Small vessel disease

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Conflict statement

Speakers' name: Naoto Inoue

- **I have the following potential conflicts of interest to report:**
  - Consulting
  - Employment in industry
  - Stockholder of a healthcare company
  - Owner of a healthcare company
  - Other(s)

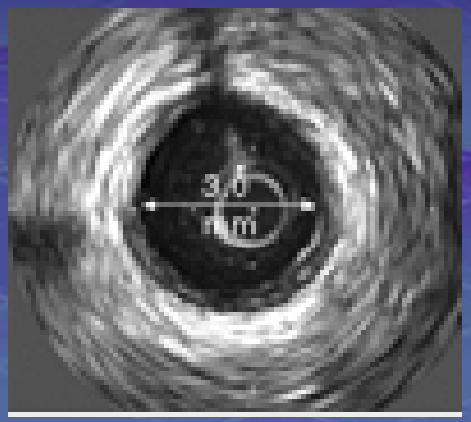
- **I do not have any potential conflict of interest**

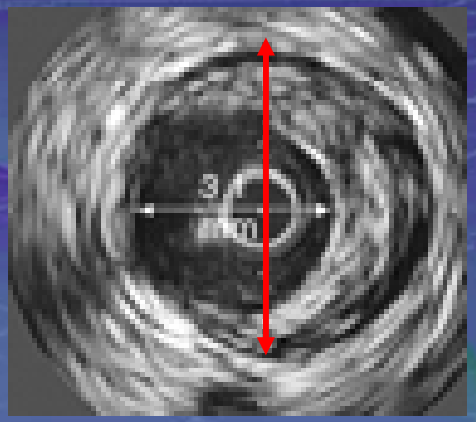
What is the small vessel?

Angiographic image

<2.5mm, <2.8mm, <3.0mm

IVUS image

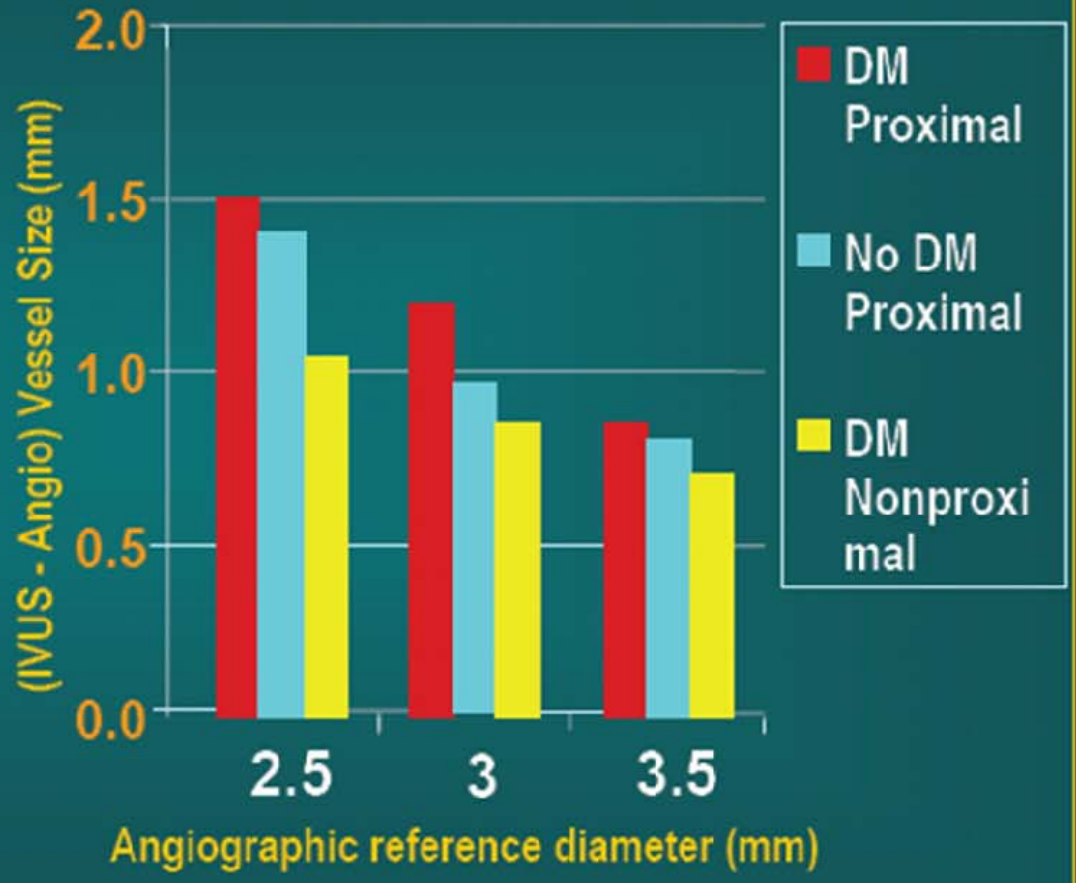




Small Vessels: Angiography vs. IVUS

The maximum Discrepancy between IVUS and angiography is found in:

1. Diabetics
2. Angiographically small arteries
3. Proximal segments



Moussa I et al. AJC 2001; 88:294

Background and morphology of small vessel

- Diabetes
- Diffuse and long lesion

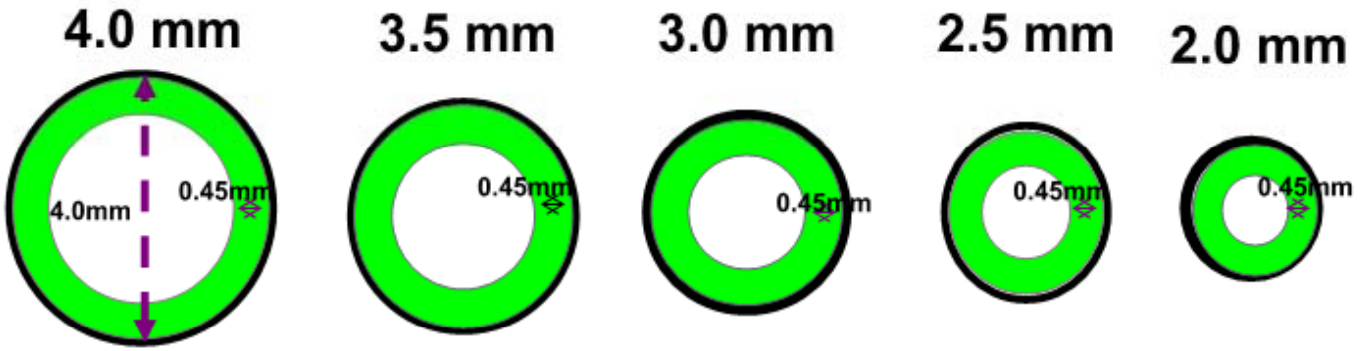
Clinical benefit by recanalization therapy

- Relief symptom
- Small ischemic territory-difficult to show ischemic evidence
- Comparison of PCI and OMT

Technical issue for the treatment of small vessel

- ✓ Avoid edge dissection
- ✓ Decide the landing zone of stent by IVUS
- ✓ Predilate with a small sized balloon
  (conventional, focal force angioplasty)
- ✓ Select 2.25 or 2.5mm stent
- ✓ Postdilate with an appropriate sized balloon
  (non-compliant and shorter balloon)

