2011년 순환기관련학회 춘계통합학술대회

~ Controversies of PCI in Complex Lesions ~

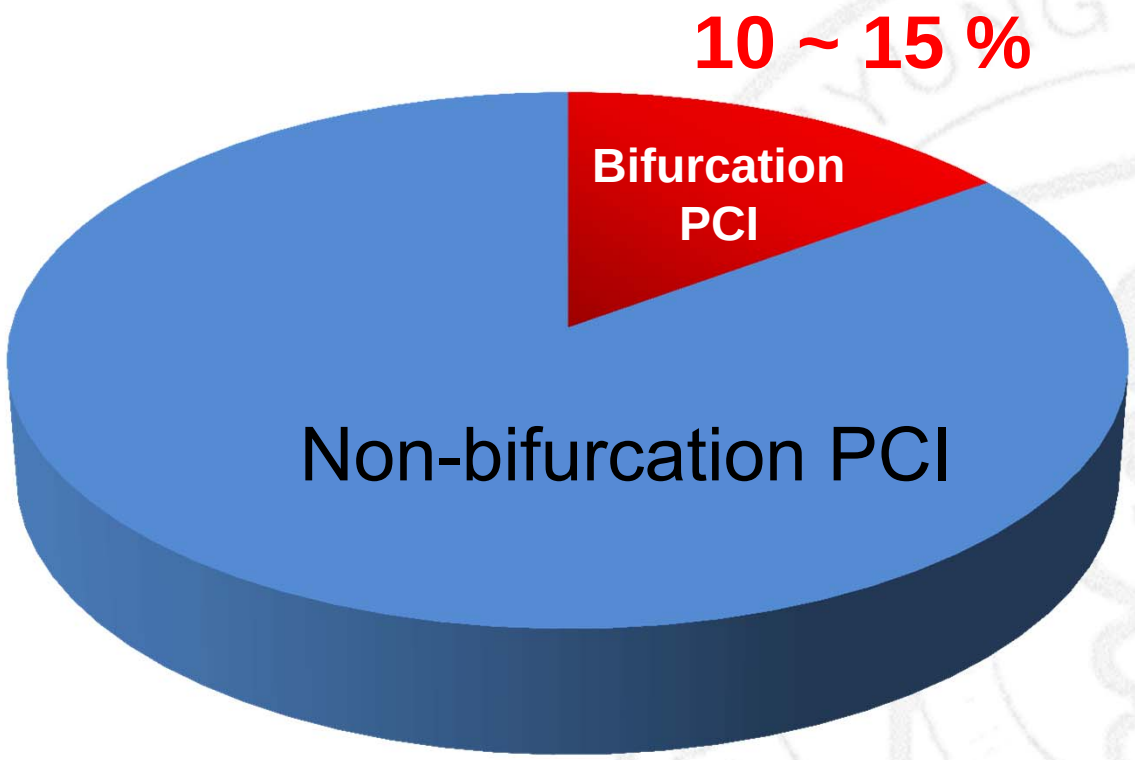
Non-Left Main True Bifurcation Lesion

One Stent Technique

계명의대 동산의료원
심장내과

허 승 호

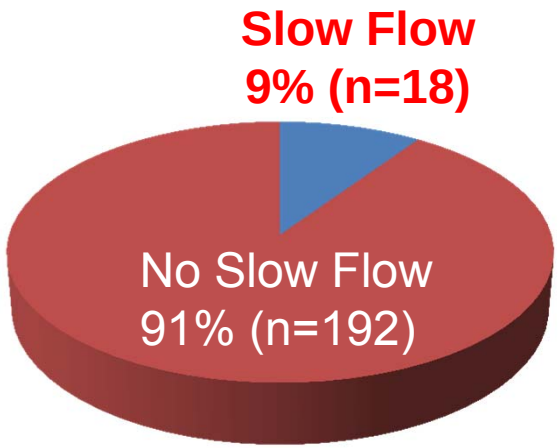
Prevalence of Bifurcation PCI



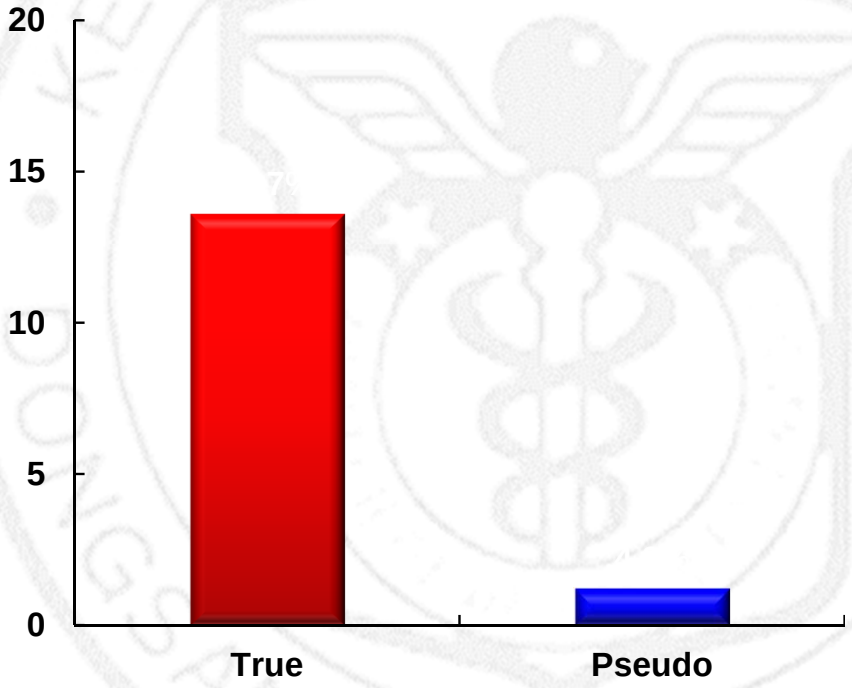
Garot P, et al. J Am Coll Cardiol. 2005;46:606-612
Al Suwaidi J et al. Am J Cardiol. 2001;87:1139-1144

