Angiographic Assessment of Bifurcation Lesions

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CVRF
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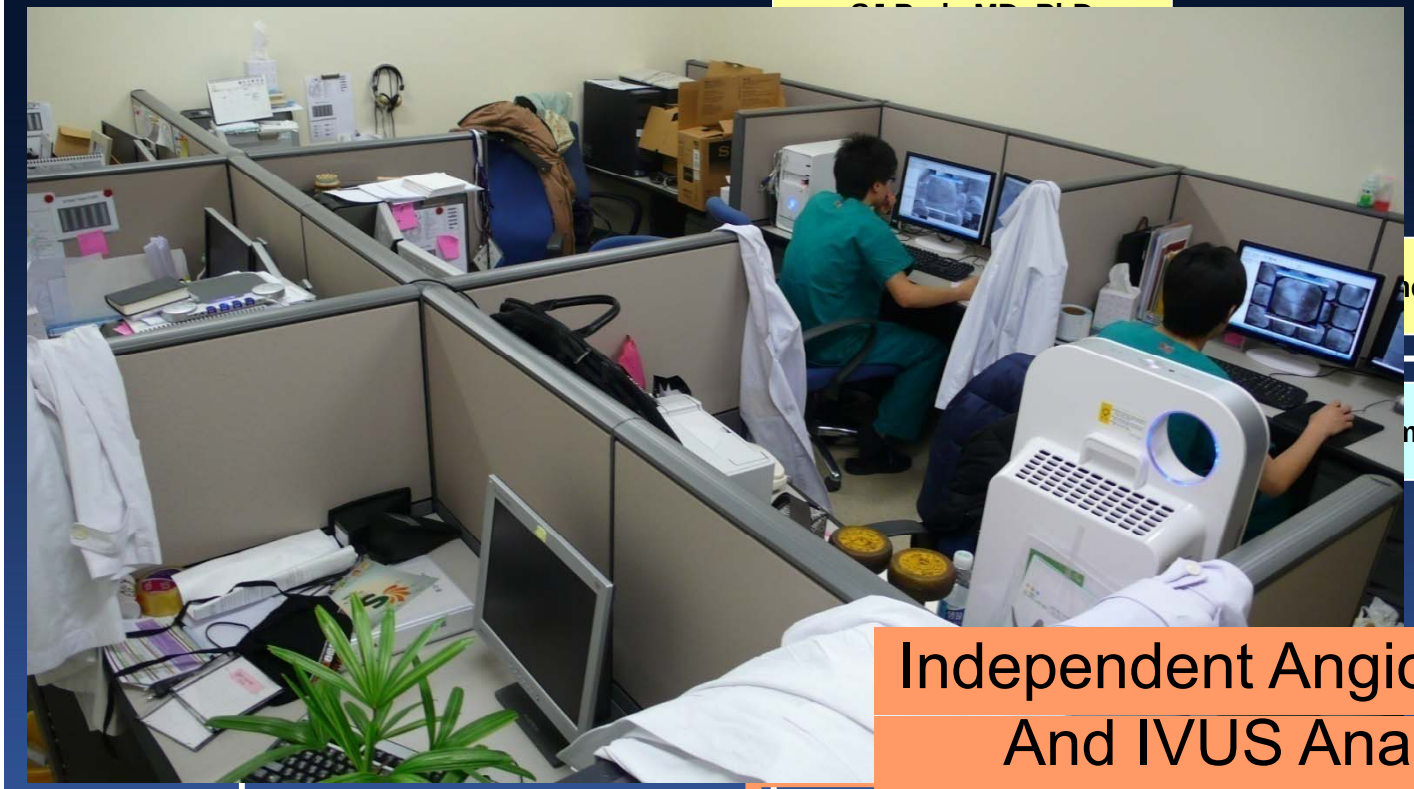
President



Business Department
(Budget, Billing, Contracts)

Independent Angiographic
And IVUS Analysis

CTA
(Clinical Trial Assistant)

IVUS/QCA Core Lab

Case Report Form of Angiographic Analysis

CARDIOVASCULAR RESEARCH FOUNDATION

Study name: _____
Site : _____
Patient ID: _____
Cath date: _____

Image

Catheter frame # _____ Arterial frame # _____

_____ _____ 1
Director / Fellow / Technician Date

CARDIOVASCULAR RESEARCH FOUNDATION

Study name: _____
Site : _____
Patient ID: _____
Cath date: _____

Site: _____ CASS
Location: _____ 1=Prox; 2=Mid 3=Distal; 4=Ostial
Frame: _____
Projection: _____
Catheter size: _____ Fr

ROCEDURE

Qualitative measurement

Morphology

Eccentric		0=Conc 1=Ecc
Bend		0-180
Thrombus		0=Absent; 1=Pres
Tortuosity		0=None; 1=Mod; 2=severe
Calcification		0=None/mild; 1=Mod; 2=severe
Ulceration		0=Absent; 1=Pres
Aneurysm		0=Absent; 1=Pres
Intimal flap		0=Absent; 1=Pres
Ectasia		0=Absent; 1=Pres
Pre-TIMI		TIMI 0-3
Frames		0 ---- 200
Frames (corr)		0 ---- 200
Bifurcation		0, A-> F
Side branch		CASS
SBPreDS		%

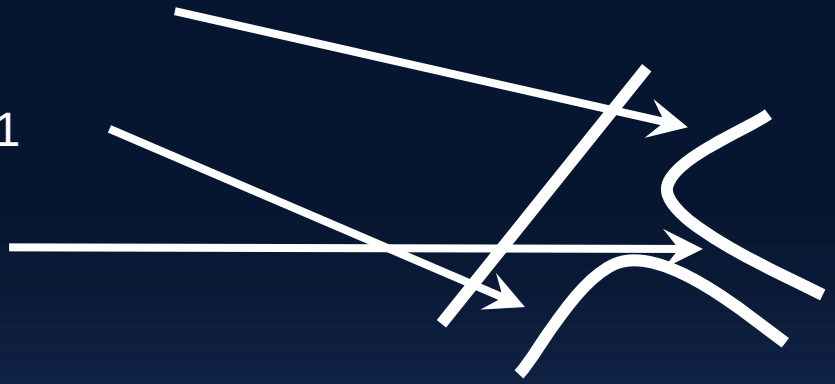
QCA

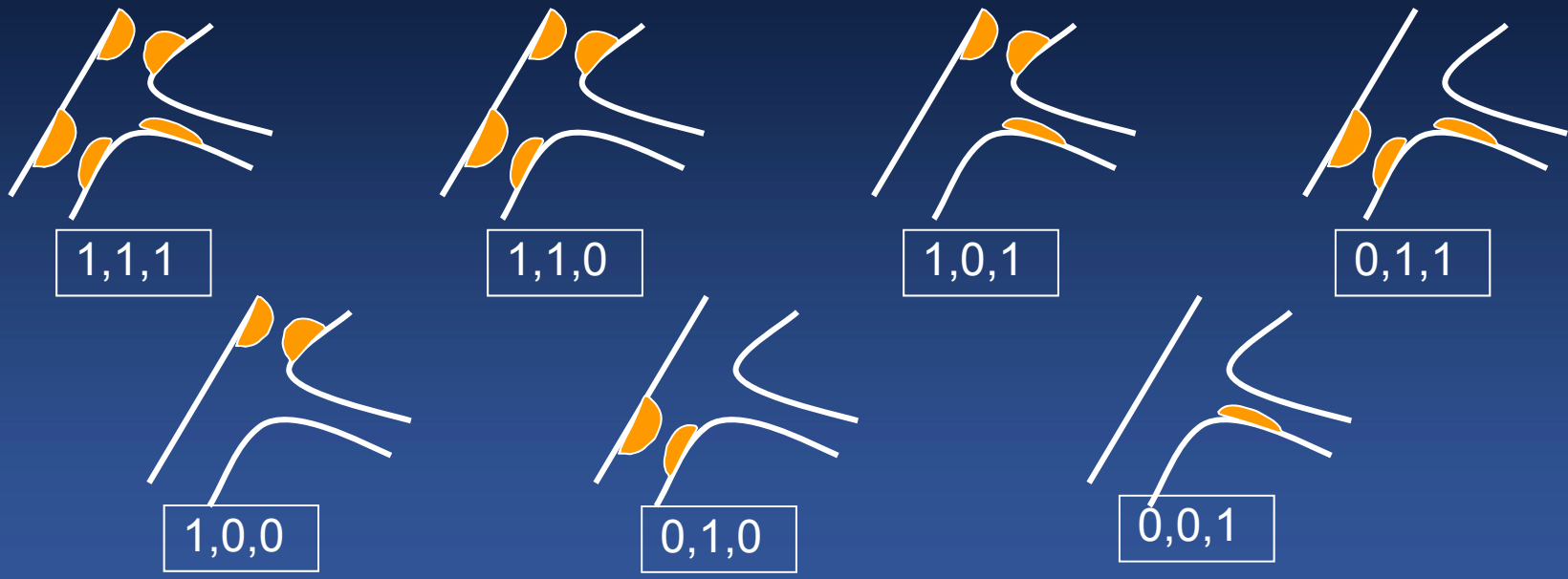
Prox Normal	
Distal Normal	
Inter normal	
MLD	
Lesion length	

