Tailored Approach with DES for Long Coronary Lesions

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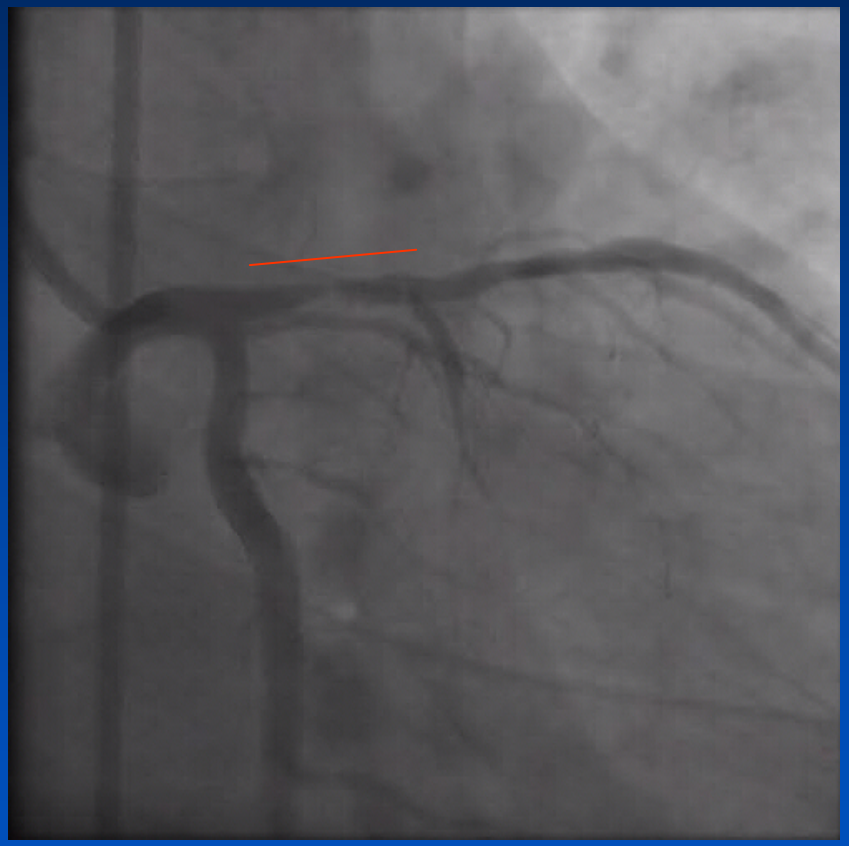
How to Manage Long Lesion Intervention ?

- Long lesions > 28 mm, <50 mm
- Very long lesions >50mm
  - What about long-term outcome ?
  - Stent overlapping, stent fracture are really problems ? Which stent would be better ?
- Impact of Cilostazol
- Very long lesions with extended to the small distal vessel

How to Manage Long Lesion Intervention ?

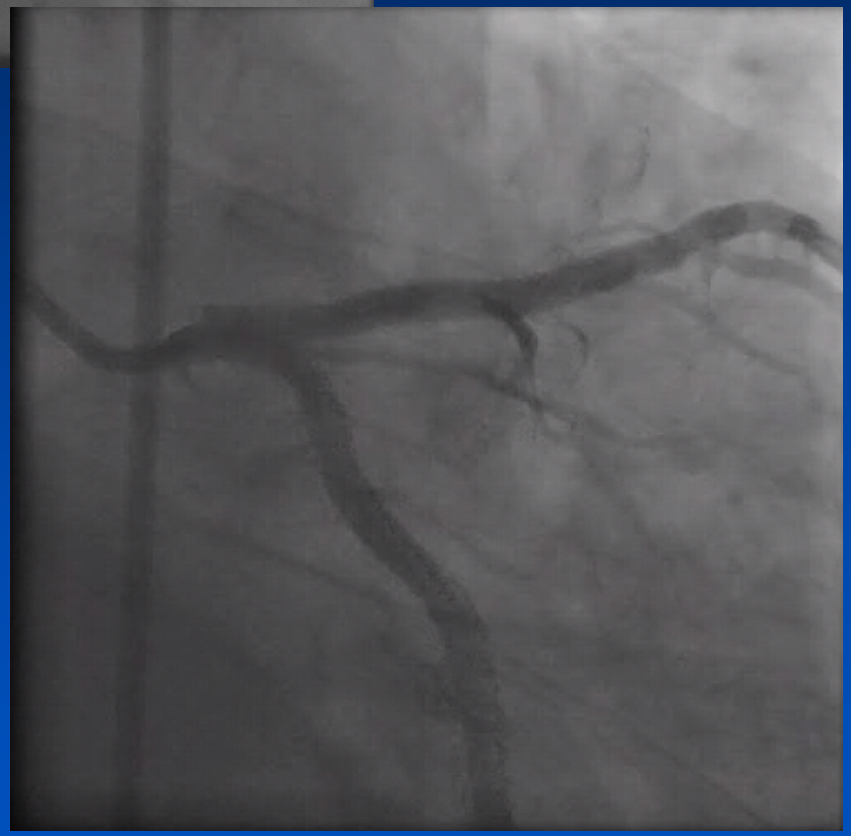
- Long lesions > 28 mm, <50 mm
  We have clear cut-off value of IVUS parameters