SB Slow Flow after PCI

Side branch slow flow after main branch DES implantation

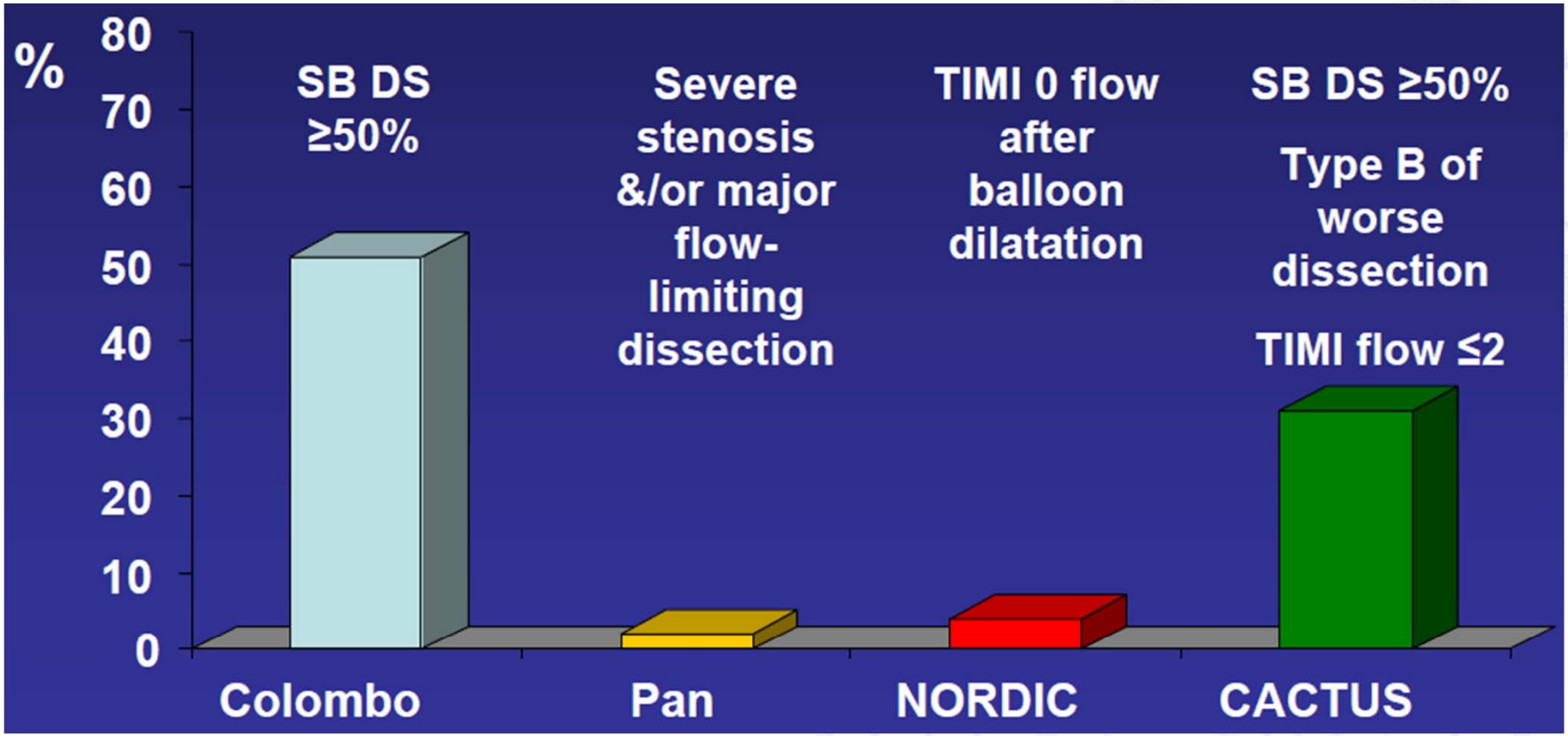


SB slow flow according to bifurcation type



Koo, et al. 2006 TCT

Various Criteria for SB Stenting



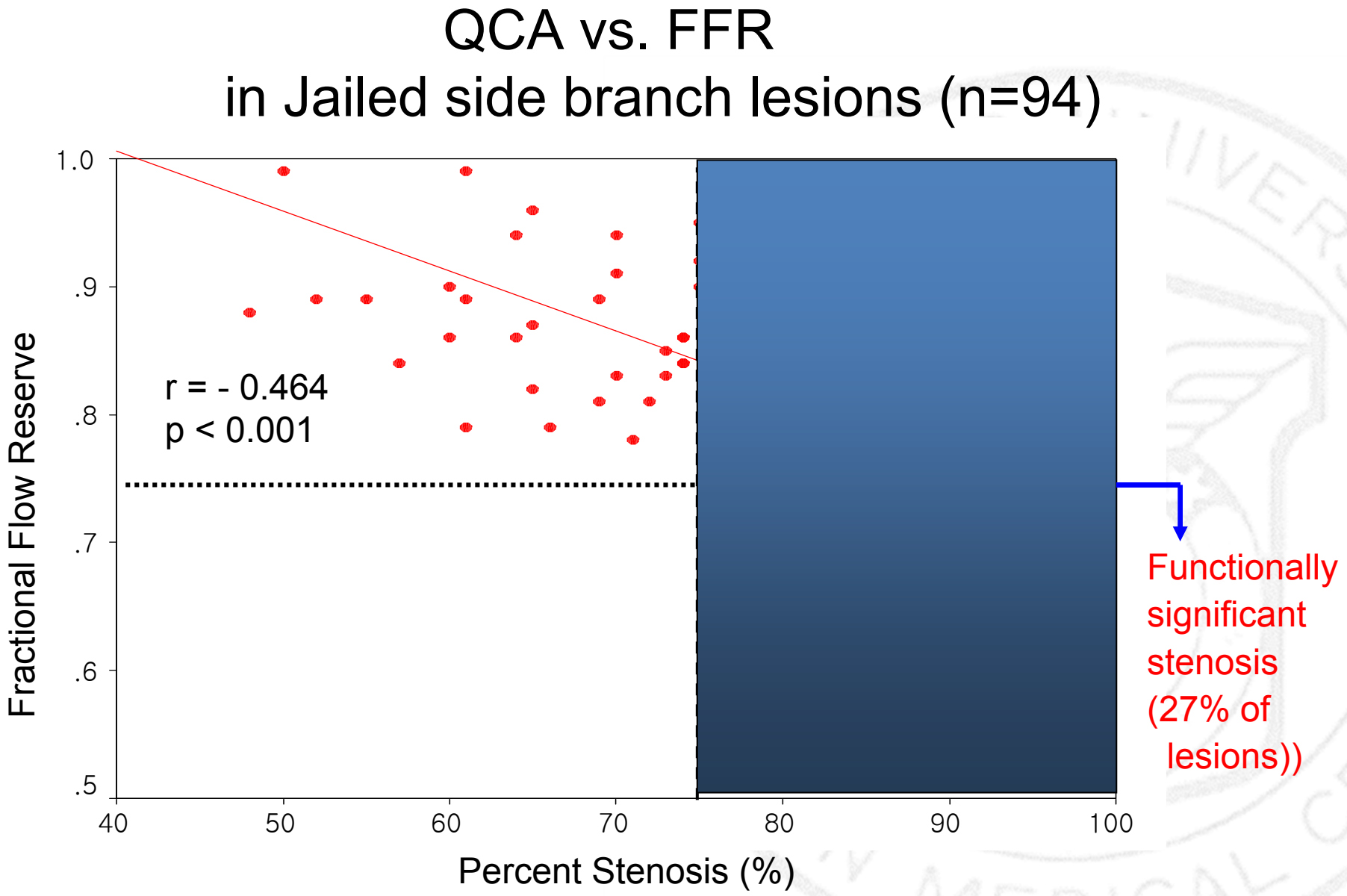
Crossover to a 2nd stent in the provisional stenting group of RCT

Colombo A, et al. Circulation 2004
Pan M, et al. Am Heart J 2004
Steigen TK, et al, Circulation 2006

Reasons for One Stent Preference in Bifurcation Lesion

1. • **Presence of Oculo-stenotic Reflex**
2.
3.
4.
5.

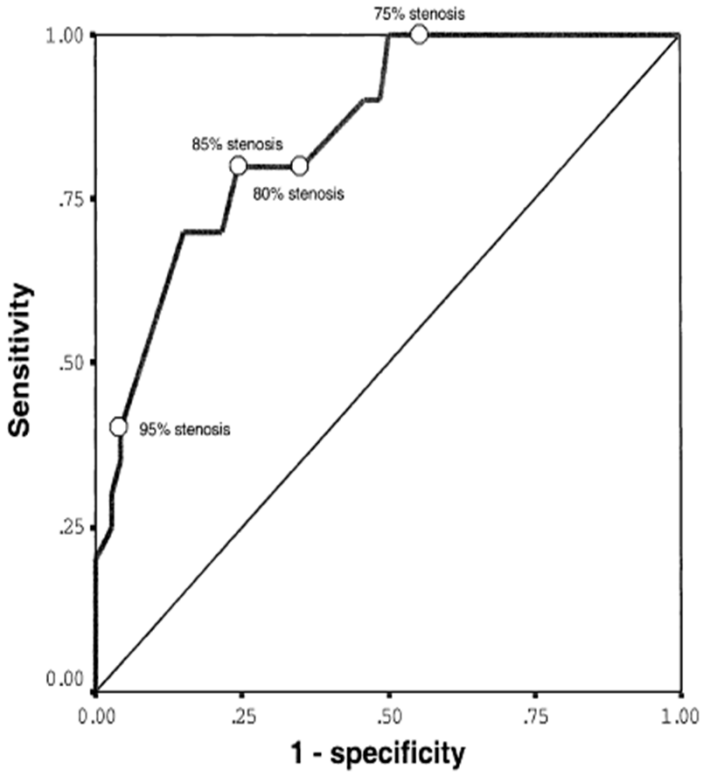
Ostium SB Stenosis is Overestimated by Angio



Koo BK, et al. JACC 2005

FFR Guided Provisional SB PCI

QCA vs. FFR
in Jailed SB lesions (n=94)



