

Recent Progress of CTO Intervention and Long-term Outcome After DES Implantation in CTO

New Tokyo Hospital Department of Cardiology

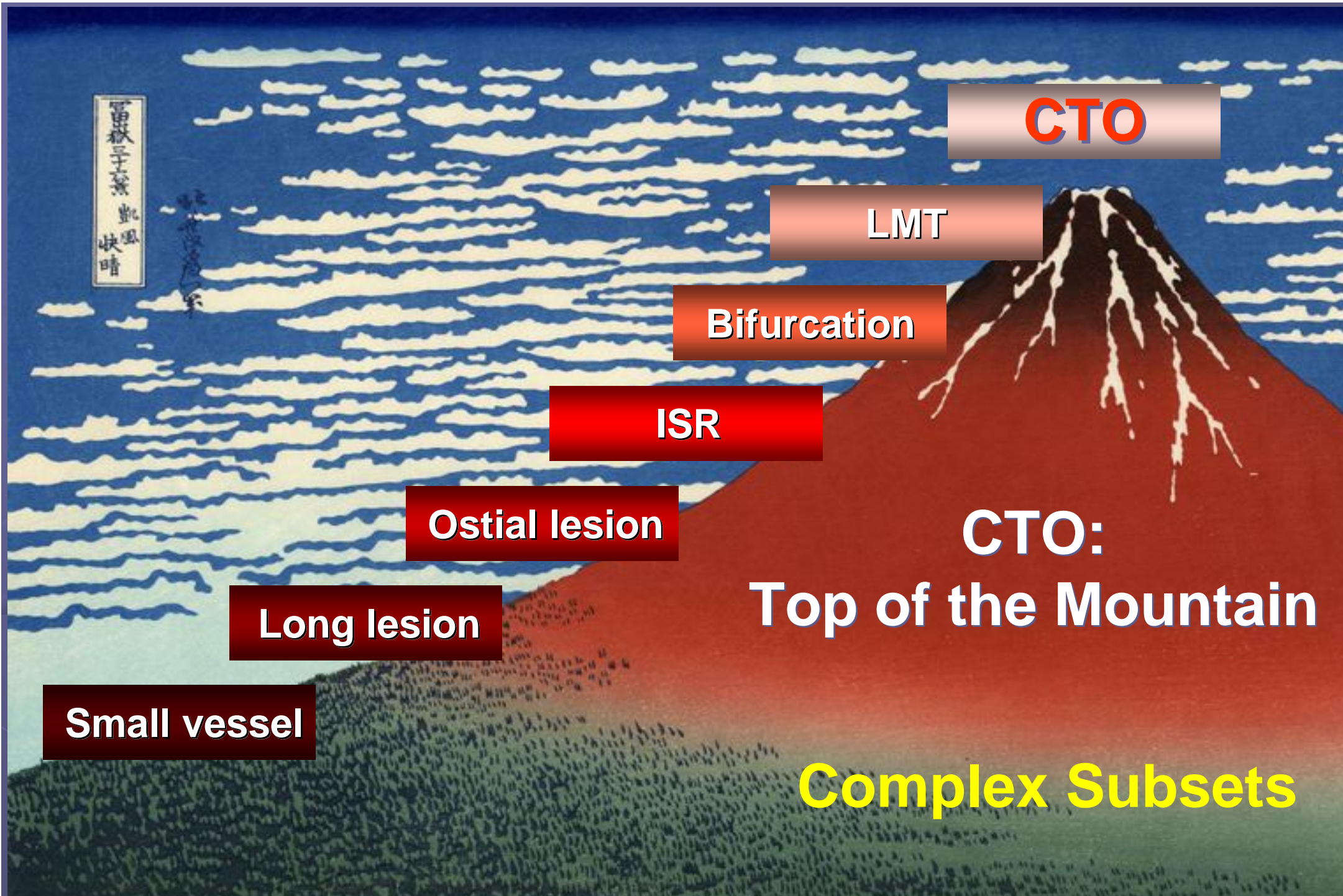
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FACC, FAHA, FESC, FSCAI, FJCC, FAPSIC

Disclosure of Conflicts

**Nothing to disclose
regarding in this presentation.**



CTO

LMT

Bifurcation

ISR

Ostial lesion

Long lesion

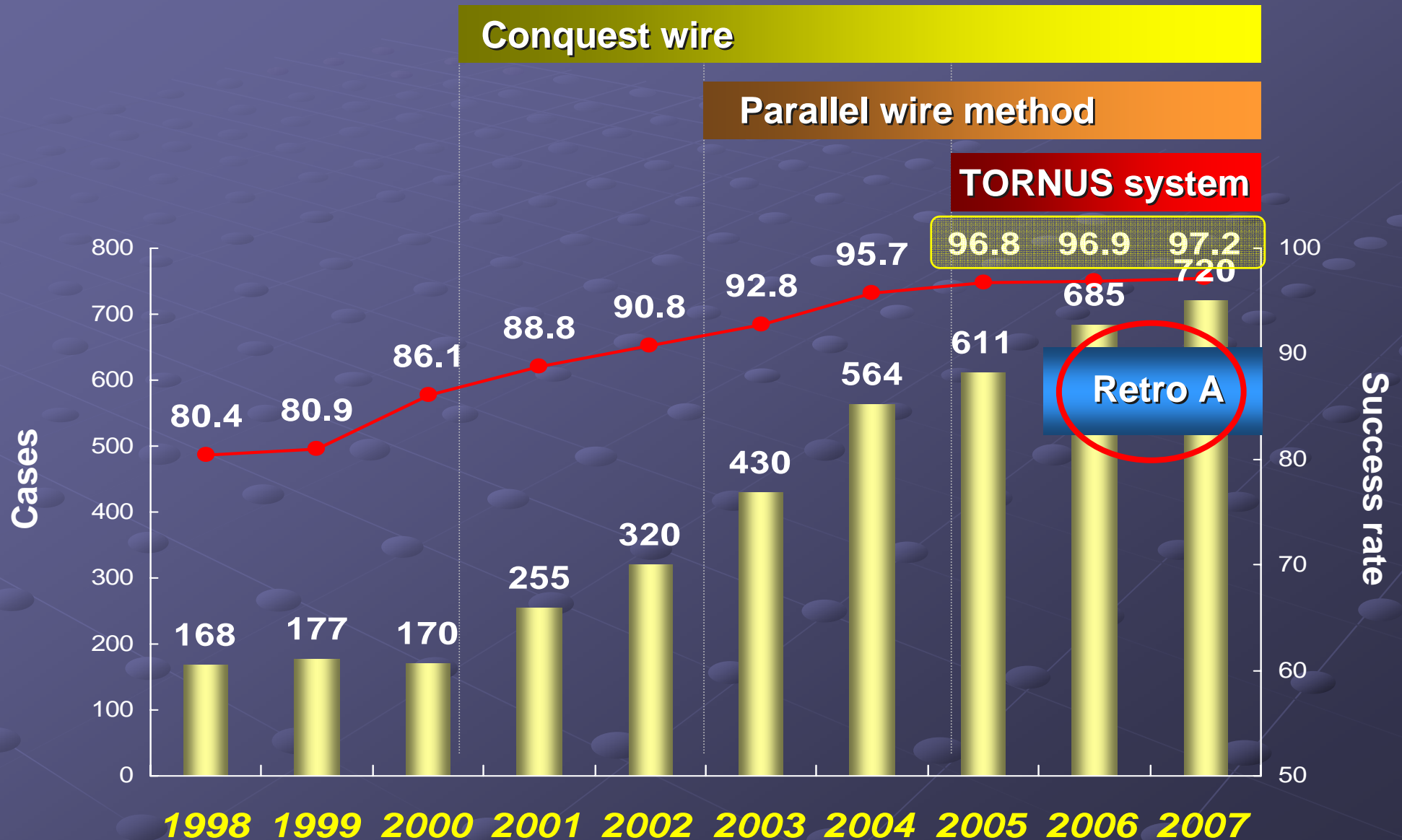
Small vessel

**CTO:
Top of the Mountain**

Complex Subsets

富嶽子雲 凱風 快晴

Changes of CTO Techniques and Success Rate



Technical Aspect of CTO Intervention

Recent Progress of PCI for CTO

(1) Technique

1. Parallel wire technique
2. Anchor balloon technique
3. Retrograde approach
4. IVUS guide approach



★ Well Understanding of CTO from Pathological and Physiological findings by CTA etc.

★ Findings from a lot of experience based evidence of Retrograde Approach.