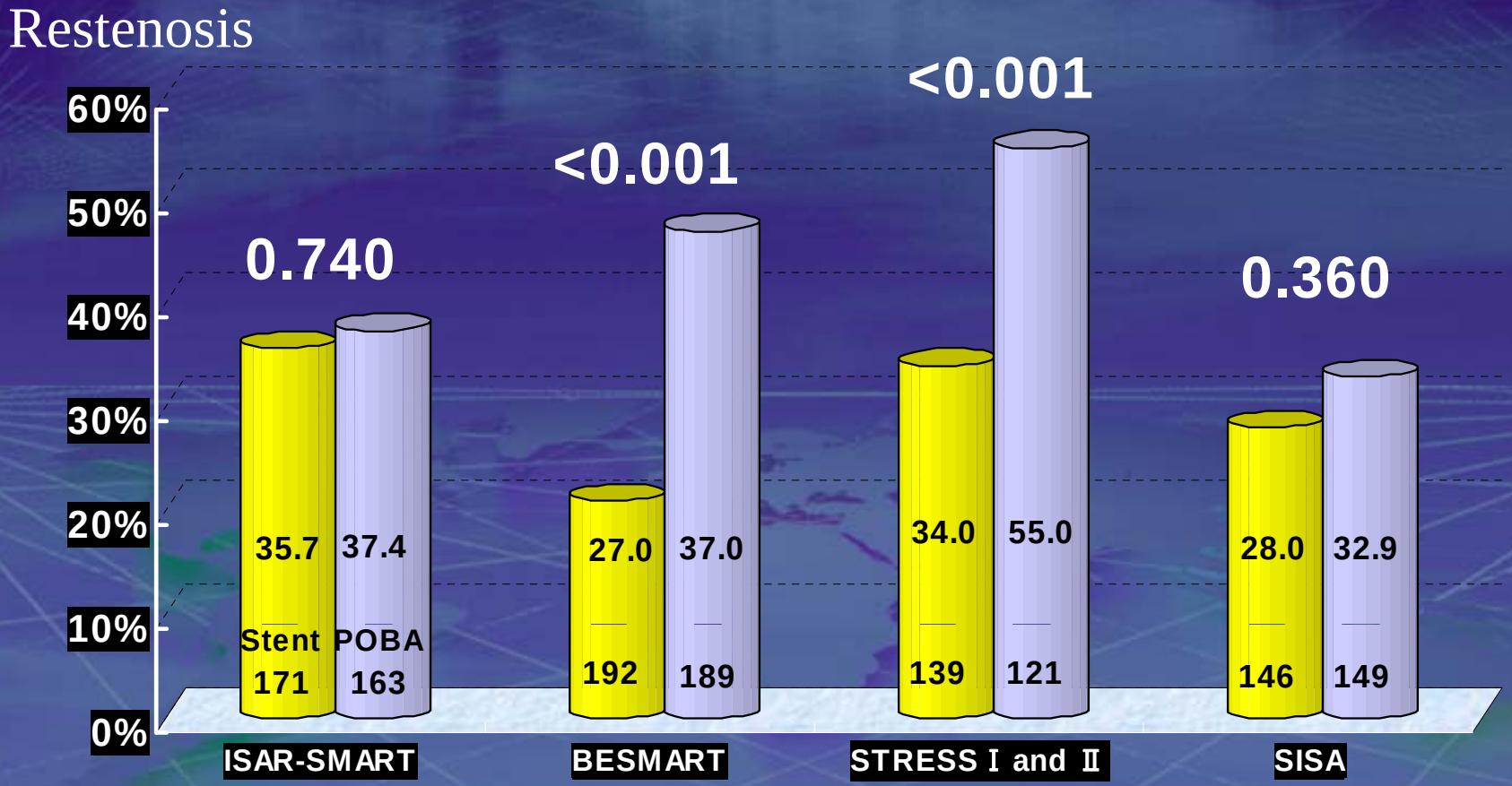
Late loss by vessel size & % diameter stenosis



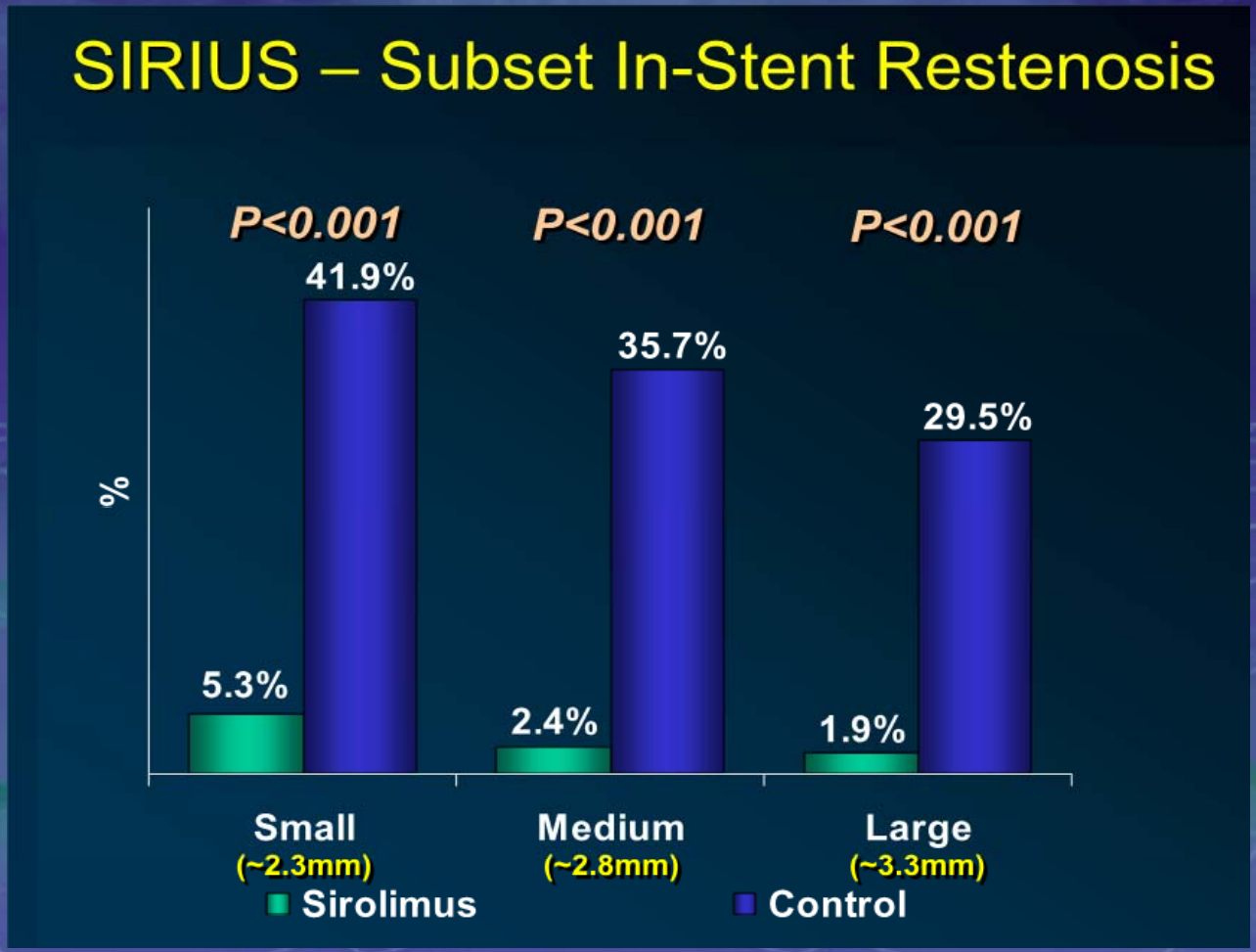
	4.0 mm	3.5 mm	3.0 mm	2.5 mm	2.0 mm
Late Loss	0.9 mm	0.9 mm	0.9 mm	0.9 mm	0.9 mm
Diameter Stenosis	23%	26%	30%	36%	45%

TCT: Moussa, Columbia Univ Med, CRF

POBA vs. BMS


Restenosis
60%
50%
40%
30%
20%
10%
0%
0.740
<0.001
<0.001
0.360
35.7
37.4
27.0
37.0
34.0
55.0
28.0
32.9
Stent
POBA
171
163
192
189
139
121
146
149
ISAR-SMART
BESMART
STRESS Ⅰ and Ⅱ
SISA