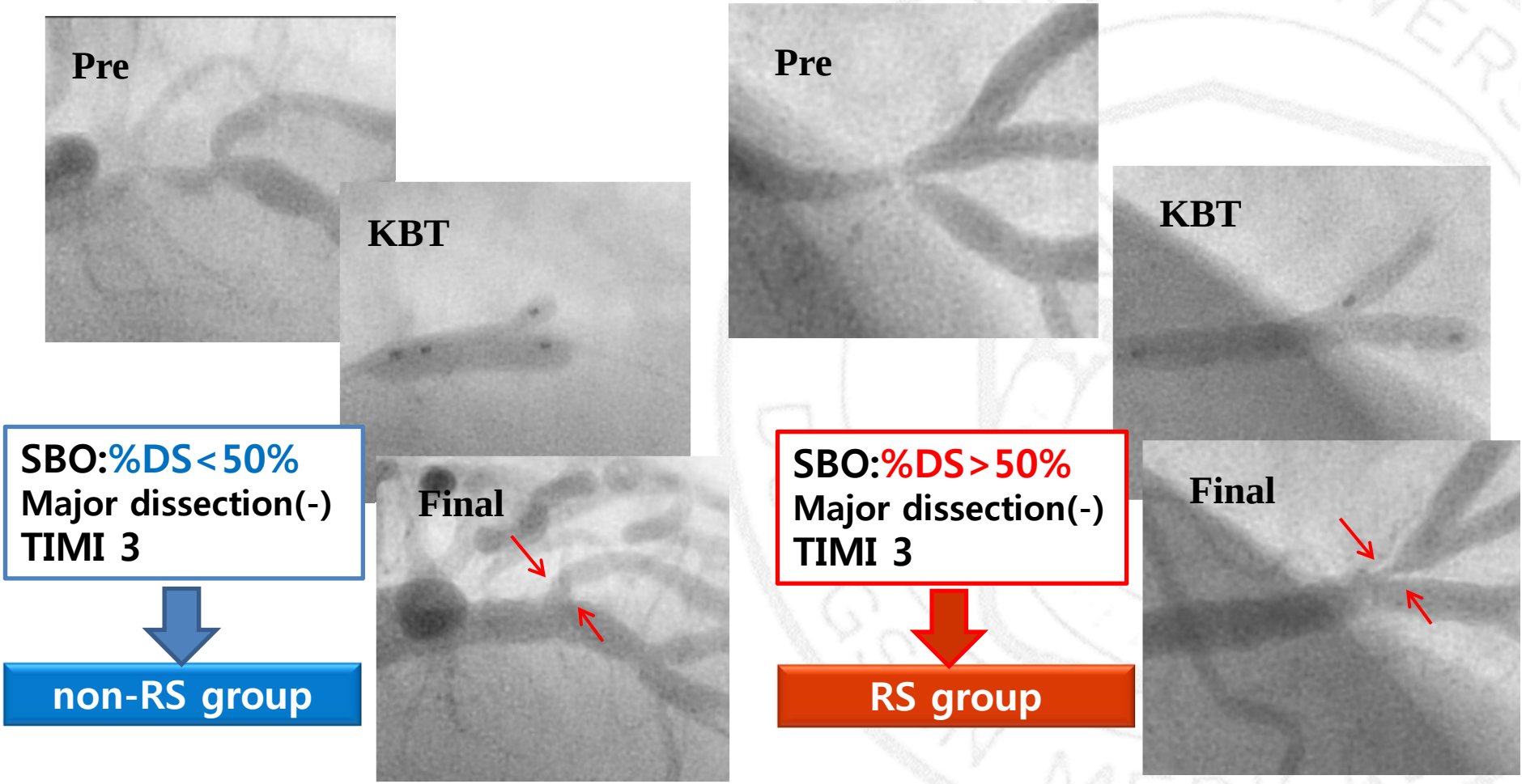
AUC: 0.85 (95% CI: 0.76 - 0.94)

% DS	Sensitivity	Specificity
75%	1.0	0.39
85%	**0.8**	**0.77**

Best Cut-off Value

Impact of Residual Side Branch Stenosis on Clinical Outcome after Single DES w/ FKB Inflation

Residual Stenosis at SBO: %DS>50% in visually, or major dissection (NHLBI type C, D or E). But, at least maintained TIMI 3 flow.



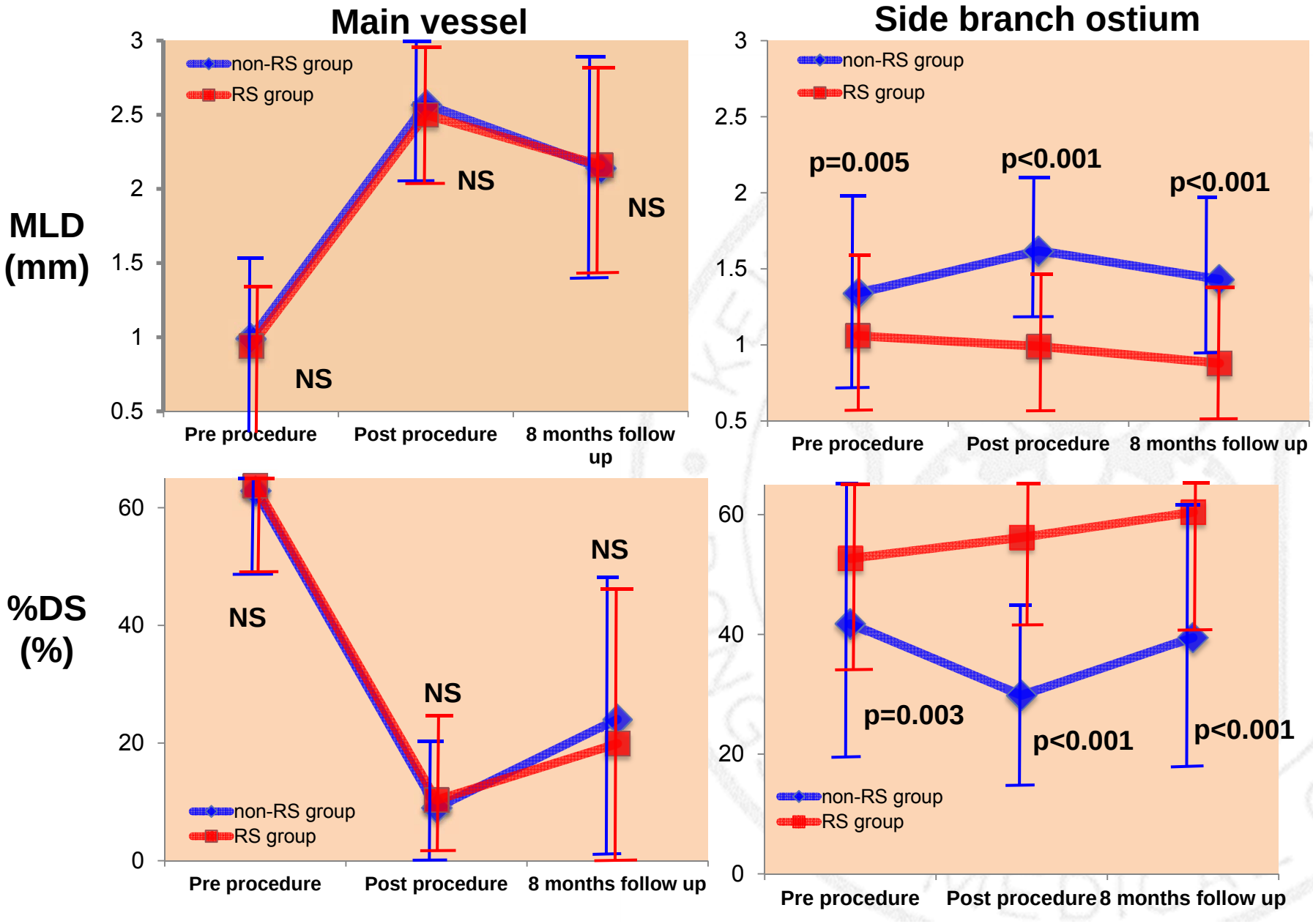
Sasaki S. TCT 2010

Strategy of PCI

n (lesions)	Non-RS group 116	RS group 47	p value
Main Vessel			
Pre dilatation (%)	75 (64.7)	32 (68.1)	NS
Direct stent (%)	40 (34.5)	15 (31.9)	NS
Scoring device usage (%)	2 (1.7)	2 (4.3)	NS
IVUS usage (%)	85 (69.8)	37 (78.7)	NS
Stent variety			
Cypher (%)	42 (36.2)	17 (36.2)	NS
TAXUS Express 2 (%)	74 (63.8)	30 (63.8)	NS
Stent diameter (mm)	3.02±0.37	3.05±0.31	NS
Stent length (mm)	21.6±5.3	22.6±5.9	NS
Side Branch			
KBT balloon diameter (mm)	2.30±0.32	2.19±0.29	NS
Max. inflation pressure (atm)	9.4±3.2	9.9±3.5	NS

Sasaki S. TCT 2010

QCA Result


Main vessel
Side branch ostium
MLD (mm)
%DS (%)
non-RS group
RS group
NS
NS
NS
NS
NS
NS
p=0.005
p<0.001
p<0.001
p=0.003
p<0.001
p<0.001
3
2.5
2
1.5
1
0.5
60
40
20
0
Pre procedure
Post procedure
8 months follow up