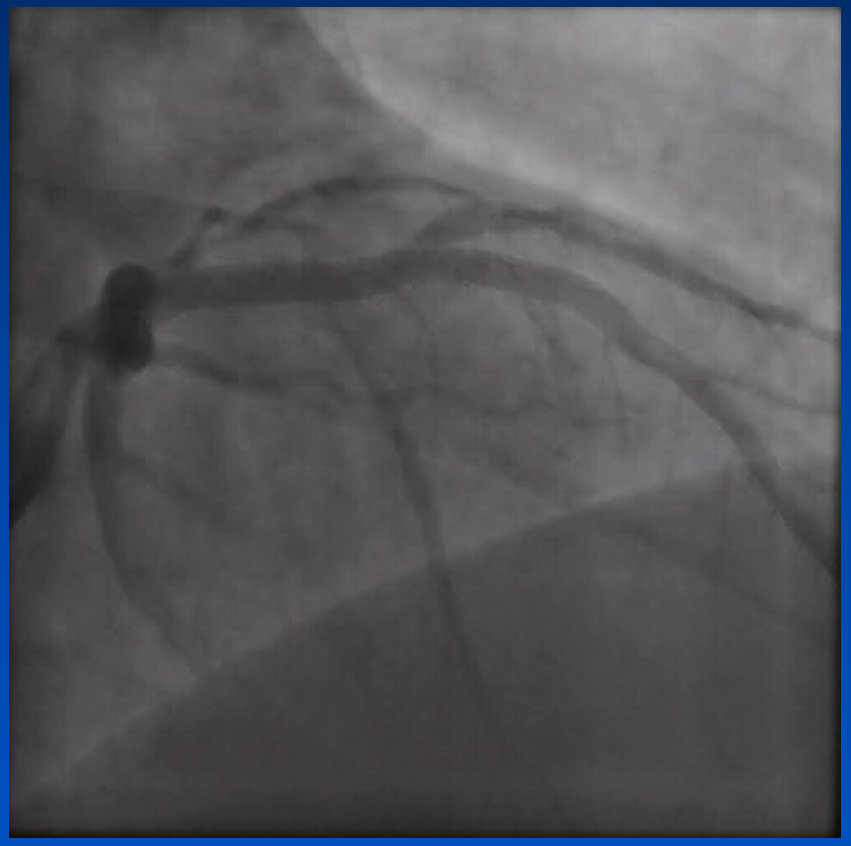
Diffuse lesion, <28 mm



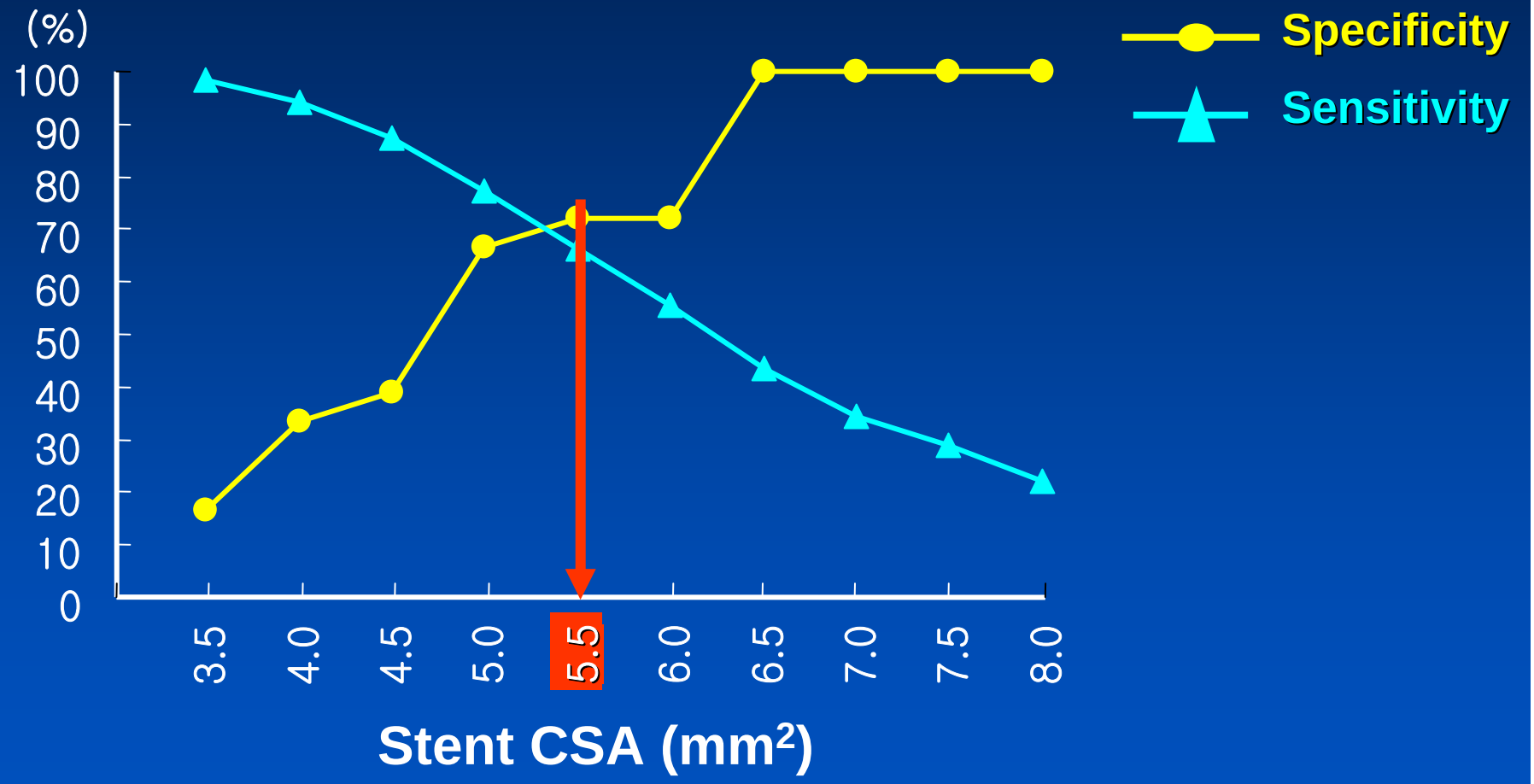
Single long DES

Cypher 3.5mm, 33 mm in length



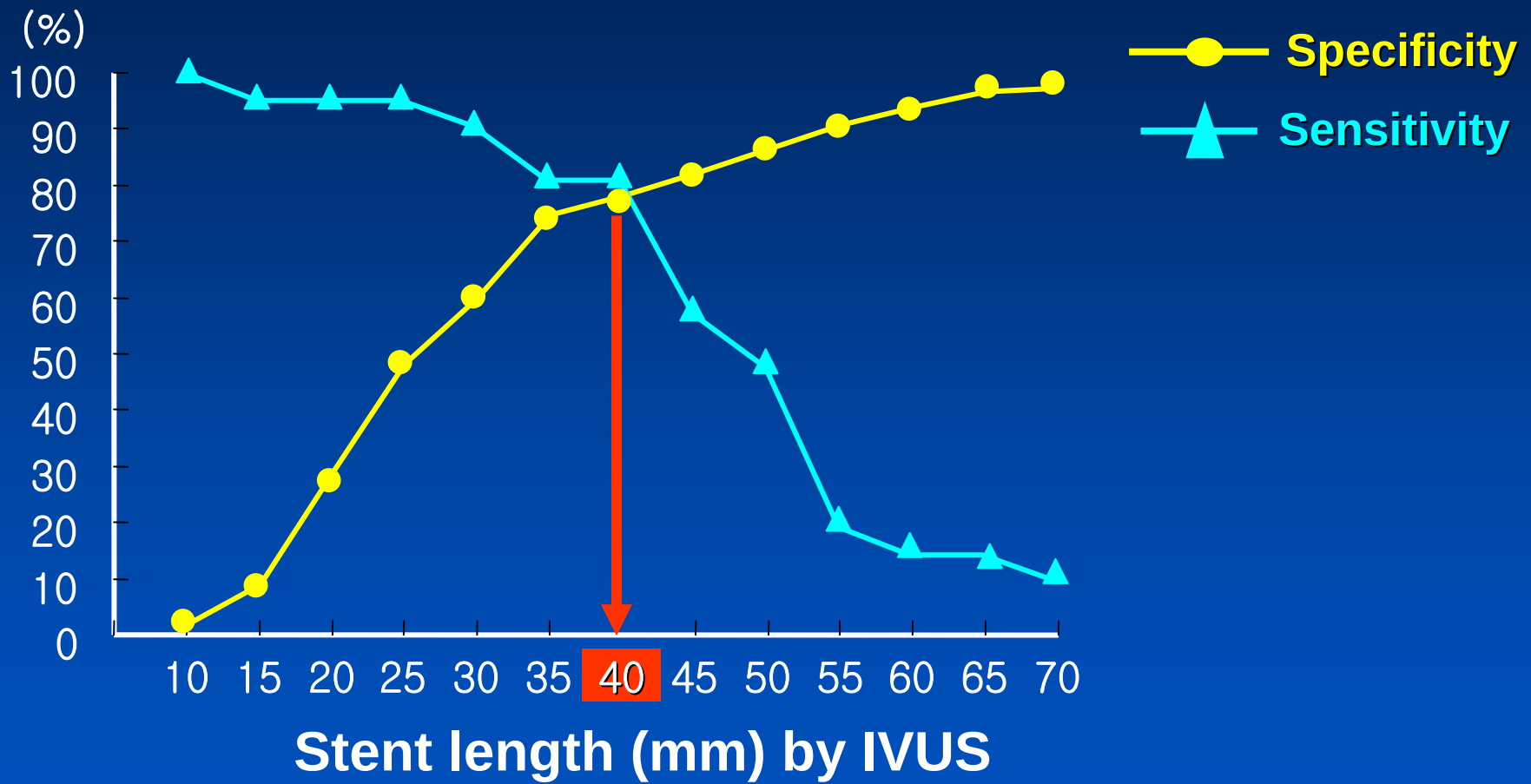


Sensitivity and specificity curves to identify optimal cut-off values of stent CSA



Hong MK, Eur Heart J, 2006:27:1305

Sensitivity and specificity curves to identify optimal cut-off values of total stent length



Hong MK, Eur Heart J, 2006:27:1305

Restenosis Rate according to Stented Length and Stent CSA by IVUS

SES Registry in Asan Medical Center

Stent length (mm)		Stent area (mm^2)	Restenosis rate	*P* value
≤ 40	and	≥ 5.5	1/284 (0.4%)	
≤ 40	or	< 5.5	3/127 (2.4%)	*P* <0.001
> 40	or	≥ 5.5	6/ 70 (8.6%)	
> 40		< 5.5	11/62 (17.7%)	

Hong MK, Eur Heart J, 2006:27:1305

Stented Length to Predict Restenosis by QCA

Predictor	Restenosis (n=20)	No Restenosis (n=257)
Stented length ≥ 46 mm	14 **(13.5%)**	90 (86.5%)
Stented length < 46 mm	6 **(3.5%)**	167 (96.5%)

Sensitivity = 70%, Specificity = 65%,
Positive predictive value = 14%,
Negative predictive value = 97%

Unpublished data from LONG-DES I study

How to Manage Long Lesion Intervention ?