Recent Progress of PCI for CTO



★ Big shift in Japan “Antegrade→Retrograde” approach” in CTO strategy(~40%)

★ Big shift in Japan “Usage of Hydrophilic Wire More and More” in case of Antegrade approach



★ CART technique, Reverse CART technique
.....And so many technique relating
Retrograde approach was introduced

Recent Progress of PCI for CTO

(2) Device

1. Development of Guidewire

Hard type Miracle Guidewire (3,6,12g): Asahi Intec Co

Conquest Guidewire(9,12,8-20): Asahi Intec Co

Athlete Magic Guidewire: JapanLifeLine

Soft type: Fielder FC, XT Guidewire →

Other Company 10 system(Thin-GW) →

2. Tornus catheter system

Tornus (regular, 88system), Channel Dilator (Crossair)

3. Balloon and Microtube-cathMany !!!!!

4. DESMany

Recent Progress of PCI for CTO

However....

From technical point of view, most important point of PCI of CTO is to Open the CTO with high success rate and without any complication.



You should select the appropriate technique which you are familiar with and is highly probable way to success. Even Retro or Antegrade ??

We already confirmed the short-term efficacy of DES regarding reducing the restenosis

Remaining Subjects

1. Long-term durability
2. Other DES also effective ?
3. Stent Thrombosis

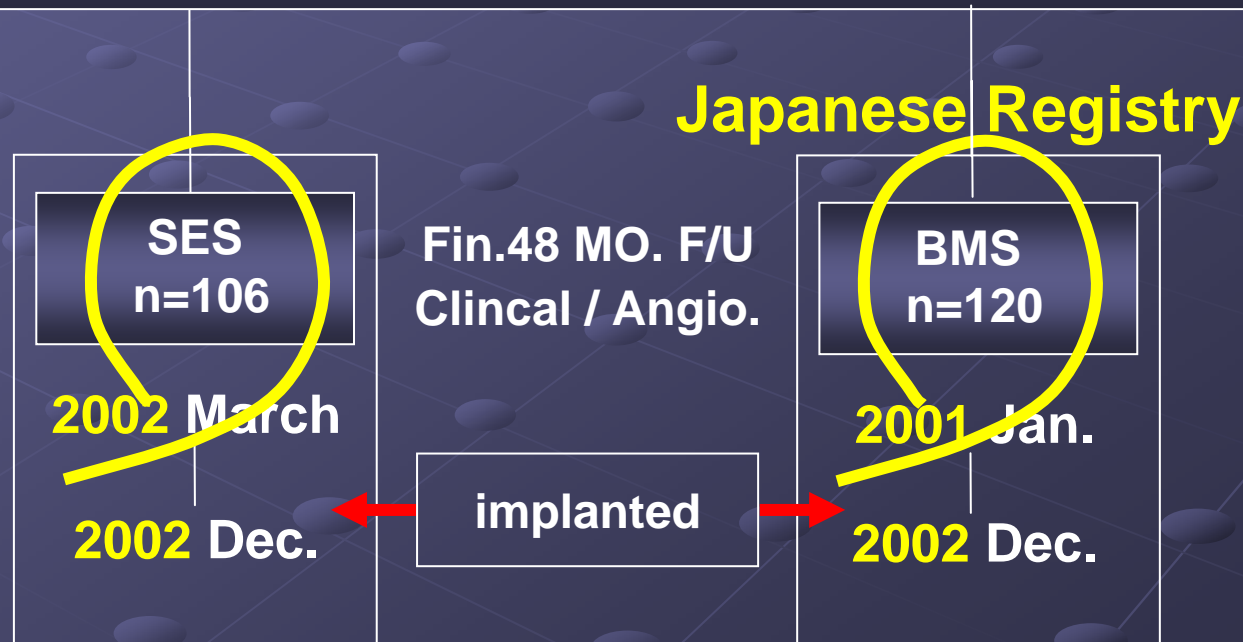
*Four-Year Durability of Sirolimus-Eluting Stent
in Patients with Chronic Total Occlusions
Compared with Bare Metal Stent :
Multicenter Registry in Asia*

TCT 2007

Study Patients

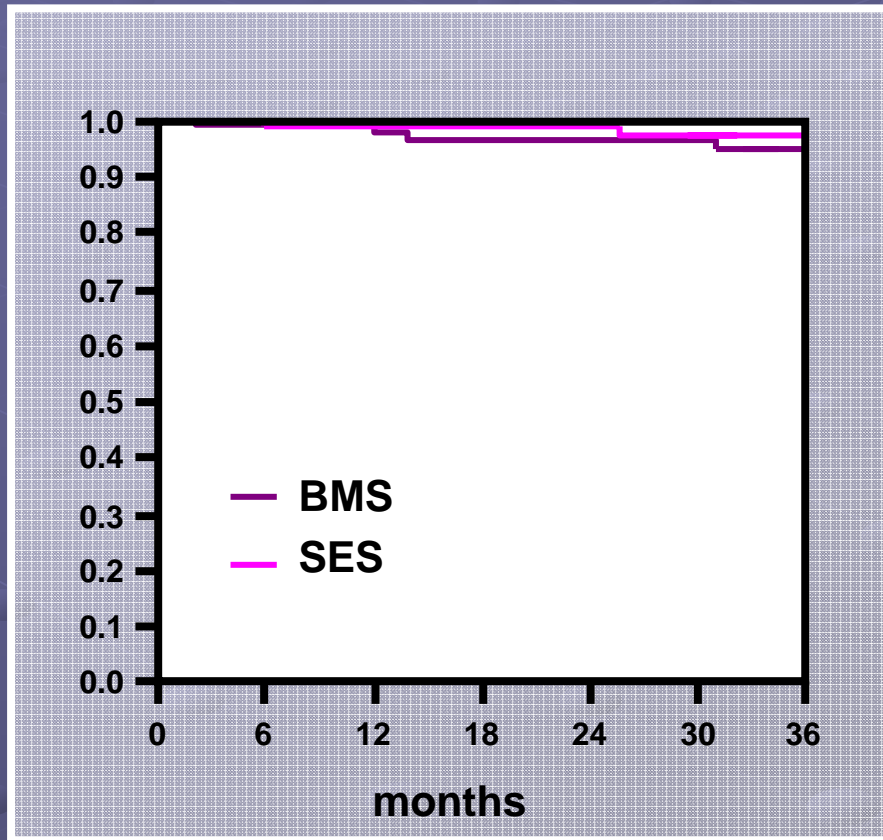
- Patient cohort includes 226 patients with CTOs in our data-base, treated with Sirolimus-eluting stent (SES), Bare Metal Stent (BMS) with 4 years follow up.