Clinical Outcomes @ 12 Months

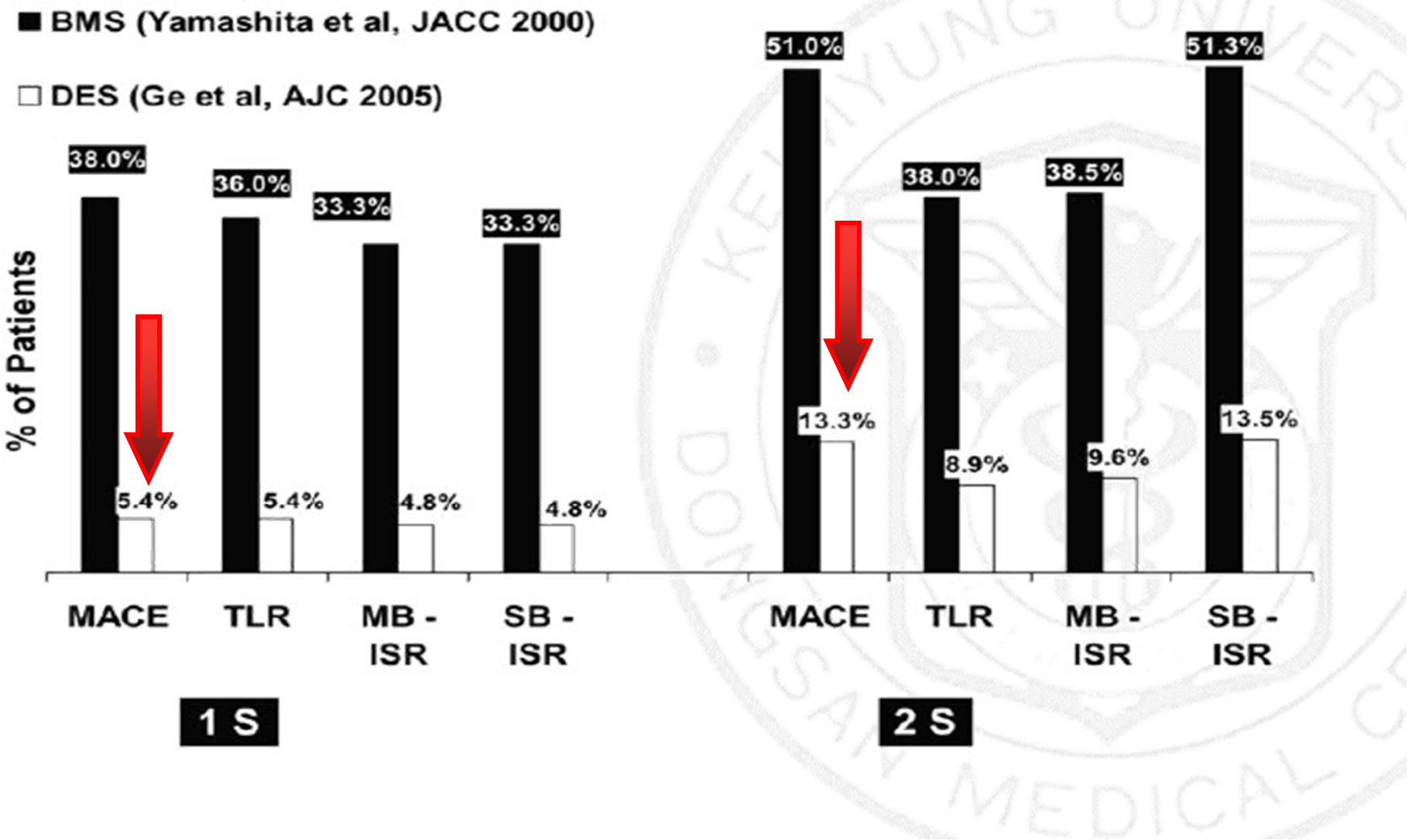
	Non-RS group	RS group	p value
n (patients)	**107**	**47**	
Cardiac death (%)	1 (0.9)	2 (4.3)	NS
Stent thrombosis (%)	1 (0.9)	0 (0)	NS
Myocardial infarction (%)	1 (0.9)	0 (0)	NS
Target lesion revascularization (%)	10 (8.6)	4 (8.5)	NS
Main vessel (lesion)	10	4	NS
Side branch (lesion)	0	0	NS
CABG (%)	0 (0)	1 (2.1)	NS
MACE (%)	11 (9.5)	7 (14.9)	NS

Sasaki S. TCT 2010

Reasons for One Stent Preference in Bifurcation Lesion

1. • Presence of Oculo-stenotic Reflex
2. • **Equal or Better Clinical Outcomes**
3.
4.
5.

Effects of DES on Clinical Outcomes from 2 Registry Studies



One-Stent Preferred to Two-Stent

~in the DES era~

Systemic 2 stenting vs. Provisional SB intervention

Author	n	Stent	TLR rate	
			 2 stents	 1 stent
Colombo, *Circulation 2004*	85	Cypher	9.5%	4.5%
Ge, *AJC 2005*	127	Cypher	8.8%	5.4%
Pen, *AHJ 2004*	91	Cypher	5%	2%
Steigen, *Circulation 2006*	413	Cypher	2%	1.4%

More Recent Randomized Trials

NORDIC

- Two arm
- SB Prov. T vs. 2 stents (Crush or Culottes)
- 6 Mo clinical FU
- 8 Mo angio FU

Steigen TK et al. Circulation. 2006;114:1955-1961

BBK

- Two arm
- SB Prov. T vs. 2 stents (routine T)
- 12 Mo clinical FU
- 9 Mo angio FU

Ferenc M et al. Eur Heart J 2008; 29: 2859–2867

CACTUS

- Two arm
- Crush vs. Prov. T
- 9 Mo clinical FU
- 9 Mo angio FU

Colombo A et al. Circulation. 2009;119:71–78

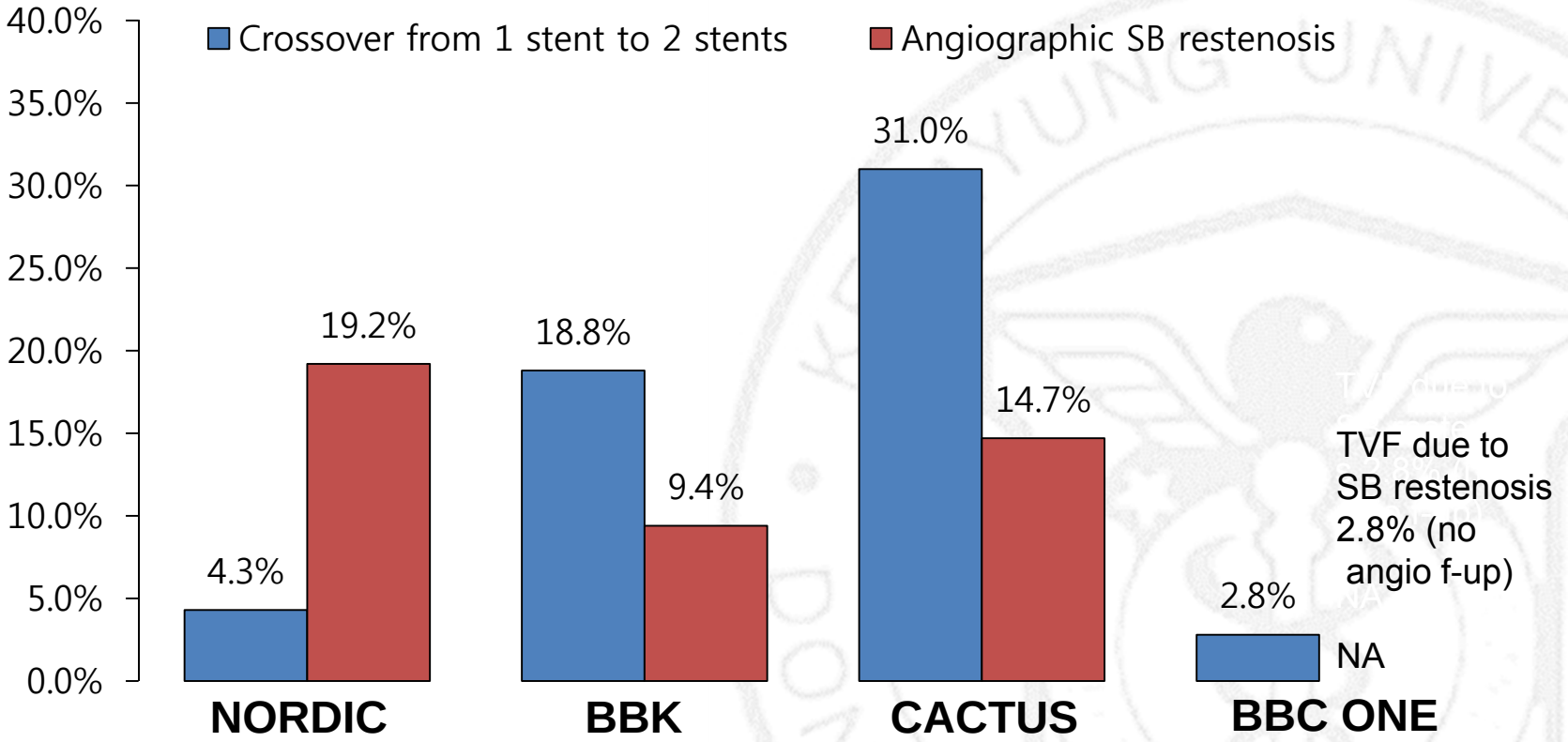
BBC ONE

- Two arm
- SB Prov. T vs. 2 stents (Crush, Culottes)
- 9 Mo clinical FU
- No angio FU

Hildick-Smith D et al. Circulation. 2010;121:1235-1243

How Often We Need 2nd Stent after MV Stent?