- ✓ Minimum late loss is better for small vessel disease
- ✓ DES should be used



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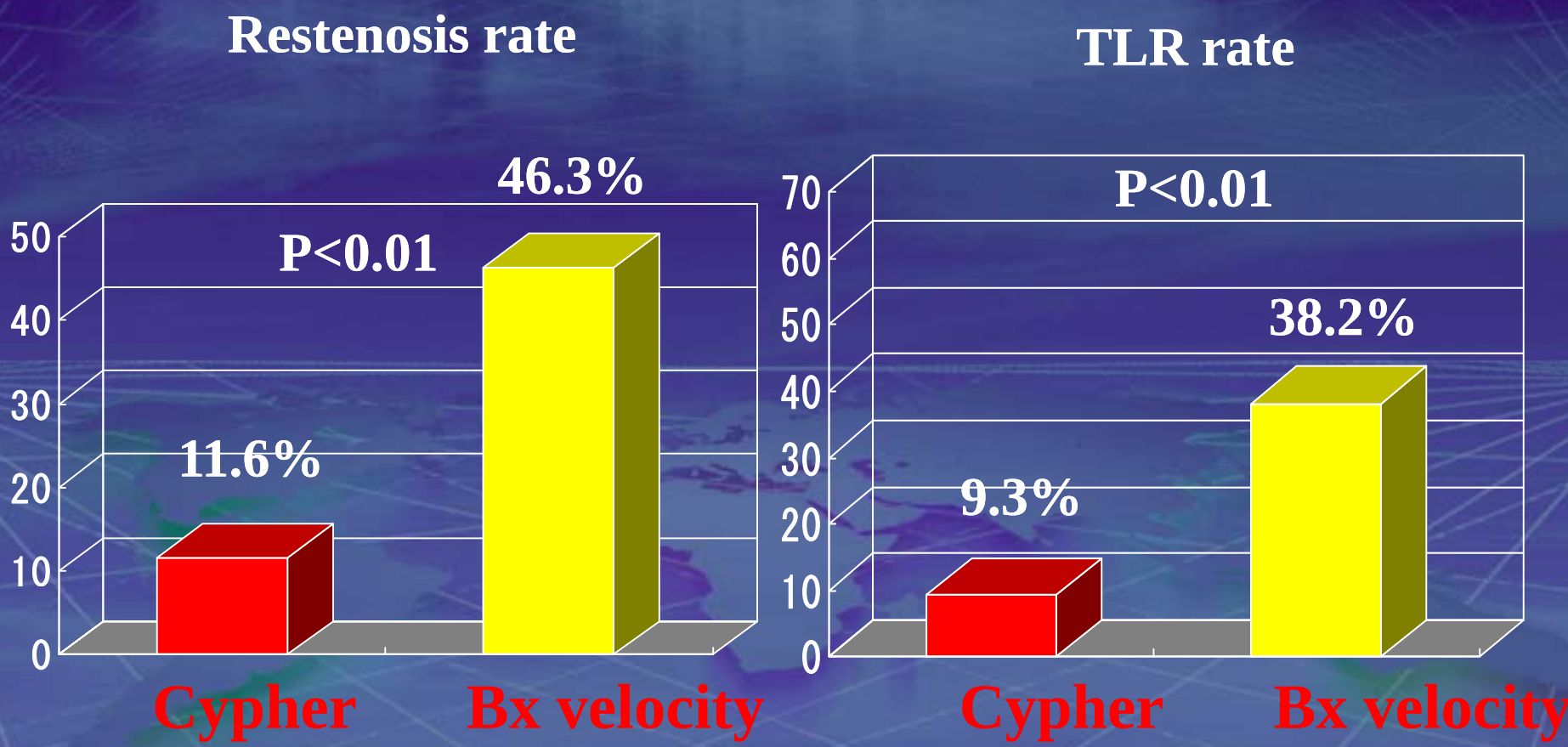
SIRIUS - Sub-Analysis

	Small		Medium		Large	
	S	C	S	C	S	C
TVF (%)	11.3	26.5	9.1	20.7	5.5	16.8
P-value	<0.001		<0.001		<0.001	
TLR (%)	7.3	20.6	3.2	18.3	1.8	12.0
P-value	<0.001		<0.001		<0.001	

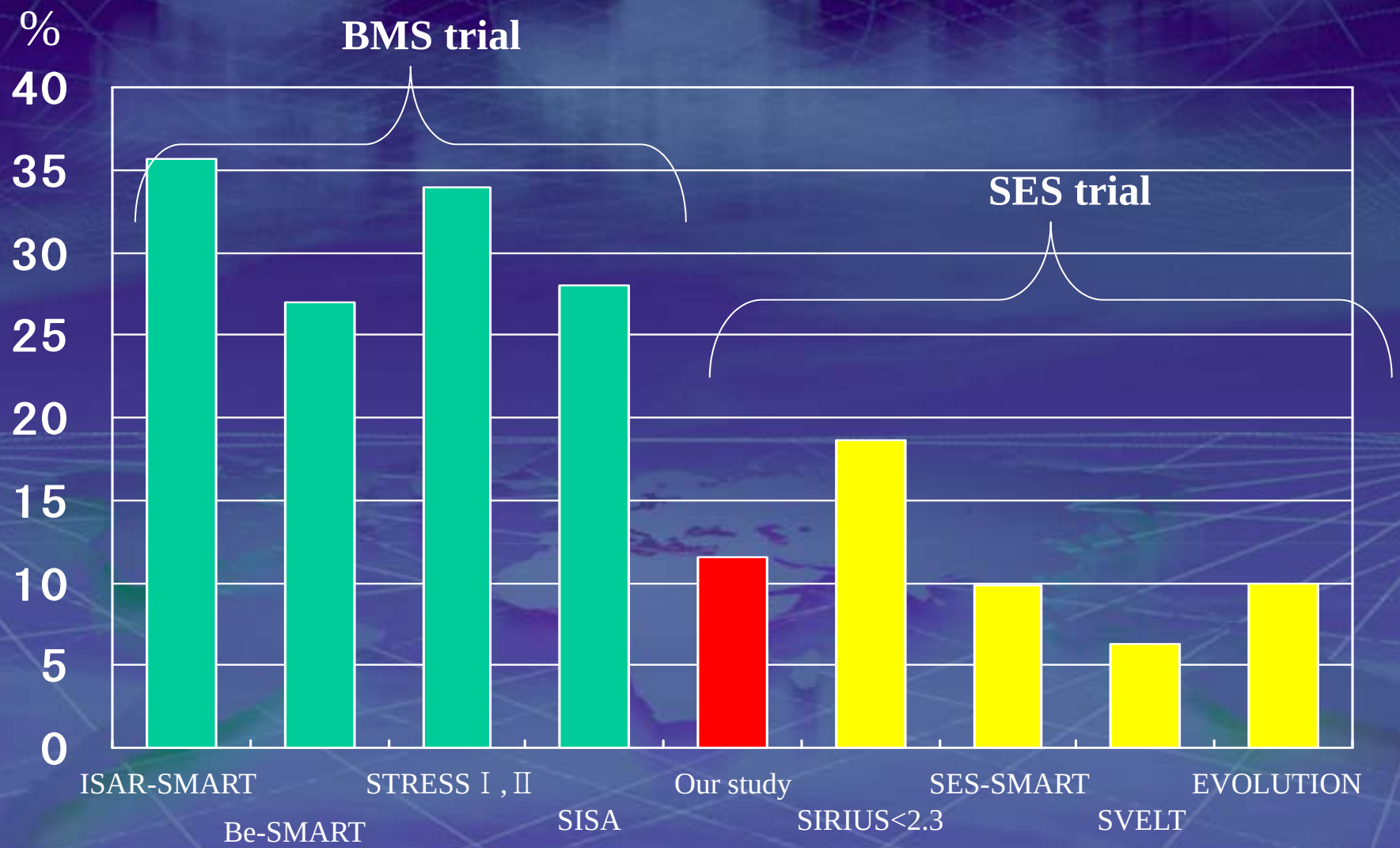
SES vs. BMS in SVD (RD<2.5mm)



N.Inoue et al.