_____ _____ 2
Director / Fellow / Technician Date

Classification of Bifurcation Stenosis

1. Prox PV > 50%: 0 or 1
2. Distal PV > 50%: 0 or 1
3. SB > 50%: 0 or 1

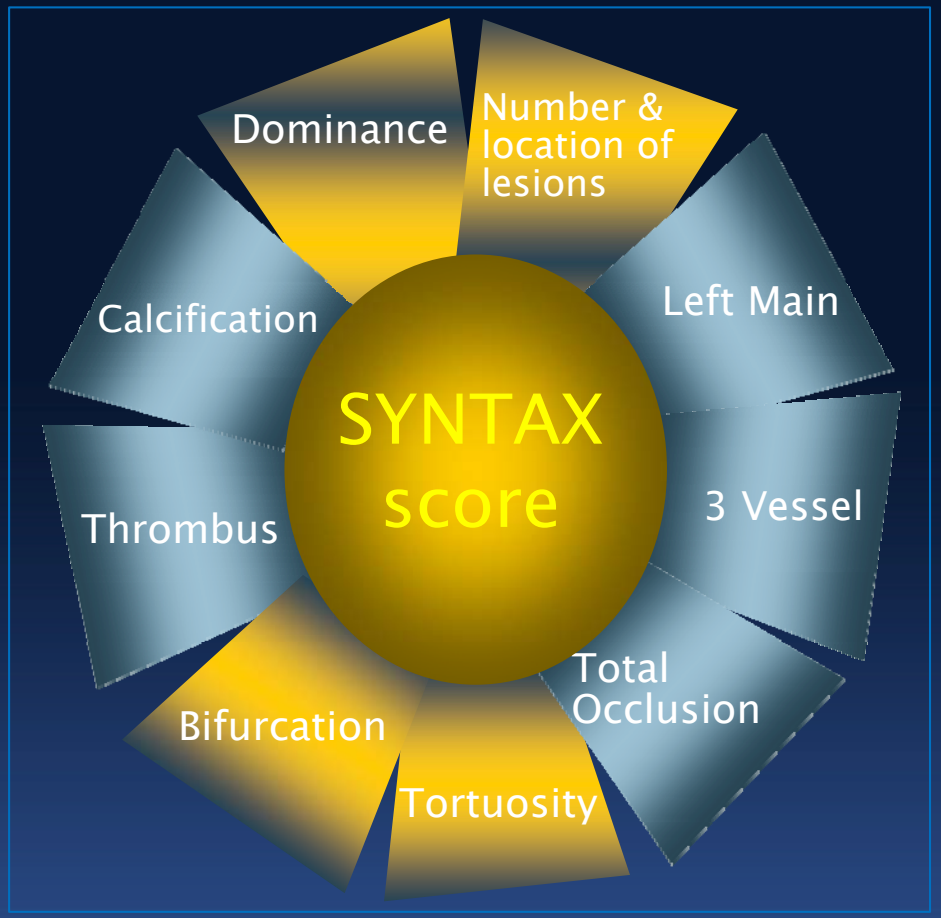




Medina A.Rev Esp Cardiol. 2006 Feb;59(2):183

Syntax score (newly developed system)

takes into account the heterogeneity of coronary lesion complexity based on the lesion's characteristics .



Sianos et al, EuroIntervention 2005;1:219-227
Valgimigli et al, Am J Cardiol 2007;99:1072-1081
Serruys et al, EuroIntervention 2007;3:450-459
BARI classification of coronary segments
Leaman score, Circ 1981;63:285-299
Lesions classification ACC/AHA , Circ 2001;103:3019-3041
Bifurcation classification, CCI 2000;49:274-283
CTO classification, J Am Coll Cardiol 1997;30:649-656

http://www.syntaxscore.com - SYNTAX Score - Microsoft Internet Explorer

파일(F) 편집(E) 보기(V) 즐겨찾기(A) 도구(T) 도움말(H)

뒤로 검색 즐겨찾기 연결

NAVER http://www.syntaxscore.com/ 이동 메일 인기 사전 화면캡처 관리 로그인

알툴바 빠른검색 알패스On 즐겨찾기On 11번가 문자 캡쳐

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SYNTAX SCORE

Search...

Welcome to the SYNTAX Score website. The SYNTAX Score is a unique tool to score complexity of coronary artery disease. However, it is very important to use this new scoring tool correctly, hence, it is strongly recommended to complete the tutorial first.

TUTORIAL

Knowledge of definitions is vital. Please use the tutorial prior to first calculator use.

Start tutorial...

CALCULATOR

Start using the calculator when you have successfully completed the tutorial.

Start calculator...

SYNTAX Trial: Two-year outcomes

EUROPEAN SOCIETY OF CARDIOLOGY®

Pieter Kappetein, MD, PhD presented the two-year results of the SYNTAX trial at the European Society of Cardiology Meeting, Barcelona on September 2nd, 2009. SYNTAX was featured in a Clinical Trial webcast. Key findings included:

- In the SYNTAX randomized patients, 2-year MACCE rates remained significantly higher for PCI than CABG, mainly driven by higher repeat revascularization in the PCI arm.
- MACCE rates at 2 years not significantly different for patients with a low (0-22) or intermediate (23-32) baseline SYNTAX Score treated with either PCI or CABG; for patients with high SYNTAX Scores (≥33), MACCE continued to be increased at 2 years in patients treated with PCI compared with CABG
- In the predefined subgroups of patients with either 3VD or LM disease:
  - In the LM group, safety outcomes and MACCE rates were similar for PCI and CABG, but the 2-year revascularization rate was lower in the CABG group.
  - Safety outcomes (death/CVA/MI) in the 3VD group were similar for PCI and CABG, but the 2-year revascularization and MACCE rates favored CABG.

The full presentation can be viewed or downloaded here:

인터넷

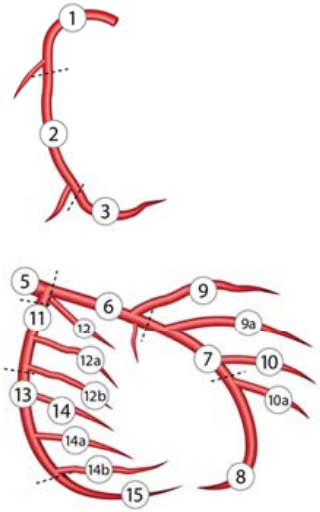
http://www.syntaxscore.com - SYNTAX Score Calculator - Microsoft Internet Explorer

SYNTAX SCORE

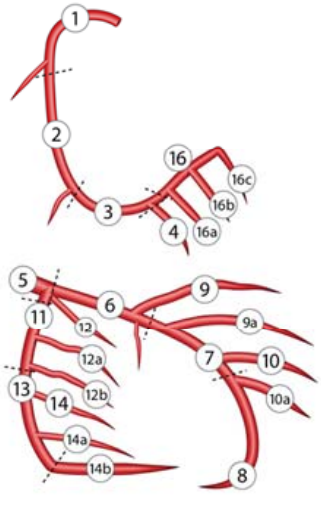
CARDIALYSIS Boston Scientific

Calculator version 2.02

Select dominance coronary system



Left dominance



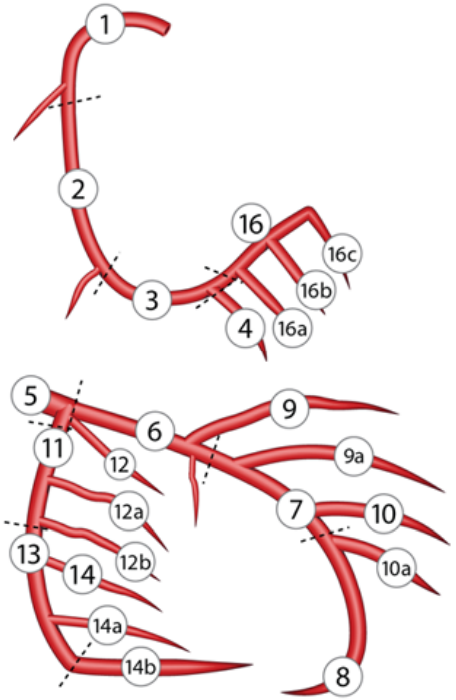
Right dominance

완료 인터넷

http://www.syntaxscore.com - SYNTAX Score Calculator - Microsoft Internet Explorer

SYNTAX SCORE CARDIALYSIS Boston Scientific

Dominance: right Current lesion: 1/1 Calculator version 2.02



3. Specify which segments are diseased for lesion 1.

Click on the coronary tree image to select or unselect segments.

		Lesion:	1
	Segments:		
RCA	RCA proximal	1	☐
	RCA mid	2	☐
	RCA distal	3	☐
	Posterior descending	4	☐
	Posterolateral from RCA	16	☐
	Posterolateral from RCA	16a	☐
	Posterolateral from RCA	16b	☐
	Posterolateral from RCA	16c	☐
LM	Left main	5	☐
LAD	LAD proximal	6	☐
	LAD mid	7	☐
	LAD apical	8	☐
	First diagonal	9	☐
	Add. first diagonal	9a	☐
	Second diagonal	10	☐
	Add. second diagonal	10a	☐
LCX	Proximal circumflex	11	☐
	Intermediate/anterolateral	12	☐
	Obtuse marginal	12a	☐
	Obtuse marginal	12b	☐
	Distal circumflex	13	☐
	Left posterolateral	14	☐
	Left posterolateral	14a	☐
	Left posterolateral	14b	☐

next

Click here for segment definitions

완료 인터넷

Bifurcation

A bifurcation is a division of a main, parent, branch into two daughter branches of at least 1.5mm. Bifurcation lesions may involve the proximal main vessel, the distal main vessel and the side branch according to the Medina classification. The smaller of the two daughter branches should be designated as the 'side branch'. In case of the main stem either the LCX or the LAD can be designated as the side branch depending on their respective calibres.
Bifurcations are only scored for the following segment junctions: 5/6/11, 6/7/9, 7/8/10, 11/13/12a, 13/14/14a, 3/4/16 and 13/14/15.

No septal branch

'Specify which segments are diseased for lesion X': one should fill out only those segment numbers of the bifurcation that have a Diameter Stenosis ≥50% in direct contact with the bifurcation.