- Long lesions > 28 mm, <50 mm
  We have clear cut-off value of IVUS parameters
  (Stent CSA 5.5mm^2 and/or Stented length <50 mm)

  - 33 mm
  - 23 x 23 mm
  - 28 x 18 mm
  - 33 x 18 mm

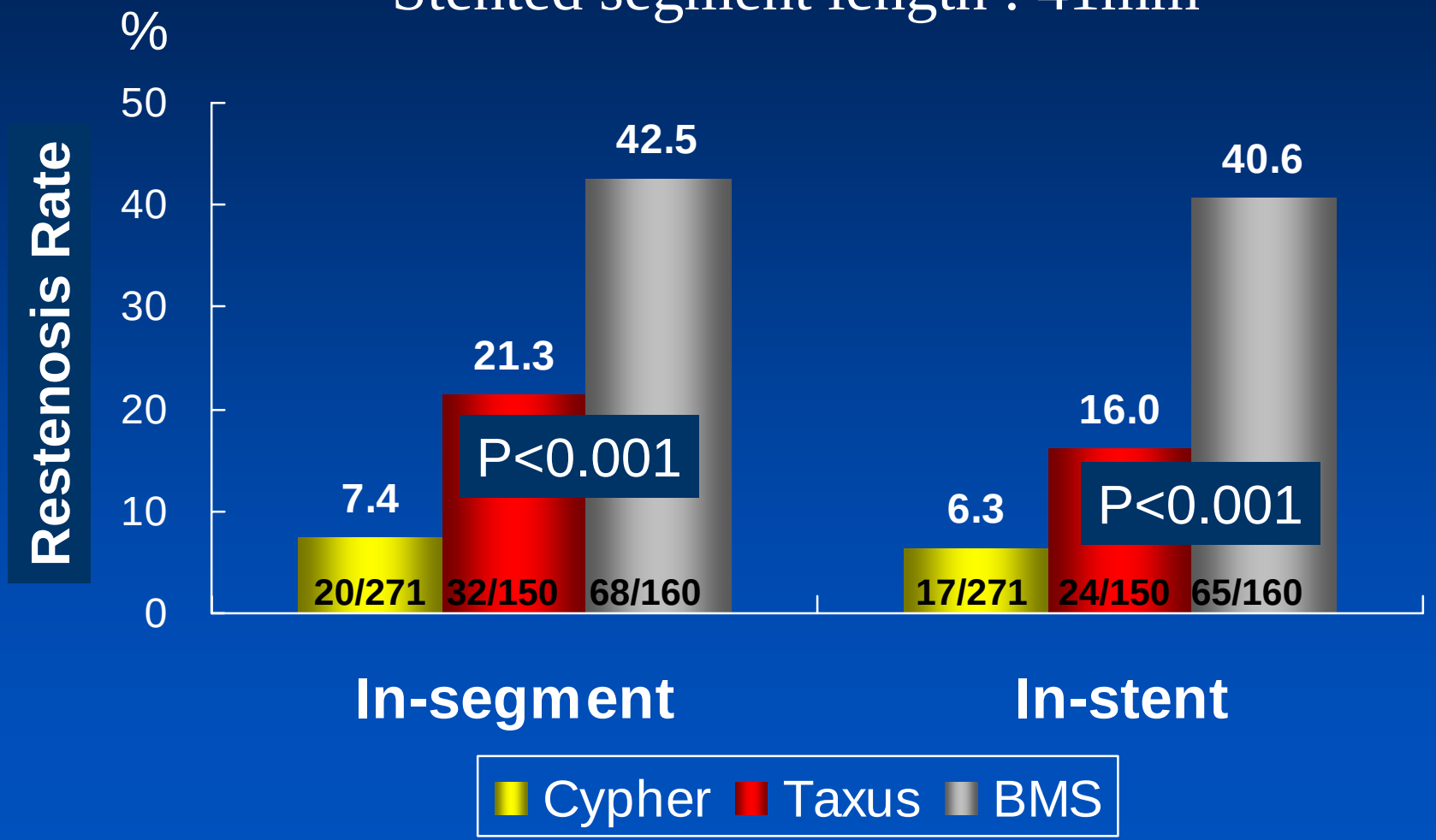
  Would be OK
  (< 10% Restenosis)

Which stent
would be better ?