TCT-ASIA 2011

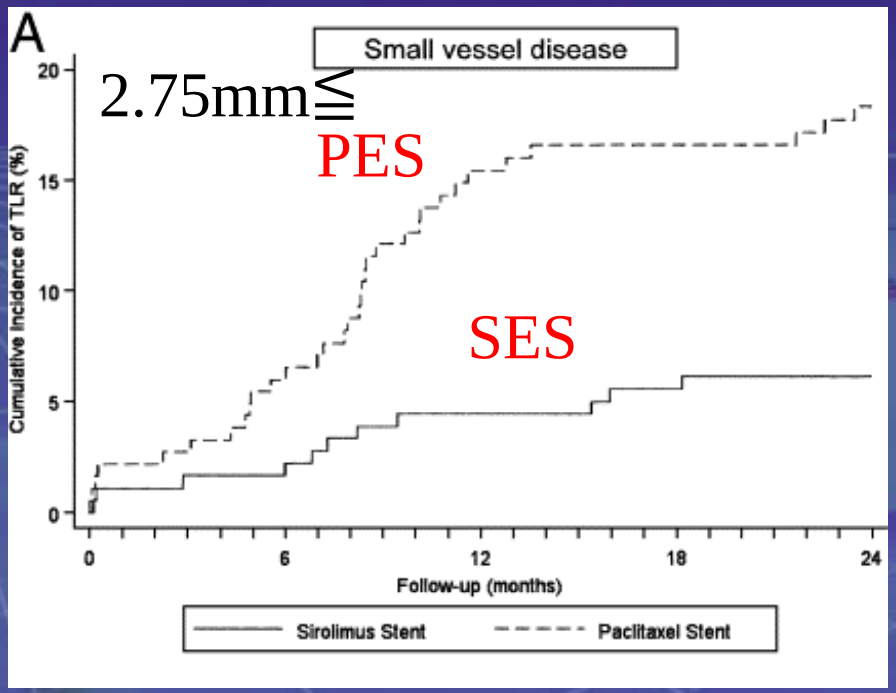
Restenosis Rate (Other Small Vessel Studies)

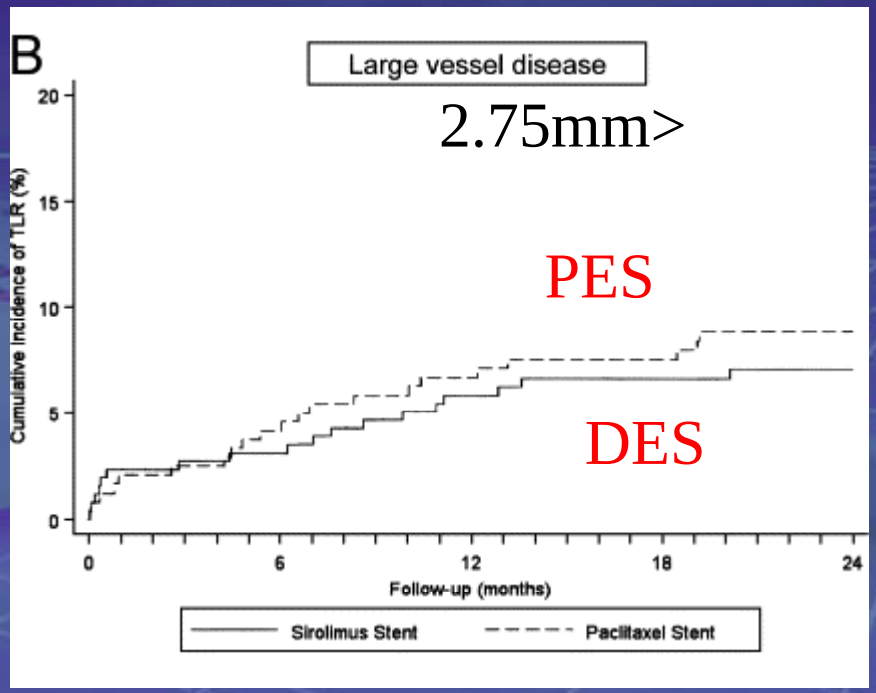


Which DES is better for small vessel disease?

Impact of Vessel Size on Outcome After Implantation of Sirolimus-Eluting and Paclitaxel-Eluting Stents: A Subgroup Analysis of the SIRTAX Trial

Mario Togni M. et al.: JACC 2007





Second generation DES would be good for small vessel disease

Xience, Endeavor Resolute, NOBORI, Biomatrix

- Similar late loss to SES
- Thinner strut
- More rapid reendotherization
- More flexible
- Low stent thrombosis rate

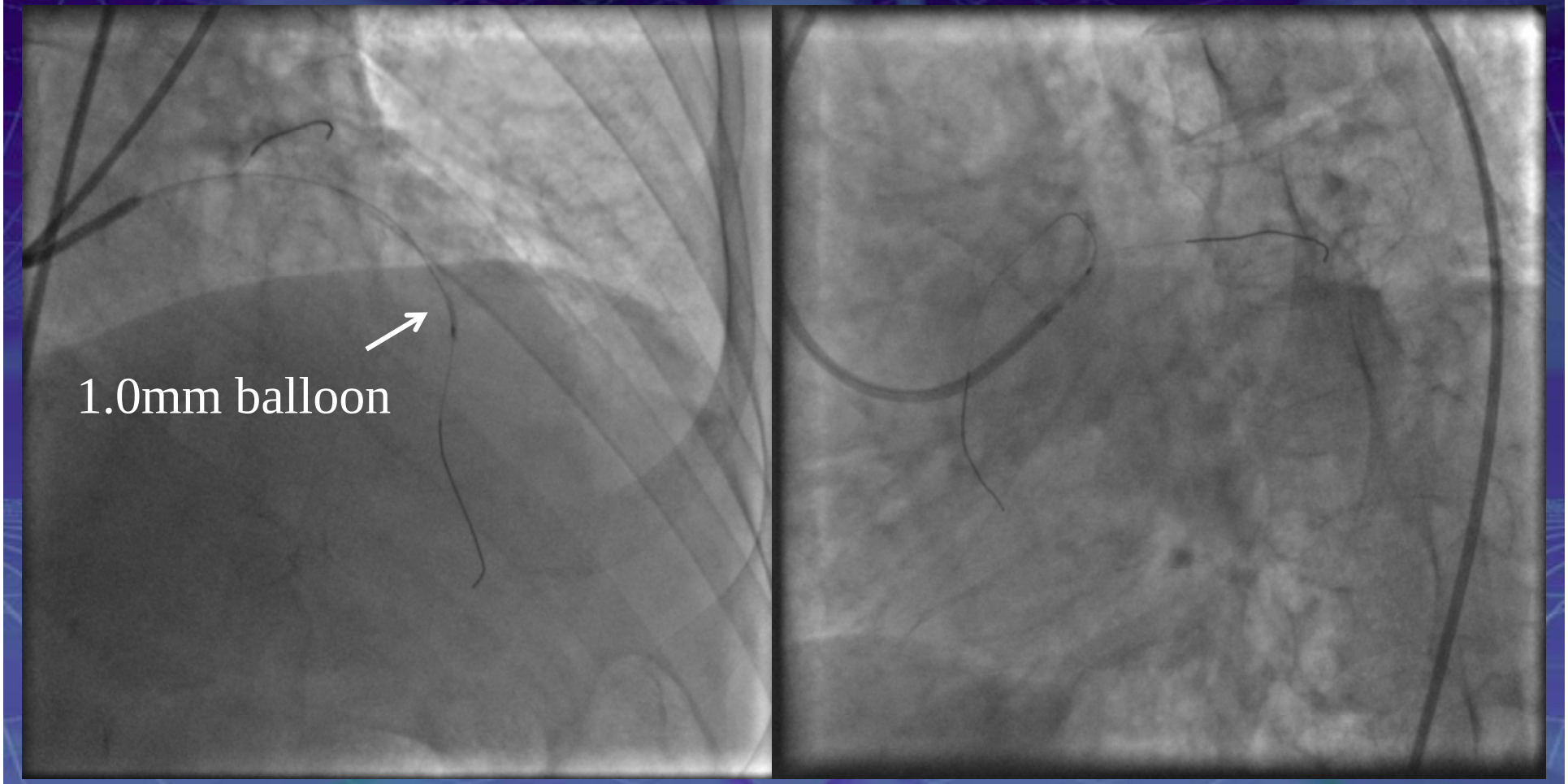
Fully biodegradable stent looks promising

