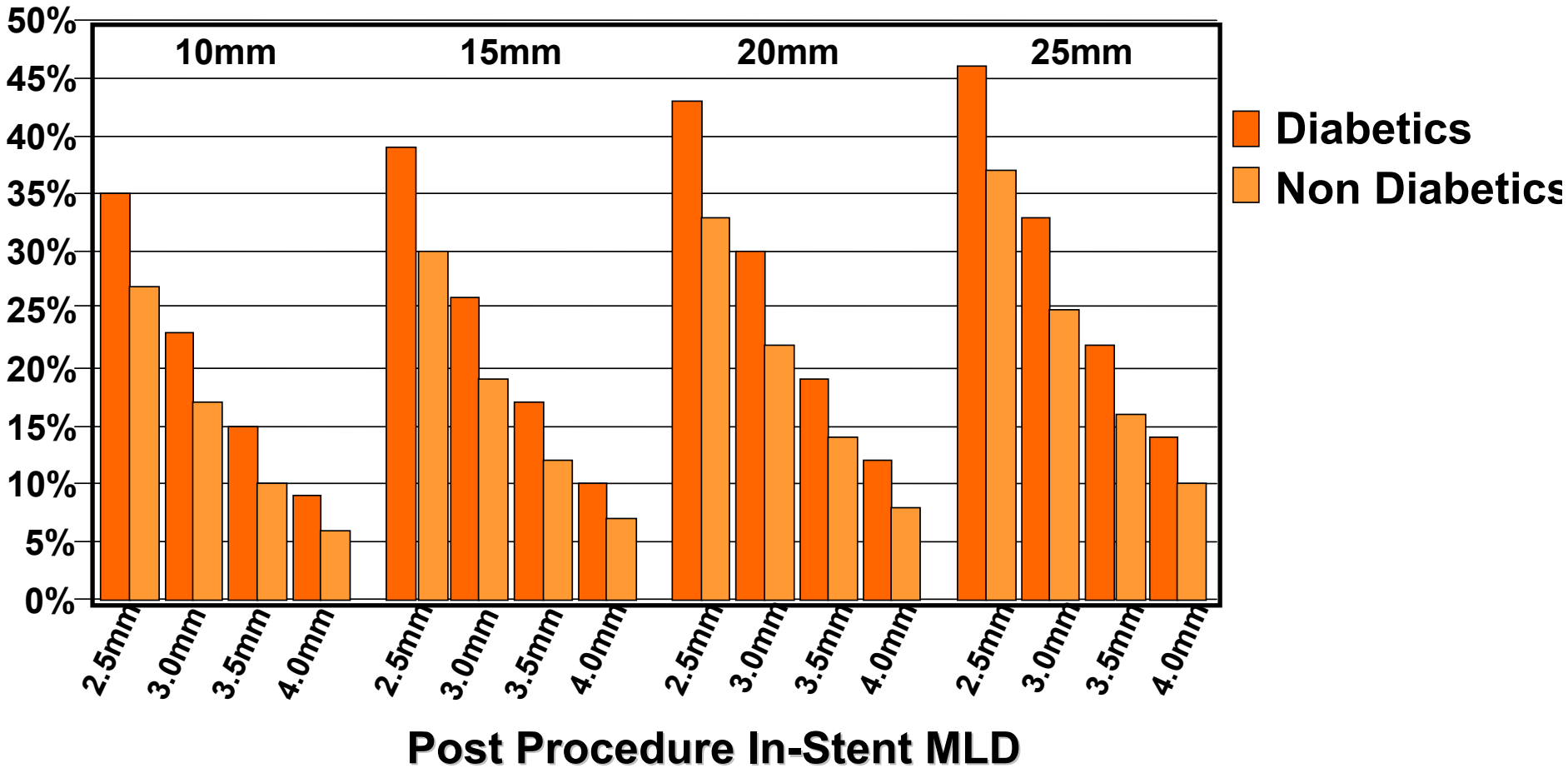




Kastrati A, et al. Am J Cardiol 1999; 83: 1617-1622

ISR

Lesion Length, Vessel Size, and Diabetes



K. Ho et al., AHA 1998

Long lesions

- What have we learned with BMS ?
- **What are we learning with DES ?**

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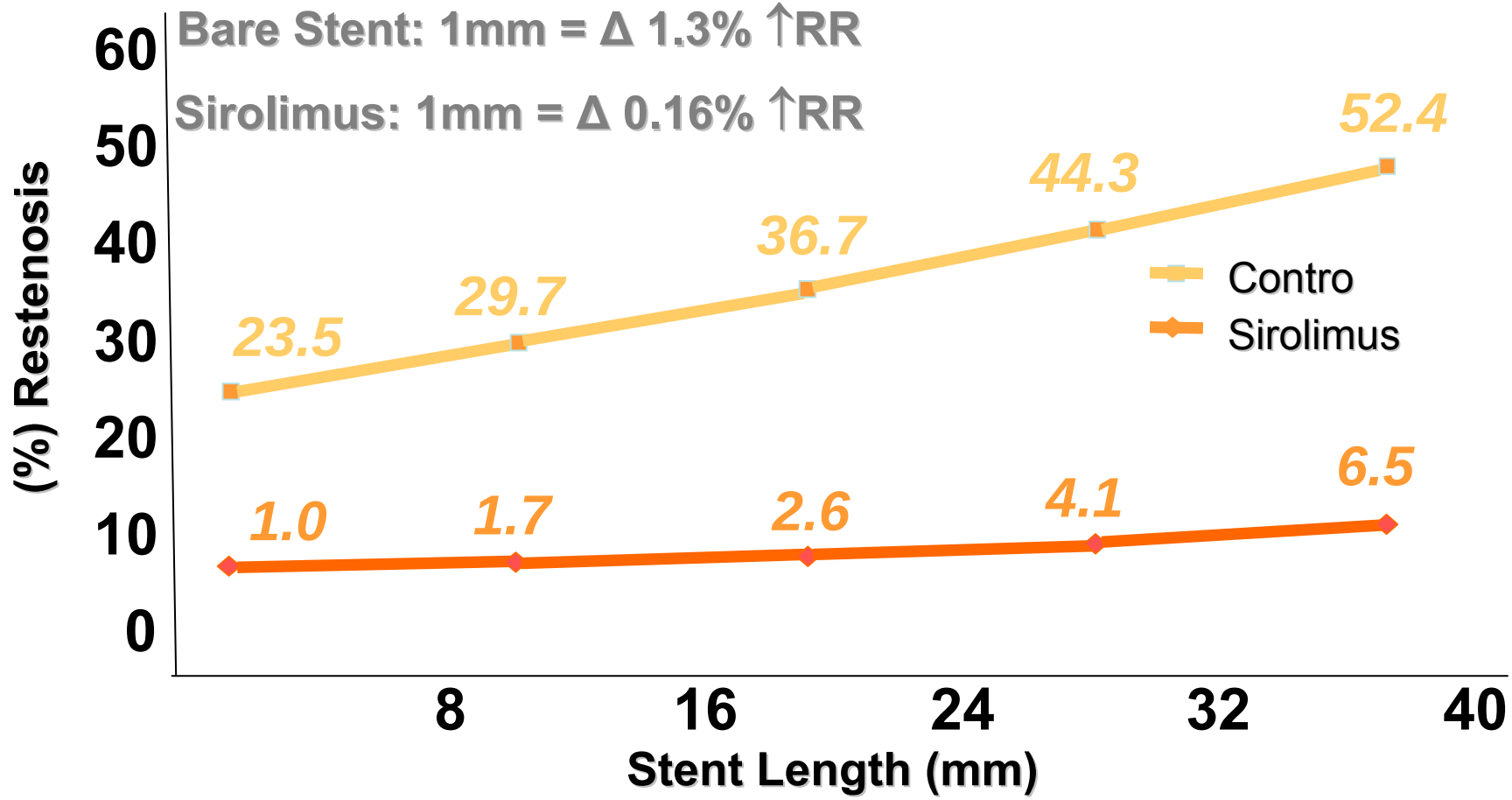
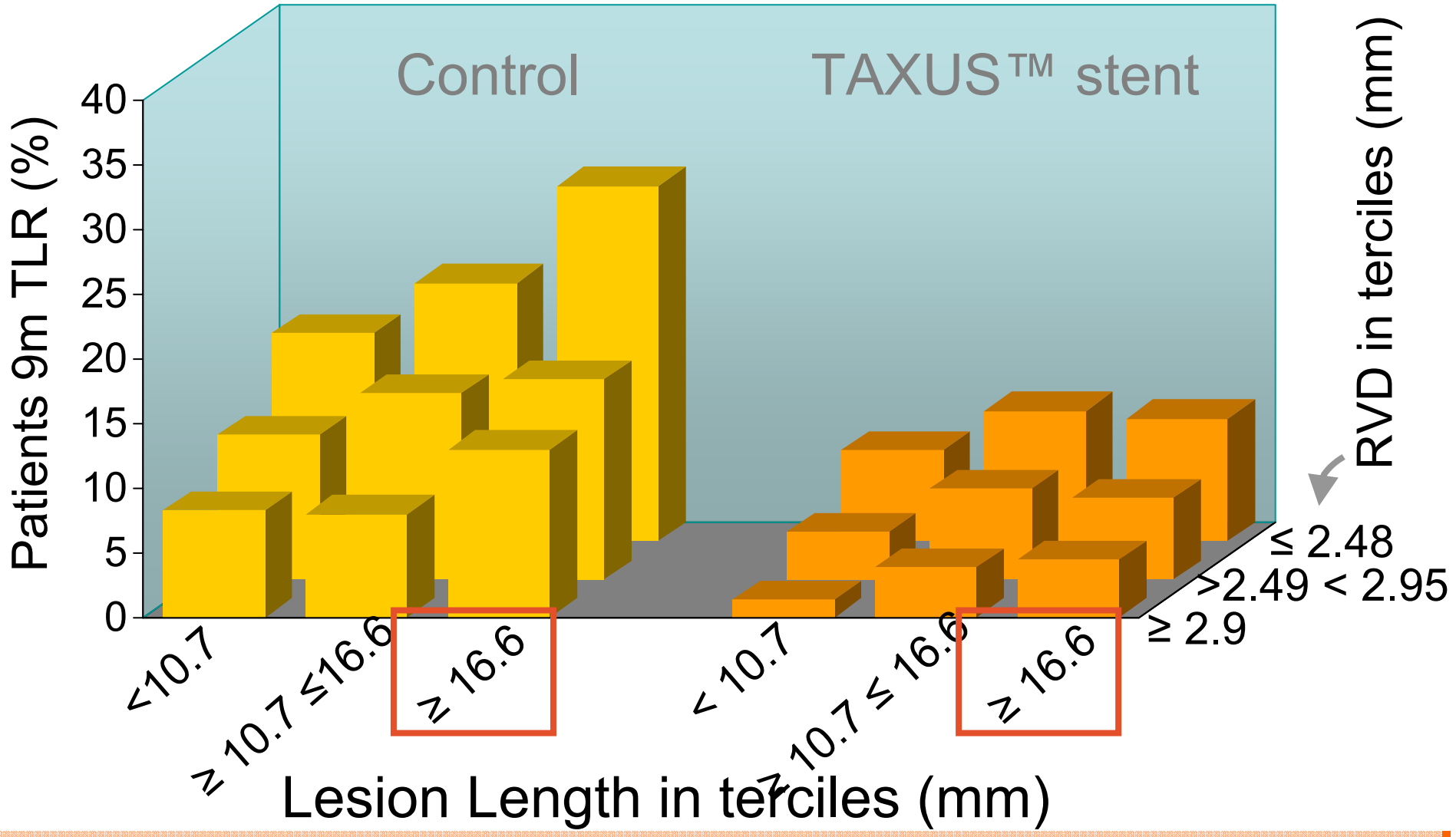
SIRIUS Restenosis vs. Stent Length