Long DES-I

Multicenter Registry Study

Lesion length :36 mm
Stented segment length : 41mm

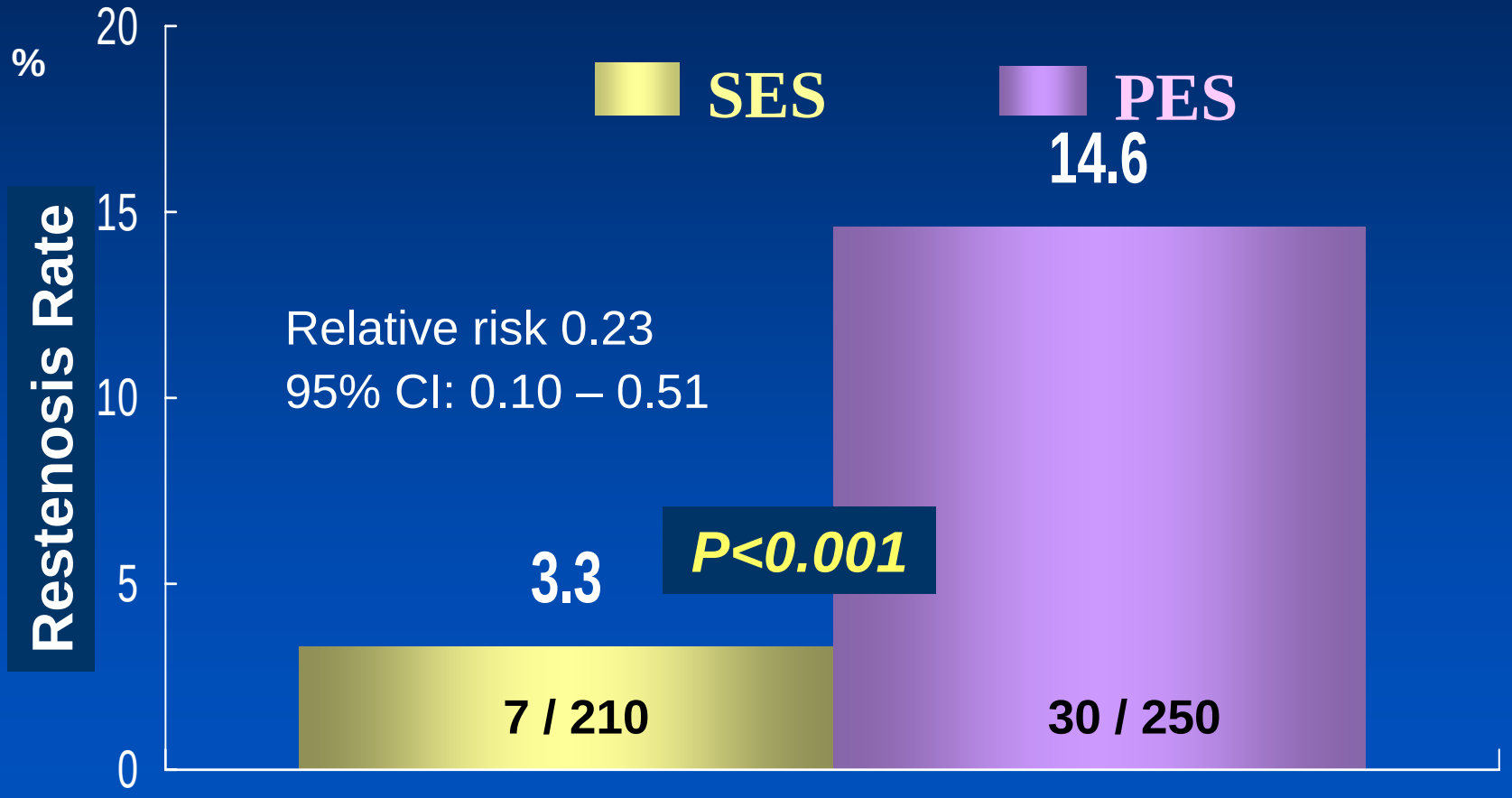


Kim YH et al, Catheter Cardiovasc Interv 2006;67:181-7

Long DES-II

Prospective
Multicenter
RCT

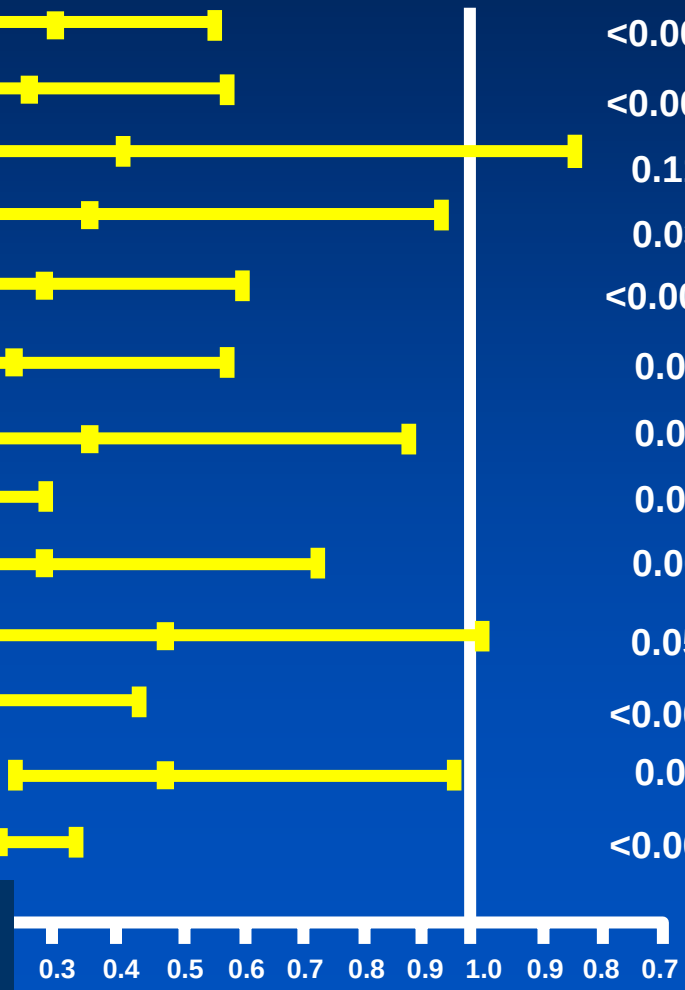
Lesion length :36-37 mm
Stented segment length : 40-41mm



Kim YH, Long DES-II investigator, Circulation, 2006;114:2148-2153

Angiographic Restenosis : Cypher vs Taxus

	Cypher	Taxus	P-value
Overall	7.4	24.3	<0.0001
Male	6.6	21.3	<0.0001
Female	10.5	21.9	0.119
Diabetes	9.9	23.5	0.033
No Diabetes	6.3	20.2	<0.0001
LAD	5.7	20.5	0.001
Non-LAD	9.8	22.1	0.020
Small Vessel (≤2.75)	9.2	27.0	0.001
Large Vessel	5.7	17.2	0.005
Stent length>45mm	13.9	25.8	0.056
Stent length≤45mm	3.5	18.2	<0.0001
Multiple stent	12.1	22.5	0.041
Single	2.3	20.0	<0.0001



“ Cypher Better ”

ZEST

All Comer **requiring PCI with DES for coronary lesions in 20 Centers of Korea**
(Total 2,640 patients)

Randomize 1:1:1
stratified by 1) Sites, 2) Diabetes, 3) Long lesions (≥ 28mm)

ENDEAVOR®	CYPER®	TAXUS Liberte™
(N=880)	(N=880)	(N=880)

Clinical follow-up at 12 months
Angiographic follow-up at 8 months

***Primary End-point: Target Vessel Failure (TVF) at 12 months**

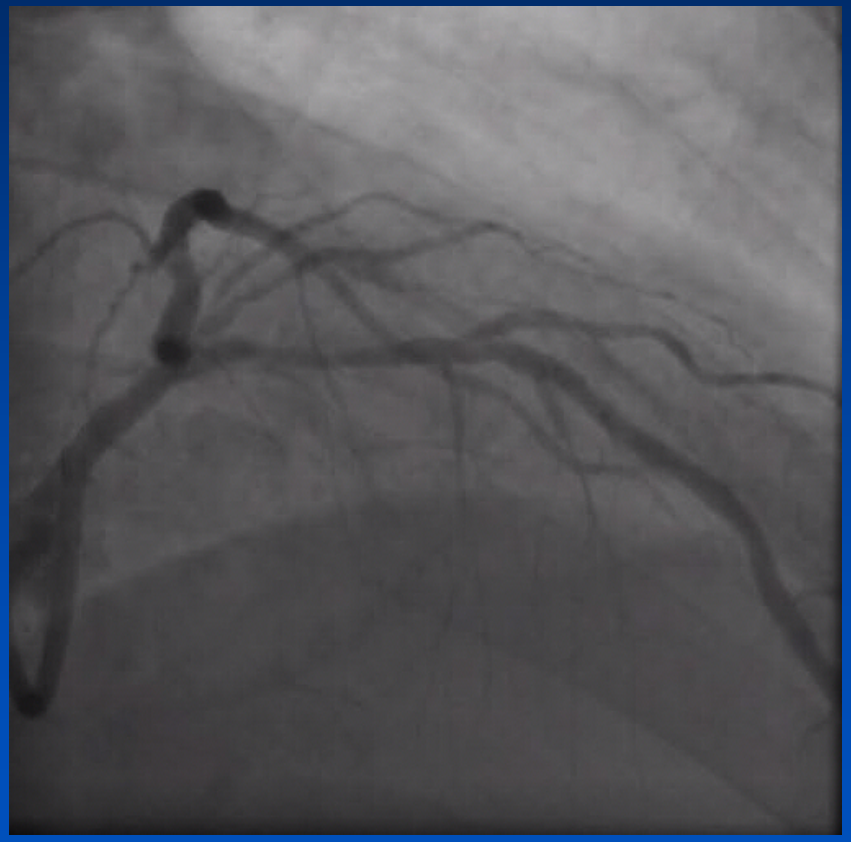
Completed enrollment at Feb. 2008

How to Manage Long Lesion Intervention ?

- Long lesions > 25 mm, <50 mm
  - We have clear cut-off value of IVUS parameters
- Very long lesions >50mm
  - What about long-term outcome ?
  - Stent overlapping, stent fracture are really problems ?