≥ 50% stenosis

Example 1

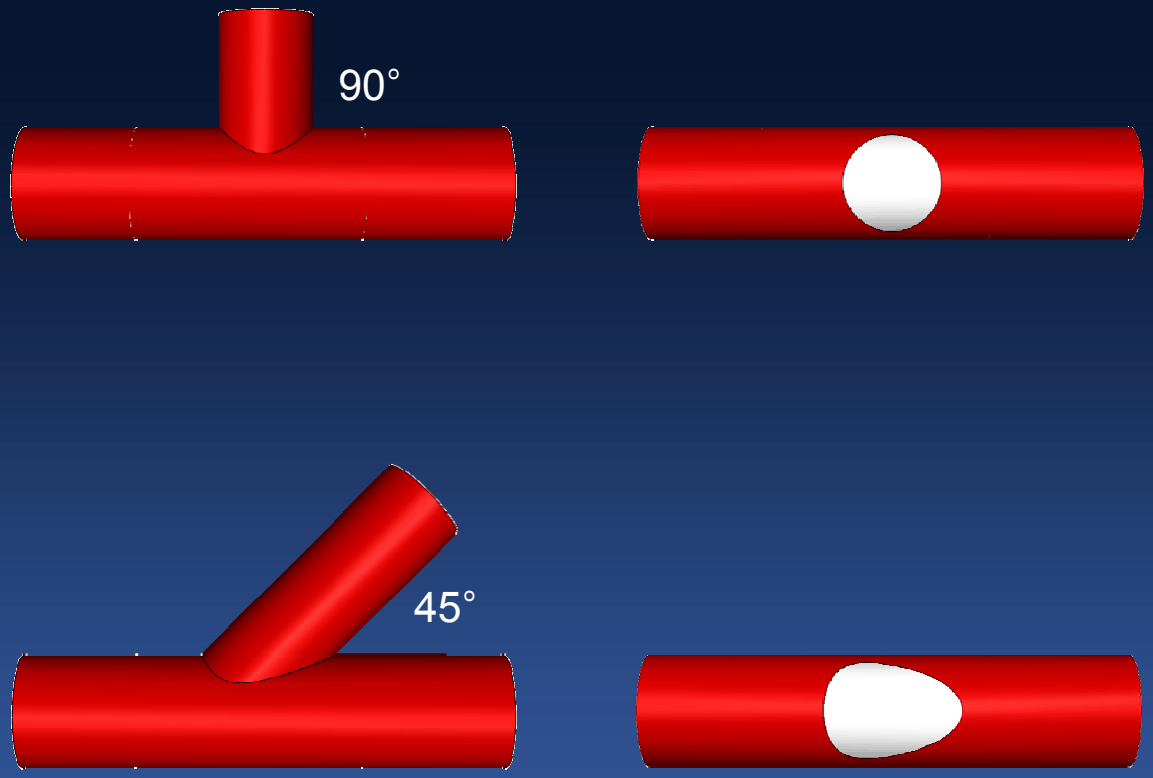
- One lesion
- one segment number involved/diseased (= segment: 7).
- Bifurcation 'Yes'
- Medina class: 0, 1, 0

Bifurcation Angle Measures

Angle between Prox PV and SB

Angle between Distal PV and SB

Size of the ostium changes with the angle of bifurcation



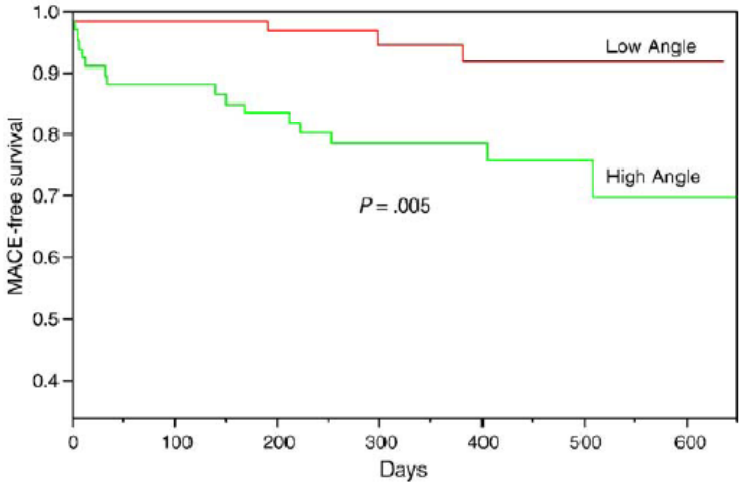
Courtesy P Mortier et al

Greater Bifurcation Angle associated with higher mortality and MACE with Crush Technique

133 pts undergoing crush stenting:

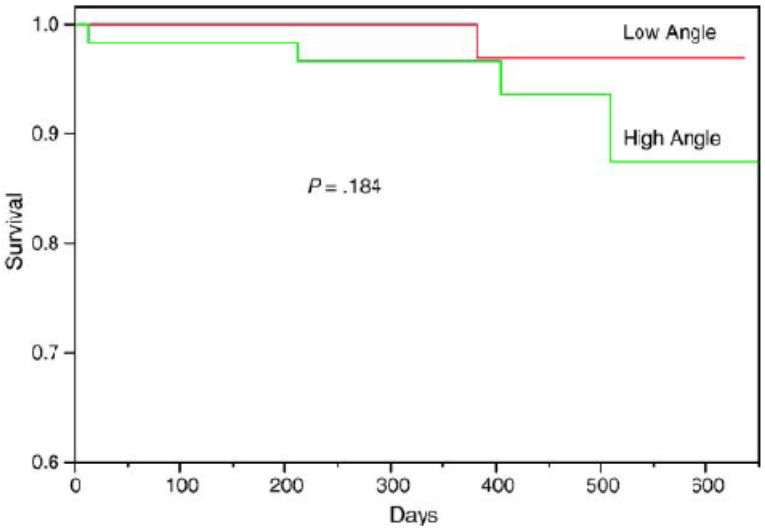
- 66 pts with low angle (<50 degrees)
- 67 pts with high angle (>50 degrees)

Figure 3 **MACE**



Kaplan-Meier plot comparing MACE-free survival up to 648 days between the low-angle group (BA <50° and high-angle group (BA ≥50°).

Figure 4 **Survival**

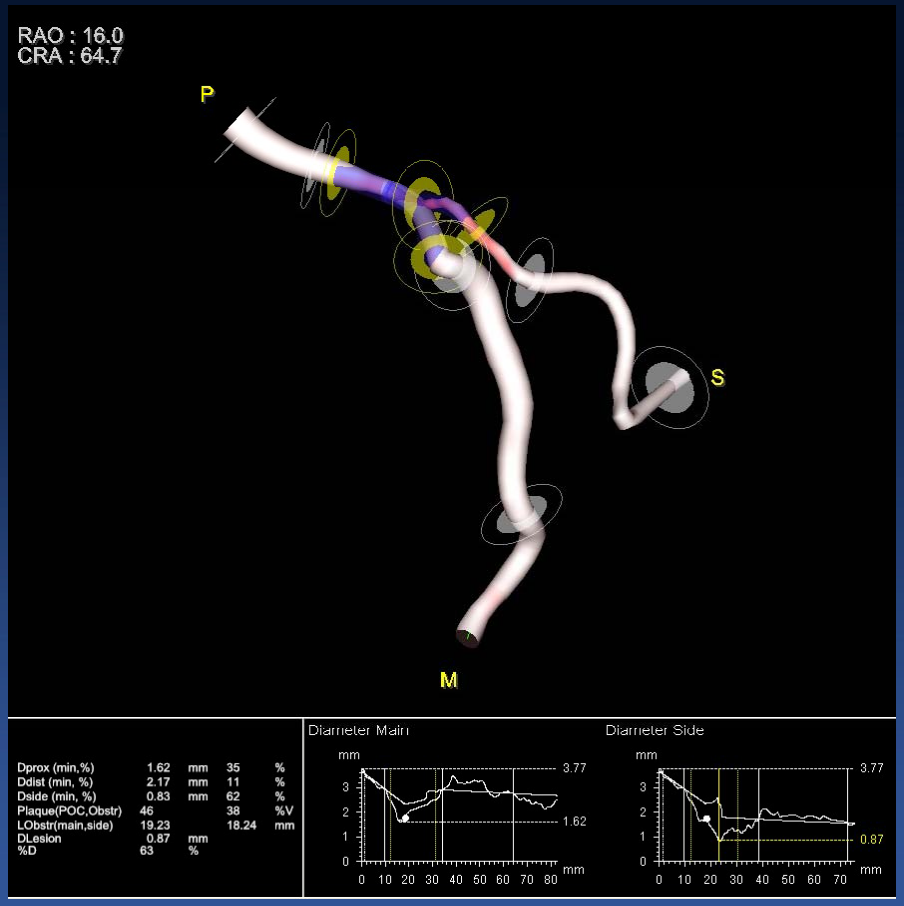


A Kaplan-Meier plot indicating survival up to 648 days in the low-angle (BA <50°) and high-angle group (BA ≥50°).

Bifurcation angle was an independent predictor of MACE

Dzavik V et al. Am Heart J. 2006

3-D Morphology



Case Report Form of Angiographic Analysis

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Patient ID: _____
Cath date: _____

Image

Catheter frame # _____ Arterial frame # _____

_____ _____ 1
Director / Fellow / Technician Date

CARDIOVASCULAR RESEARCH FOUNDATION

Study name: _____
Site : _____
Patient ID: _____
Cath date: _____

Site: _____ CASS
Location: _____ 1=Prox; 2=Mid 3=Distal; 4=Ostial
Frame: _____
Projection: _____
Catheter size: _____ Fr

PRE-PROCEDUR

Quantitative measurement

Morphology

Eccentric		0=Conc 1=Ecc
Bend		0-180
Thrombus		0=Absent; 1=Pres
Tortuosity		0=None; 1=Mod; 2=severe
Calcification		0=None/mild; 1=Mod; 2=severe
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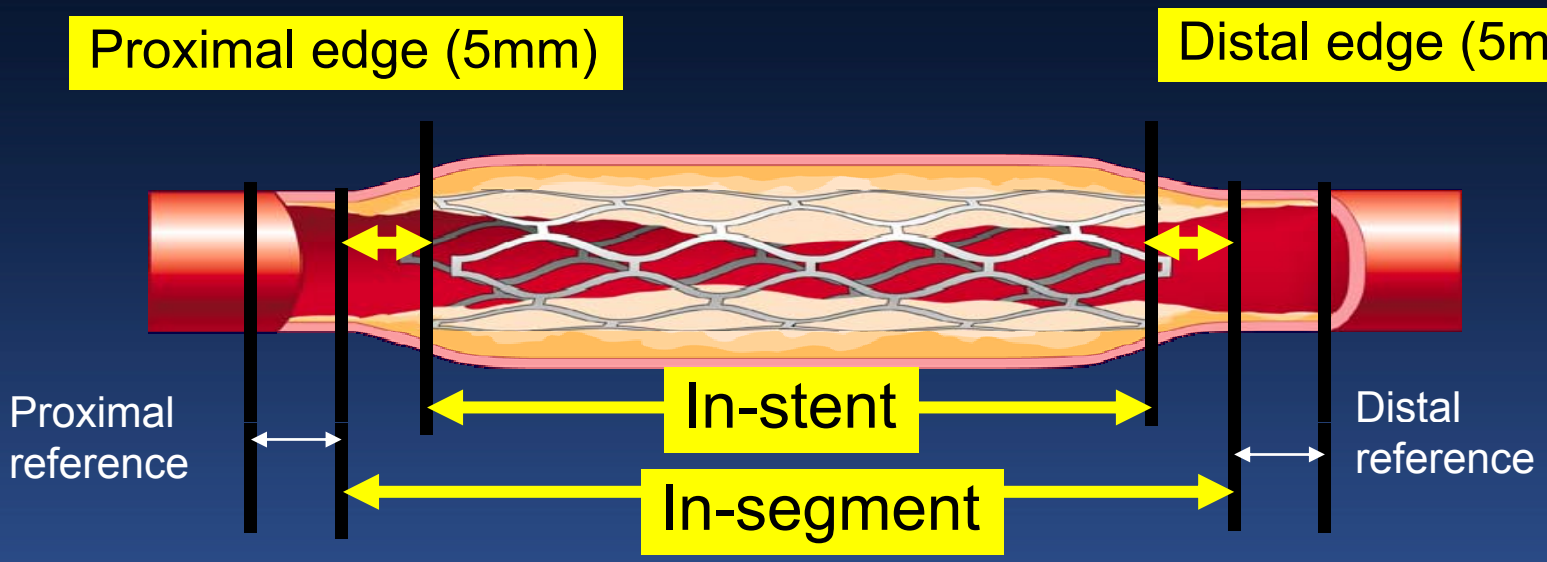
Aneurysm		0=Absent; 1=Pres
Intimal flap		0=Absent; 1=Pres
Ectasia		0=Absent; 1=Pres
Pre-TIMI		TIMI 0-3
Frames		0 ---- 200
Frames (corr)		0 ---- 200
Bifurcation		0, A-> F
Side branch		CASS
SBPreDS		%