Asian Multicenter DES-CTO Registry Total 796 patients

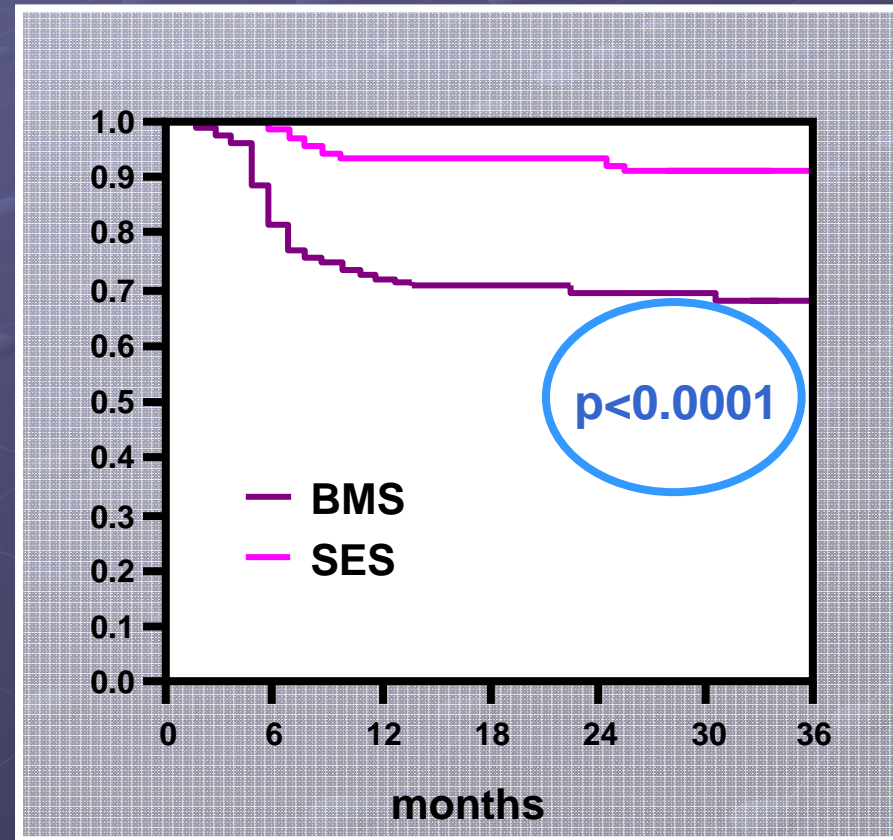


4 Years Event Free Survival

All Cause of Death



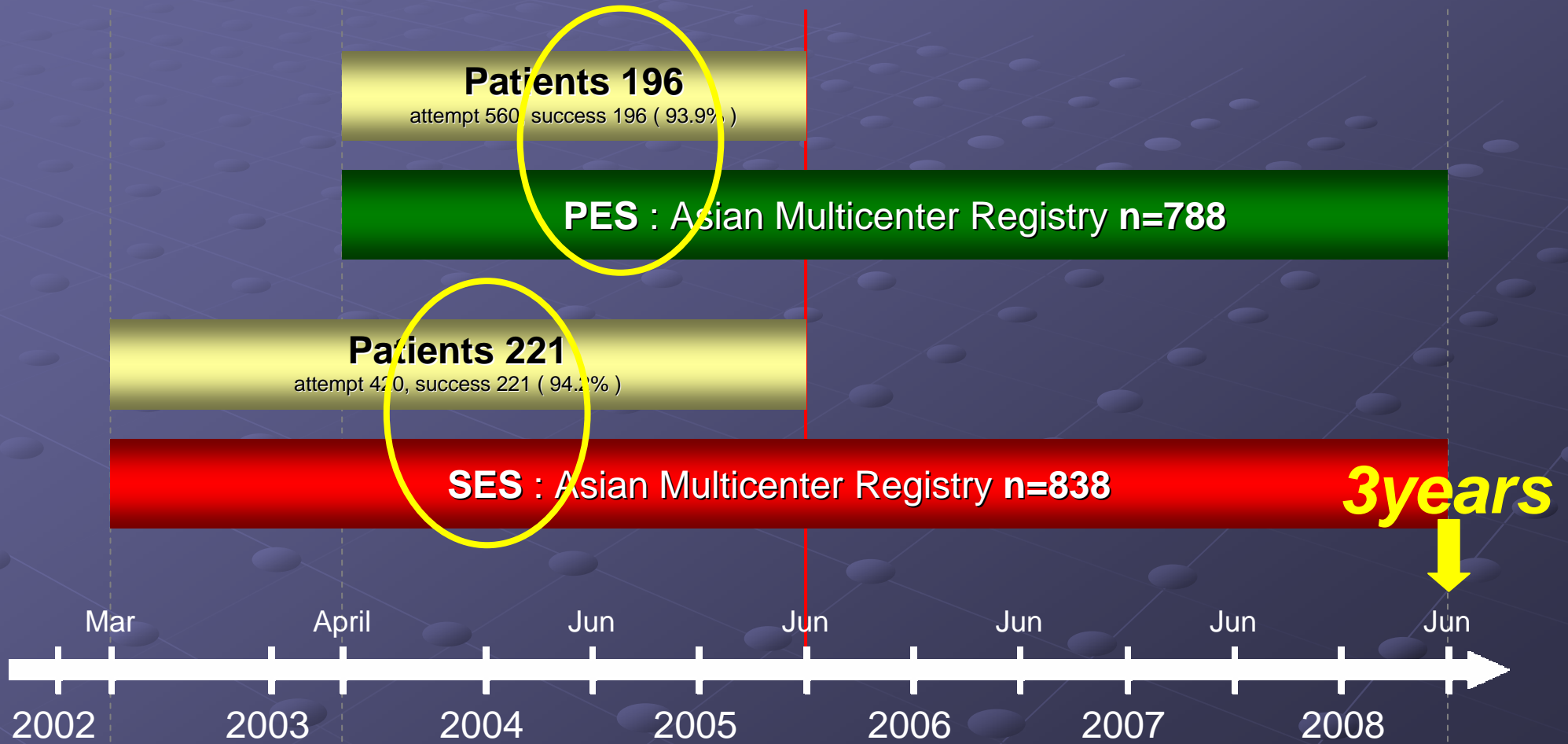
Death, MI, TVR, TLR



**Comparison of 3 Years Efficacy and Durability of
Sirolimus-Eluting Stent and Paclitaxel-Eluting Stent
in Patients with Chronic Total Occlusions:
Multicenter Registry in Asia**