Small VD and multi VD

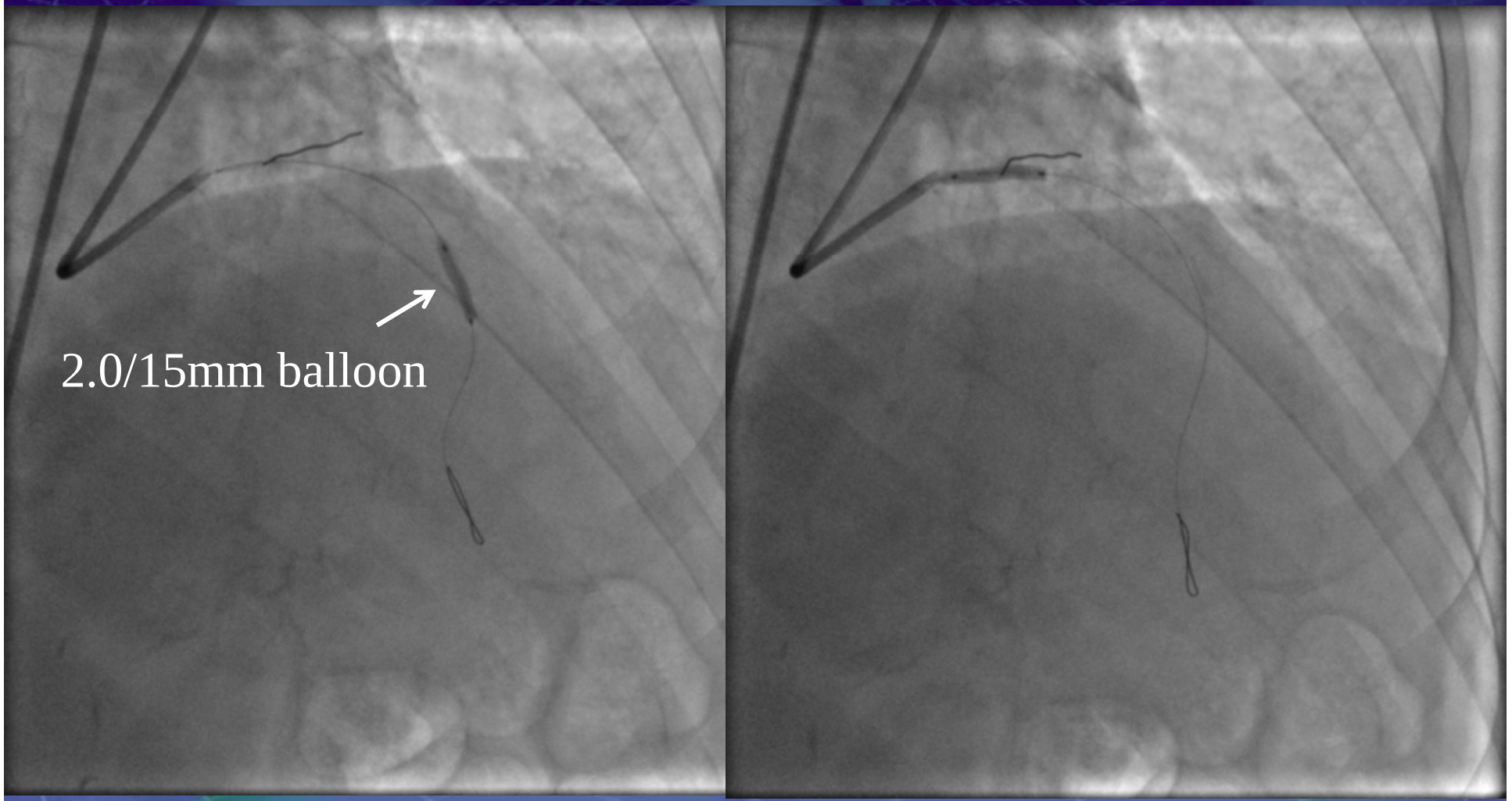
LMT-RD: 2.48mm, LAD distal 2.10mm

G.C. 6F EBU 3.5

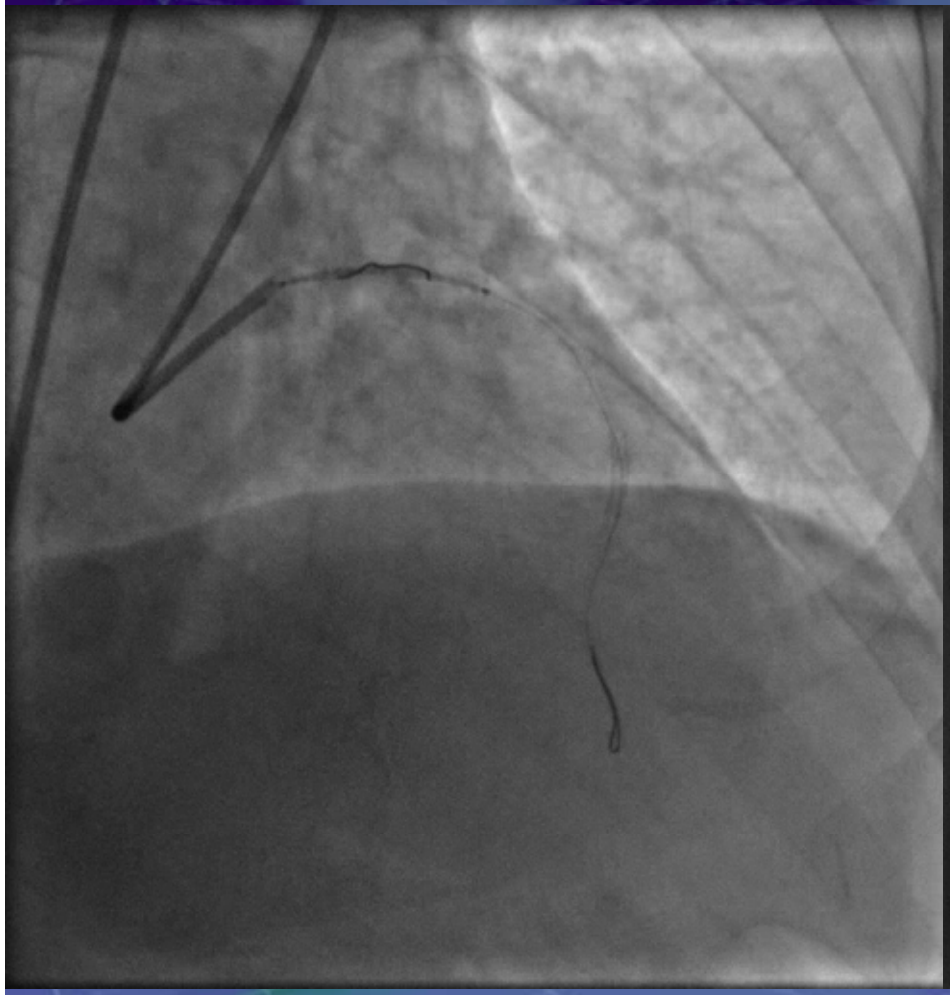
75 y.o. female Unstable angina, DM



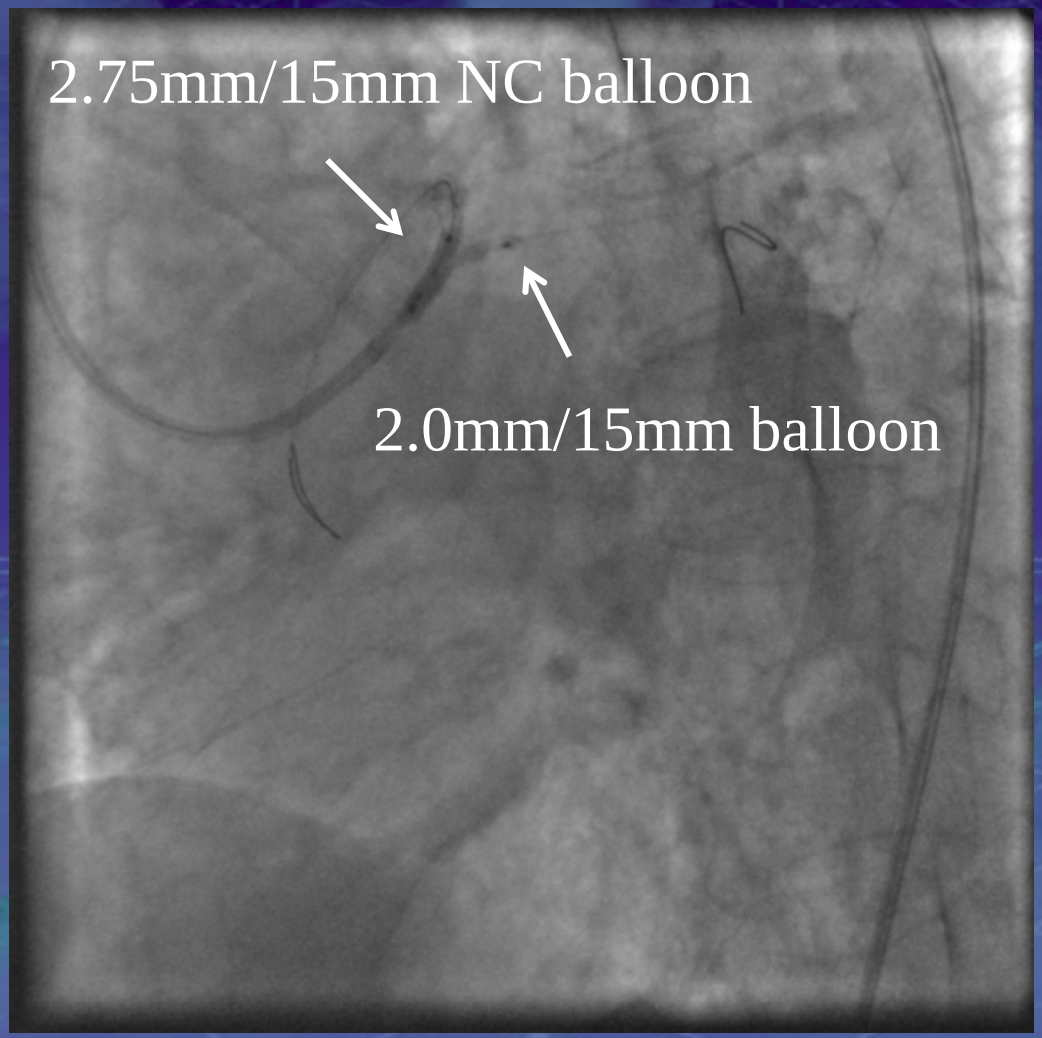
2.0mm balloon could not pass


2.0/15mm balloon