QCA

Prox Normal	
Distal Normal	
Inter normal	
MLD	
Lesion length	

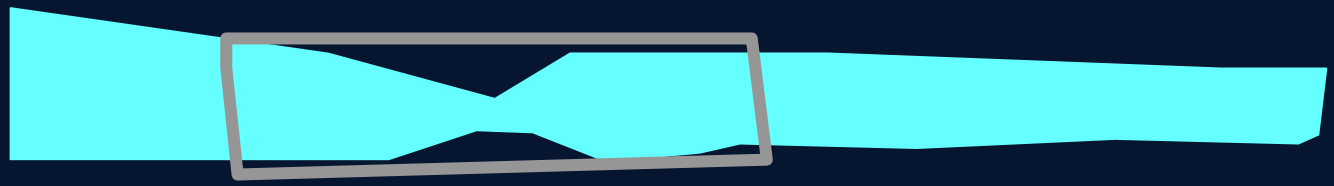
_____ _____ 2
Director / Fellow / Technician Date

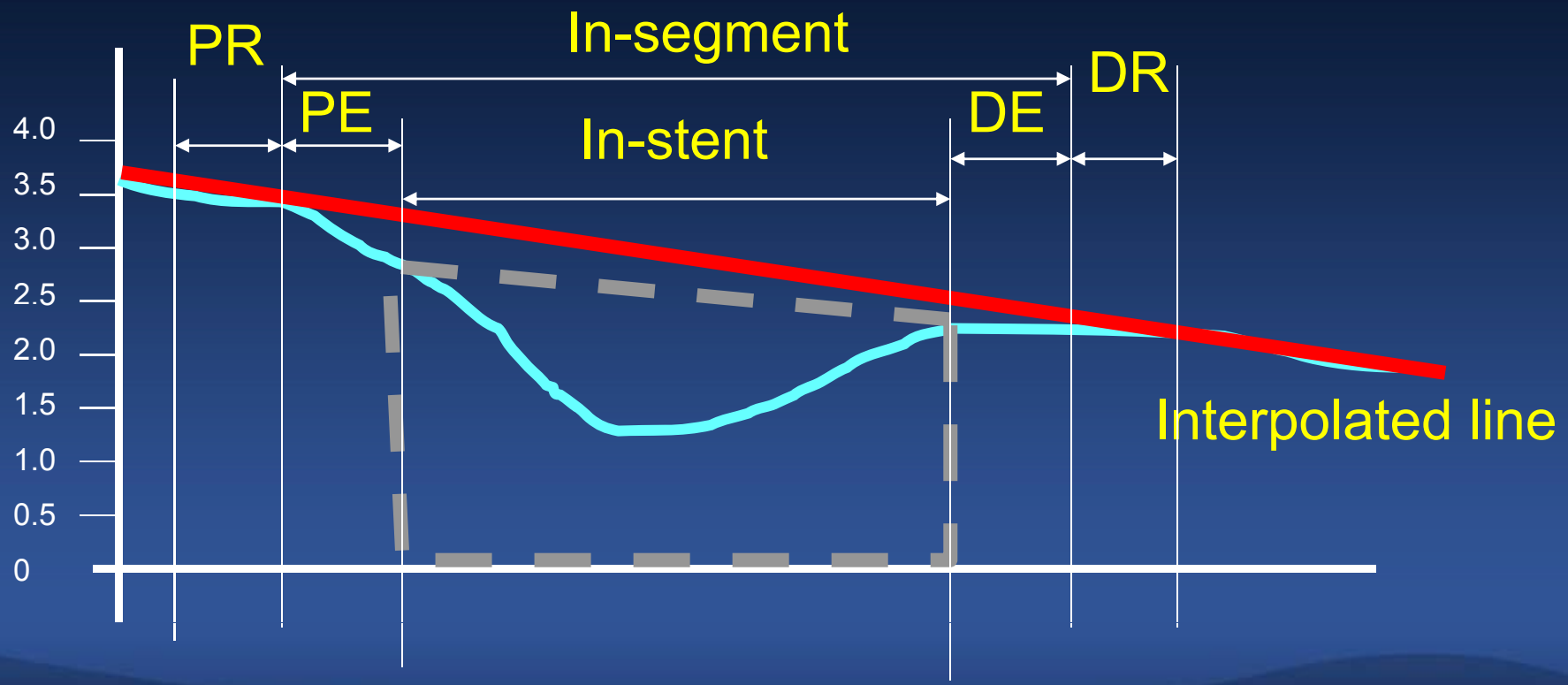
Standard DES Measurement



Automatic Border Detection for QCA

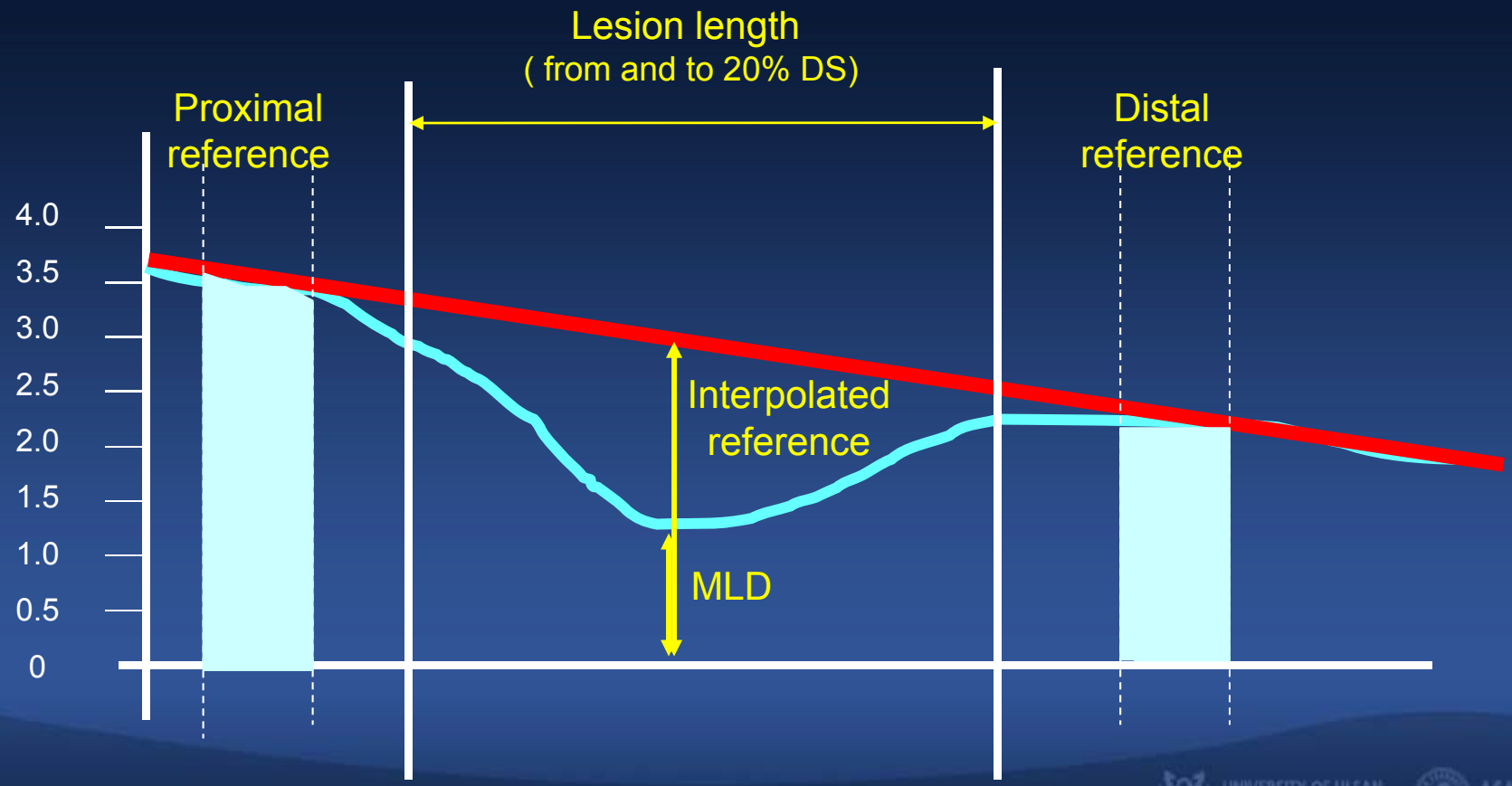
Interpolated reference line is the index.