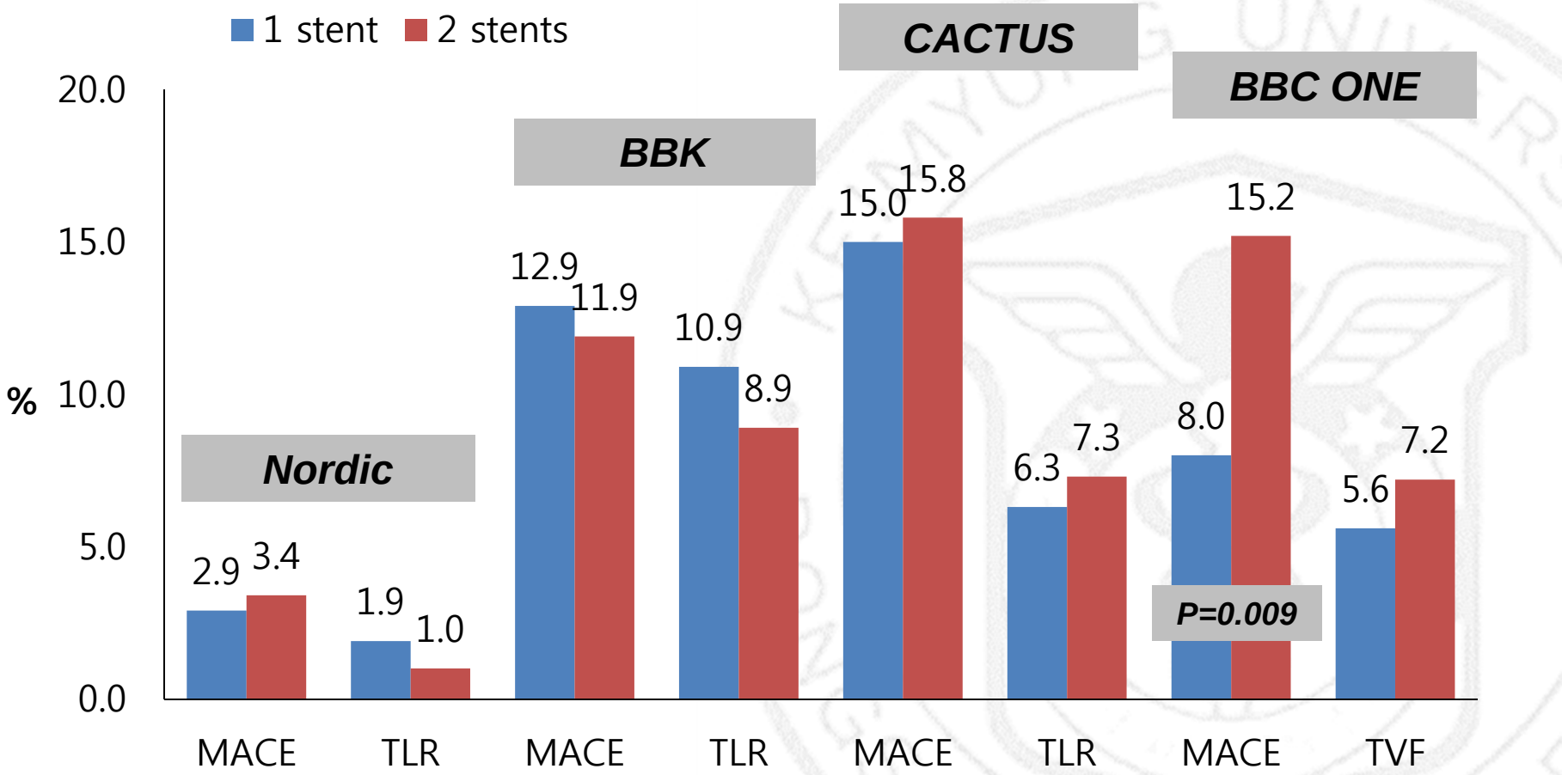
Crossover from 1 Stent to 2 Stents



	NORDIC	BBK	CACTUS	BBC ONE
2nd Stent Indication	If TIMI<3 → SB dilation; SB stenting if TIMI = 0 after dilation	Flow limiting dissection or residual stenosis of ≥ 75%	Residual steno. ≥50%; dissection of type B or worse; TIMI flow ≤2	TIMI flow <3, persistent ostial pinching of SB (<70%), threatened SB closure, or SB dissection > type A

Steigen TK et al. Circulation. 2006;114:1955-1961 Ferenc M et al. Eur Heart J 2008; 29: 2859–2867 Colombo A et al. Circulation. 2009;119:71–78 Hildick-Smith D et al. Circulation. 2010;121:1235-1243

MACE and TLR in Bifurcation Studies



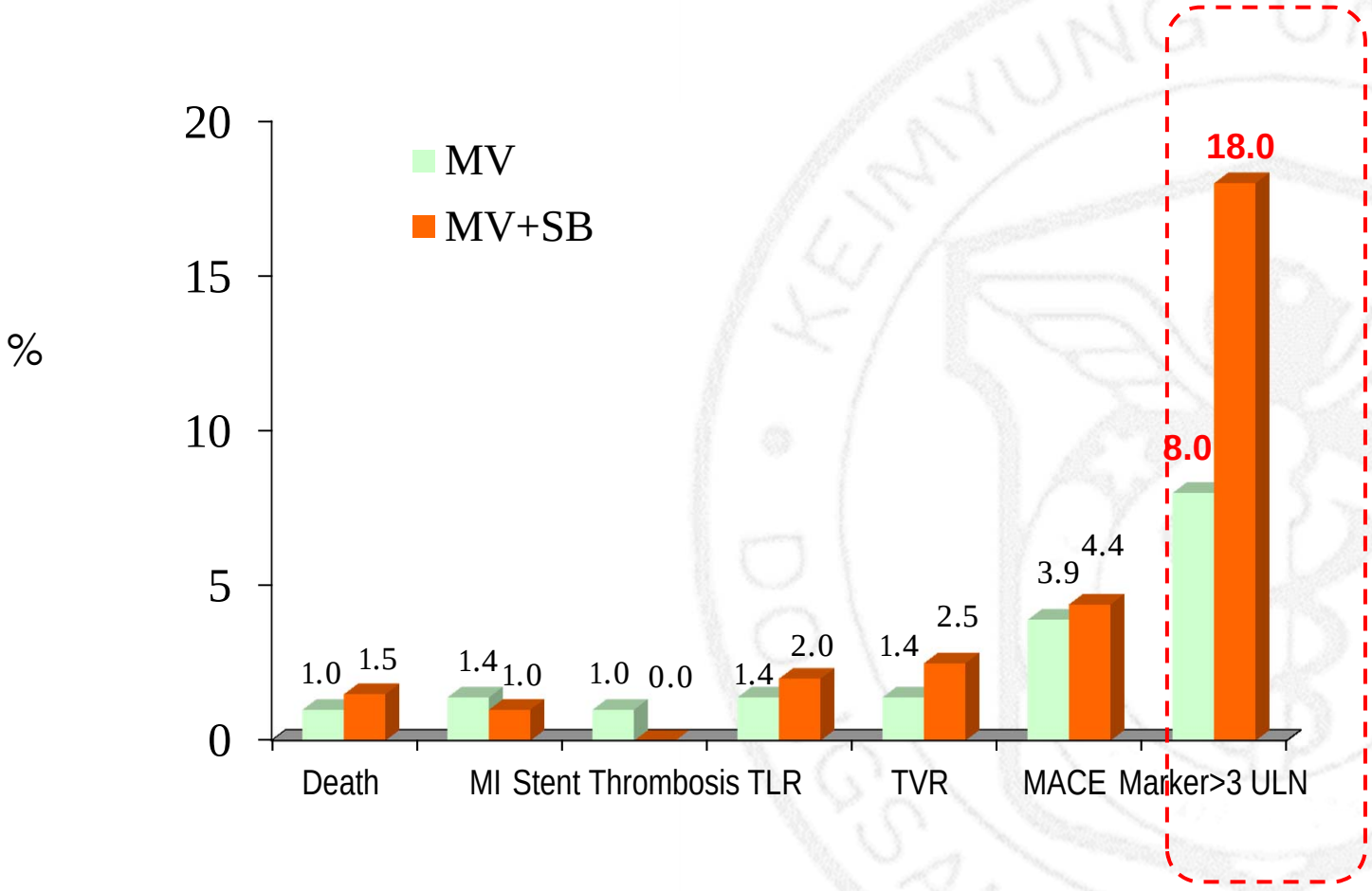
Steigen TK et al. Circulation. 2006;114:1955-1961, Ferenc M et al. Eur Heart J 2008; 29: 2859–2867 Colombo A et al. Circulation. 2009;119:71–78 Hildick-Smith D et al. Circulation. 2010;121:1235-1243

Reasons for One Stent Preference in Bifurcation Lesion

1. • Presence of Oculo-stenotic Reflex
2. • Equal or Better Clinical Outcomes
3. • **Less Complications**
4.
5.