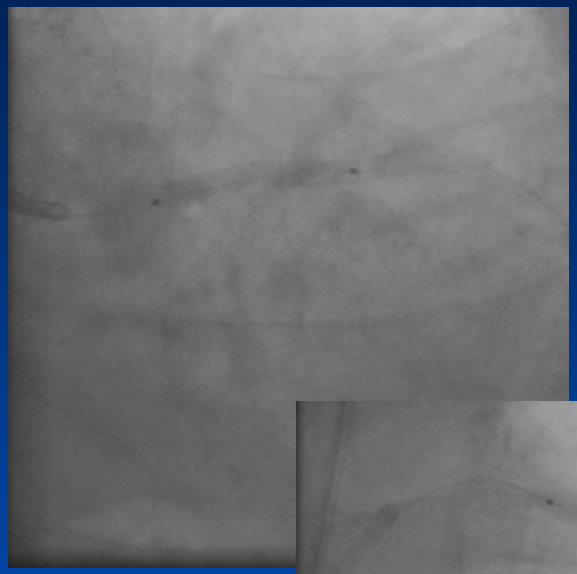
Very long lesion

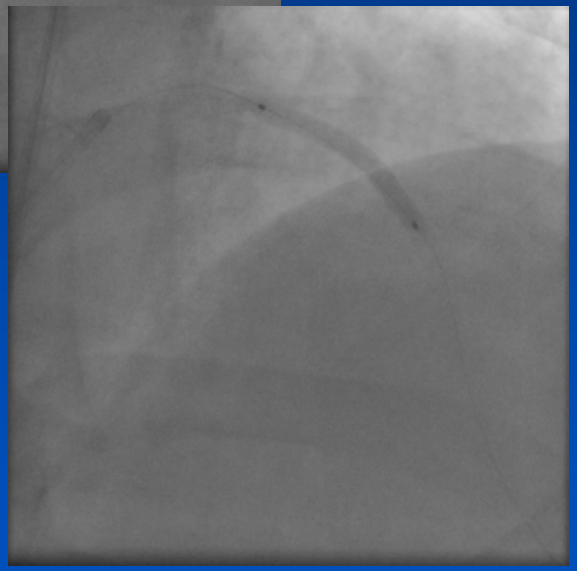
> 50 mm

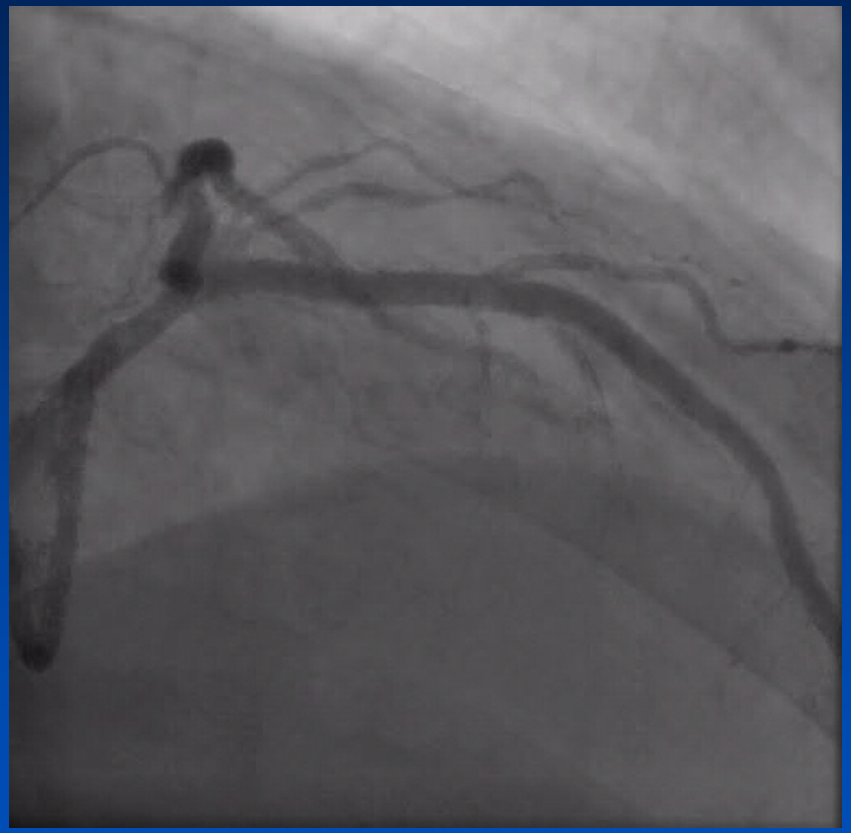


Very long lesion

Two DES with overlapping



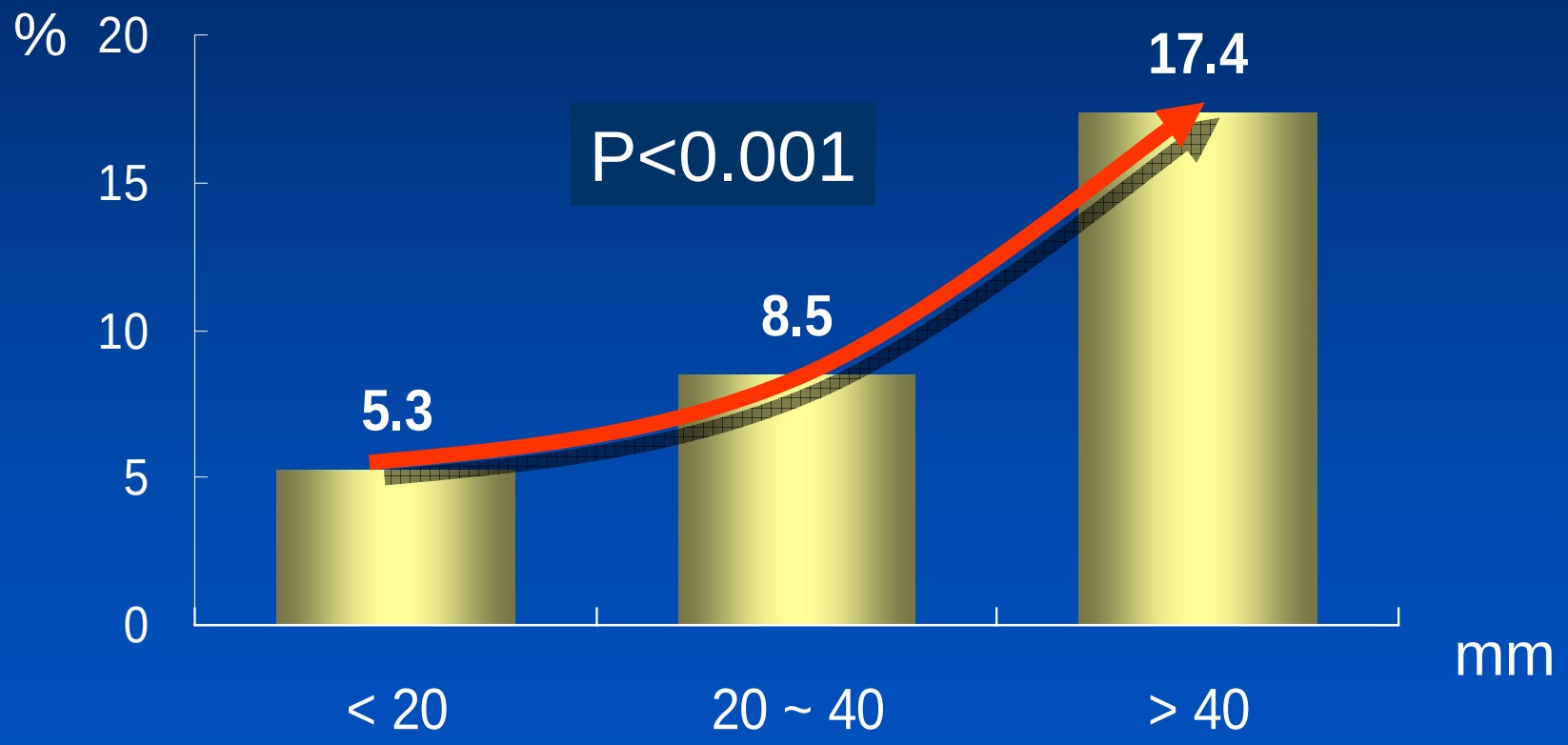




2 x Cyphers 3.5mm, 33 mm

What about Long-term Outcomes ?
(Full Metal Jacket)