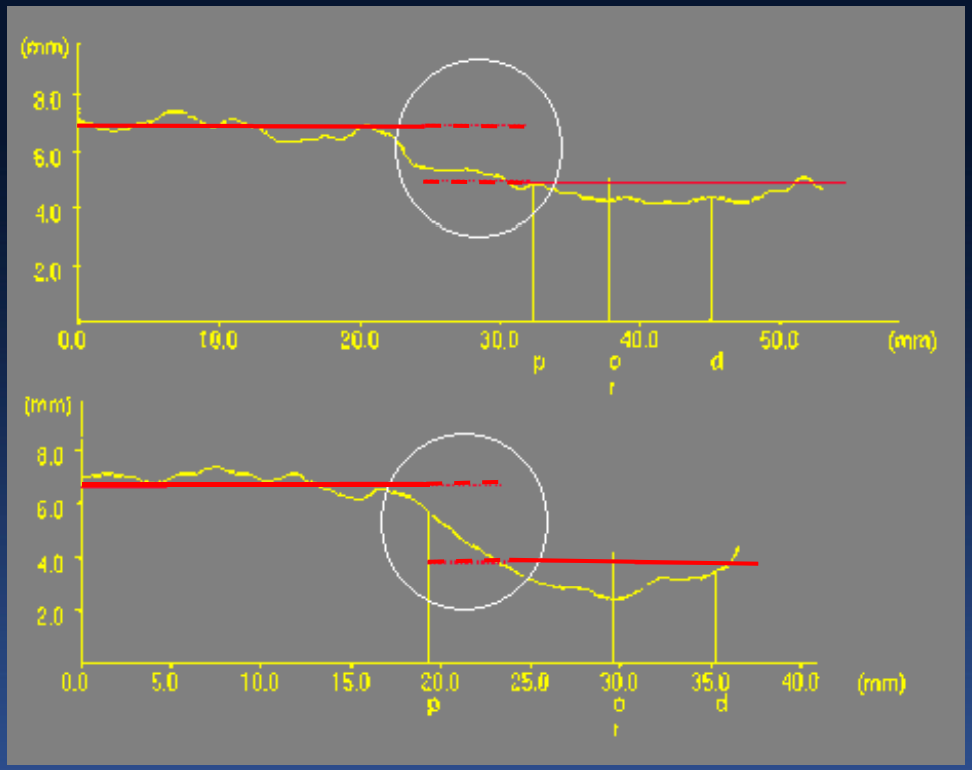
Assessment of Diameter Stenosis

MLD = 1.2 mm
Mean reference: [3.5mm (PR) +2.5mm (DR)] / 2 = 3.0 mm
Interpolated reference: 3.2 mm
DS = [3.2mm (int. ref.) -1.2mm (MLD)]X100 / 3.2 (int. ref.) = 63%



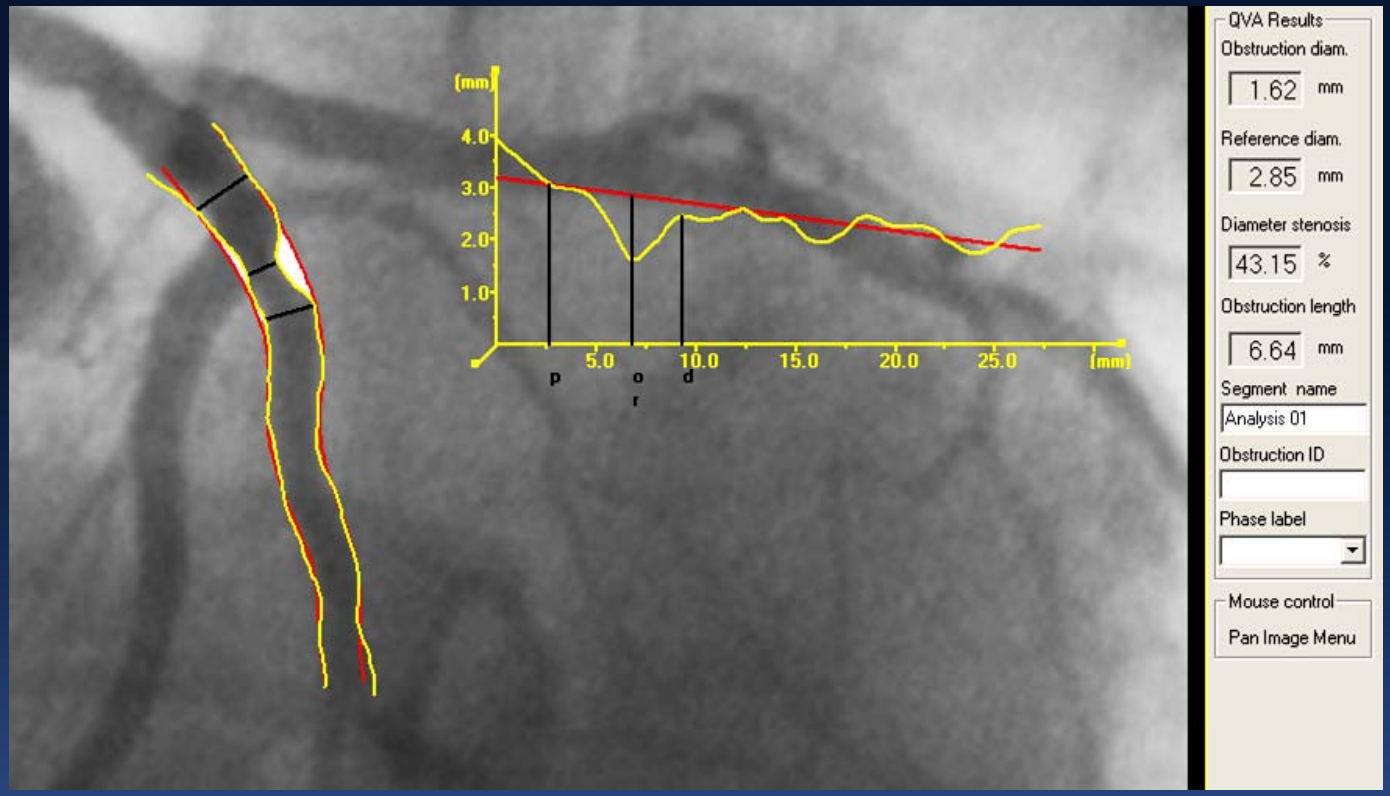
QCA Limitation: Step Down

Method to determine the proper reference diameter for each individual segment



The "Step down" phenomenon is a major limitations of Standard QCA when applied to bifurcation analyses

QCA Limitations: Step Down



Problem: Mismatch between prox vessel and distal vessel

Results in: Overestimated Reference
Overestimated %DS
Better for lesion length

Solutions:

Use Distal Reference or

Limit analysis to distal PV

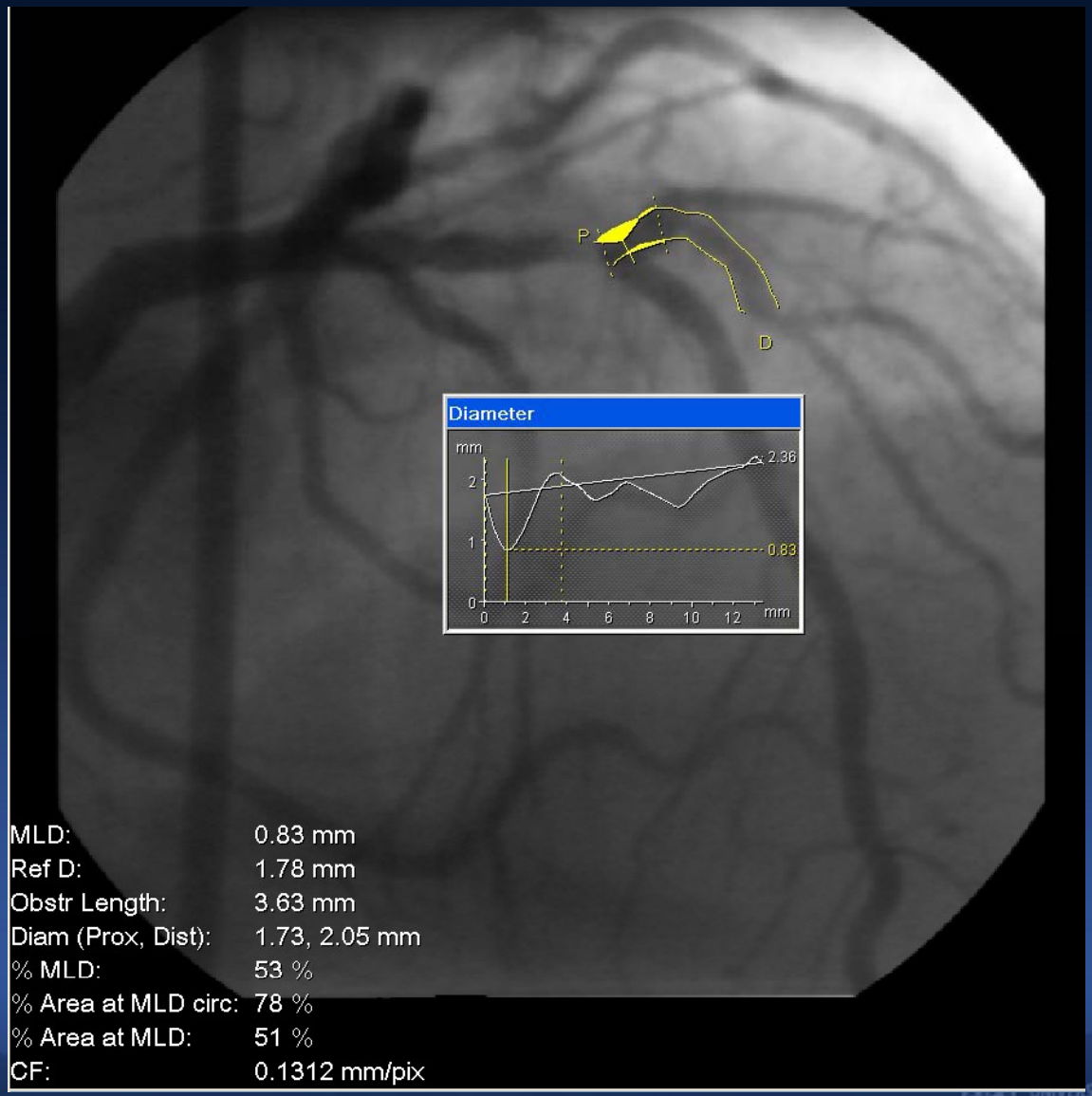
QCA Limitation: No Proximal Reference

Problems: Vessel contour track into MLD
Cannot assess lesion length

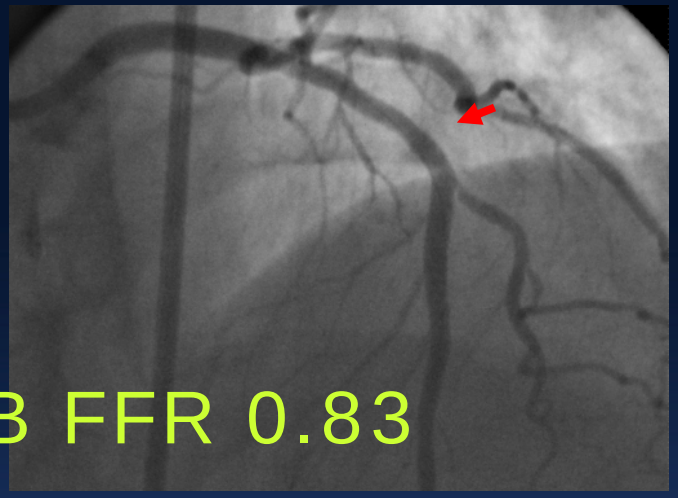
Results in: Underestimated reference
Underestimated %DS