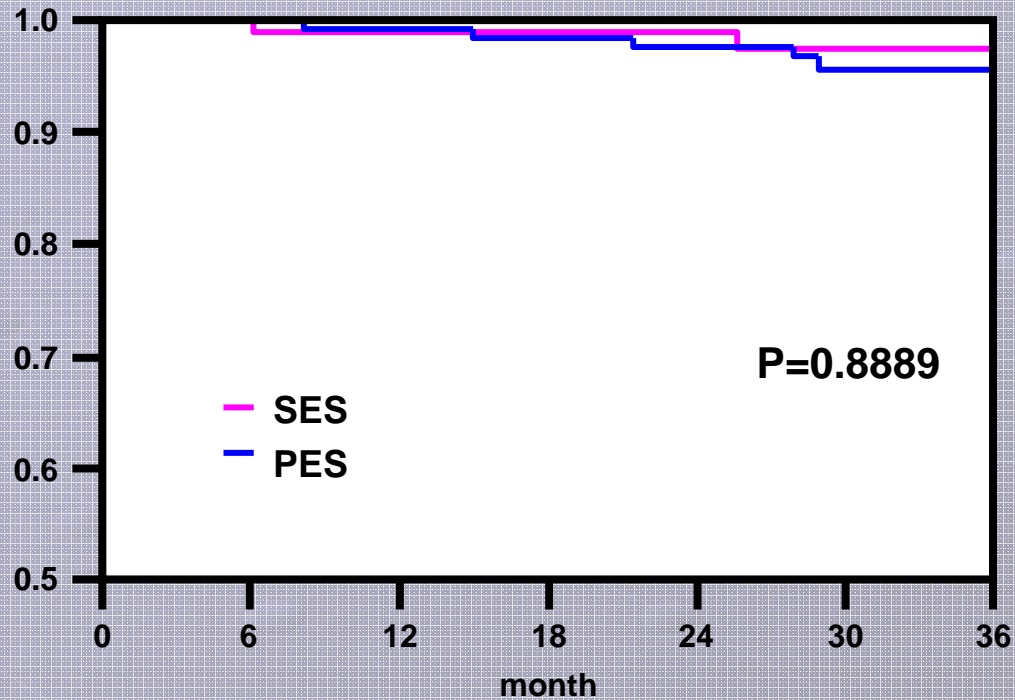
ESC 2008

Study Patients

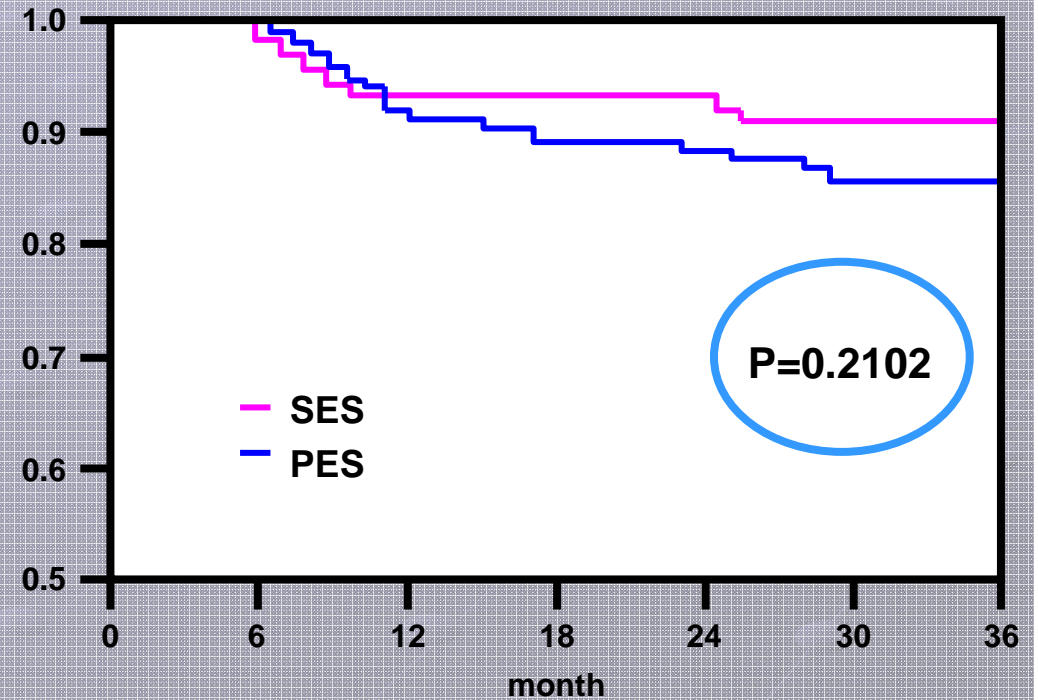


3 Years Event Free Survival

All Cause of Death

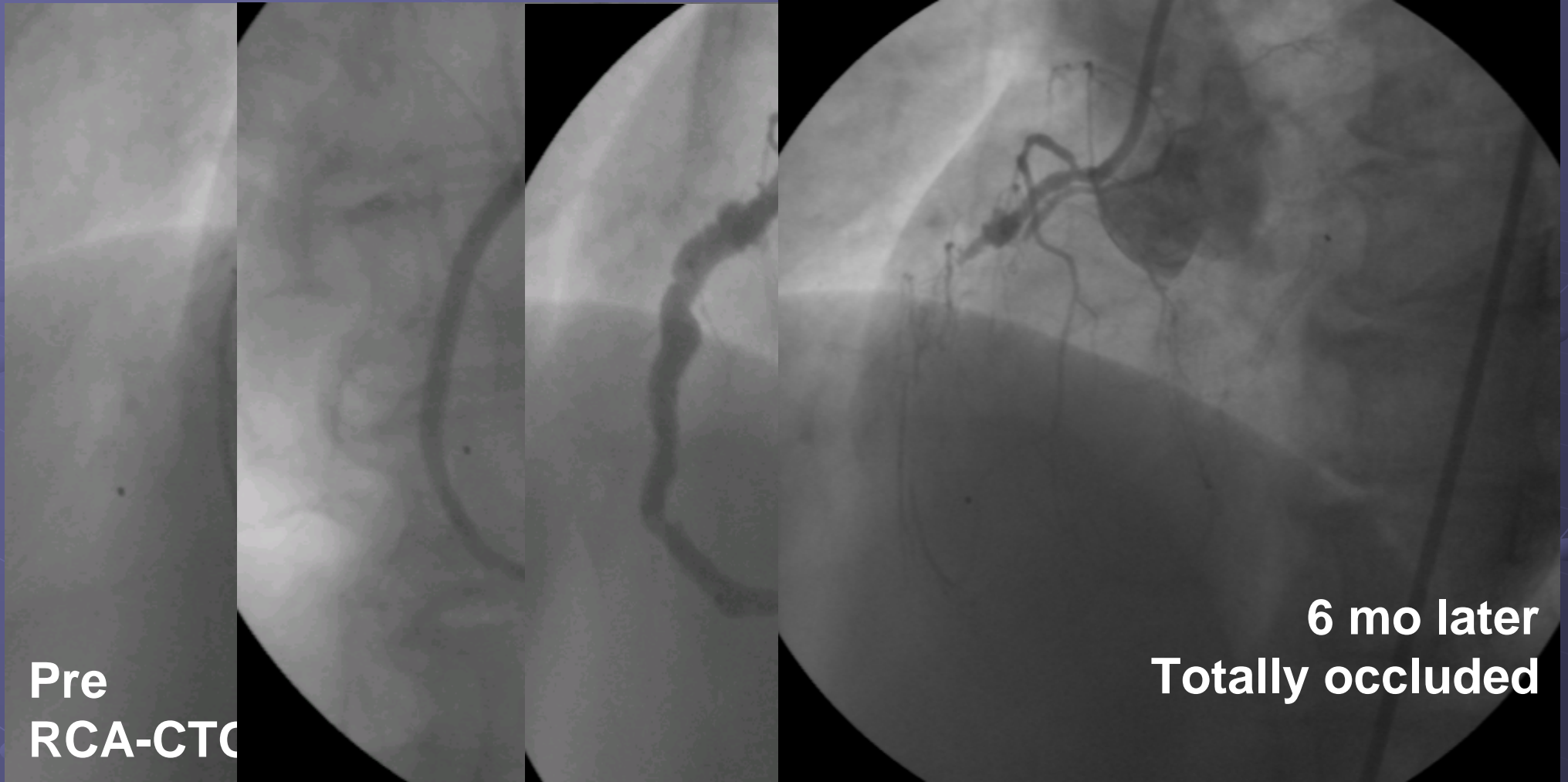


MACE



Case 1: RCA CTO

TAXUS



Remaining Subjects

1. Long-term durability
2. Other DES also effective ?
3. Stent Thrombosis

*Drug-Eluting Stents for the Treatment of
Chronic Total Occlusion: A comparison with
Sirolimus, Paclitaxel, Zotarolimus, EPC Capture
and Everolimus-Eluting Stent
-Multicenter Registry in Asia-*

AHA 2008

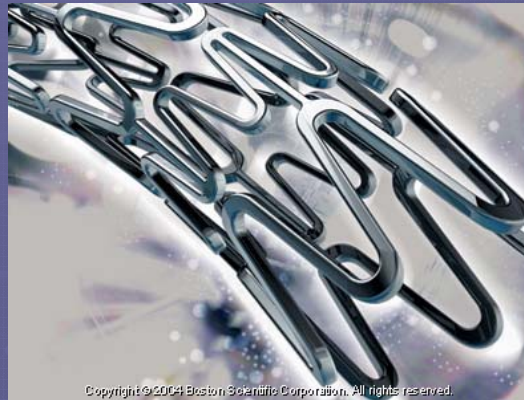
CYPHER™

Cordis, Johnson & Johnson
Sirolimus-Eluting Stent



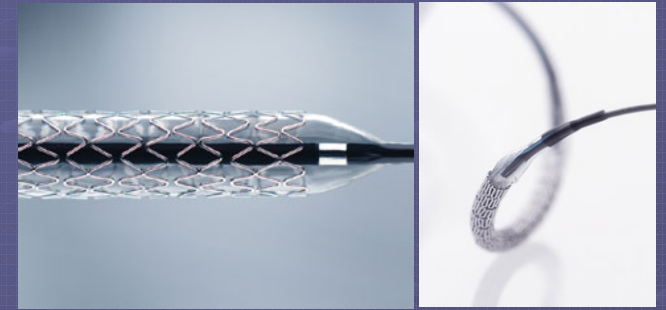
TAXUS™

Boston Scientific
Paclitaxel-Eluting Stent



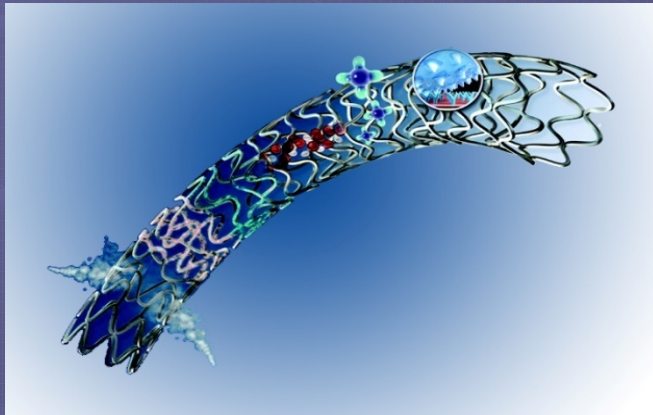
ENDEAVOR™

Medtronic
Zotarolimus-Eluting Stent



Genous™

OrbusNeich
EPC-Capture Stent



XIENCETM

Abbott Vascular
Everolimus-Eluting Stent



Study Patients

- Patient cohort includes **1,082 patients** with CTOs in our data-base, treated with Sirolimus-eluting stent (SES), Paclitaxel-eluting stent (PES), Zotarolimus-eluting stent (ZES), EPC capture stent (ECS) and Everolimus-eluting stent (EES).