Stented Segment is still Independent Predictor of Restenosis



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

Clinical Outcomes at 1 year of Very Long Lesions in RESEARCH

Stented length of 79mm (64-168)

	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	7.4	0.53
TVR (%)	7.5	7.5	7.6	0.96
MACE (%)	18.0	18.5	17.1	0.87

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

Milan

Clinical Outcomes at 1 year for Long LAD Lesions

Stented length of 64±18 mm (27 PES, 39 SES)

	In-hospital (n=66)	Follow-up (n=66)
Death	0	0
Q wave	0	0
Non-Q wave	11 (16.6%)	1 (1.5%)
Thrombosis	1 (1.5%)	0
Restenosis	0	13 (19.6%)
TVR	0	10 (15%)
CABG	0	1 (1.5%)

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

Clinical Outcomes at 1 year of Very Long Lesions in AMC

Stented length of 72±14 mm (266 SES, 86 PES)

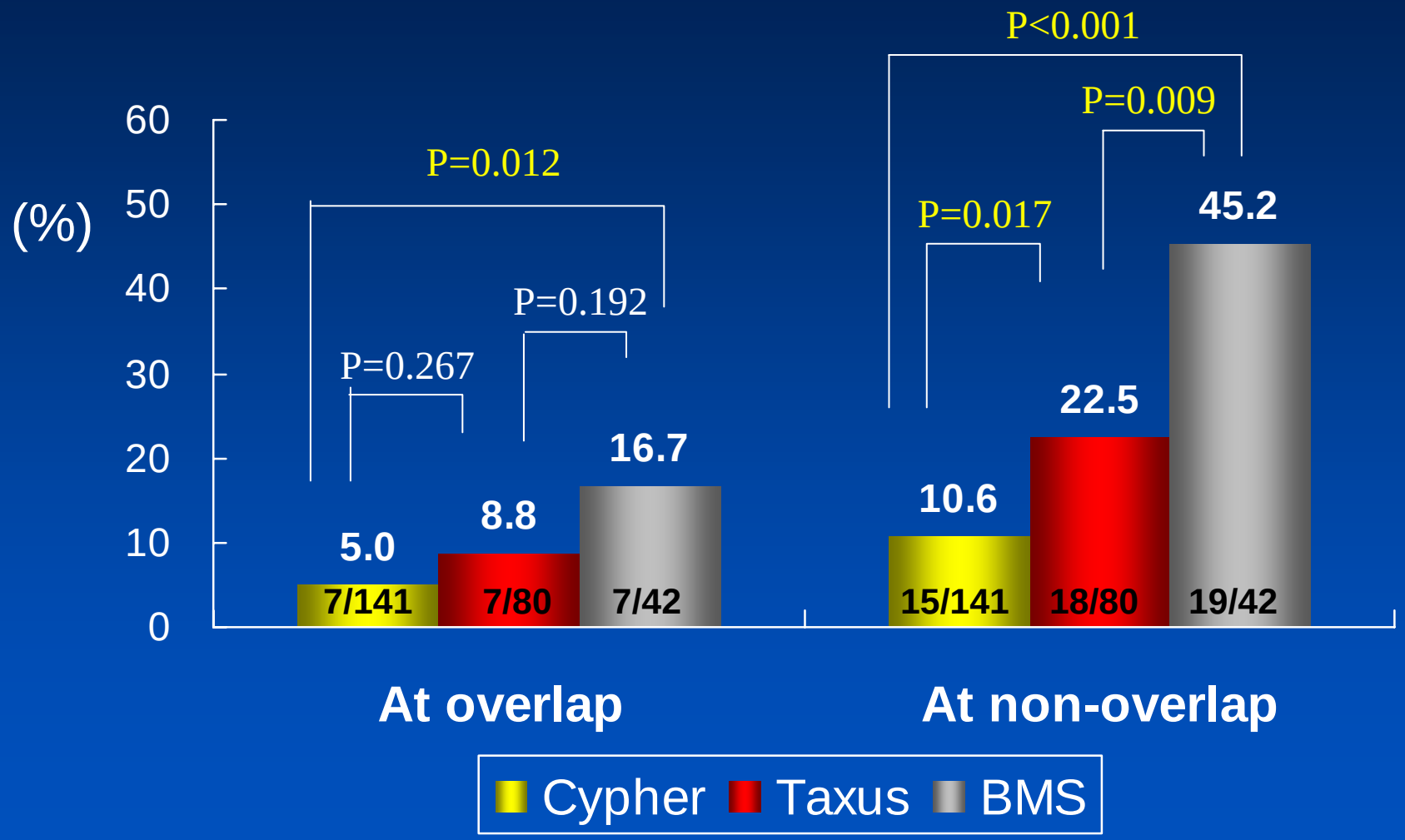
	In-hospital (n=347)	Follow-up (n=346)
Death	1 (0.3%)	9 (2.6%)
Q wave	2 (0.6%)	3 (0.9%)
Non-Q wave	68 (19.6%)	68 (20%)
Thrombosis	2 (0.6%)	3 (0.9%)
Restenosis	0	41 (13.7%)
SES vs PES	0	11% vs 22%
TVR	2 (0.6%)	13 (3.8%)

Lee CW et al, Am J Cardiol 2006; 98 :918-922

Stent Overlapping
(Full Metal Jacket)