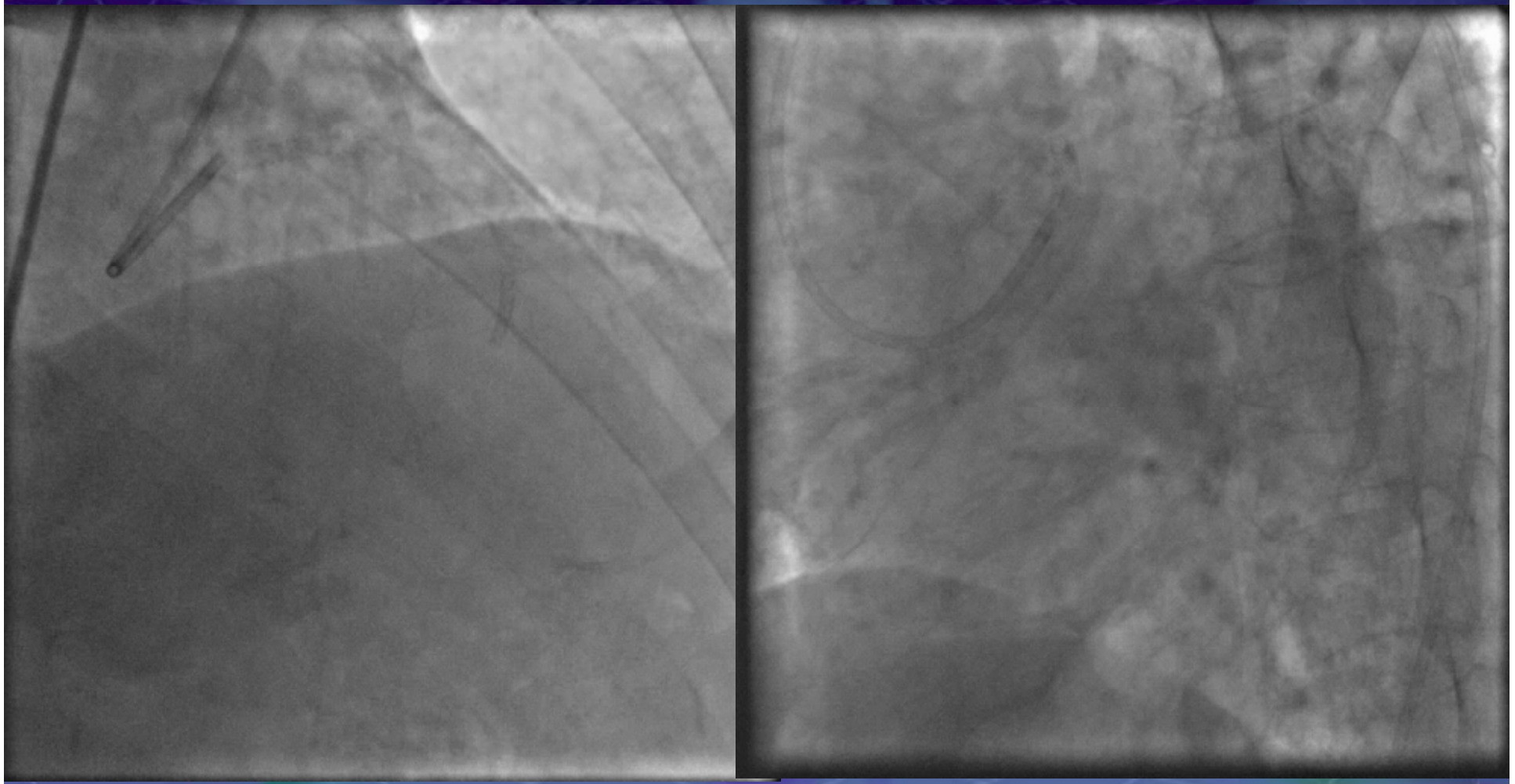
2.25/14mm Biomatrix with 6atm



2.5mm/24mm NOBORI for LMT

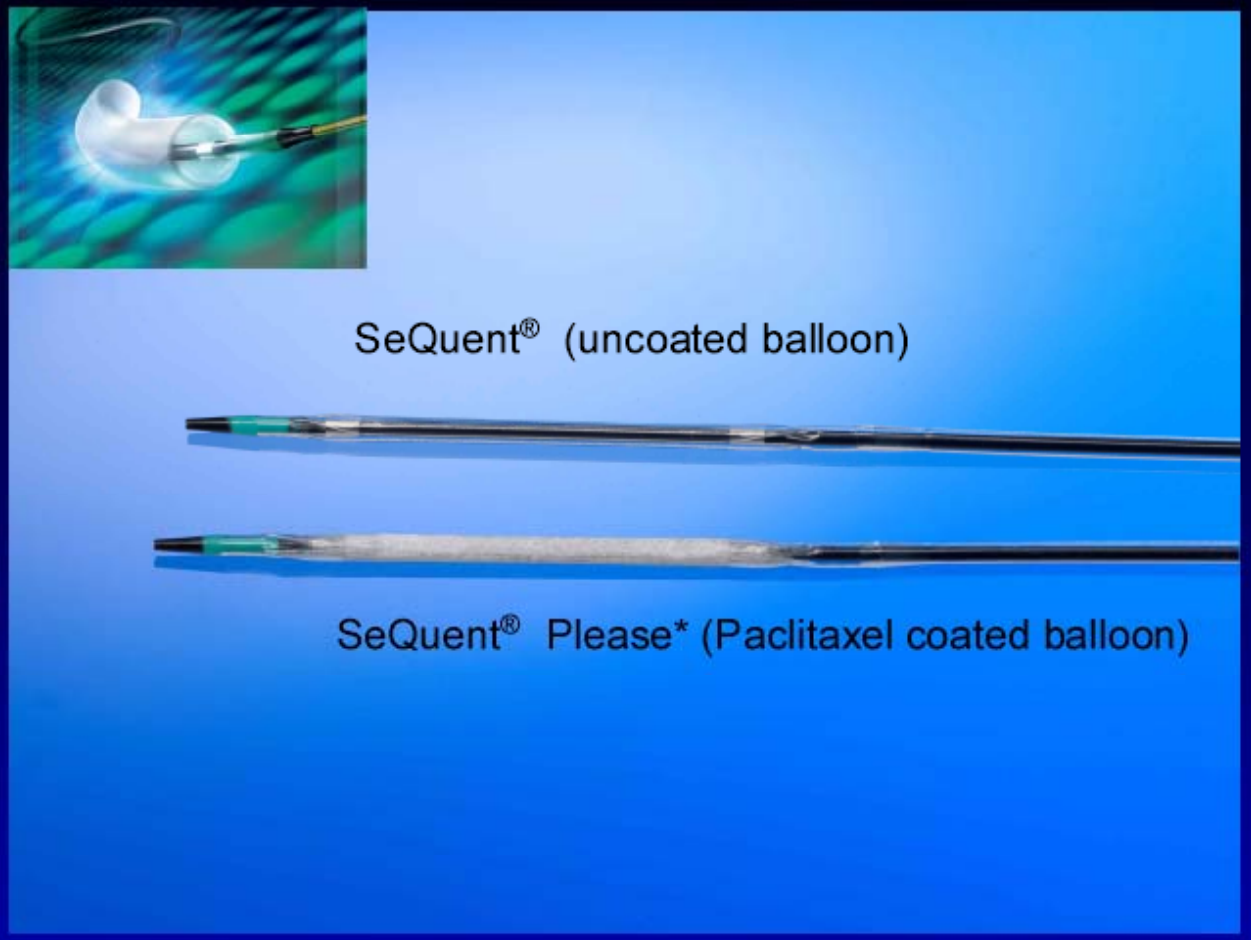


KBT



Final angiogram

Drug eluting balloon



*SeQuent® Please is manufactured based on the PACCOCATH technology with 3 µg paclitaxel / mm²; CE mark since 11.03.2009