Asian-Multicenter DES-CTO Registry Total 1,082 patients



Antiplatelet Therapy

1. Aspirin 100 mg / day

2. Clopidogrel 75 mg / day

12 months long

(with loading dose 300 mg: 1 day)

*EPC Capture stent 1 month long

Study Endpoints

Primary End Point

- ◆ 30 days MACE
- ◆ 12 months MACE

Secondary End Points

- ◆ 12 months angiographic restenosis rate

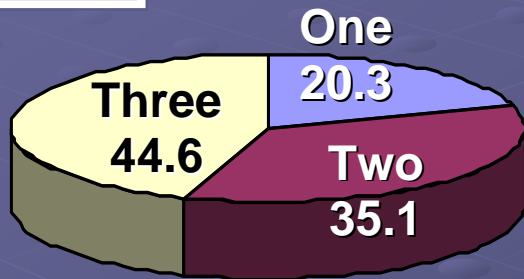
Baseline Characteristics

	SES (n=365)	PES (n=482)	ZES (n=154)	ECS (n=39)	EES (n=42)
Age (yrs:mean)	68.8	67.9	68.9	69.7	69.1
Male (%)	73.9	70.1	64.9	78.9	71.4
Coronary risk factor (%)					
Hypertension	52.1	51.9	57.8	51.3	50.0
Hyperlipidemia	30.1	27.0	32.4	39.5	38.0
Diabetes mellitus	30.7	28.8	26.0	33.3	33.0
Current smoker	52.1	47.7	64.9	54.5	52.4
Prior MI (%)	27.4	27.4	24.7	38.5	33.3
LVEF (%:mean)	47.8	48.3	49.5	47.8	48.8

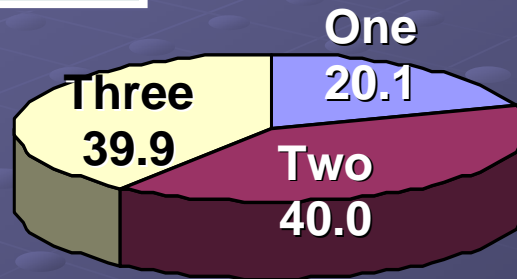
Angiographic Lesion Characteristics

Numbers of Diseased Vessels

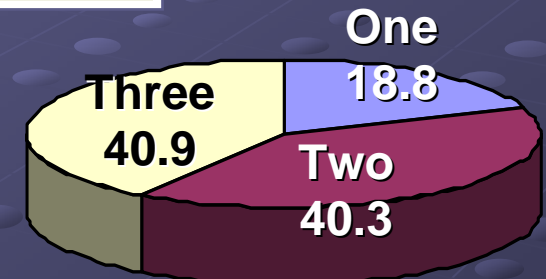
SES



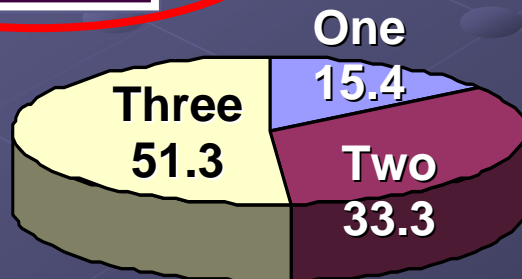
PES



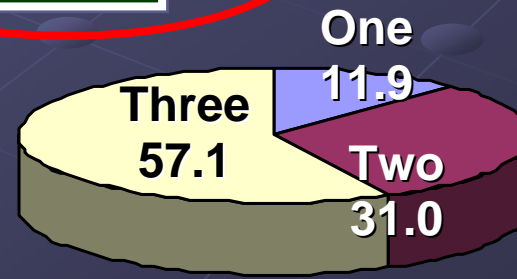
ZES



ECS



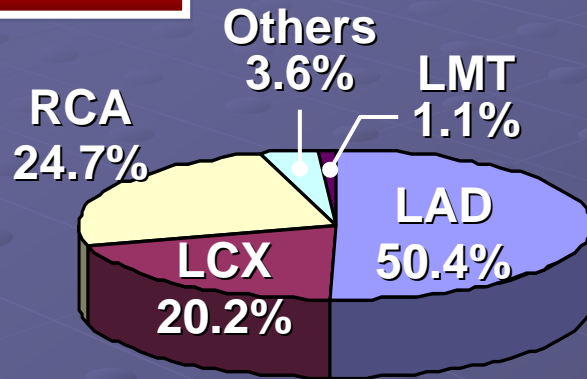
EES



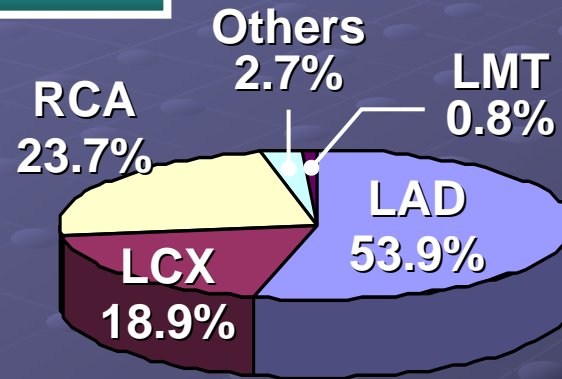
Angiographic Lesion Characteristics

Location of CTO

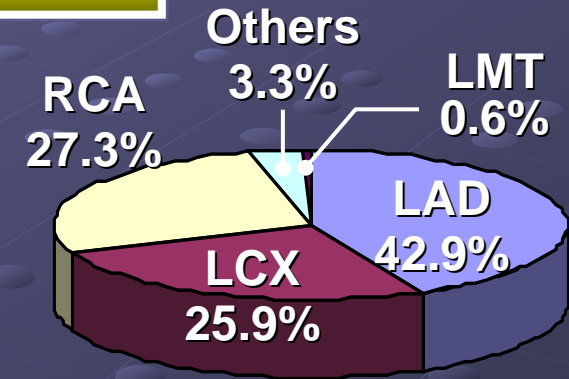
SES



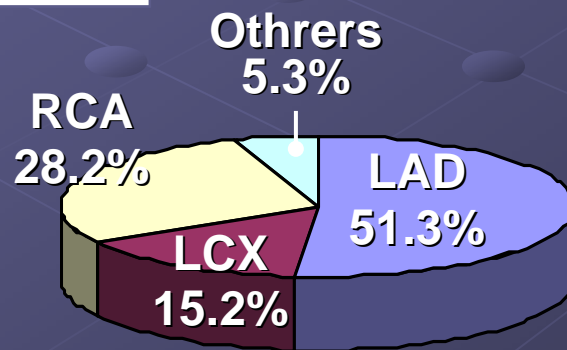
PES



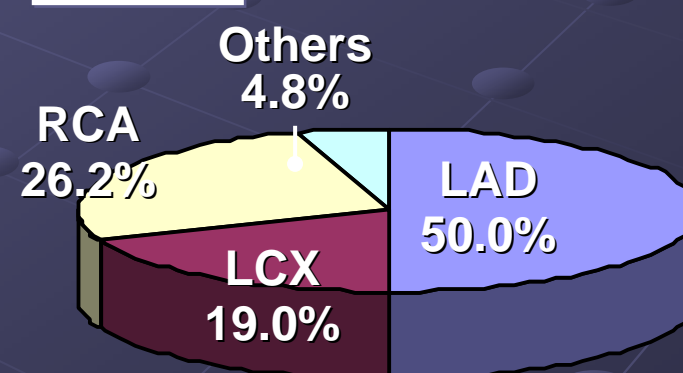
ZES



ECS



EES



Angiographic and Procedure Characteristics

	SES (n=365)	PES (n=482)	ZES (n=154)	ECS (n=39)	EES (n=42)
Reference diameter (proximal) (mm:mean)	2.85	2.81	2.79	2.92	2.92
MLD post stenting (mm:mean)	2.64	2.57	2.56	2.67	2.70
Angiographic calcification (%)	68.5	58.1	66.2	76.9	71.4
Side branch: present (%)	27.4	30.1	50.0*	25.6	47.6*
Lesion length (mm:mean)	37.5	39.8	35.2	28.9†	27.8†
Stent length (mm:mean)	44.8	47.1	43.8	37.9†	35.5†
Maximal inflation pressure (atm:mean)	19.9	19.5	18.9	19.0	19.2
Stent overlap (%)	90.4	87.1	90.3	88.5	88.0

*p<0.05 vs SES, PES and ECS. †p<0.05 vs SES, PES and ZES.