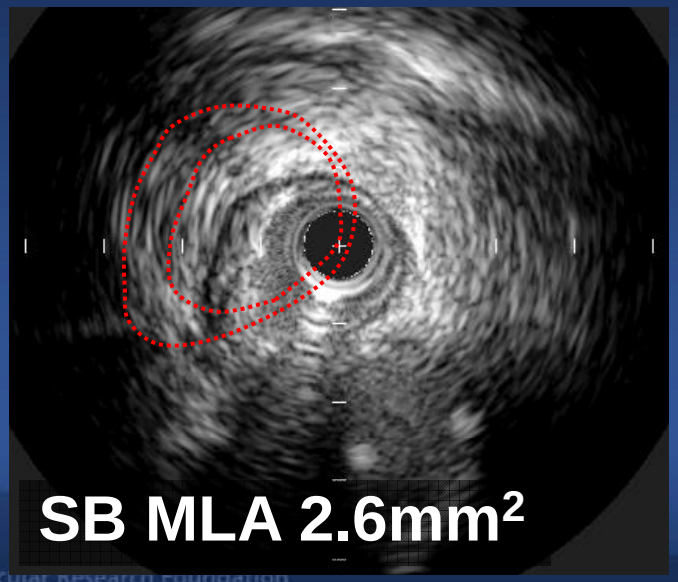
Solution: Use Distal Reference

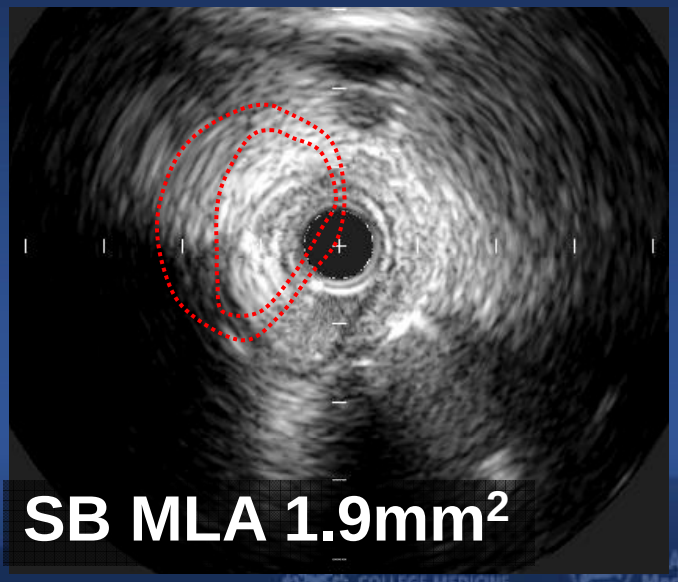
Incorrect Measurement



Limitation: poor correlation with functional ischemia !



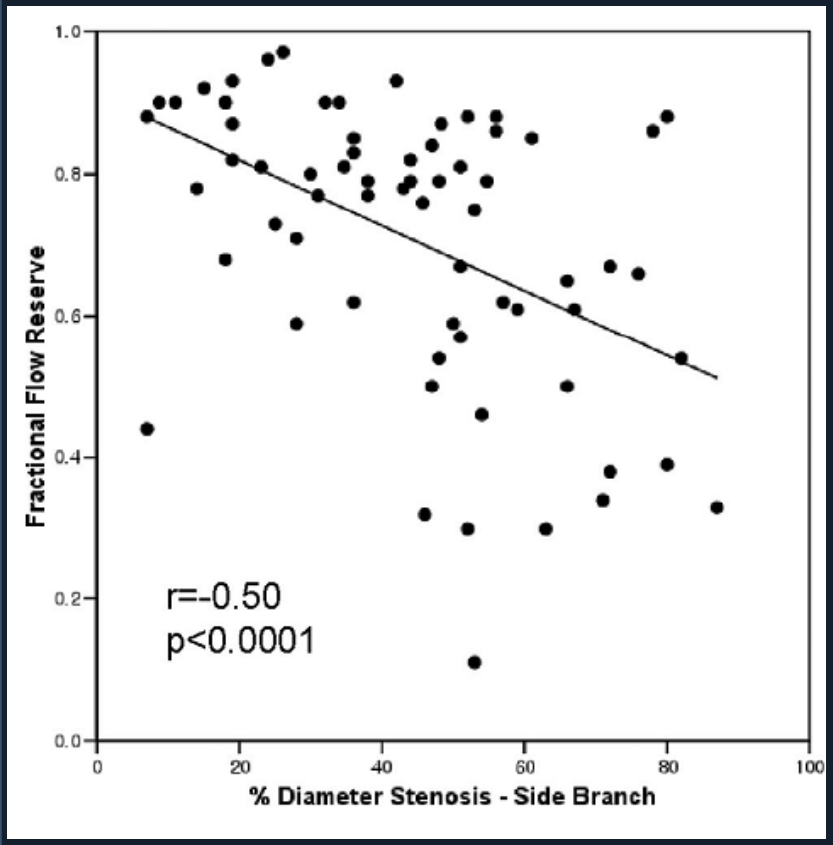




Pre-PCI %DS vs. Post-Stenting SB FFR

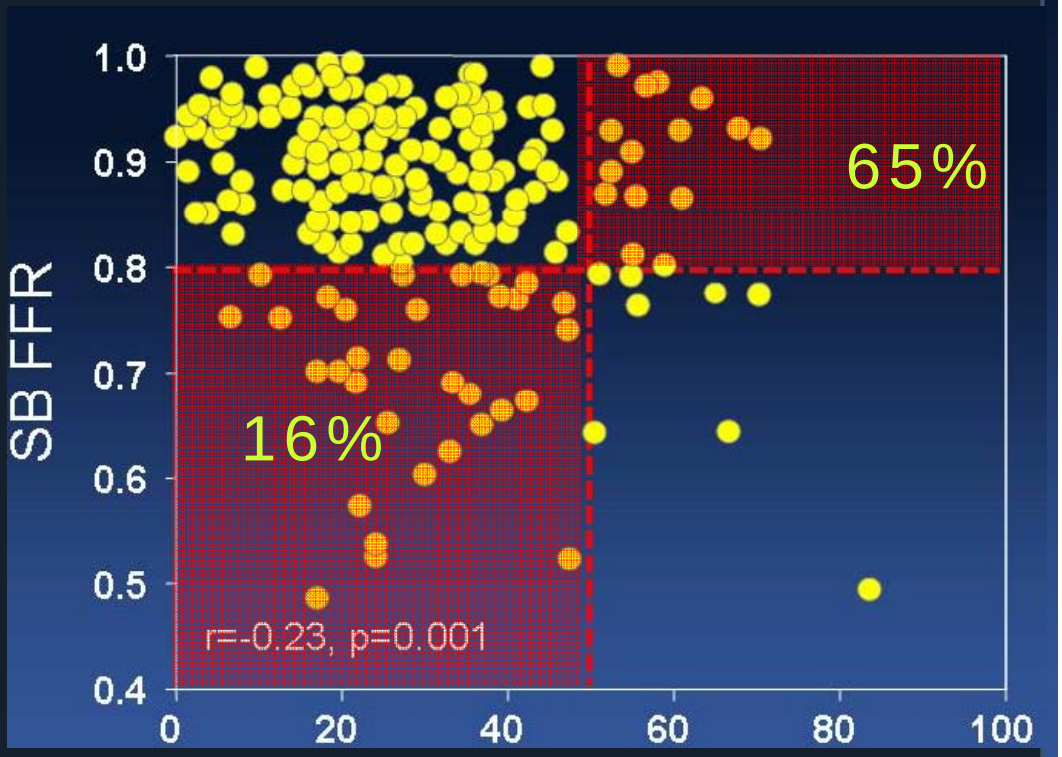
Koo et al.