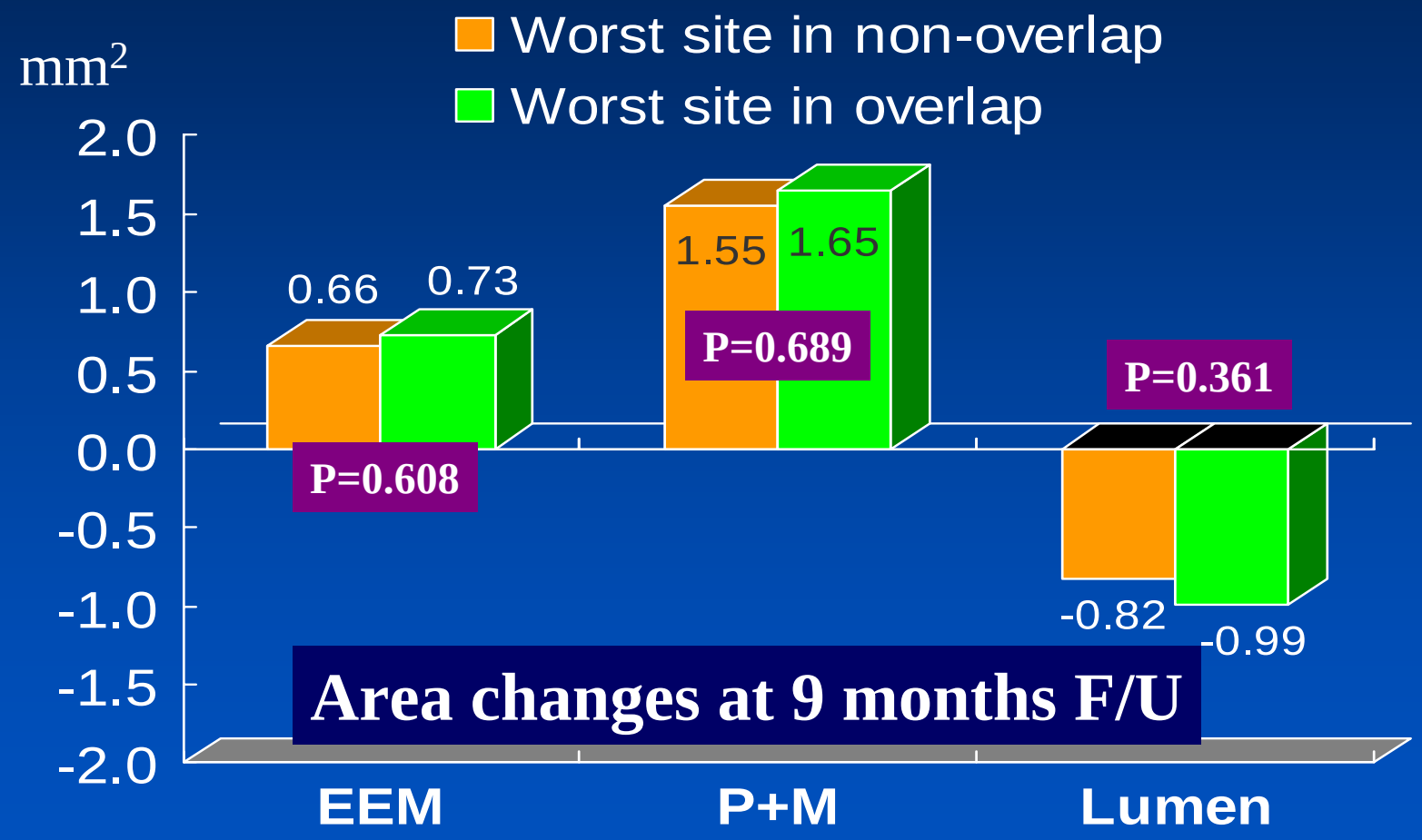
Impact of Stent Overlapping

In-segment Restenosis Rate in Multiple Stenting



Kim YH et al, Catheter Cardiovasc Interv 2006;67:181-7

Stent-overlap did not show any difference in IVUS subgroup analysis : Long-DES I study



Stent Fracture
(Full Metal Jacket)

Stent Fracture
SIRUS Angiographic Analysis

- 305 patients analyzed with 497 follow-up angiograms
  - 4 fractures identified (1.3%),
  - 3x Fracture Type 1 (0.98%)
  - 1x Fracture Type 2 (0.33%)
- All fractures occurred with multiple stents near the site of overlap, all vessels calcified including one chronic total occlusion.
- 1 ISR at that site with TLR (Type 1 Fracture – tissue growth)

Popma JJ TCT 2007

Stent Fracture in Long Lesion
from Long-DES II in AMC

- Angiographic analysis : 415 long lesions
- Incidence of fracture : 7 (1.7%)

Variable	Fracture (+) (N=7)	Fracture (-) (N=408)	P value
Reference diameter, mm	2.86 ± 0.21	2.82 ± 0.48	0.633
Lesion length, mm	38.4 ± 18.8	34.6 ± 11.9	0.985
Stent length, mm	42.4 ± 19.0	41.0 ± 13.1	0.928
Acute gain, In-stent, mm	2.37 ± 0.40	1.78 ± 0.53	**0.005**
Balloon to artery ratio	1.25 ± 0.20	1.24 ± 0.19	0.834
Late loss, In-stent	0.71 ± 0.48	0.26 ± 0.50	**0.015**
Restenosis, In-stent	1 (14.3 %)	29 (7.1 %)	0.411

Kim HS et al, Int J Cardiol 2008 (in press)

Incidence of TAXUS Express Stent Fracture

Study	Total	Fractures	Percentage
Taxus IV	875	2	0.23%
Taxus V	1401	12	0.86%
Taxus VI	589	2	0.34%
Altas	623	1	0.16%

Popma JJ TCT 2007

How to Manage Long Lesion Intervention ?

- Long lesions > 28 mm, <50 mm
  We have clear cut-off value of IVUS parameters
- **Very long lesions >50mm (Full Metal Jacket)**
  Long-term outcome would be acceptable (stent thrombosis rate 0.8-1.5%, TVR 4-15%)
  Stent overlapping would be OK,
  The incidence of stent fracture is relatively low and this is not clearly related with angiographic restenosis too.

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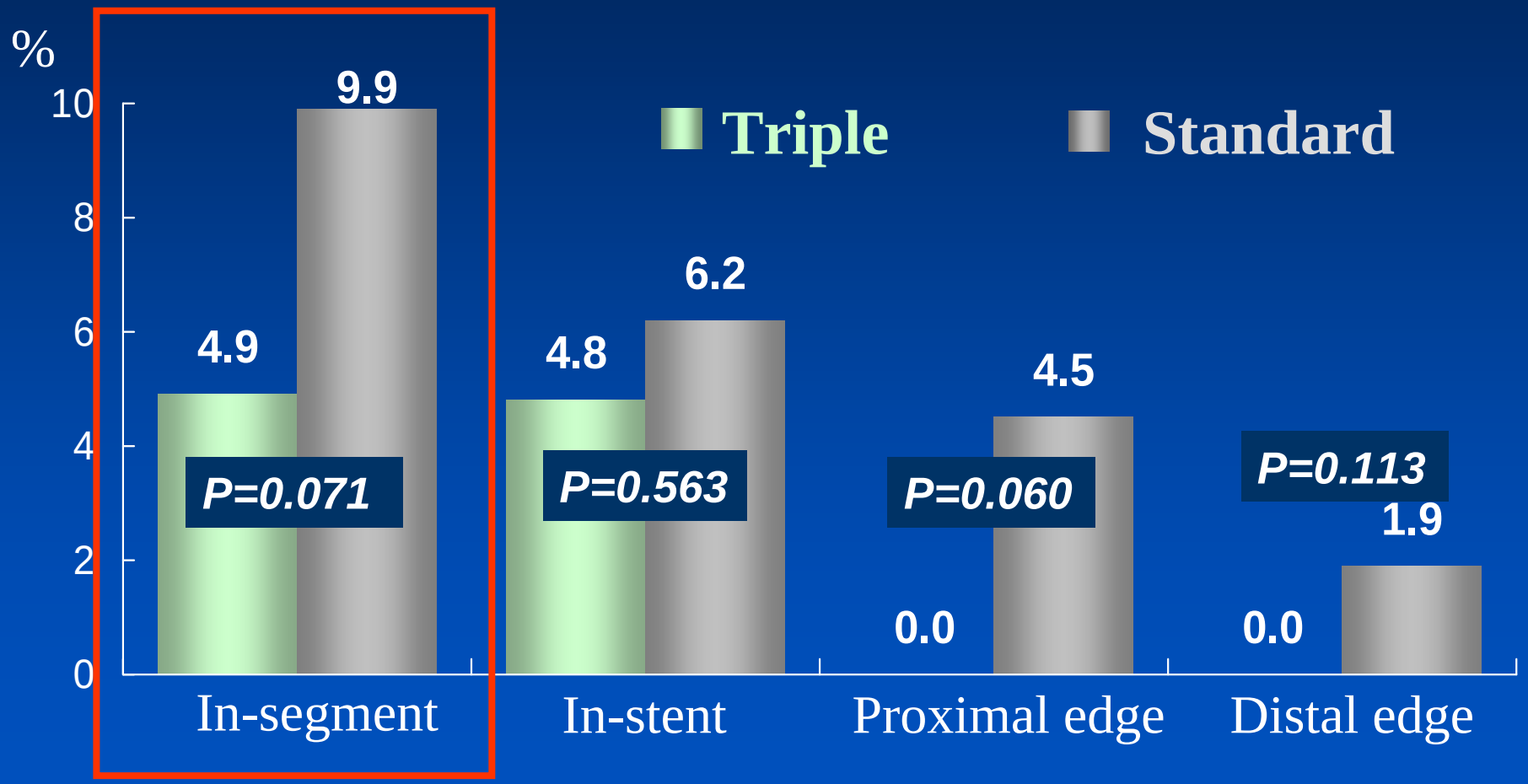
- Very long lesions >50mm
  - What about long-term outcome ?
  - Stent overlapping, stent fracture are really problems ?
- Impact of Cilostazol (Aspirin+Plavix+Cilostazol)