B. Scheller *TCT-ASIA 2011*

PEPCAD I SVD

"The Paclitaxel-Eluting PTCA-Balloon Catheter to Treat Small Vessel Coronary Artery Disease. A Pilot Study"

prospective, non-randomized, multi-center, one-arm phase-II pilot study
De-novo lesions, reference diameter 2.25 - 2.8 mm; SeQuent Please

Primary Variable

- 6-month late lumen loss

Secondary Variables

- Procedural success (≤30% stenosis)
- 6-month binary restenosis rate
- 6-month MACE
- MACE at 1 and 3 years

Inclusion Criteria

- Stable or unstable angina (no MI)
- De-novo lesion in native coronary arteries

Medication

- ASS ≥ 100 mg daily
- Clopidogrel 75 mg daily
  - –1 month DEB only
  - –3 months DEB with additional non-DES stent

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PEPCAD I SVD – QCA, 6 months FU

ITT, n=120

Diabetic patients	41 / 120 (34.2 %)
Reference diameter	2.36 ± 0.19 mm
Lesion length	11.46 ± 4.72 mm
MLD pre PCI MLD post PCI	0.71 ± 0.25 mm 1.89 ± 0.30 mm
Follow-up	6.4 ± 1.3 months
Control angiography	104 / 120 (86.7 %)
Late lumen loss	0.32 ± 0.56 mm
Binary restenosis in-segment	18 / 104 (17.3 %)
Binary restenosis in-lesion	17 / 104 (16.3 %)
TLR	14 / 120 (11.7 %)
Total MACE	18 / 120 (15.0 %)

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PEPCAD I SVD – Outcome, 6 months FU

	DEB only	DEB & BMS	p
n	82	32	
Follow-up	6.4 ± 1.2 months	6.5 ± 1.5 months	0.9
Control angiography	73 (89 %)	29 (91 %)	1
Late lumen loss	0.18 ± 0.38 mm	0.73 ± 0.74 mm	0.0006
Binary restenosis in-segment Binary restenosis in-lesion	4 / 73 (5.5 %) 4 / 73 (5.5 %)	13 / 29 (44.8 %) 12 / 29 (41.3 %)	<0.0001 <0.0001
TLR	4 (4.9 %)	9 (28.1 %)	0.001
Stent thromboses and TLR	N/A	2 (6.3%)	
Myocardial infarction	1 (1.2 %)	1 (3.3 %)	1
Death	0 (0 %)	0 (0 %)	1
Total MACE	5 (6.1 %)	12 (37.5 %)	<0.0001

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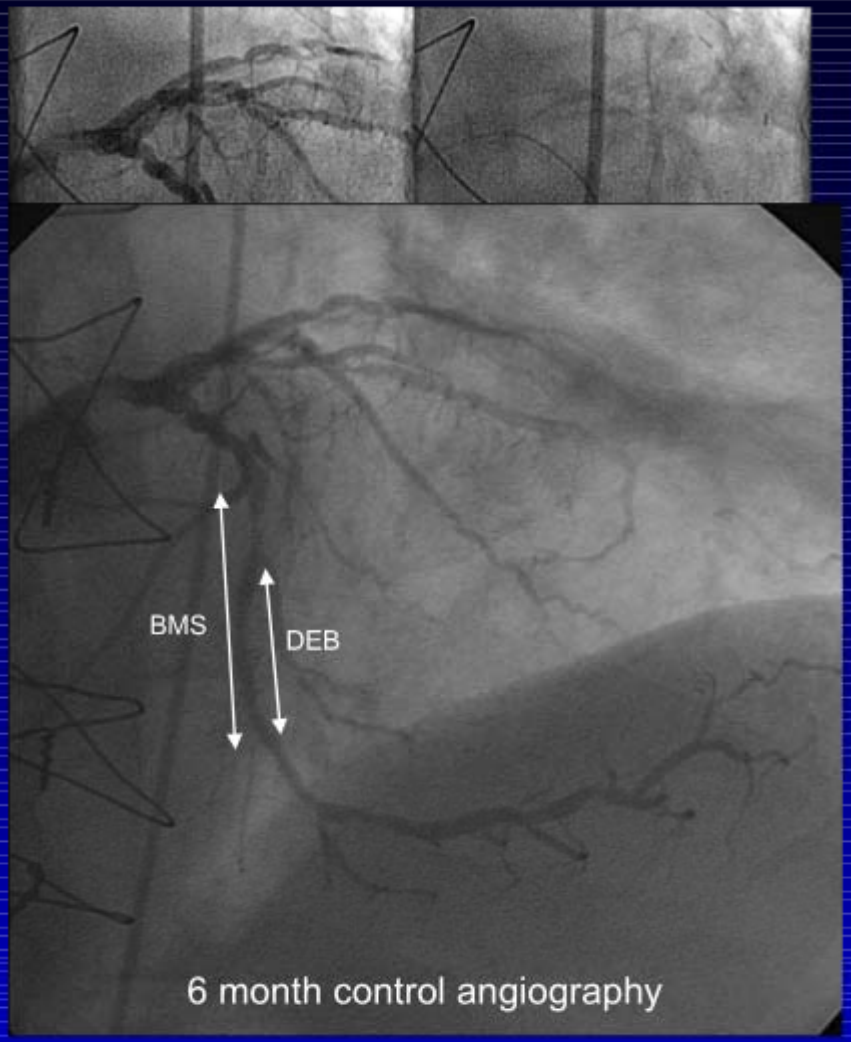
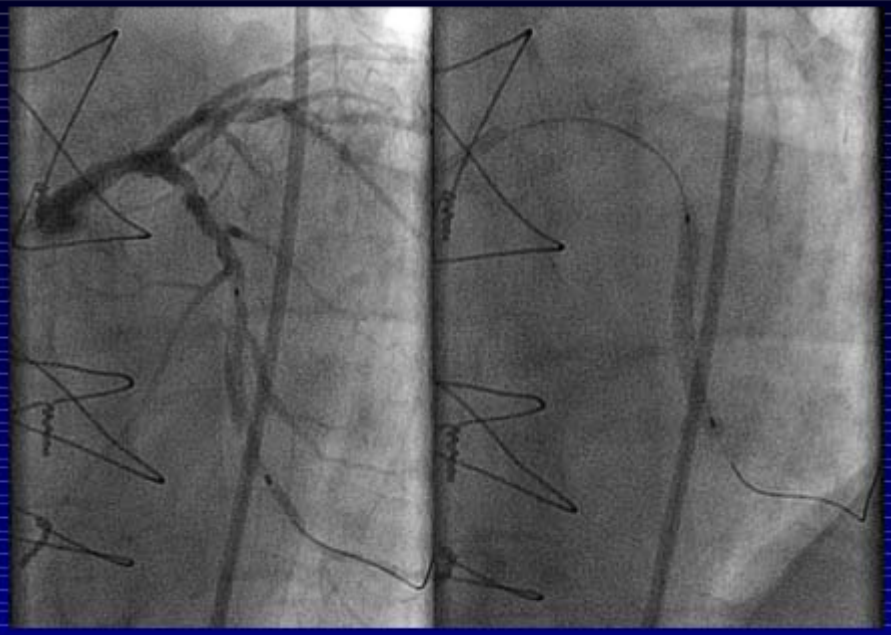
PEPCAD I SVD – DEB + BMS