Circ Cardiovasc Interv 2010;3:113-9



AMC Data

Ahn et al (JACC submission) 2011



Challenge in measuring Bifurcations

Innovative derivation of RVD in carina segment

arterial contours

reference contours

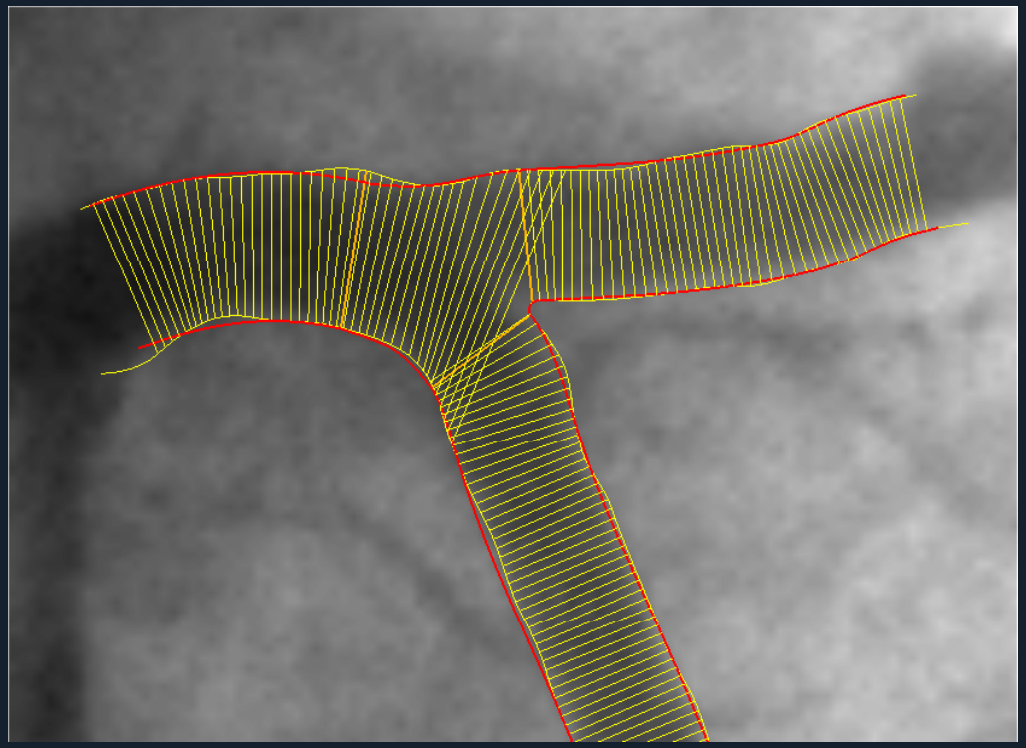
fragment delimiters

arterial diameters in proximal parent and carinal segment

Challenge in measuring Bifurcations

Innovative derivation of RVD in carina segment

Y Model: LM

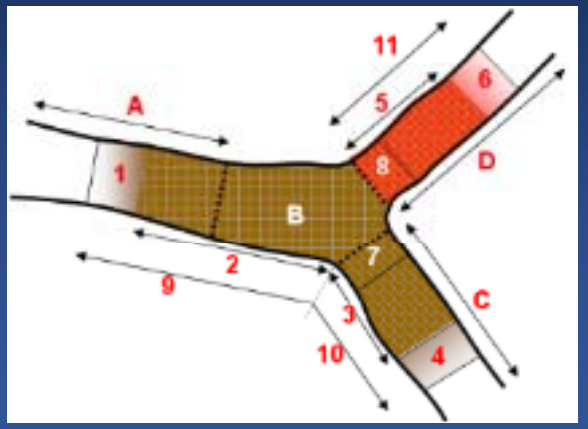


T Model

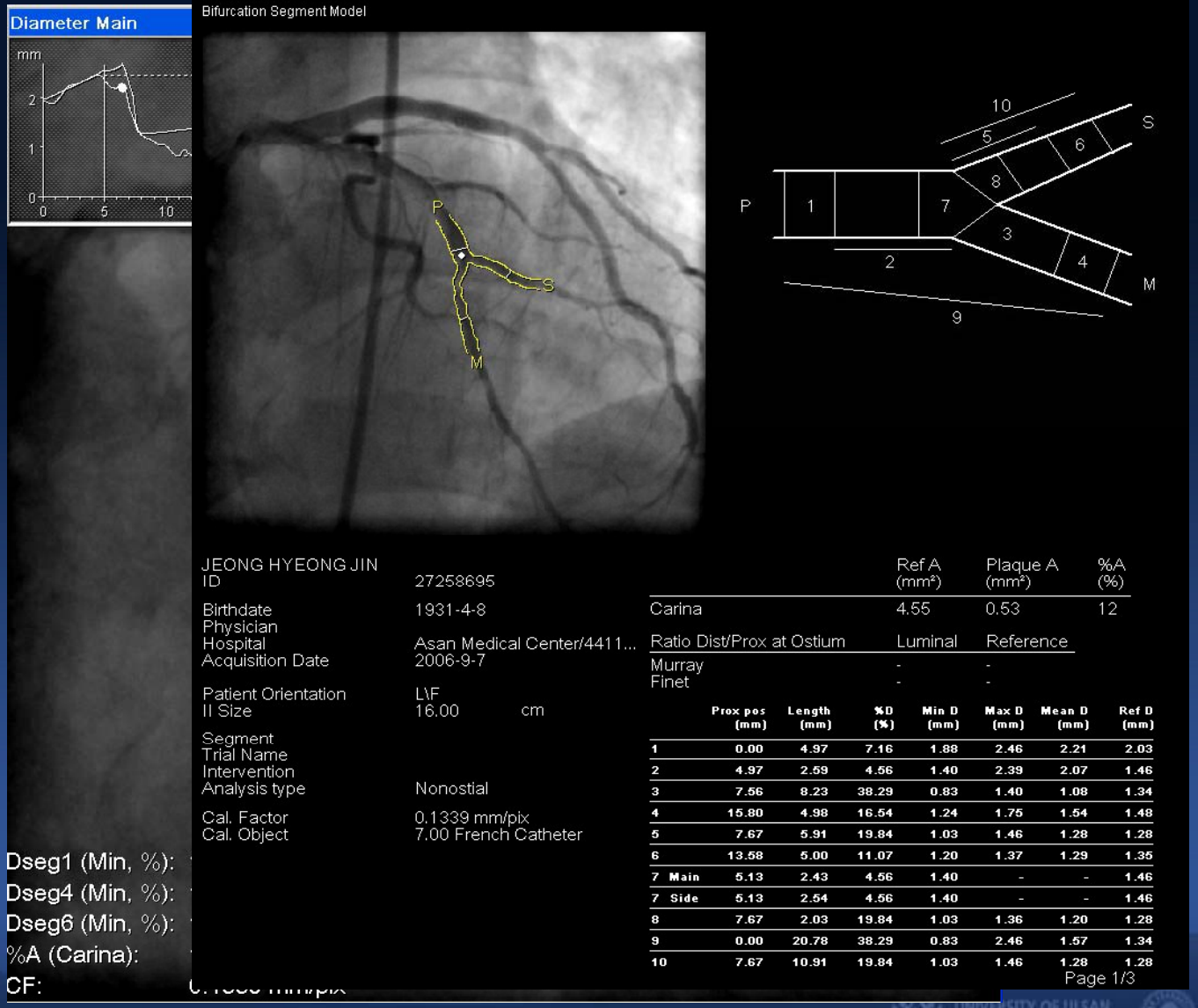
Standard Bifurcations

Edge Segment Definitions

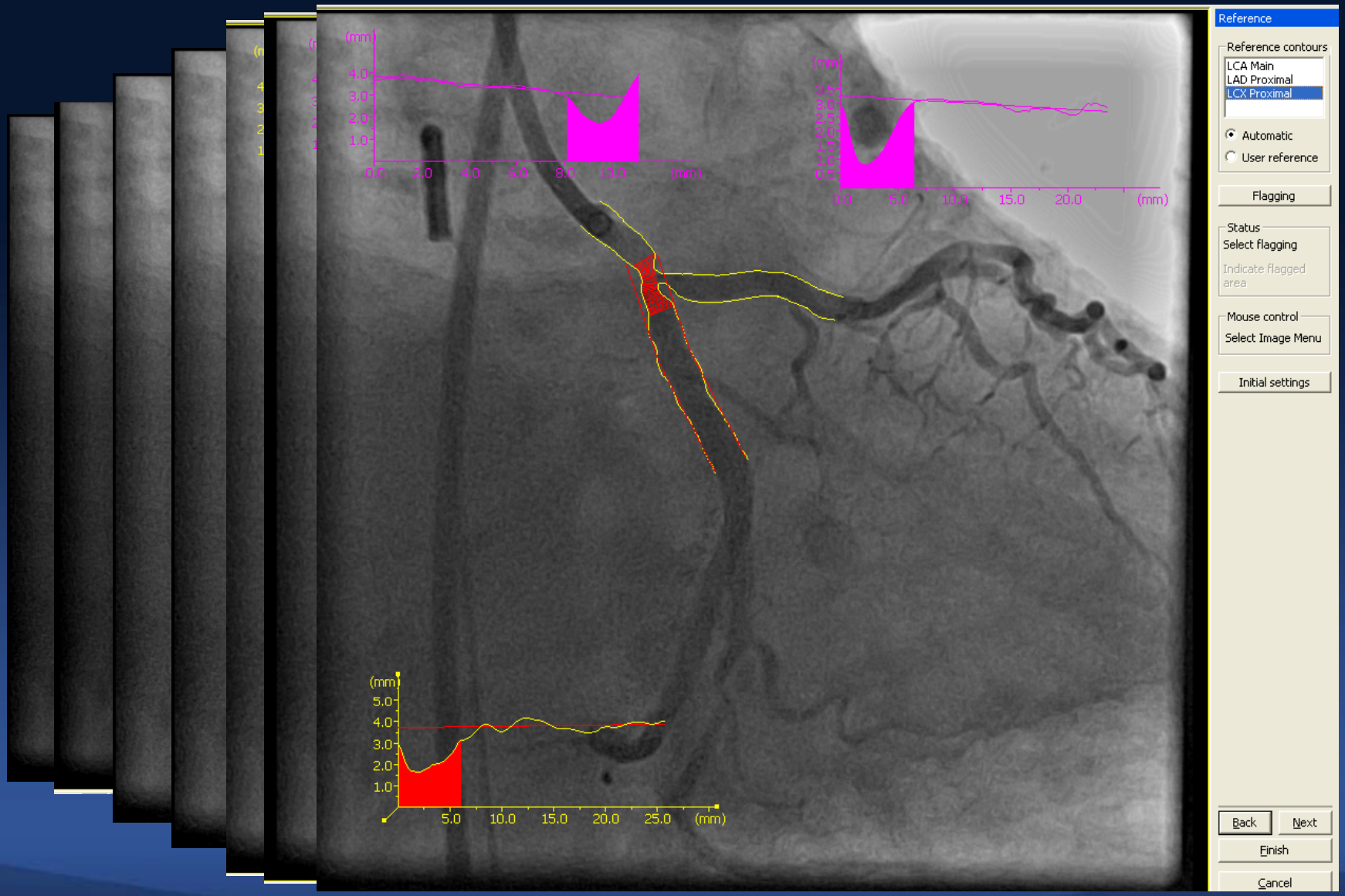
	Length	Position MLD	MLD	Ref D	% DS	Distance MLD-stent	Max D	Mean D
Segment 1	5.00	0.523	3.843	3.728	-3.07	0.174	3.845	3.844
Segment 2	18.50	6.099	3.407	3.709	8.14		3.854	3.604
Segment 3	6.53	25.724	2.560	2.462	-3.96		3.231	2.975
Segment 4	5.00	27.485	2.229	2.443	8.76	1.761	2.560	2.380
Segment 5	10.63	19.253	1.786	2.368	24.57		5.400	2.160
Segment 6	5.00	30.012	1.685	1.944	13.31	1.056	2.035	1.815
Segment 7	5.00	24.198	2.876	2.478	-16.04		3.231	3.049
Segment 8	5.00	19.253	1.786	2.368	24.57		5.400	2.158
Segment 9	19.20	6.099	3.407	3.709	8.14		3.854	3.613
Segment 10	11.53	27.485	2.229	2.443	8.76		3.231	2.717
Segment 11	15.63	19.253	1.786	2.368	24.57		5.400	2.050