Angiographic Restenosis Rate at 9 months F/U

Long –DECLARE : Multicenter, Prospective Randomized study



Lee SW et al, Am J Cardiol. 2007;100:1103

Clinical Outcomes at 1 year

	Triple	Standard	P
Patients	206	200	
Death	0	1 (0.5%)	0.493
Cardiac	0	1 (0.5%)	
Non-cardiac	0	0	
MI	1 (0.5%)	1 (0.5%)	0.242
Stent thrombosis	1 (0.5%)	1 (0.5%)	1.0
Acute	0	0	
Subacute	1	0	
Late	0	1	
TLR	5 (2.4%)	16 (8.0%)	0.014
MACE	5 (2.4%)	17 (8.5%)	0.007

Lee SW et al, Am J Cardiol. 2007;100:1103

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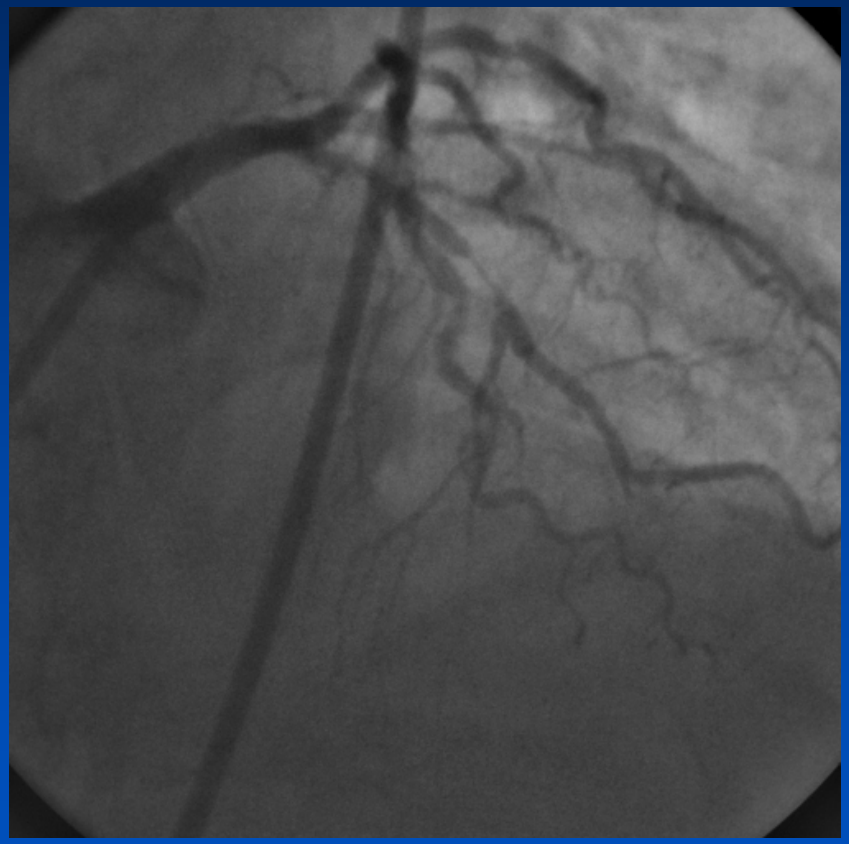
Extremely Long Lesion

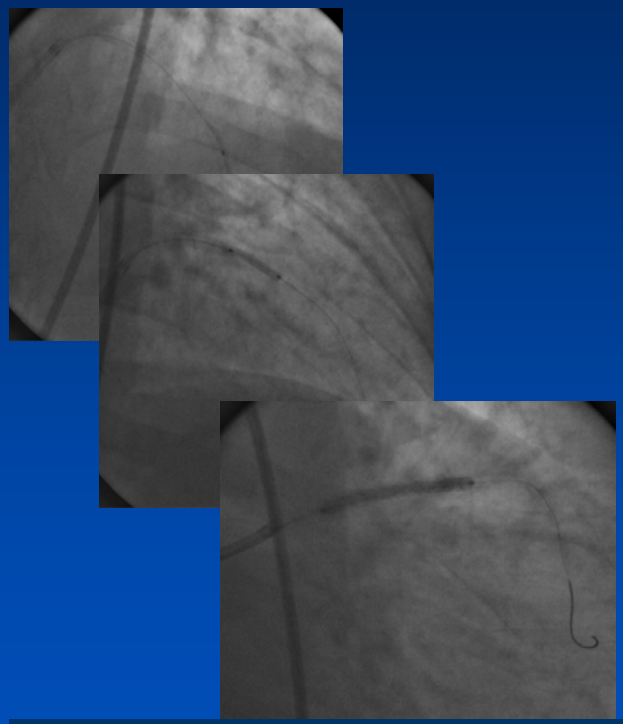
CTO in distal LAD, BMS-ISR in proximal LAD



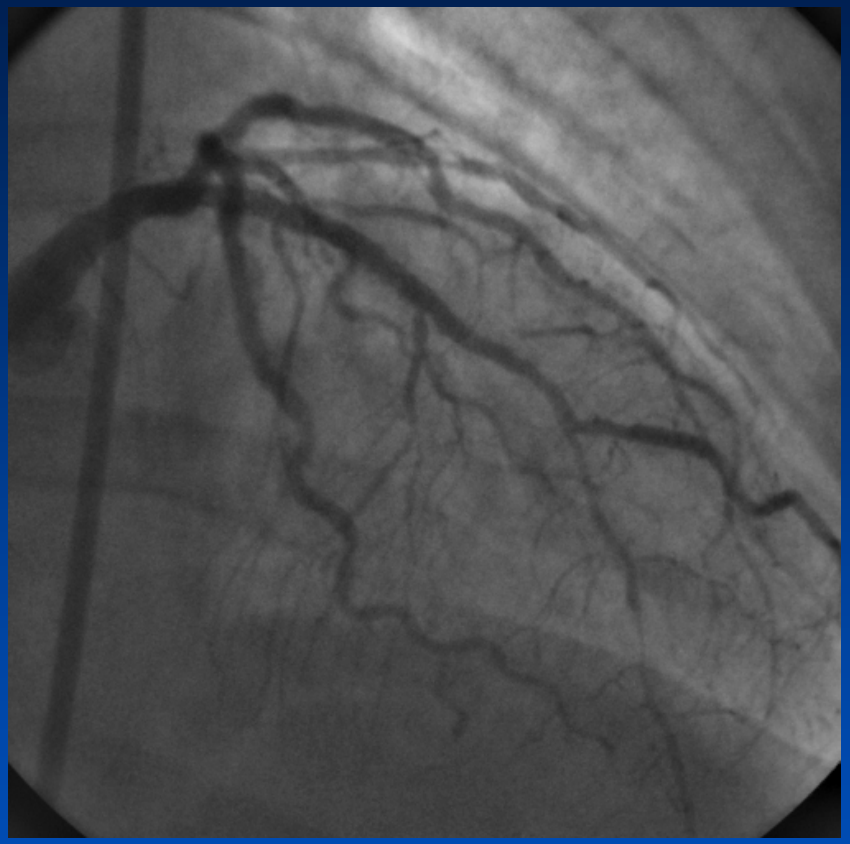
Do you believe CABG better ?

Medical treatment is another good treatment modality.

How to treat the distal LAD leson ?
(very diffuse and small vessel disease)
Full lesion coverage vs. Spot stenting ?



Cypher 3.0 x 33
After repeated ballooning



I do not prefer two-step procedure, but for particular this case,
I would like to wait and see the changes of ischemic territory and distal coronary flow.

How to Manage Long Lesion Intervention ?

1. Shorter and Bigger, the better
   Stented length<50 mm and/or Stent CSA>5.5 mm2
2. IVUS guided procedure may be helpful
3. Multiple overlapping would be OK
4. Triple antiplatelet therapy may be helpful to reduce the TLR and MACE


Thank You !!
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