Clinical Results: 30 Days Clinical Outcome

	SES (n=365)	PES (n=482)	ZES (n=154)	ECS (n=39)	EES (n=42)
Clinical success (%)	98	98	98	100	100
MACE (n)					
Death	0	0	0	0	0
QMI	2	2	1	0	0
Urgent CABG	0	0	0	0	0
Urgent PCI	2 (SAT)	3 (SAT)	1 (SAT)	0	0
SAT	2	3	1	0	0
Cardiac tamponade	2	2	0	0	0

SAT 0.6%

MI 0.6%

Clinical Results:

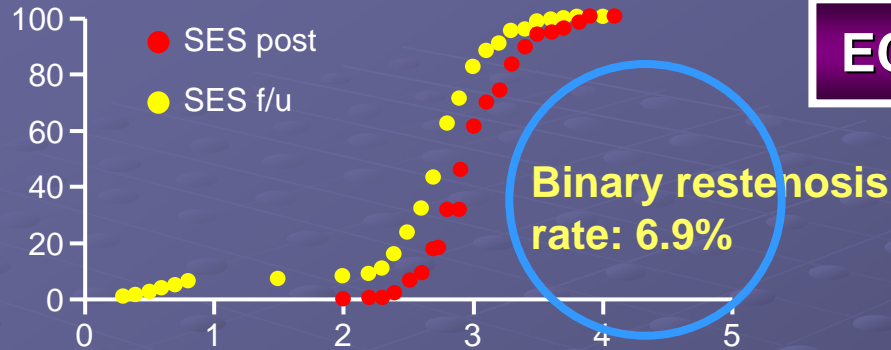
Follow-Up Clinical Outcome

	SES (n=365)	PES (n=482)	ZES (n=154)	ECS (n=39)	EES (n=42)
Ref. diameter (mm:mean)	2.85	2.81	2.79	2.92	2.92
MLD (mm:mean)	2.49	2.33	2.08	2.20	2.50
Late loss (mm:mean)	0.15	0.24	0.48*	0.47*	0.20
Loss index (%:mean)	5.7	9.3	18.8*	17.8*	7.4
Restenosis rate (%)	6.3	9.3	13.0*	15.4*	7.1
Re-occlusion rate (%)	0	0.8	1.3	2.5	0
TVR (%)	5.8	9.3	12.3*	12.9*	7.1
TLR (%)	4.4	8.3	11.0*	10.3*	4.8

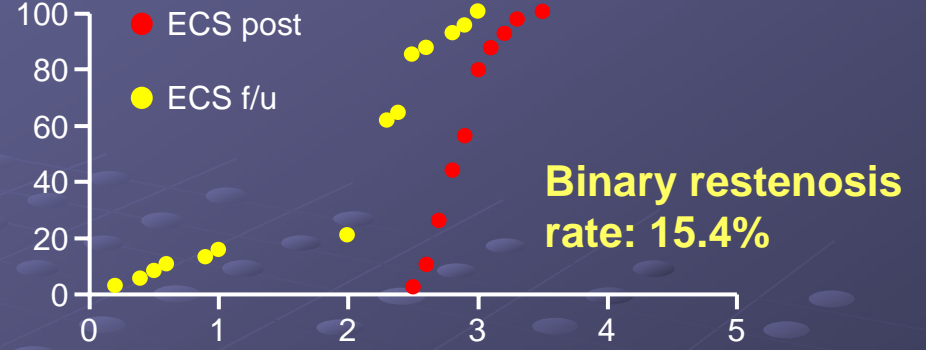
*p<0.05 vs SES, EES

Cumulative Distribution Curve of Changing MLD

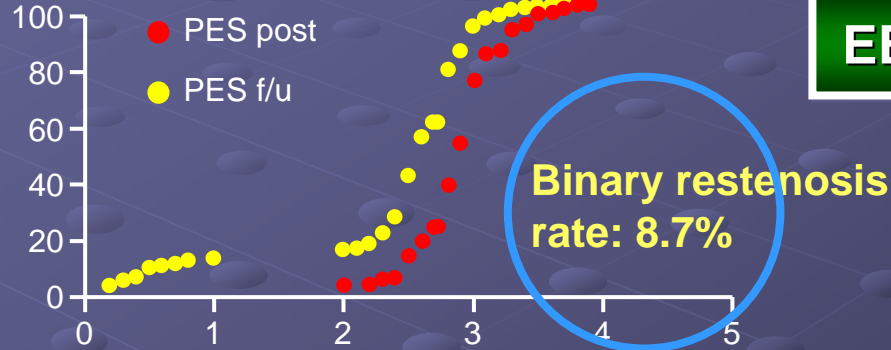
SES



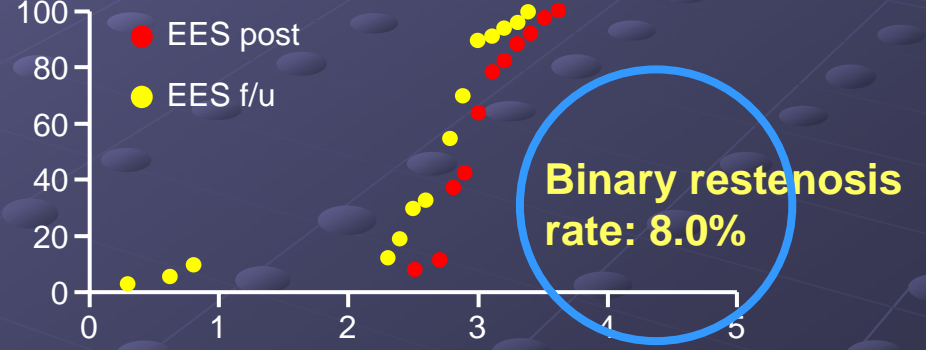
ECS



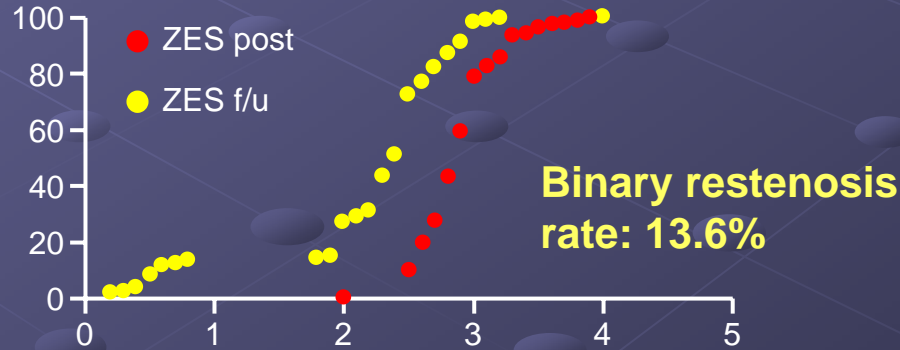
PES



EES



ZES



Predictor of Restenosis

	OR	95% CI	p
Stent length	1.129	1.082 – 1.179	<0.001
EF	0.896	0.868 – 0.925	<0.001
Bifurcation	3.669	2.171 – 6.202	<0.001

Stent (vs PES)

SES	0.406	0.215 – 0.765	0.0053
ZES	1.098	0.541 – 2.227	0.7956
ECS	4.522	1.443 – 14.18	0.0096
EES	2.214	0.513 – 9.550	0.2865

Independent Predictor of Thrombosis

	OR	95% CI	p
Lesion length	1.072	1.016 – 1.131	0.011
EF	0.931	0.874 – 0.991	0.026
Bifurcation	16.30	2.038 – 130.88	0.009

Clinical Results:

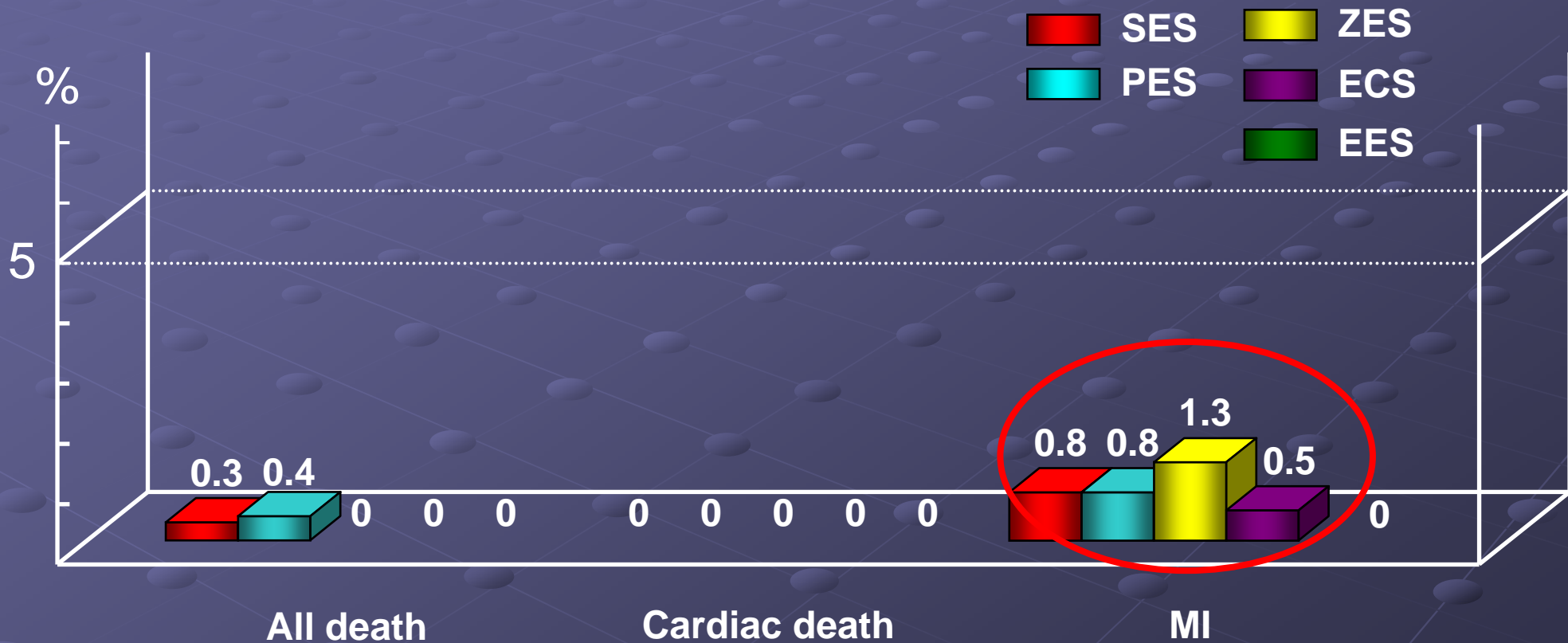
12 Mo Clinical Results

	SES (n=365)	PES (n=482)	ZES (n=154)	ECS (n=39)	EES (n=42)
MACE (%)					
Death	0.3	0.4	0	0	0
MI	0.8	0.8	1.3	0.5	0
LAST	0.5(2)	0.4(2)	0	0	0
CABG	0.5(2)	0.4(2)	0	0	0
Re-PCI	7.9	9.3	14.3*	15.4*	7.1
Any events (%)	8.7	10.3	15.6*	16.1*	7.1

*p<0.05 vs SES, EES

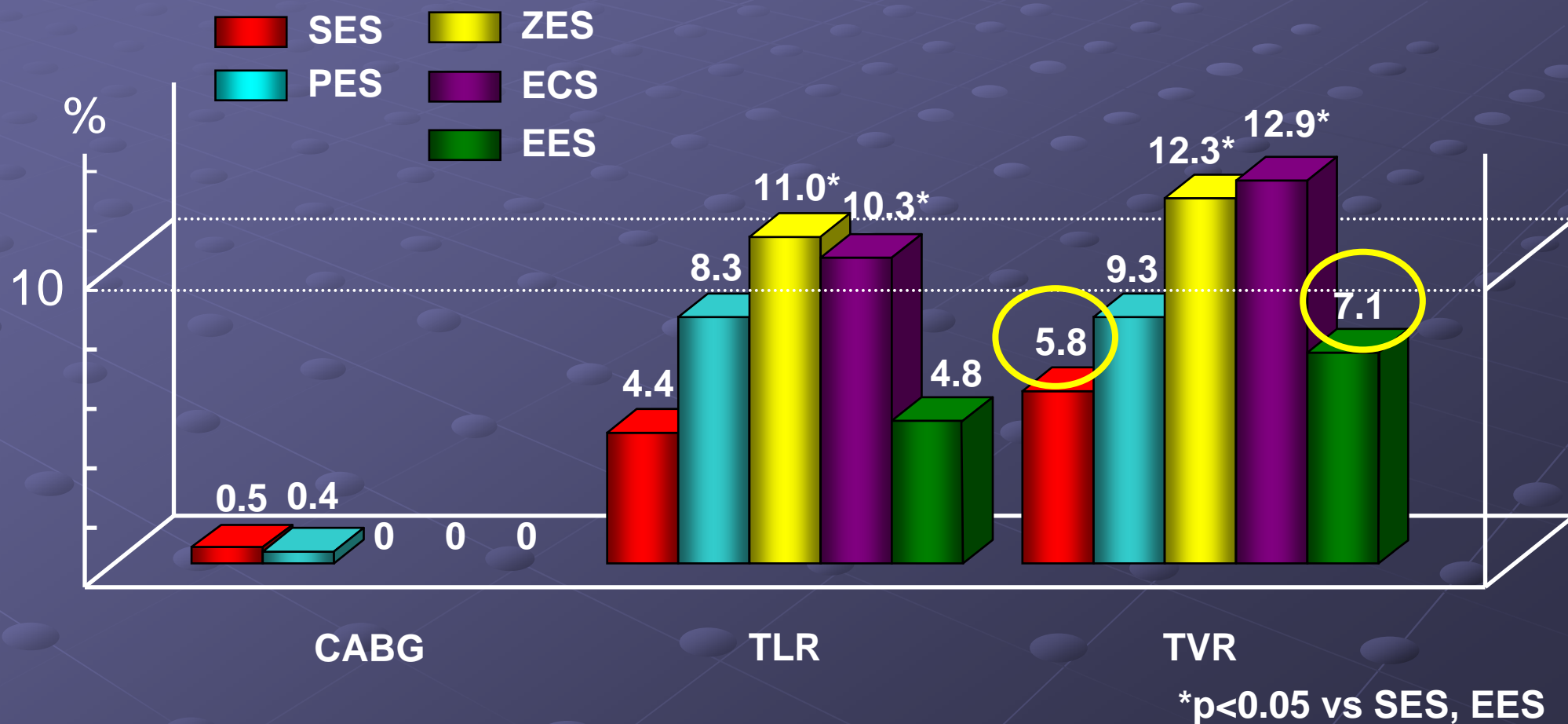
Clinical Results:

12 Mo MACE



Clinical Results:

12 Mo MACE

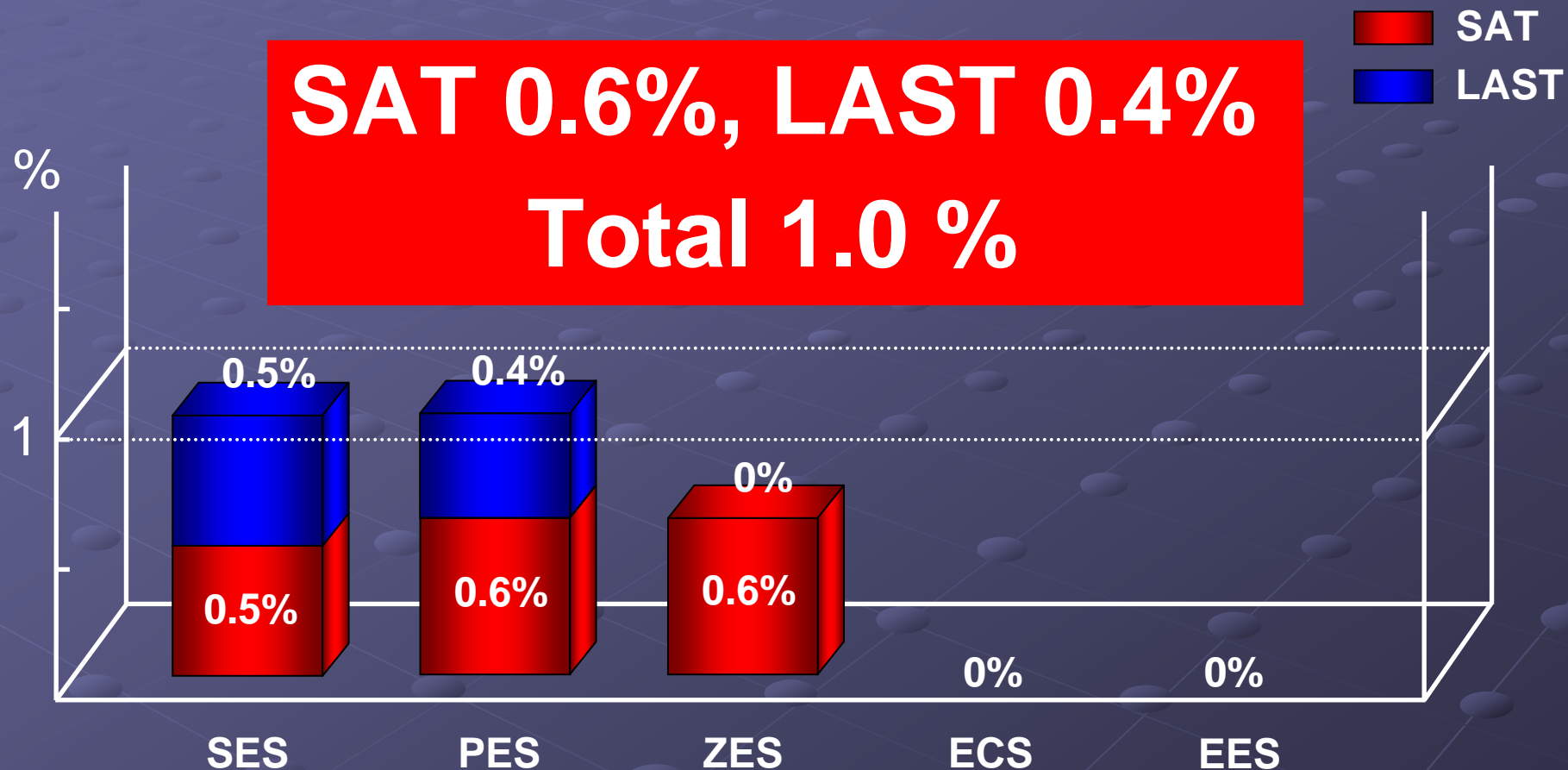


Remaining Subjects

1. Long-term durability
2. Other DES also effective ?
3. Stent Thrombosis

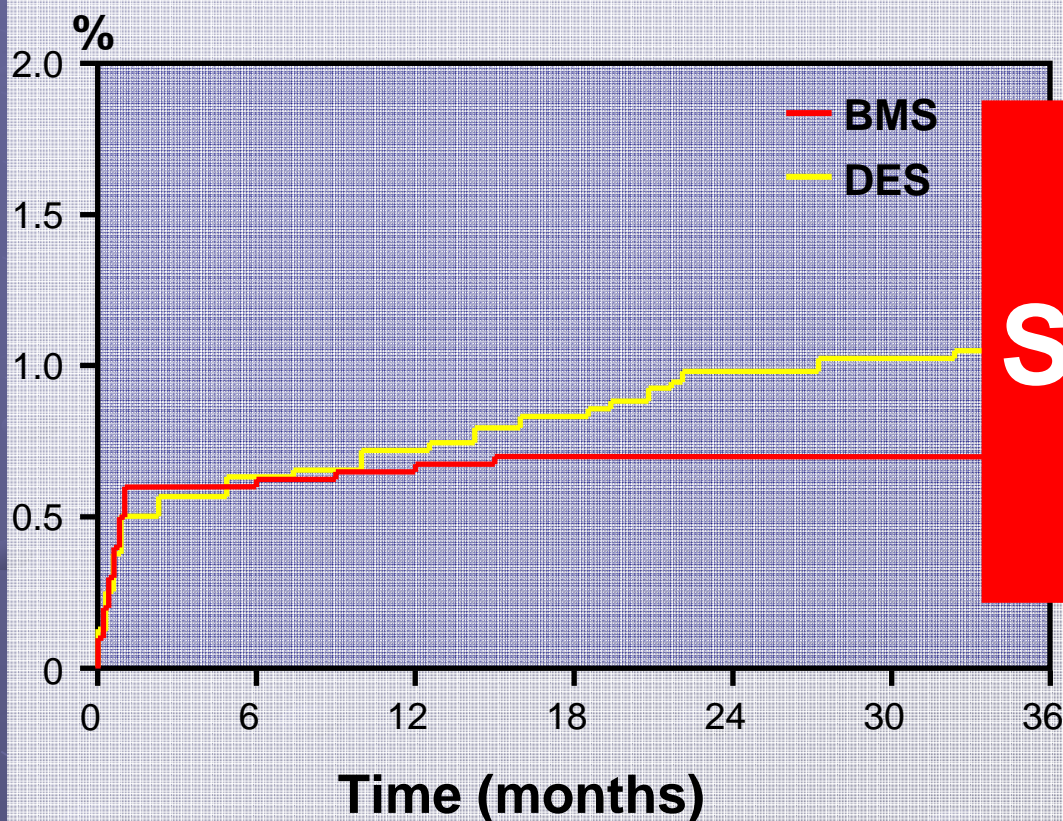
Clinical Results:

Thrombosis: 12 Mo

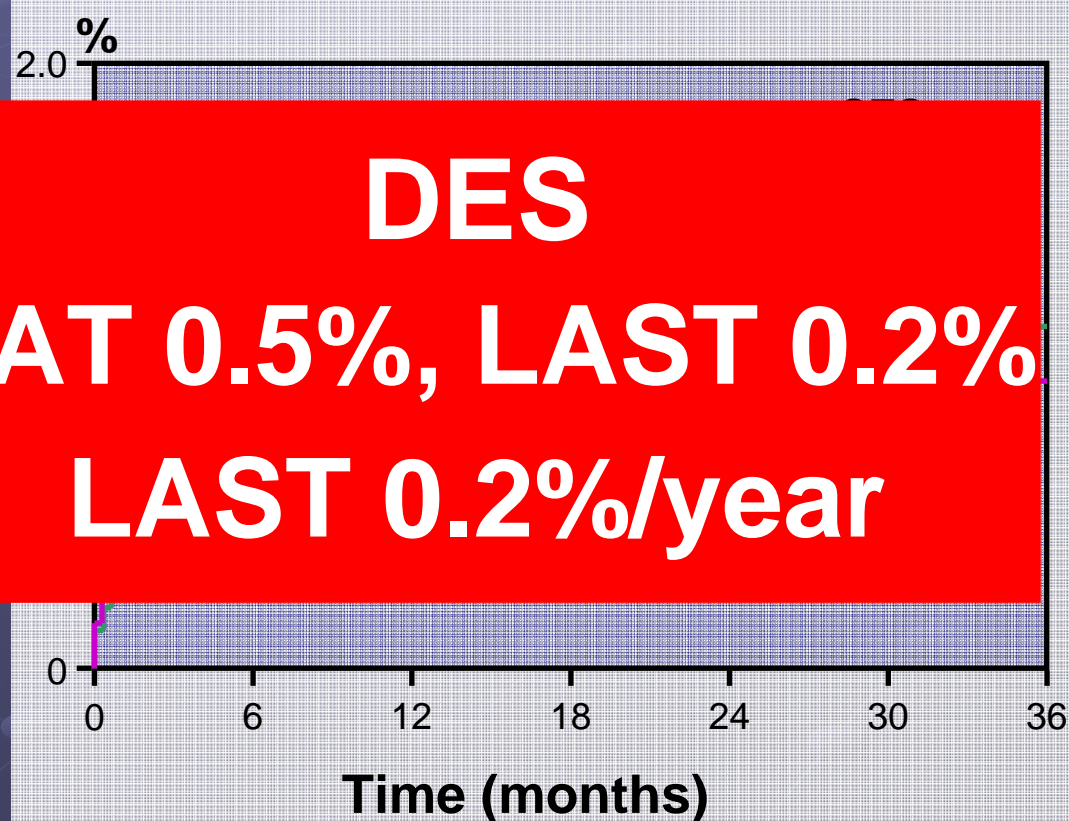


Stent Thrombosis in 8809 Pts: Asian races

BMS vs DES



SES vs PES



Summary 1

1. Recently we developed the new techniques such as parallel wire technique, sea-saw wiring technique, anchor wire technique, retrograde approach technique and IVUS guide technique to improve the initial clinical success rate of PCI for chronic total occlusions.
2. Treatment of chronic total coronary artery occlusions with the Sirolimus-eluting stent (SES), Paclitaxel-eluting stent (PES), Zotarolimus-eluting stent (ZES), EPC capture stent (ECS) and Everolimus-eluting stent (EES) are safe and feasible.
3. Implantation of the SES, PES, ZES, ECS and EES result in a larger MLD at follow-up and dramatically decrease the restenosis rate and target lesion revascularization.

Summary 2

4. Those clinical benefit in terms of reducing the restenosis due to strongly suppressing neo-intimal hyperplasia are durable at least 4 years (SES).
5. Incidence of **Stent thrombosis** after implantation of SES, PES, ZES ECS and EES in 1082 CTO cases of Asian population is **0.6% SAT** and **0.4% LAST** (1 year).
6. Patients treated with SES and EES showed the lesser rate of restenosis rate because of the lesser late loss compared with ZES and ECS.