In-Stent Restenosis



Effect of Vessel Size and Lesion Length on 9m TLR

(All Patients, TAXUS II, IV, V, VI trials)



Control = BMS

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EUROPCR06

Clinical, Angiographic, and Procedural Predictors of Angiographic Restenosis After Sirolimus-Eluting Stent Implantation in Complex Patients.

An Evaluation From the Rapamycin-Eluting Stent Evaluated At Rotterdam Cardiology Hospital (RESEARCH) Study

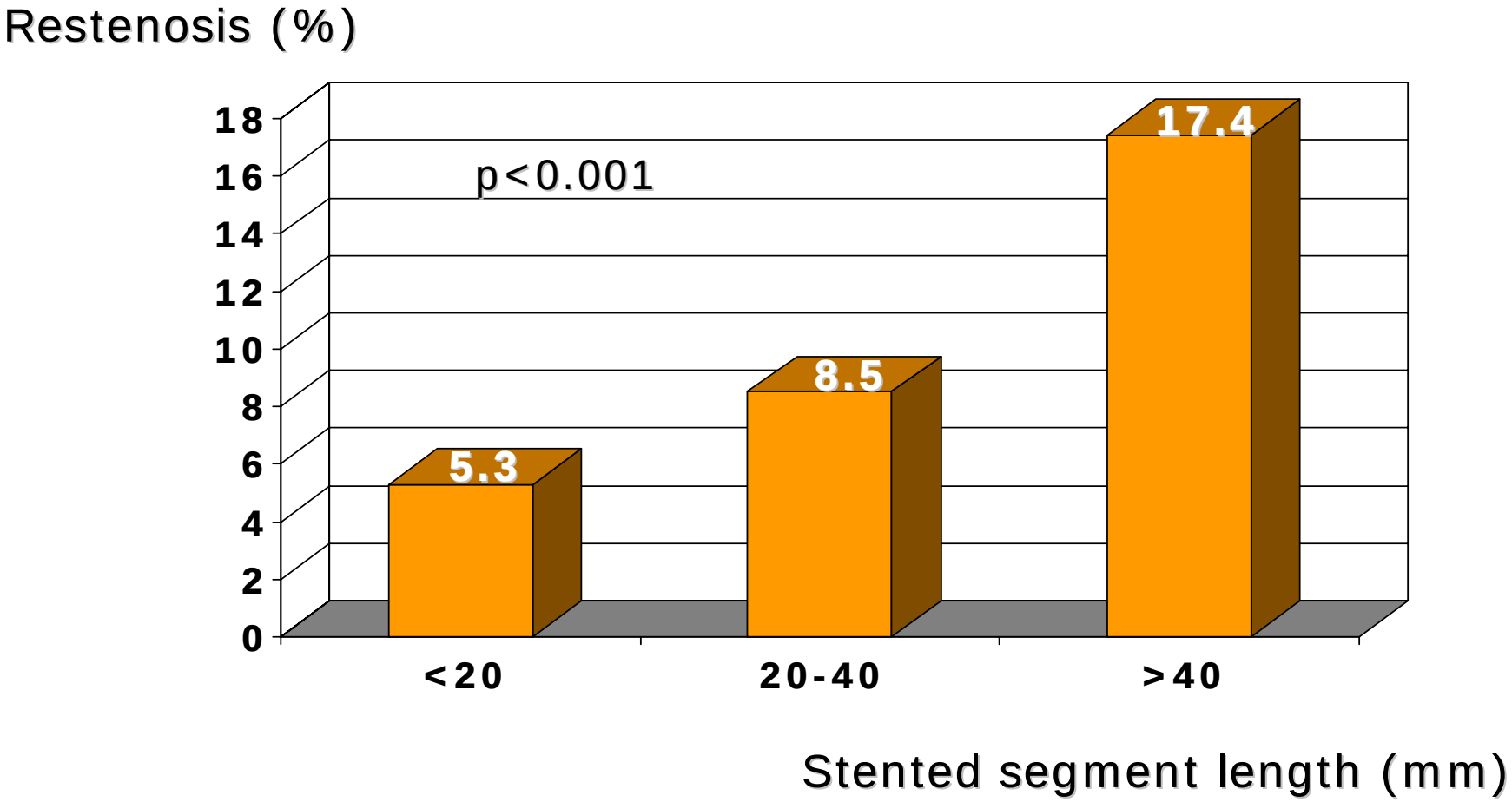
238 patients, 441 lesions, restenosis = 7.9%

TABLE 5. Actual Rates of Post-SES In-Segment Restenosis According to the Presence of High-Risk Characteristics*

	In-Segment Restenosis Rate, %
Treatment of in-stent restenosis	19.6
Ostial location	14.7
Diabetes mellitus	14.3
Stented length >26 mm†	13.9
Reference diameter <2.17 mm‡	10.3
Non-LAD location	10.8

P. Lemos et al. *Circulation*. 2004;109:1366-1370.

Restenosis vs Stented Segment Length



Lee et al. Am J Cardiol 2006;97:506-511

Clinical outcome at 1 year of very long lesions in Research

Stented length=79mm (64-168)

Events (%)	All n=122	SES n=81	PES n=41	p value
Death	4.1	2.5	7.3	0.2
MI	10.0	11.2	5.4	0.53
TVR	7.5	7.5	7.6	0.96
MACE	18.0	18.5	17.1	0.87

Aoki et al. Am Heart J 2005;150:994-9

Clinical outcome at 1 year (Milan)
Very long lesions

Events (%)	In-hospital n=66	Follow-up n=66
Death	0	0
Q MI	0	0
Non Q MI	16.6	1.5
Restenosis		19.6
TVR	0	15
CABG	0	1.5

Tsagalou et al. J Am Coll Cardiol 2005;45:1570-3

Taxus V - Multiple Stent QCA Analysis Patient Demographics

	Control n=184	TAXUS n=188	P value
Diabetes mellitus (%)	33.7	35.1	0.83
RVD (mm)	2.68±0.56	2.66±0.55	0.77
Lesion Length (mm)	25.7±10.4	24.9±9.5	0.44
Calcification, any (%)	41.5	38.3	0.60
Type $C_{ACC/AHA}$ (%)	75.0	72.3	0.64

Taxus V - Multiple Stent QCA Analysis MACE rate

	Control n=184	TAXUS n=188	P value
30-Day MACE	3.3%	8.6%	0.0457
Cardiac Death	0.0%	0.0%	
MI	3.3%	8.6%	0.0457
TVR	0.5%	1.6%	0.62
9-Month MACE	32.0%	20.7%	0.0172
Cardiac Death	0.6%	0.5%	1.00
MI	3.9%	8.7%	0.08
TVR	29.8%	16.3%	0.0027