NORDIC Bifurcation Study

Clinical outcomes



Left main stem lesion : 2%

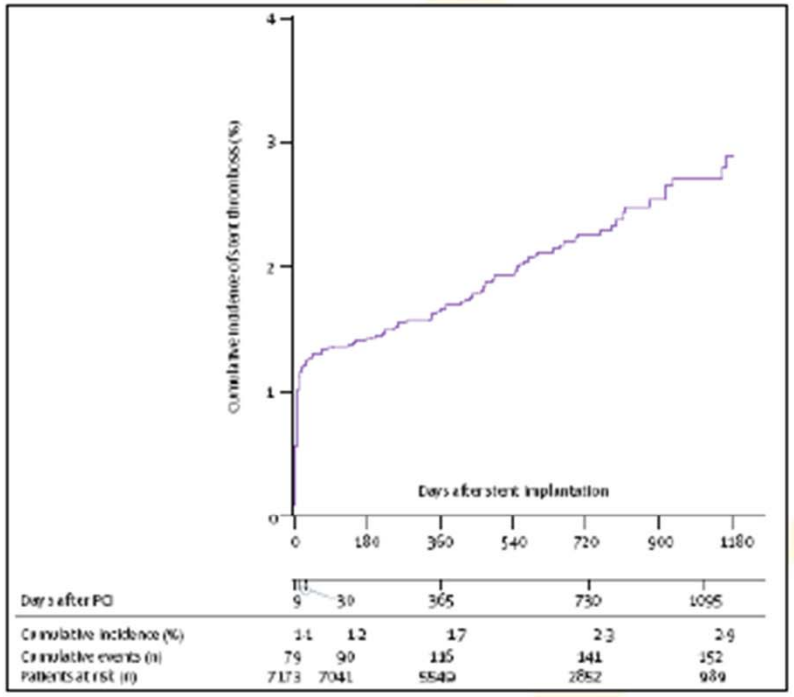
Bifurcation as a Potent, Independent Risk Factor for Stent Thrombosis

	n	RR	95% CI	FU
Iakovou et al JAMA 2005	2229	**5.96**	1.90-18.68	Subacute
Ong et al JACC 2005	2229	**8.11**	2.50-26.26	Late
Kuchulakanti et al Circulation 2006	1017	**3.00**	1.30-6.80	6 Mo
Hwang + Koo TCT 2006	2974	**4.40**	4.40-21.92	Late

EBC

Bifurcation as a Potent, Independent Risk Factor for Stent Thrombosis

Bern-Rotterdam registry (n=8146 patients)

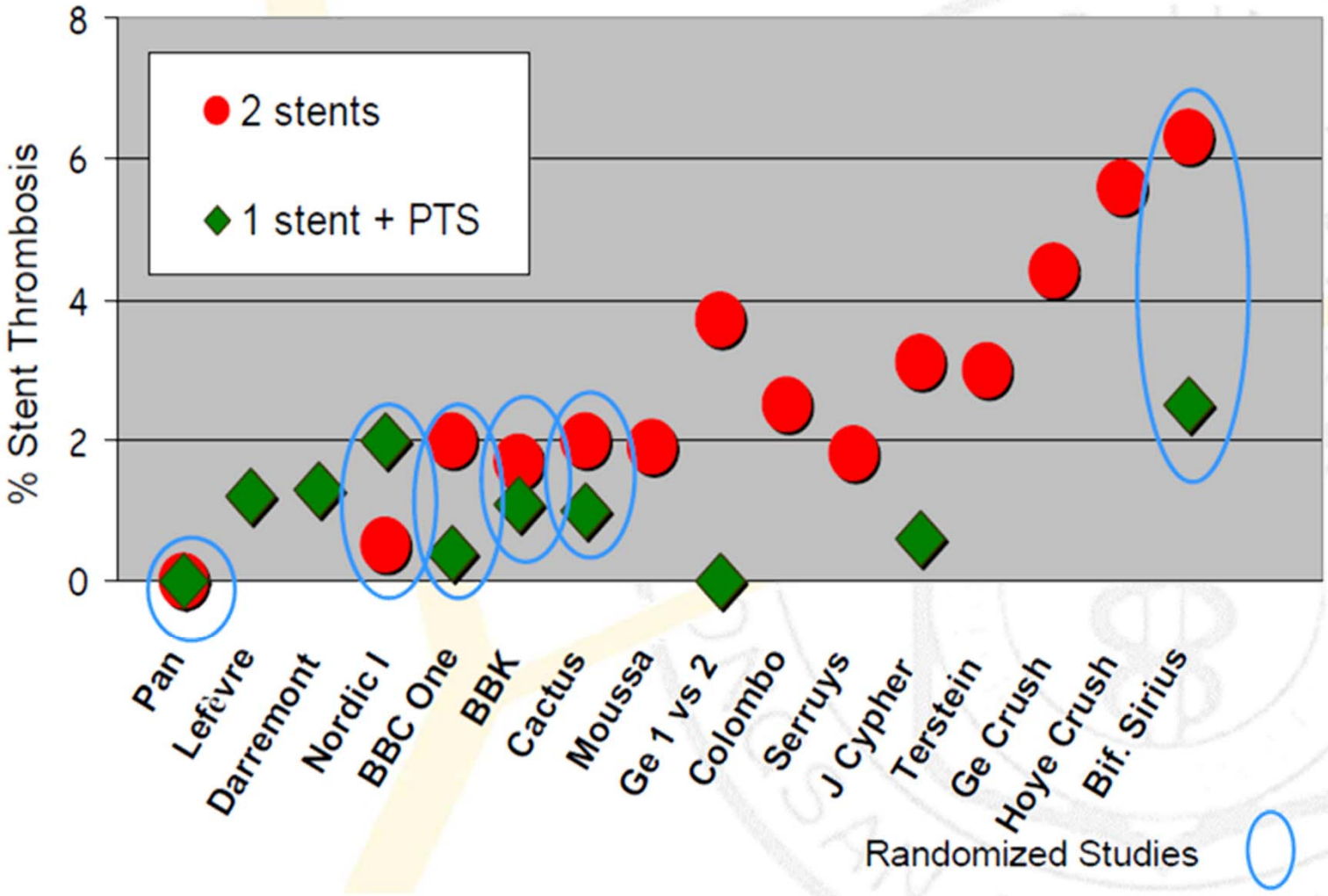


Multivariate Cox proportional hazards model to identify the presence of a bifurcation lesion as an independant predictor of stent thrombosis

Early ST	**2.52**	(1.26-5.02)
Late ST	0.22	(0.03-1.71)
Overall ST	1.47	(0.79-2.72)

Daemen et al, Lancet 2007

Bifurcation as a Potent, Independent Risk Factor for Stent Thrombosis



Predictors of LST / VLST

Multivariable analysis

LST / VLST in 67 lesions among 16,801 lesions treated exclusively by Cypher

Factors	R.R.	95%C.I.	P Value
Hemodialysis	1.91	(1.29 - 2.65)	0.002
ESRD (e-GFR < 30/Non-HD)	1.81	(1.2 - 2.65)	0.007
Two stents for bifurcation	1.81	(1.17 - 2.59)	0.01

Hildick-Smith D. TCT 2010

Meta-Analysis

Double Versus Single Stenting for Coronary Bifurcation Lesions

A Meta-Analysis

Demosthenes G. Katritsis, MD, PhD, FRCP; George C.M. Siontis, MD; John P.A. Ioannidis, MD

Background—Several trials have addressed whether bifurcation lesions require stenting of both the main vessel and side branch, but uncertainty remains on the benefits of such double versus single stenting of the main vessel only.