geographic missmatch

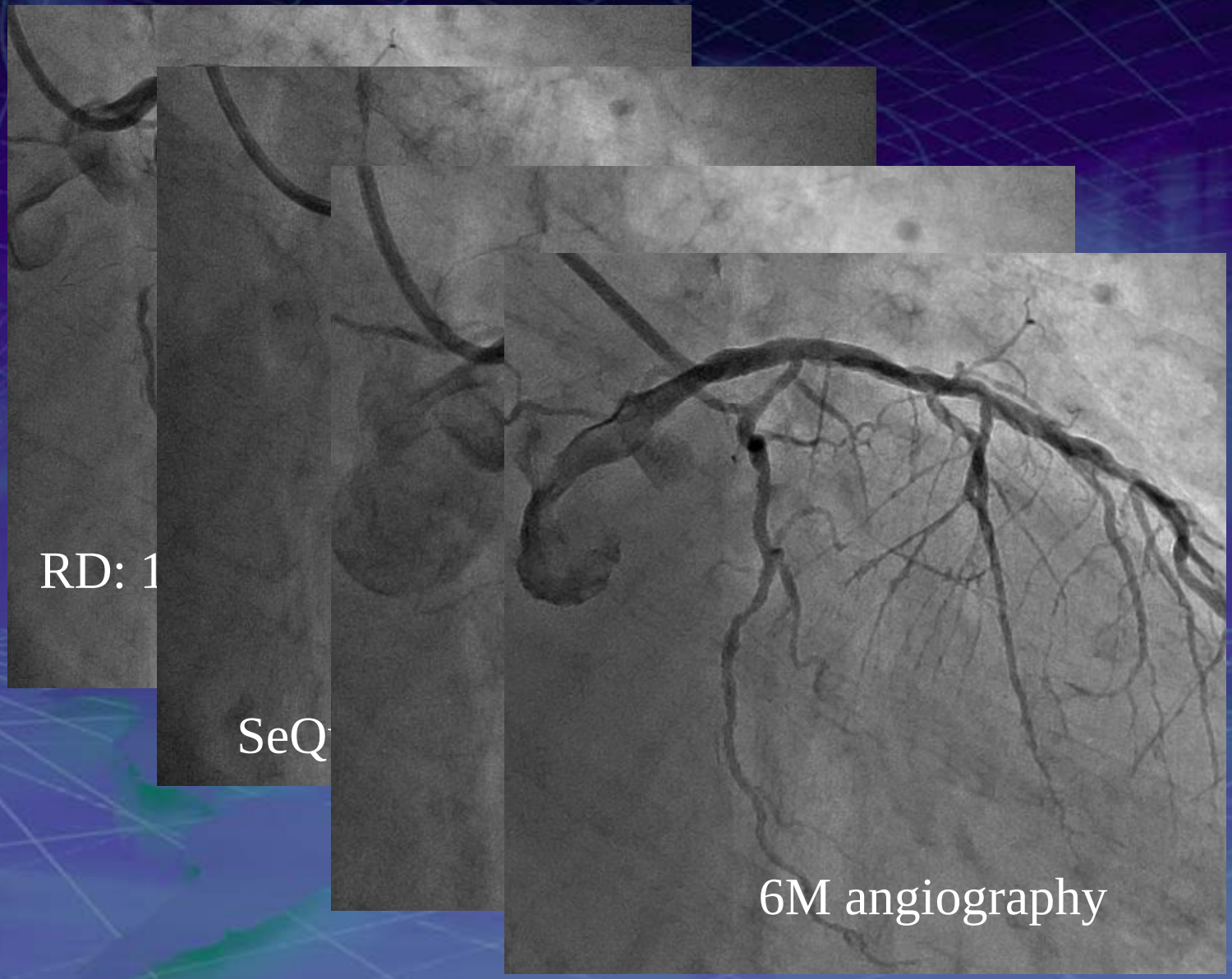
DEB 2.5 17 mm

BMS 2.5 25 mm

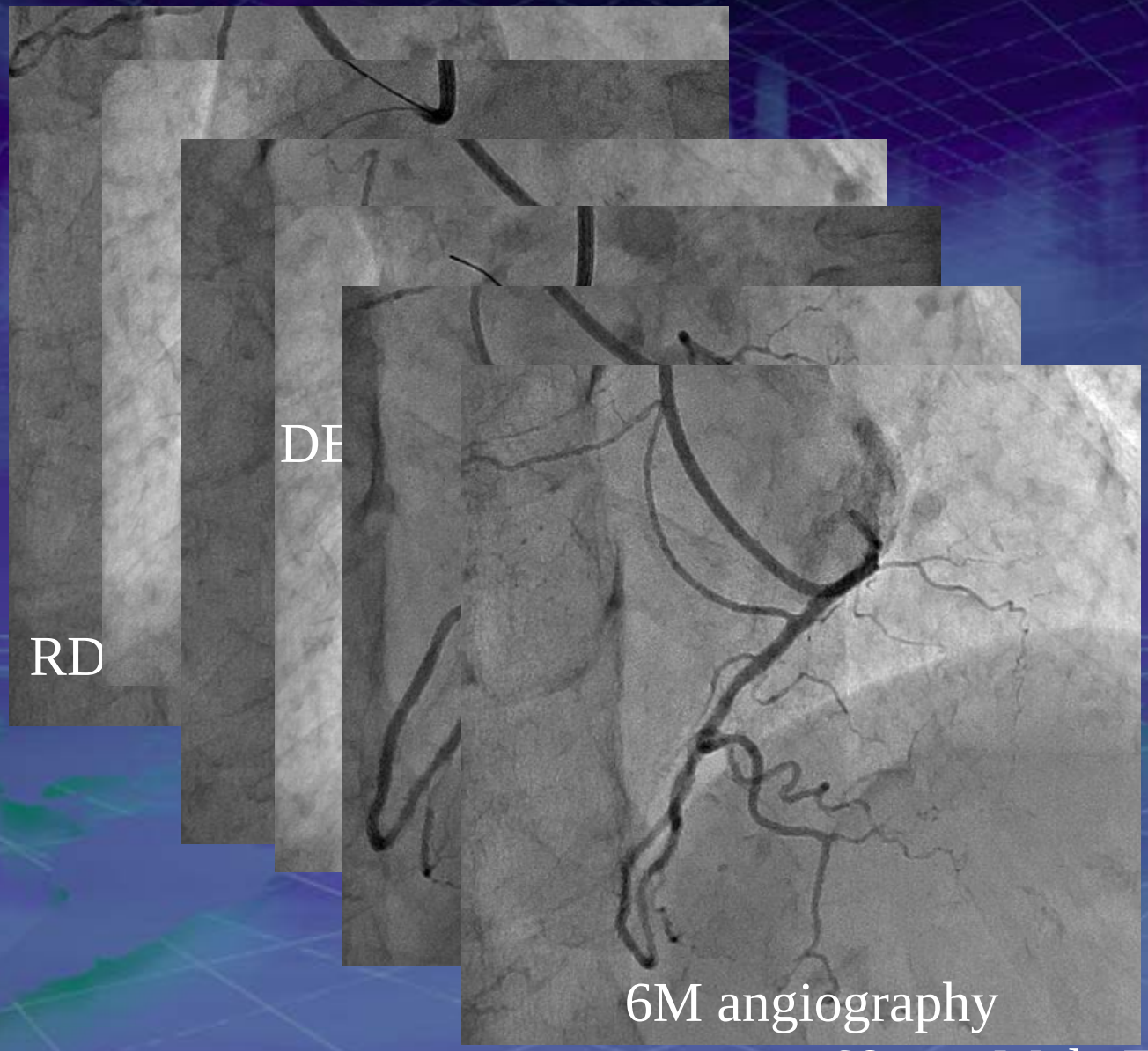




	Restenosis (N=13)	No restenosis (N=16)	p
Geographic mismatch	10 / 13 (77 %)	3 / 16 (19 %)	0.029
Total stent length	19.4 ± 8.4 mm	14.4 ± 10.2 mm	0.035
Balloon length – stent length	-2.31 ± 10.72 mm	2.75 ± 7.71 mm	0.096



74 y.o. Male Effort angina



68 y.o. Male Effort angina

Conclusion

- ✓ Consider the indication of PCI for SVD
- ✓ Manage diabetes and diffuse disease
- ✓ Minimum late loss is key
- ✓ Second generation DES
- ✓ Special technique is needed for the prevention of edge dissection and to get wide lumen area
- ✓ Drug eluting balloon might be another option