Restenosis
after long DES implantation

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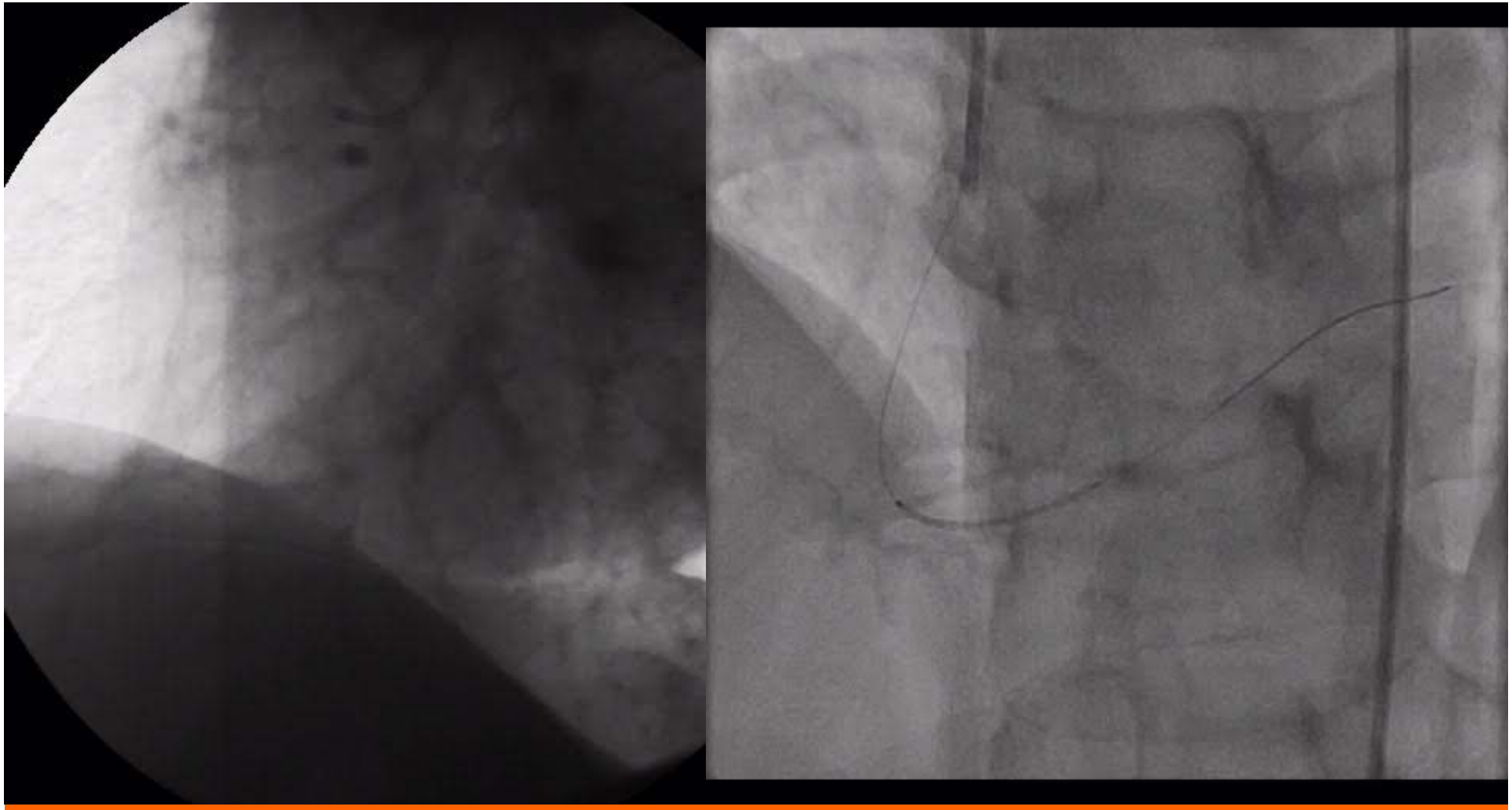
Male 54 y.o. angina III