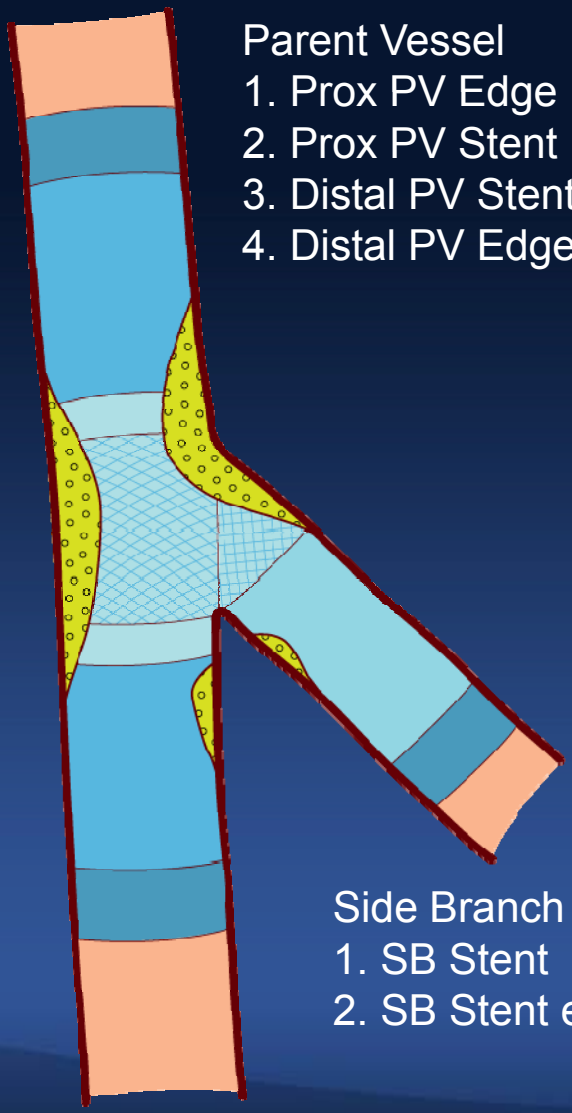
Dedicated Bifurcation QCA



Dedicated Bifurcation Software

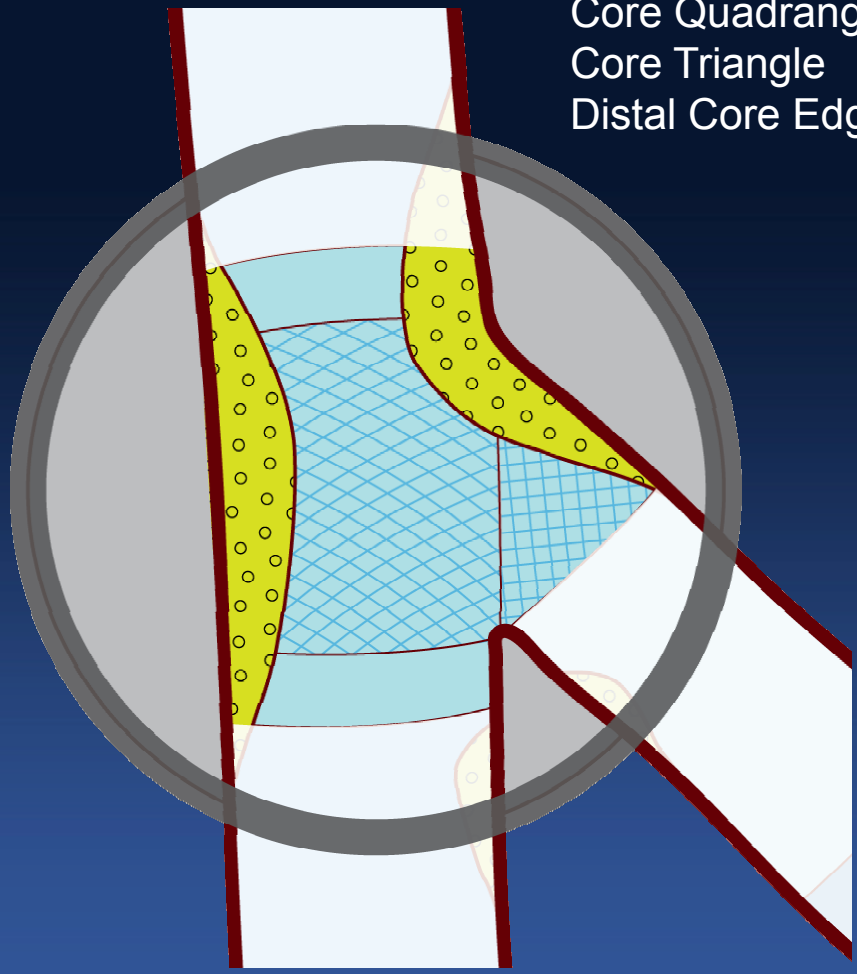


Bifurcation Core Analysis



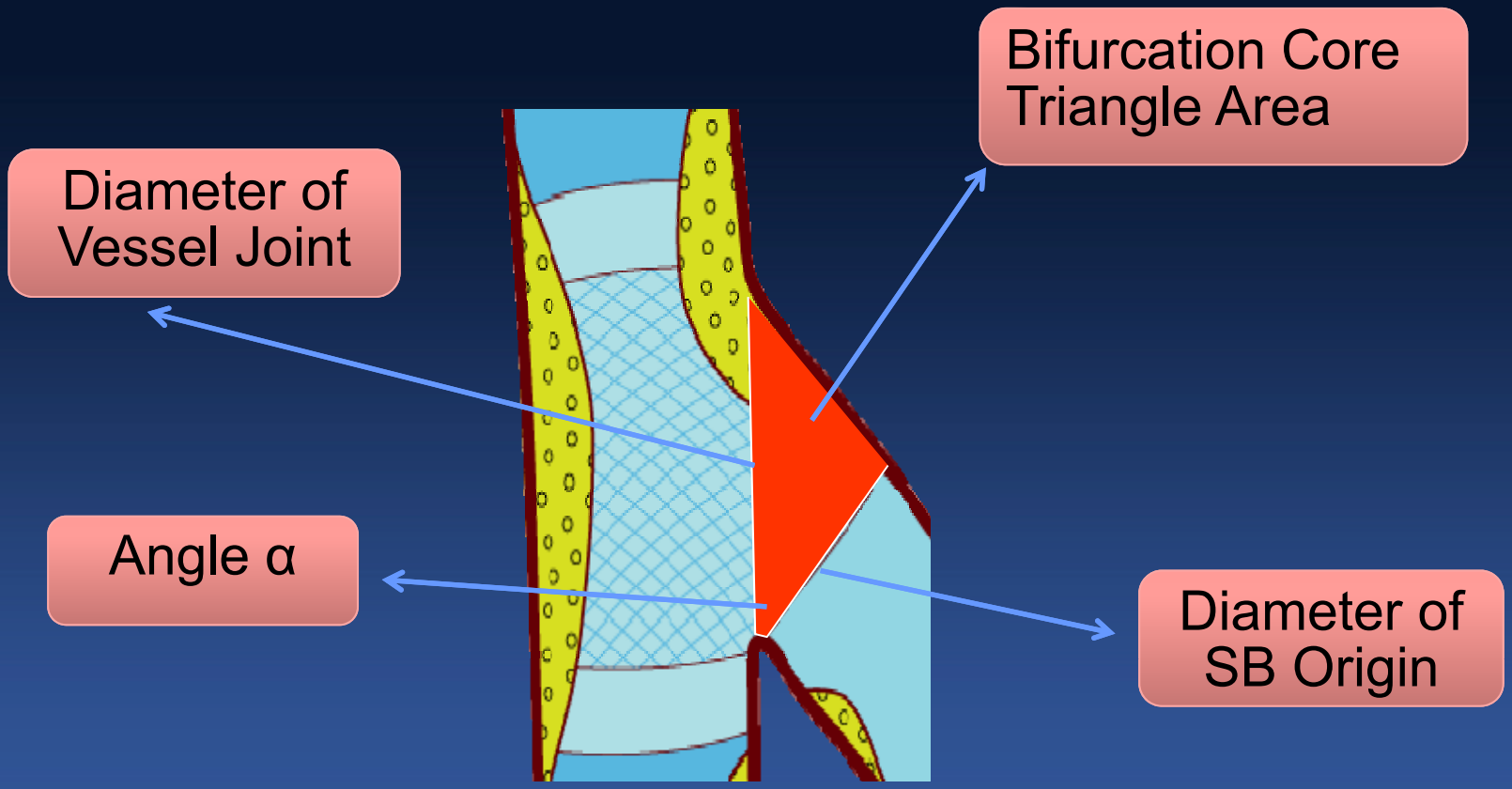
Parent Vessel
1. Prox PV Edge
2. Prox PV Stent
3. Distal PV Stent
4. Distal PV Edge

Side Branch
1. SB Stent
2. SB Stent edge



Prox Core Edge
Core Quadrangle
Core Triangle
Distal Core Edge

Bifurcation Core Triangle as a Measure for Carina Shift, Ostial Scaffolding, and Ostial Preservation



Conclusions

- Angiography has many limitations in assessing bifurcation lesions.
- Novel QCA software is designed to accurately derive reference measures and minimal luminal diameters.
- Given the asymmetry at the MV and SB transition zone, traditional QCA miss dimensions relevant to the ostial intersection.
- Bifurcation Core area and angle measures provide ostial SB geometry changes from baseline to final treatment.
- This new QCA analysis should provide critical information to guide intervention procedures and new device development.