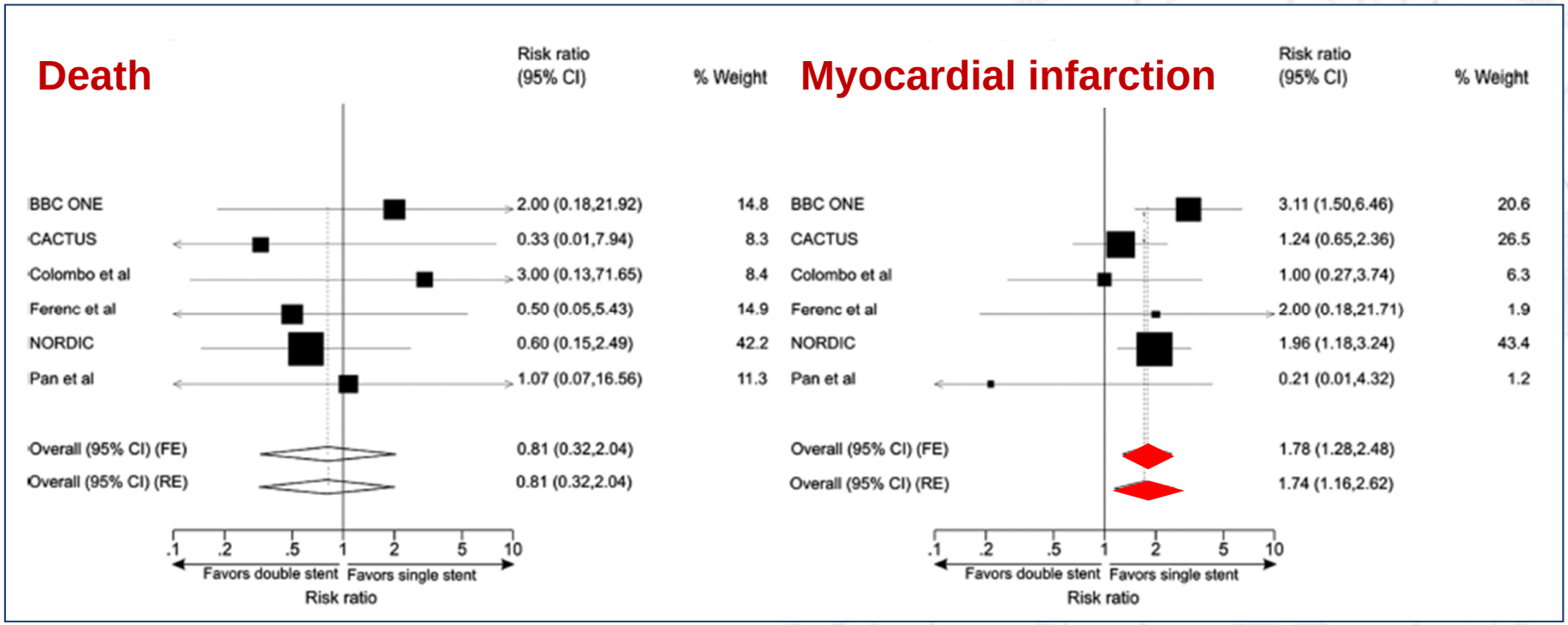
Methods and Results—We have conducted a meta-analysis of randomized trials including patients with coronary bifurcation lesions who were randomly selected to undergo percutaneous coronary intervention by either double or single stenting. Six studies (n=1642 patients) were eligible. There was increased risk of myocardial infarction with double stenting (risk ratio, 1.78; P=0.001 by fixed effects; risk ratio, 1.49 with Bayesian meta-analysis). The summary point estimate suggested also an increased risk of stent thrombosis with double stenting, but the difference was not nominally significant given the sparse data (risk ratio, 1.85; P=0.19). No obvious difference was seen for death (risk ratio, 0.81; P=0.66) and target lesion revascularization (risk ratio, 1.09; P=0.67).

Conclusions—Stenting of both the main vessel and side branch in bifurcation lesions may increase myocardial infarction and stent thrombosis risk compared with stenting of the main vessel only. (*Circ Cardiovasc Intervent.* **2009;2:409-415.**)

Key Words: angioplasty ■ coronary bifurcation ■ PCI ■ stents ■ meta-analysis

Two vs. One Stenting Meta-Analysis

N=1642 patients



2 stents **1 stent**

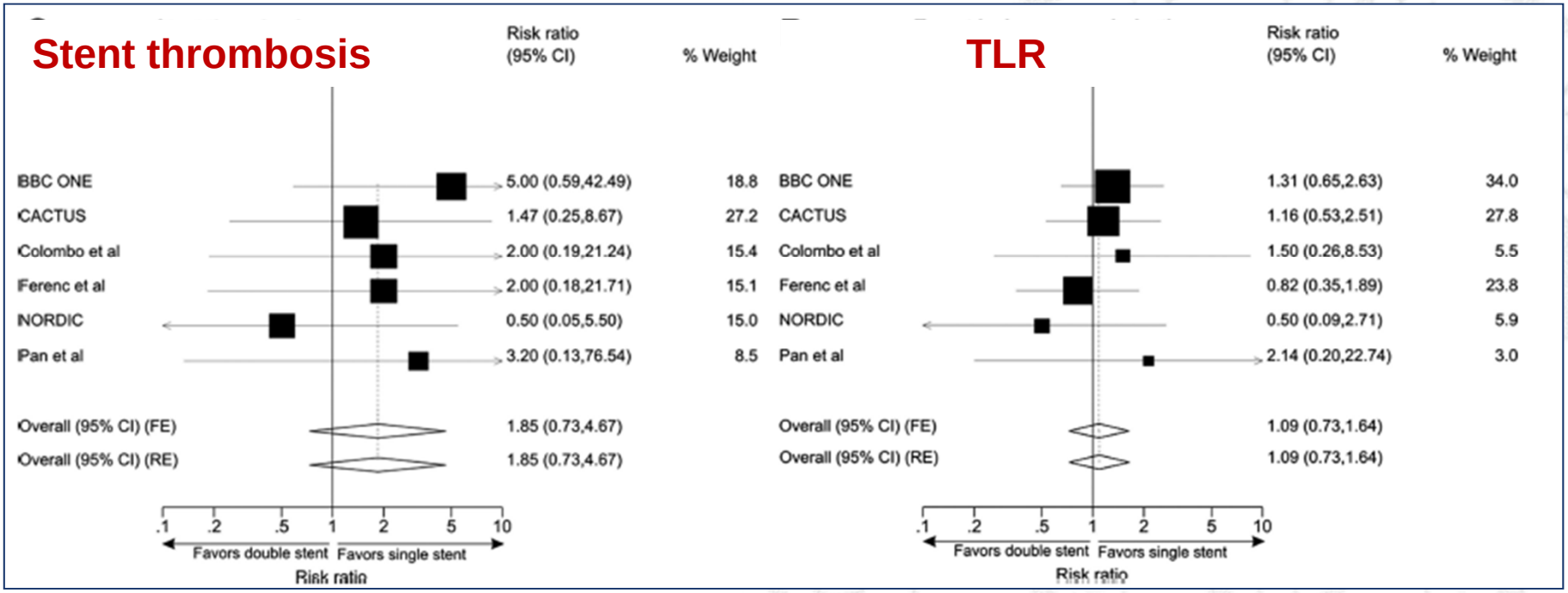
2 stents **1 stent**

Erglis A TCT 2010

Katritsis DG et al. Circ Cardiovasc Intervent. 2009;2:409-415

Two vs. One Stenting Meta-Analysis

N=1642 patients



2 stents **1 stent**

2 stents **1 stent**

Conclusion: Compared w/ single stenting, **double** stenting in bifurcation lesions **may increase MI** and **ST** risk

Erglis A TCT 2010

Katritsis DG et al. Circ Cardiovasc Intervent. 2009;2:409-415

Reasons for One Stent Preference in Bifurcation Lesion

1. • Presence of Oculo-stenotic Reflex
2. • Equal or Better Clinical Outcomes
3. • Less Complications
4. • **Simple Technique**
5.

One Stent Technique is Simple

Vs.

- Wire exchanges
- Stent delivery
- Recrossing stents
- Kissing balloons

Down Side of Two Stents

공기중 방사능 수치
I 131: 0.000140mSv
Cs134: 0.000313mSv
Cs137:0.0000646mSv

Where Are We?

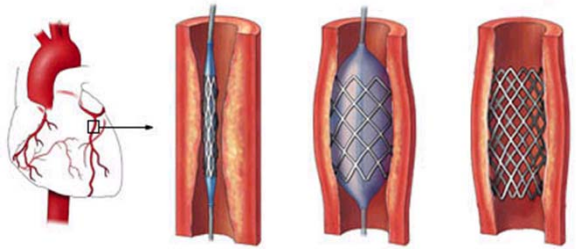
(단위:mSv)

1000

250 ← 연간 피폭한도 제한

100

23 ← Single PTCA

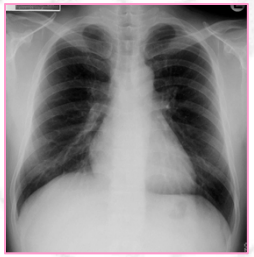


Cardiac CT → 16.3

Angio → 7.4

연간 방사선 기준선량 → 1

0.1 ← Chest 1장



Cs 134 검출 → 0.0003

0.0001 ← 요오드(I 131) 검출

PTCA 230장
Angio 74장

한국원자력안전기술원(KINS)

연합뉴스 기사입력 2011-04-08 16:43

NORDIC Bifurcation Study

Procedure data

	MV+SB (n=206)	MV (n=207)	P-value
Procedure time (min)	74 ± 30	59 ± 30	< 0.0001
Fluoro time (min)	21 ± 10	15 ± 9	< 0.0001
Contrast (ml)	283 ± 117	233 ± 93	< 0.0001