03-2005: EF=70%, 90% long RCA stenosis

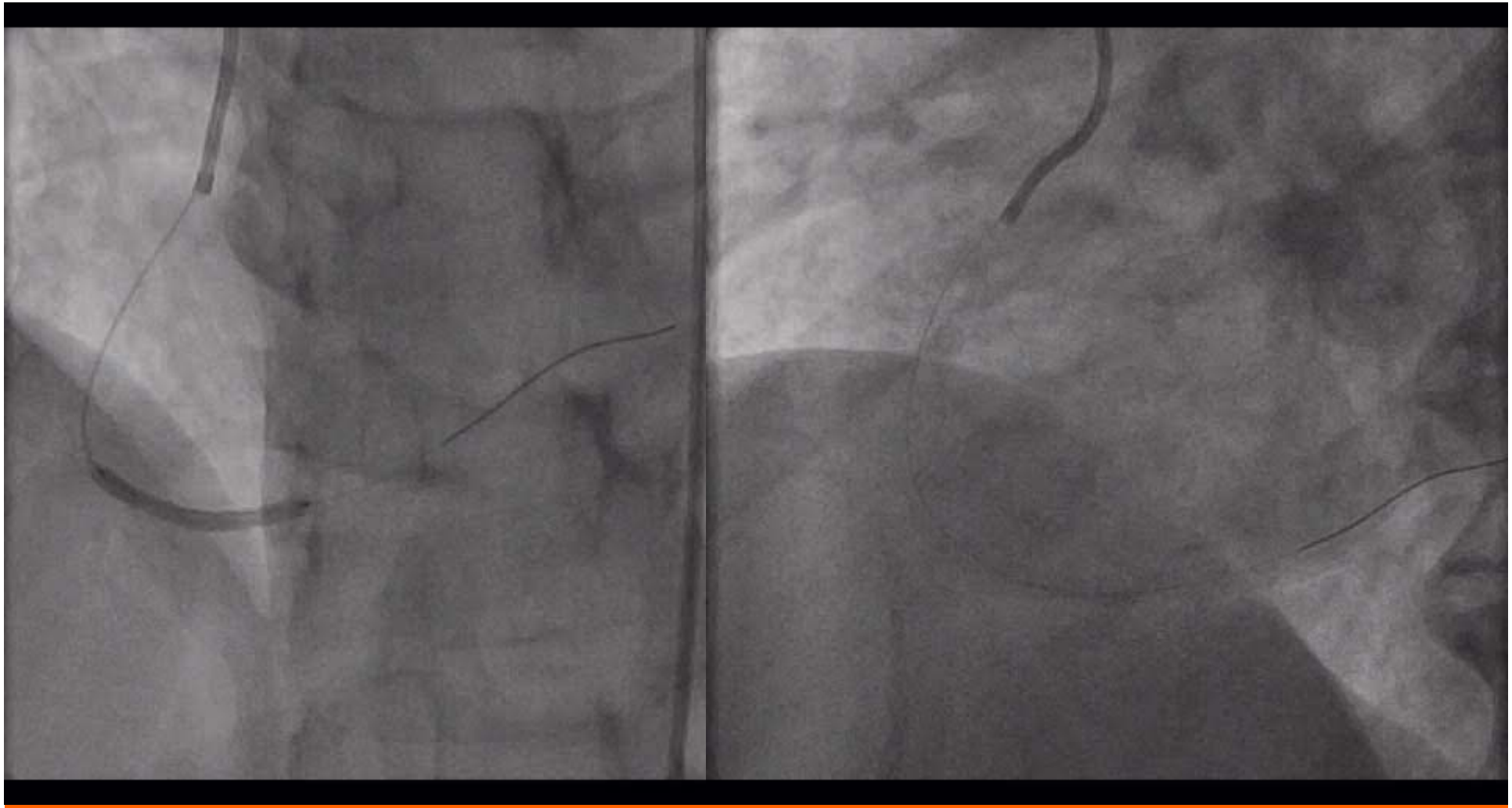


Cypher 2.5x33mm

EUROPCR06

Male 54 y.o. angina III

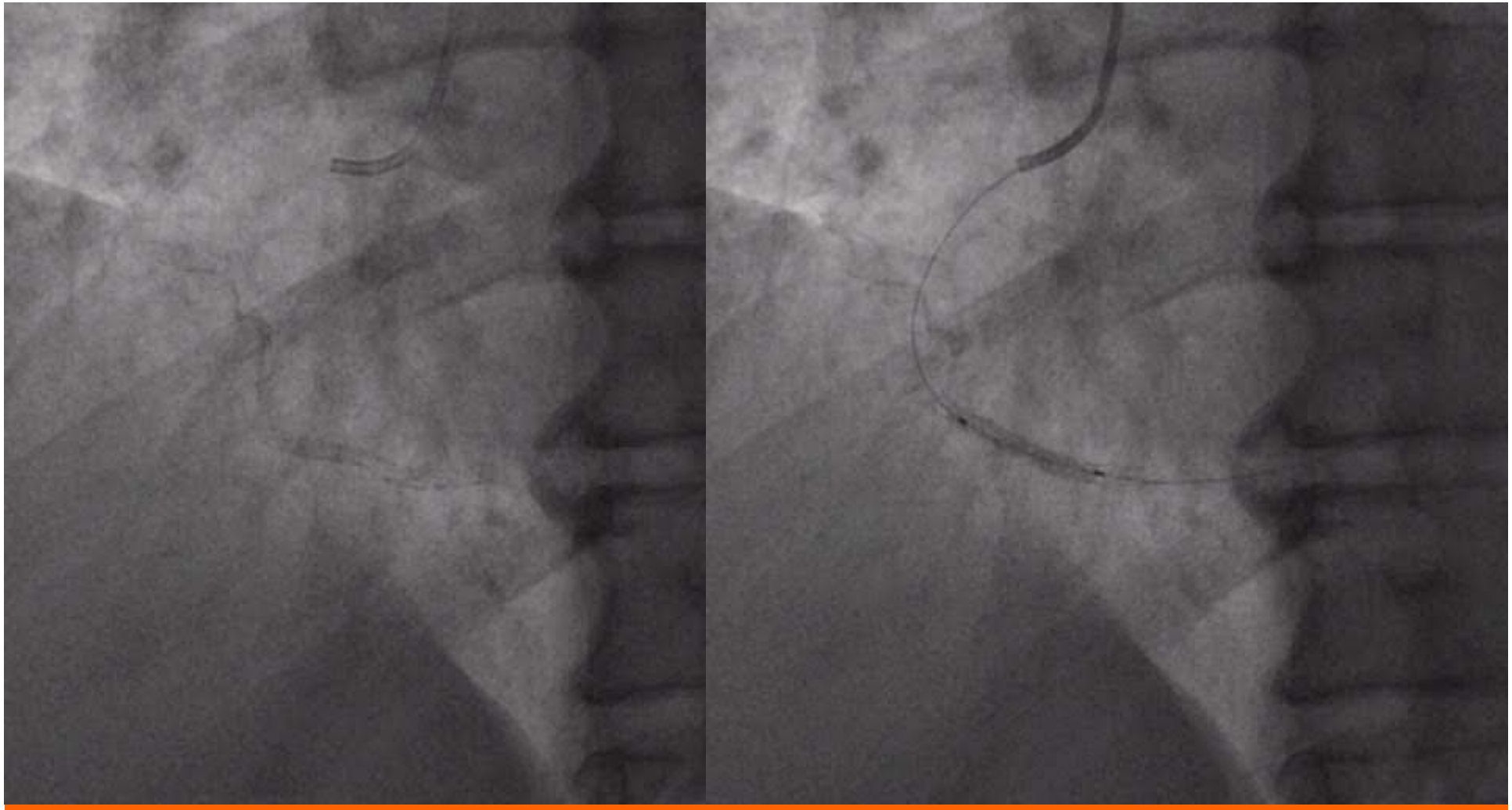
03-2005: EF=70%, 90% long RCA stenosis



Cypher 2.5x33mm, 18 atm. QCA: diameter post = 2.8mm

EUROPCR06

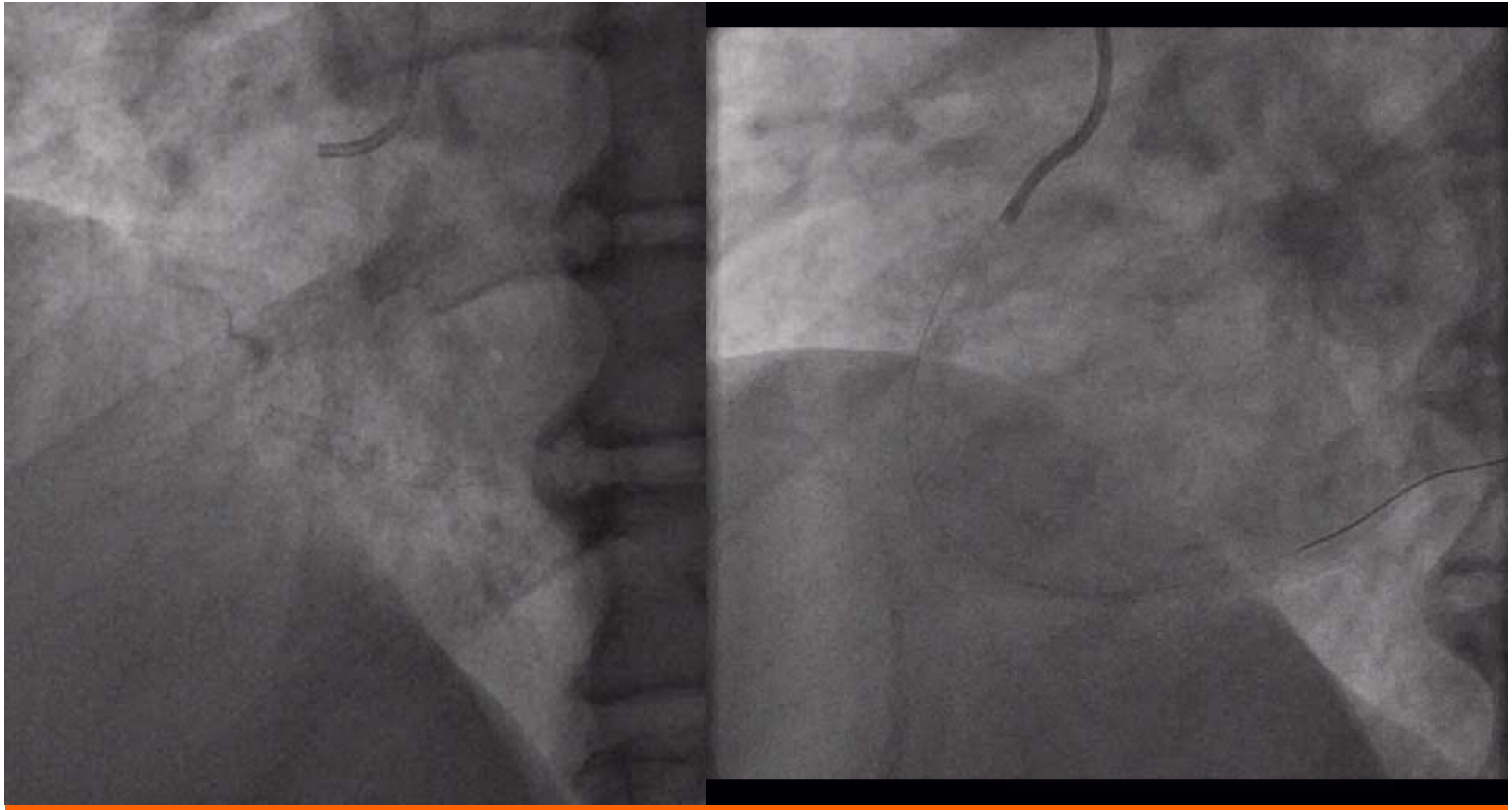
Male 54 y.o. angina III
03-2005: Cypher / RCA
01-2006: recurrent angina, restenosis



Focal restenosis . 3.0mm balloon (18 atm) & 3.5mm (12atm)

EUROPCR06

Homme 54 ans, tabac, angor d'effort de novo
03-2005: Cypher / C. Droite
01-2006: Récidive d'angor, resténose



QCA: diameter post=3.4mm

Previous result 03-2005 (2.8mm)

Woman 70 y.o.IDD, Renal Ins. (creat.=22mg/l)
10-2003: PCI / OM (Cypher)
12-2004: PCI / LAD (Taxus)
10-2005:ACS, LAD restenosis

Diffuse restenosis

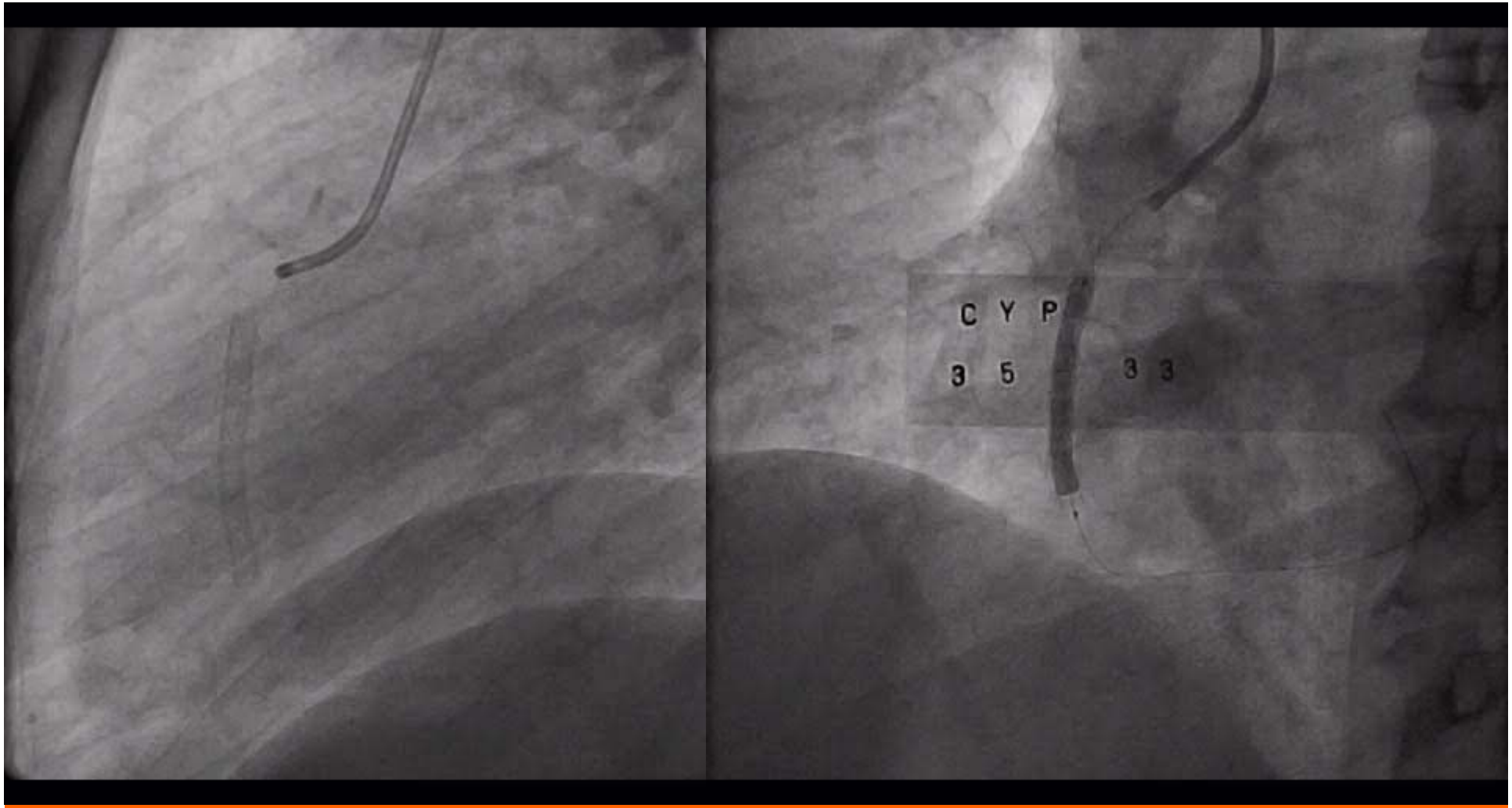
3.0mm balloon, 18 atm.

Woman 70 y.o.IDD, Renal Ins. (creat.=22mg/l)
10-2003: PCI / OM (Cypher)
12-2004: PCI / LAD (Taxus)
10-2005:ACS, LAD restenosis

Final result – Diagonal occlusion

EUROPCR06

Male 68 y.o. , NIDD
05-2005: Recanalisation of RCA + 2 Taxus stents
10-2005: Silent inferior ischemia

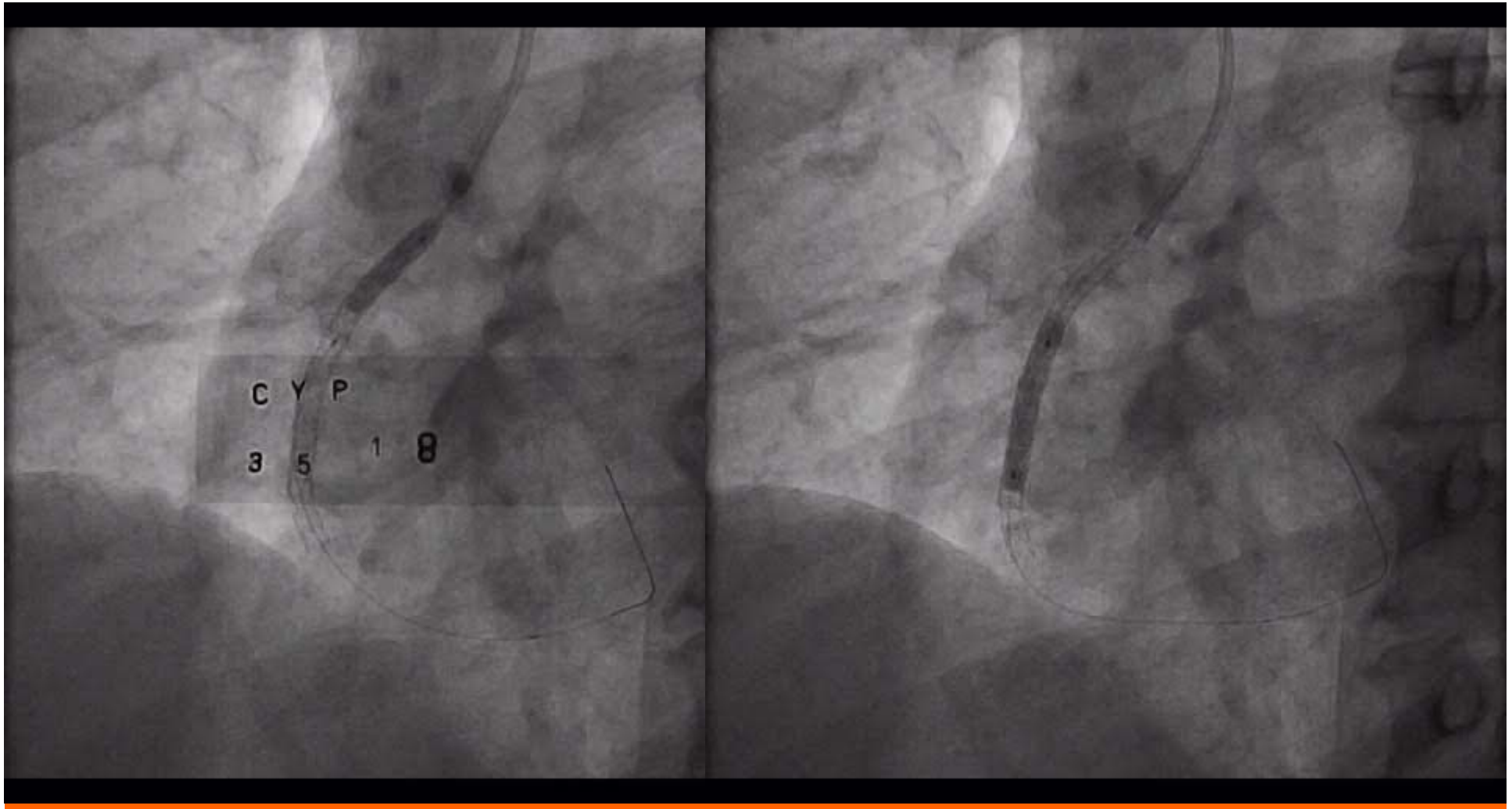


Diffuse restenosis

3.5x33mm Cypher

EUROPCR06

Male 68 y.o. , NIDD
05-2005: Recanalisation of RCA + 2 Taxus stents
10-2005: Silent inferior ischemia

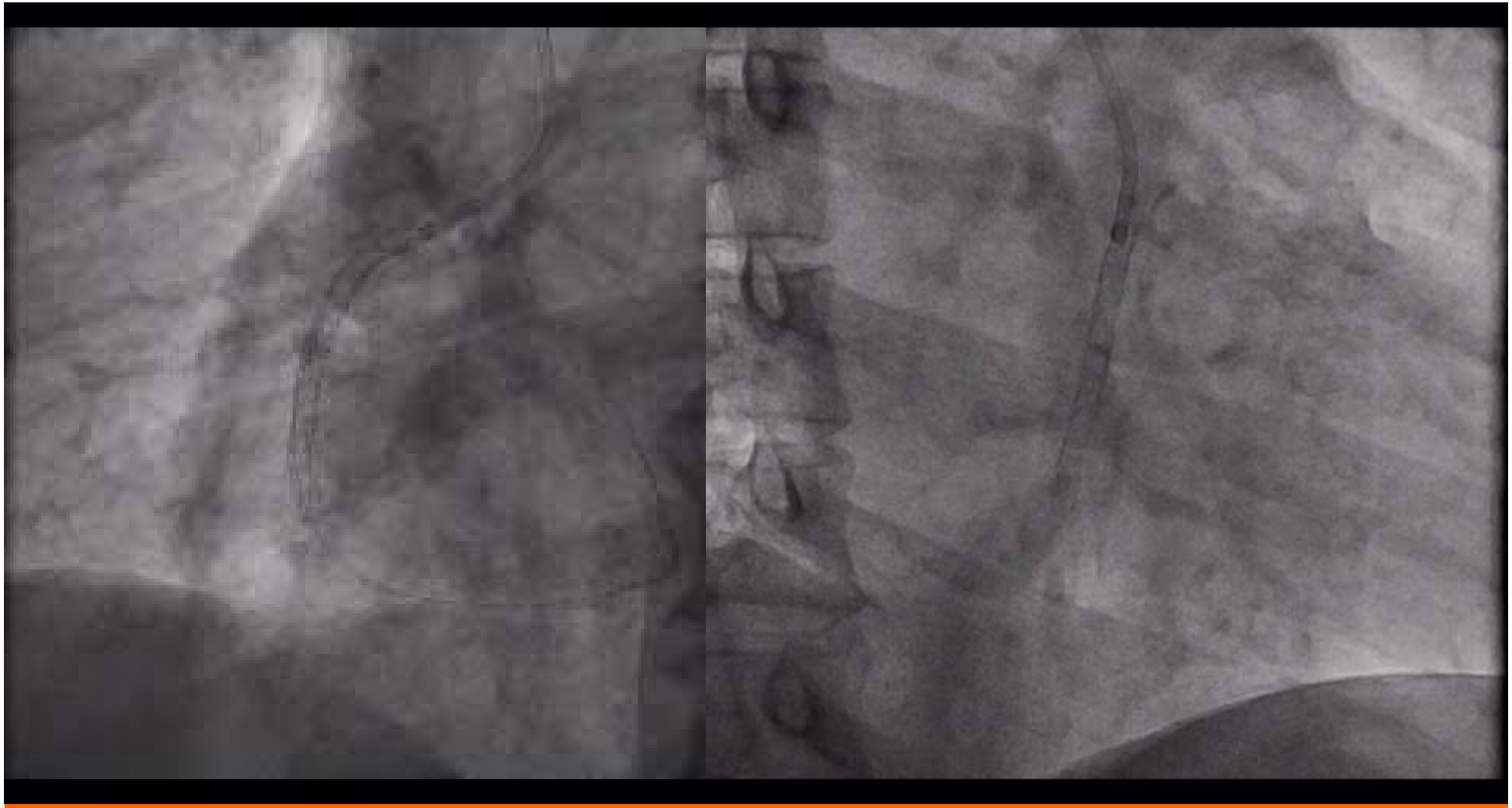


3.5x18mm Cypher

Post dilatation

EUROPCR06

Male 68 y.o. , NIDD
05-2005: Recanalisation of RCA + 2 Taxus stents
10-2005: Silent inferior ischemia



Final result – Side branch occlusion

Long lesions

- Almost all long lesions can technically be treated with implantation of long stents.
- Vessel calcification and tortuosity can make the procedure more difficult.
- The use of debulking or buddy wire technique can facilitate stent positioning.
- Restenosis and TLR rates are lower with DES
- Treatment of ISR can lead to side branch occlusion