Steigen TK et al. Circulation 2006;114: 1955-1961

BBC ONE

	Complex	Simple	P value
Procedure time (mins; mean, SE)	78 (1.9)	57 (1.6)	<0.001
Fluoroscopy time (min; mean, SE)	22 (0.8)	15 (0.7)	<0.001
Diamentor ($cGy.cm^2$) (mean, SE)	7900 (350)	6140 (300)	<0.001
No. guidewires used (mean, SE)	3.11 (0.08)	2.21 (0.06)	<0.001
No. balloons used (mean, SE)	3.97 (0.11)	2.26 (0.09)	<0.001
No. stents used (mean, SE)	2.21 (0.07)	1.17 (0.04)	<0.001

BBC ONE Circulation 2010

Reasons for One Stent Preference in Bifurcation Lesion

1. • Presence of Oculo-stenotic Reflex
2. • Equal or Better Clinical Outcomes
3. • Less Complications
4. • Simple Technique
5. • **Cost Effectiveness**

Total Cost

One Stent

1 DES

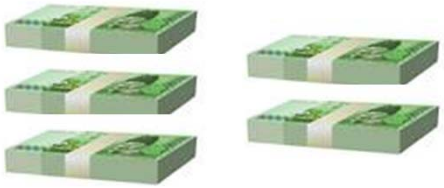
balloon (1 or 2)

contrast fee

guiding catheter

guidewire (1 or 2)

IVUS and/or FFR (optional)



Two Stents

2 DESs

2 balloons

more contrast fee

longer term DAT or TAT

guiding catheter

2 guidewires

IVUS and/or FFR (more often)

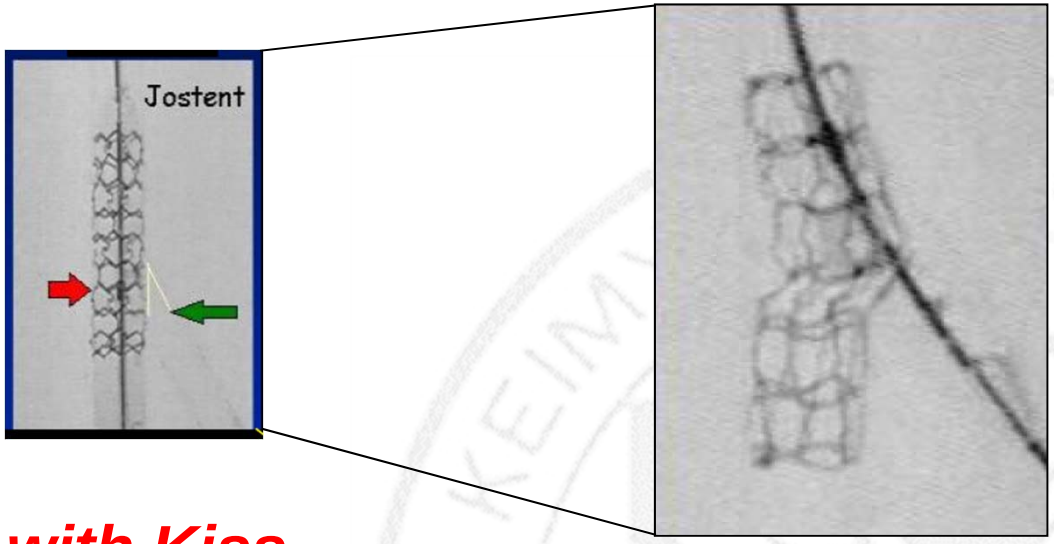
ONE STENT PREFERENCE

BUT

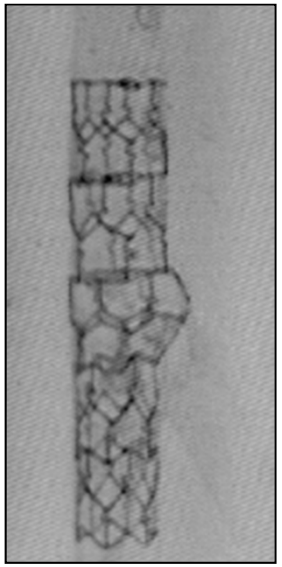
We keep in mind the fact that…..

When POBA through MB Stent …

Provisional
T-stent



Absolutely End with Kiss



- Must be performed optimally
  - After dilatation of SB, kissing Balloon dilatation is essential to correct the MV stent deformation

Keep It Open (KIO)

When the **SB** has ostial or diffuse disease
+ the SB is not suitable (too small) for stenting
or clinically not relevant

6 Fr guiding catheter

1. Wire both branches
2. Dilate MB if needed
3. Stent MB and leave wire in the SB
4. Perform post-dilatation of the MB with Jailed wire in the SB

➡ Do not re-wire SB or postdilate or predilate SB

Hermiller JB. SCAI 2009

One Stent Approach for Bifurcation Lesions

KIO

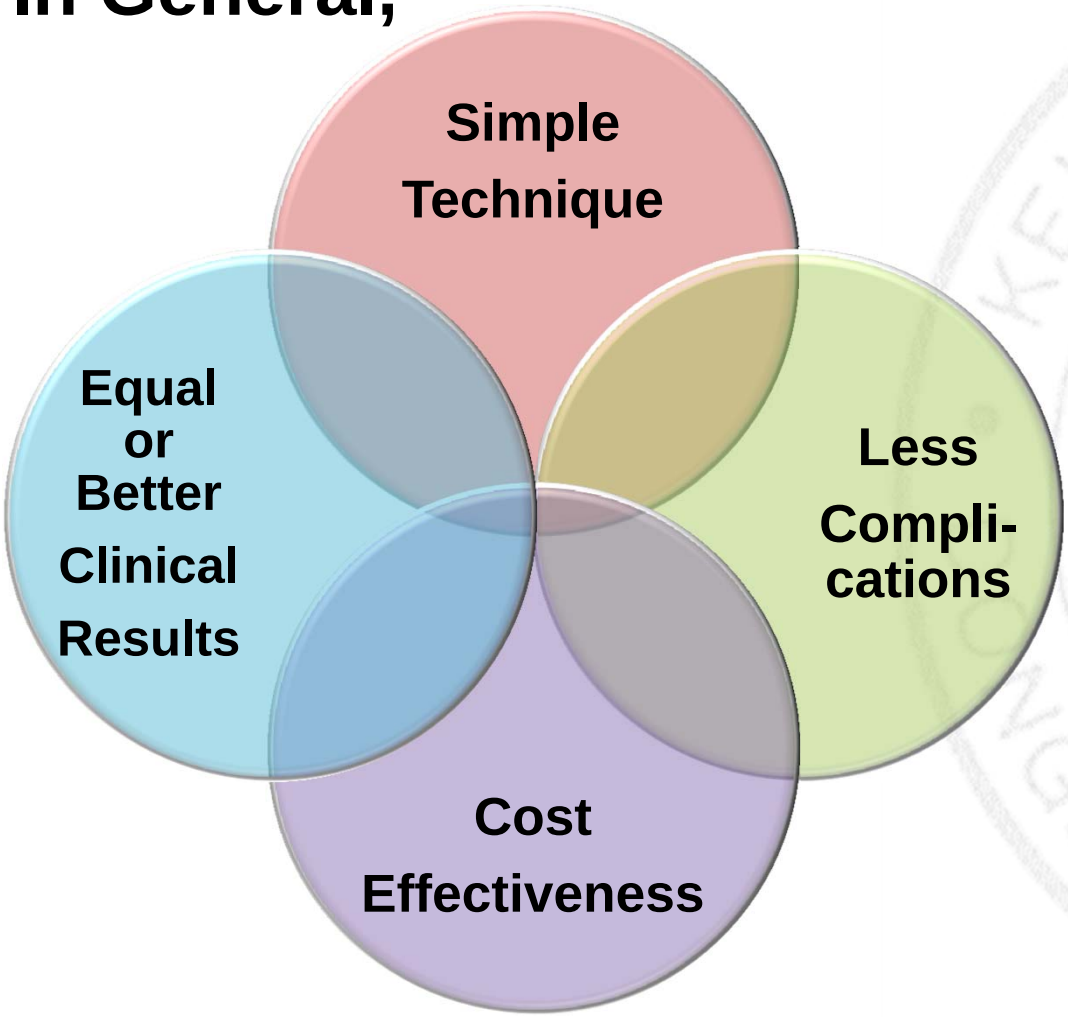
Provisional
Stent Strategy

Hermiller JB. SCAI 2009

CONCLUSION

Stent Technique for Bifurcation Lesion

In General,



“ One Stent +/- FKBI is Enough”

THANK YOU FOR YOUR ATTENTION