Long lesions

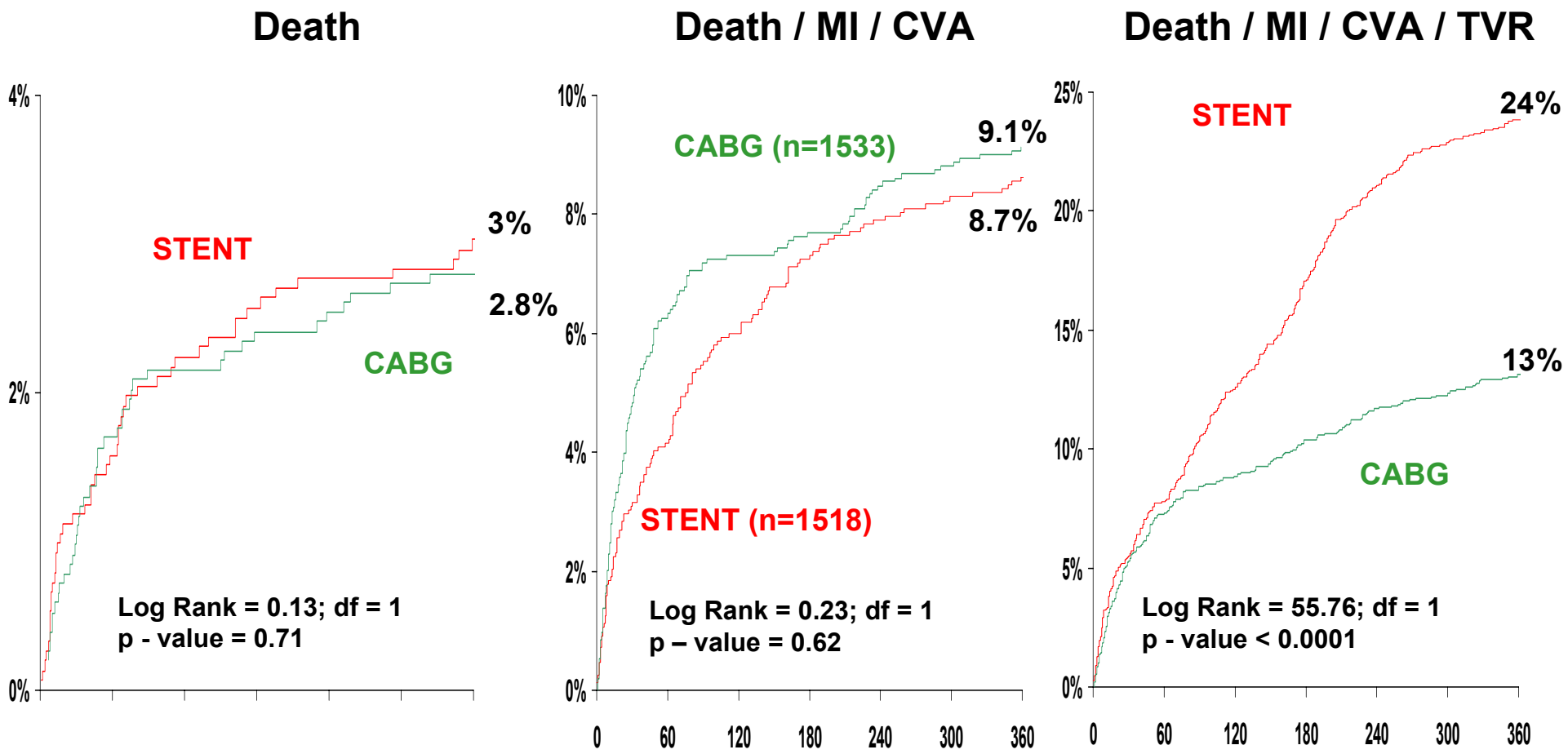
- While clinical results are favourable in «standard» lengths (<30mm), they are less encouraging in very long stenosis.
- The expected clinical outcome after stenting of long lesions will be influenced by the other predictors of restenosis (vessel size, diabetes) and MACE (diabetes, renal insufficiency…)
- Safety concerns:

  Risk of stent thrombosis after placement of multiple long or overlapped DES

  Premature interruption of dual antiplatelet therapy

Multi-Vessel Disease

Meta-analysis of BMS vs CABG RCT's



Mercado et al.

ARTS II
Baseline Demographics

	ARTS II N=607	ARTS I (CABG) N=605	ARTS I (PCI) N=600
Male (%)	77	76	77
Age (years)	63	61	61
Body mass index (kg/m^2)	28	27	27
Previous MI (Q-wave)	34 (18)	42 (24)	44 (26)
Diabetes (IDDM)	26 (5)	16 (3)	19 (4)
Hypertension	67	45	45
Hypercholesterolemia	74	58	58
Family history	36	42	39
Current smokers	19	26	28
Ejection fraction	60	60	61
Unstable angina	37	35	37

Serruys PW et al. Late breaking session ACC 2005

ARTS II - Lesion Characteristics

% of patients	ARTS II N=607 pts N=2160 les.	ARTS I (CABG) N=605 pts N=1638 les.	ARTS I (PCI) N=600 pts N=1606 les.
2-VD	46	66	69
3-VD	54	30	27
% of lesions			
LAD location	42	41	39
LCx location	29	29	29
RCA location	29	30	31
Discrete (<10mm)	61	68	66
Tubular (10-20mm)	27	25	27
Diffuse (>20mm)	12	7	7
Type C lesion	14	8	8
Side branch involvement	34	32	35

Serruys PW et al. Late breaking session ACC 2005

ARTS II
Procedural Characteristics

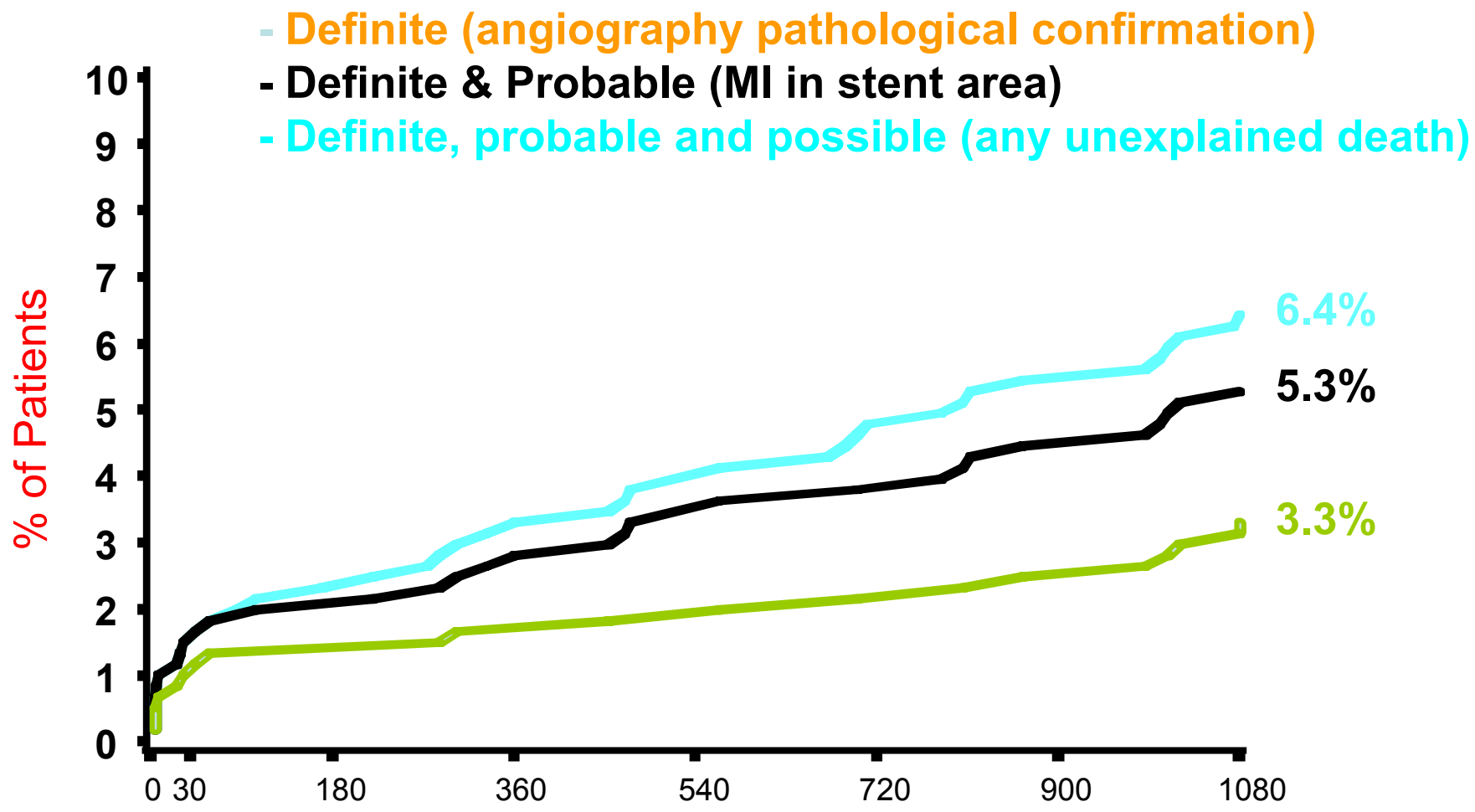
	ARTS II N=607 pts N=2160 les.	ARTS I (CABG) N=605 pts N=1638 les.	ARTS I (PCI) N=600 pts N=1606 les.
Lesions, #	3.6	2.8	2.8
Stented les. / anast. seg., #	3.2	2.6	2.5
Stents, #	3.7	-	2.8
Direct stenting, %	35	-	3
Max. inflation pressure, atm	16.4	-	14.6
Total stent length, mm	73	-	48
(range)	12-253	-	8-165
Gp IIb/IIIa inhibitor use, %	33	-	-
Use of arterial conduit, %	-	93	-
Duration of procedure, mins	85	193	99
Hospital stay, days	3.4	9.6	3.9

Serruys PW et al. Late breaking session ACC 2005

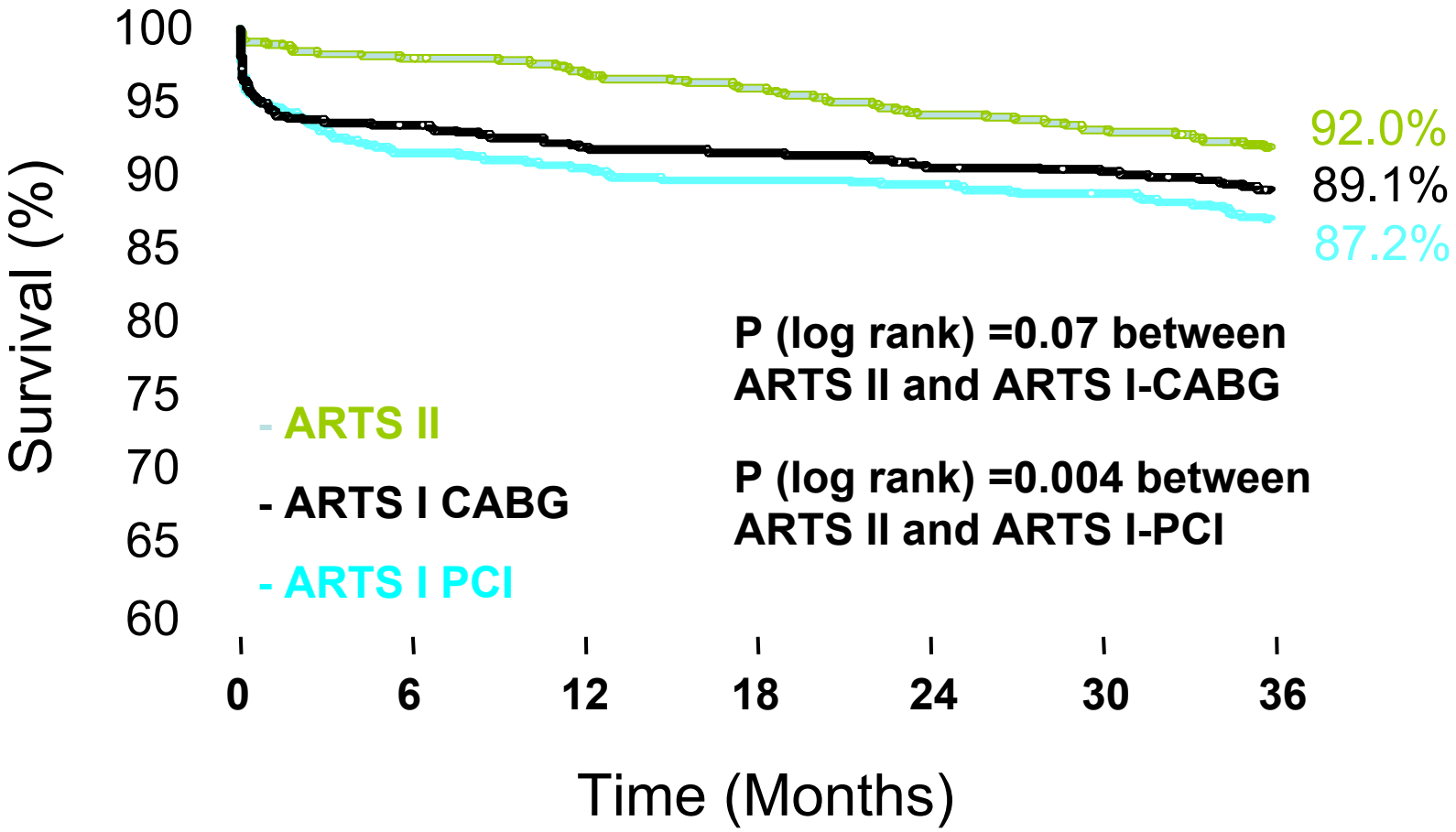
EUROPCR06

ARTS II – Stent thrombosis up to 3 years *

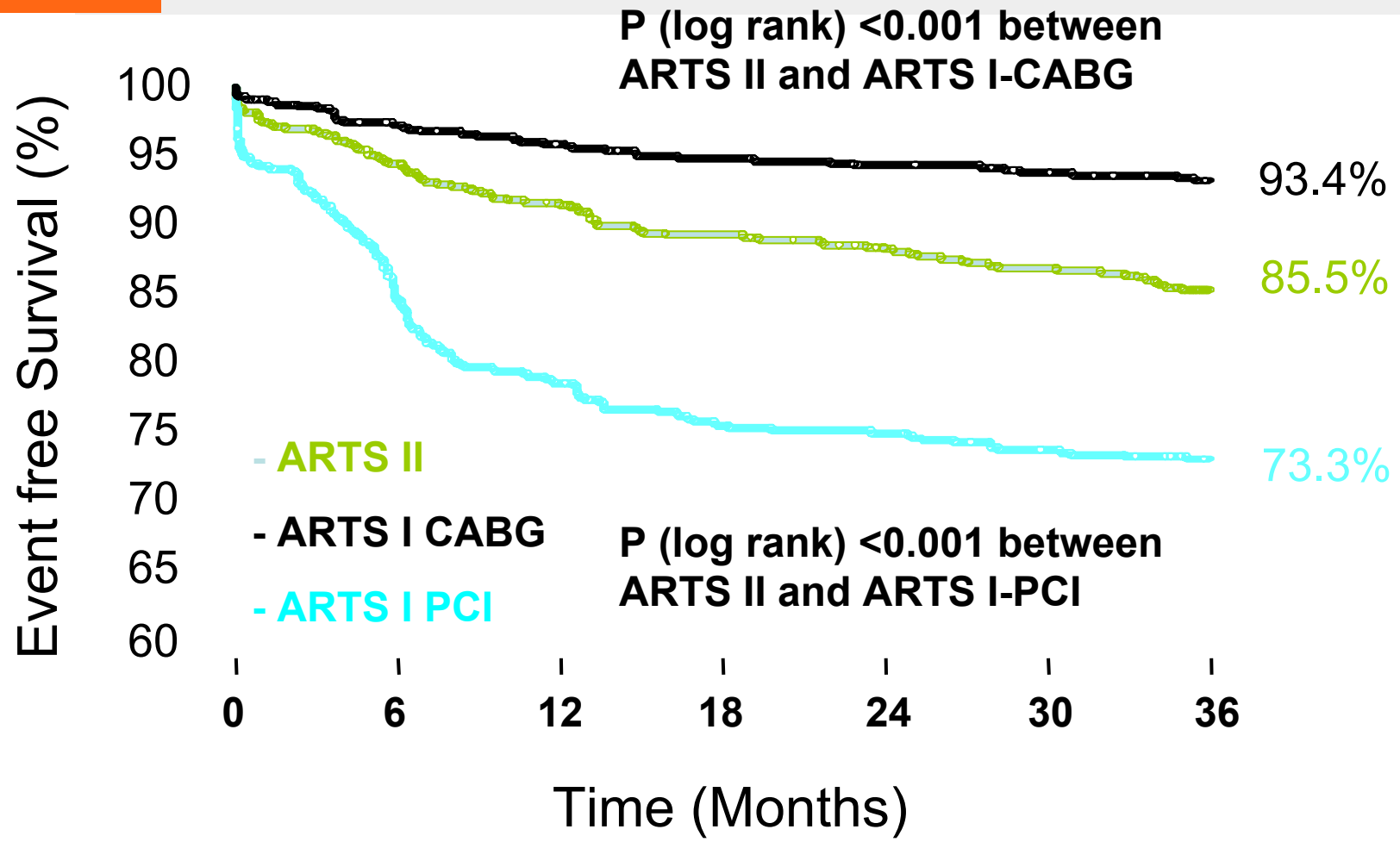
* Re-adjudication according to Dublin definitions



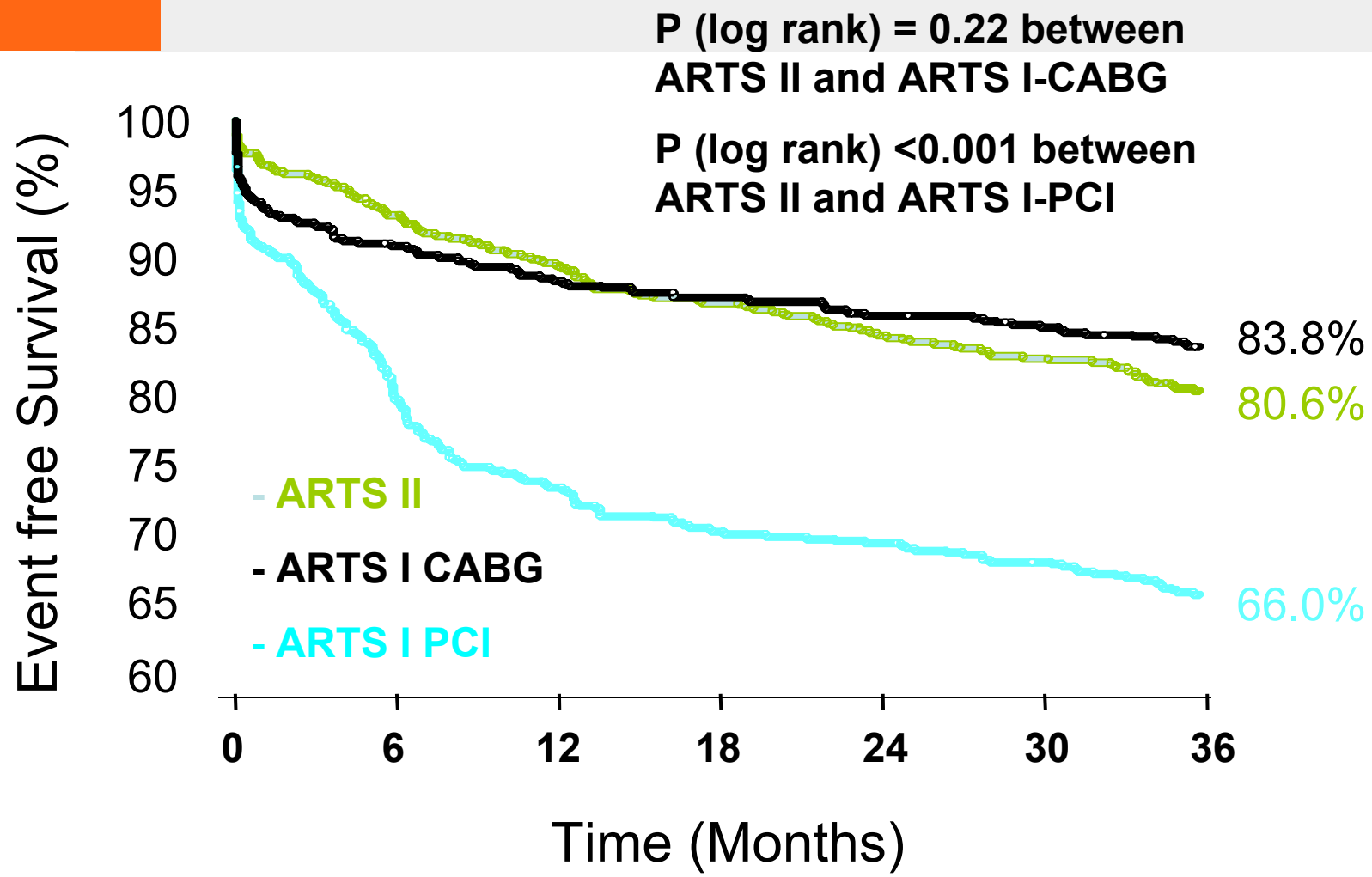
ARTS II - Death/CVA/MIs up to 3 years



ARTS II - Re-Intervention up to 3 years



ARTS II - MACCE up to 3 years



ARTS II – Diabetic population (3 years)

Hierarchical MACCE up to 3 years N=112	ARTS II N=159	ARTS I (CABG)	ARTS I (PCI) N=96
Death	**8 (5.0%)**	**5 (5.2%)**	**8 (7.1%)**
Stroke*	**4 (2.5%)**	**5 (5.2%)**	**5 (4.5%)**
MI **	**3 (1.9%)**	**3 (3.1%)**	**8 (7.1%)**
CABG***	**6 (3.8%)**	**0 (0.0%)**	**11 (9.8%)**
Repeat PCI******	**23 (14.5%)** ↗	**4 (4.2%)**	**21 (18.8%)**
MACCE	**44 (27.7%)** ↘	**17 (17.7%)**	**53 (47.3%)**
Stent thrombosis	**2 (1.3%)** ↘	**-**	**8 (7.1%)**

Figures in Orange indicate statistical difference (95% CI) between ARTS II and ARTS I groups

*** Without death**

**** Without death and stroke**

***** Without death, stroke and MI**

****** Without death, stroke, MI or CABG**

SYNTAX: Study Design

All Patients with 3VD/LM

Heart Team (surgeon and interventionalist)

amenable for both treatments options

amenable for one treatment approach

Randomized Arm

N=1500 (1:1)

TAXUS *VS* CABG

- reasonable doubt
- follow-up: 30d, 6m, 1-5 yrs
- Goal: to define the most appropriate treatment through randomized trial methods

Two Registry Arms

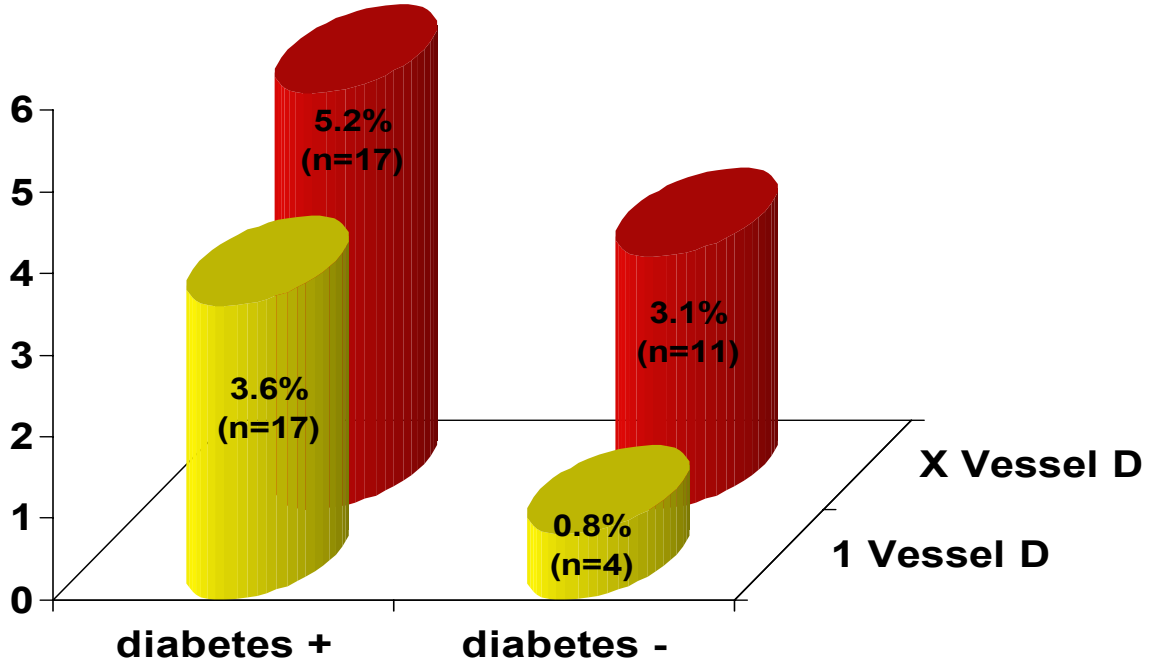
CABG
2750 captured (750 followed)

PCI
All captured and followed

- consensus exists that only one treatment option (CABG vs PCI) is appropriate
- Goal: to profile larger pool of non randomizable patients and their subsequent outcomes

EVASTENT

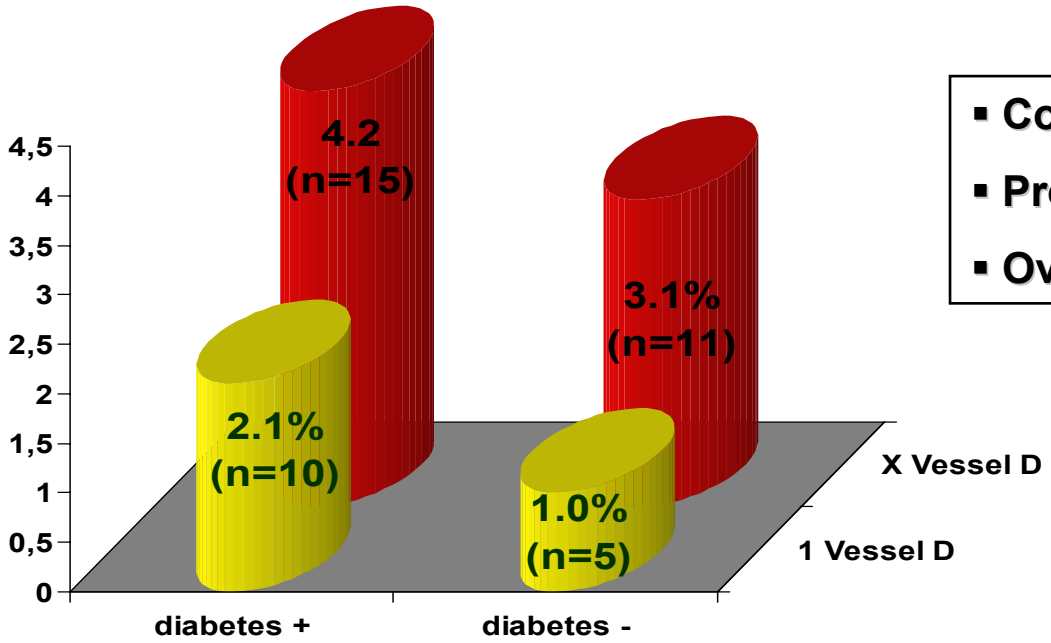
Global mortality
2.9% (50/ 1662 pts with Fup)



db+ 4.2% vs. db- 1.7%	p<.002
MVD 4.1% vs. 1VD 2.1%	p< .017

EVASTENT

Stent thrombosis



- Confirmed : 1.6% (27 pts)
- Probable : 0.8% (14 pts)
- Overall : 2.4% (41 pts)

db+ 3% vs. db- 1.7%	p=.07
Ins+ DM 3.7% vs. db- 1.7%	p=.001
XVD 3.7% vs. 1VD 1.5%	p<004

FREEDOM: Study Design

Diabetes Mellitus with 2-3VD

surgeon and interventionalist

amenable for both treatments options

amenable for one treatment approach

Randomized Arm

N=2400 (1:1)

DES *vs* CABG

- follow-up: 30d, 6m, 1-5 yrs
- Goal: to define the most appropriate treatment ***for diabetic patients*** through randomized trial methods

Two Registry Arms

N=2000

CABG
All captured and followed

PCI
All captured and followed

- consensus exists that only one treatment option (CABG vs PCI) is appropriate
- Goal: ***to compare outcomes with randomized group***

Multi-Vessel Disease

Discussion PCI vs CABG:

Age,

Diabetes

Previous cardiac surgery

Comorbidities (previous stroke, COPD, renal insufficiency)

LV function

2 or 3VD

Type of lesions (length, vessel size, calcifications, CTO)

Complete or incomplete revascularisation

Dual antiplatelet therapy

EUROSCORE ++

« The deepest sin against the human mind is to believe things without evidence »

Thomas H. Huxley (1825-1895)