

# **Coronary CT guided left main bifurcation PCI**

**- Calcium importance for the result of LMT stenting -**

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## COI Disclosure

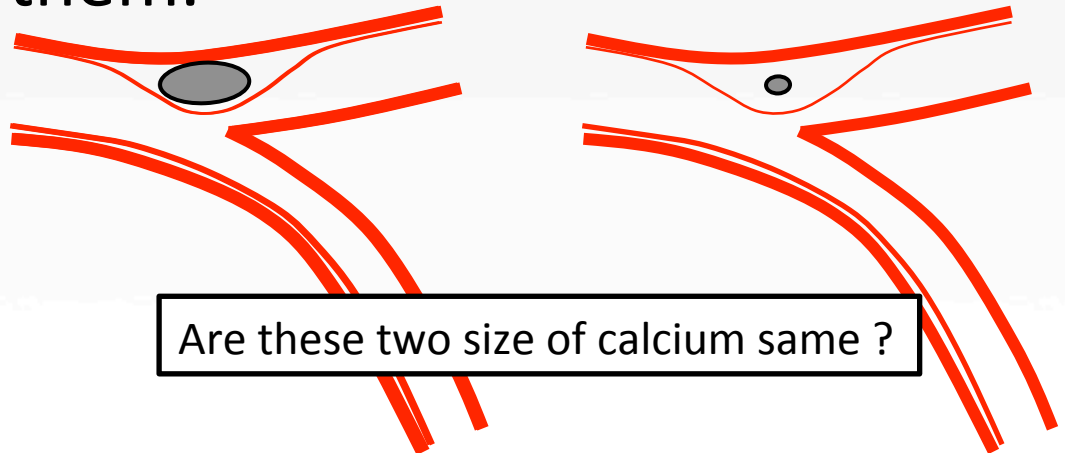
*Masaaki Okutsu*

The authors have no financial conflicts of interest to disclose concerning the presentation.

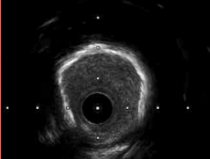
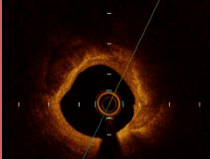

# Introduction

- Current consensus of LMT bifurcation PCI recommends single stent strategy. However, LCX ostium has sometimes severe stenosis or occlusion after crossover stenting unexpectedly. There are some factors that affect to jailed LCX ostium.
  - MB plaque, SB plaque, low angle, and ...

Calcification is one of them.



# Which modality is best for calcium ?

	IVUS		OCT		CT	
Presence	◎		○ x:deep calc		◎	
Thickness measurement	×		○ x:large size or far location		x?	
Form	×		○ x:large size or far location		◎	

# Coronary artery calcium

- **Quantification of coronary artery calcium using ultrafast computed tomography.**

A.S. Agatston, et al. J Am Coll Cardiol, 1990

“The threshold for a calcific lesion was set at a computed tomographic density of **130 Hounsfield units** having an area  $\geq 1\text{mm}^2$ .”

- **Noninvasive detection and evaluation of atherosclerotic coronary plaques with multislice computed tomography.**

Schroeder S, et al. J Am Coll Cardiol. 2001

“ . . . and calcified plaques (n=17) of  $419 \pm 194$  HU (ranging from **126 to 736 HU**).”

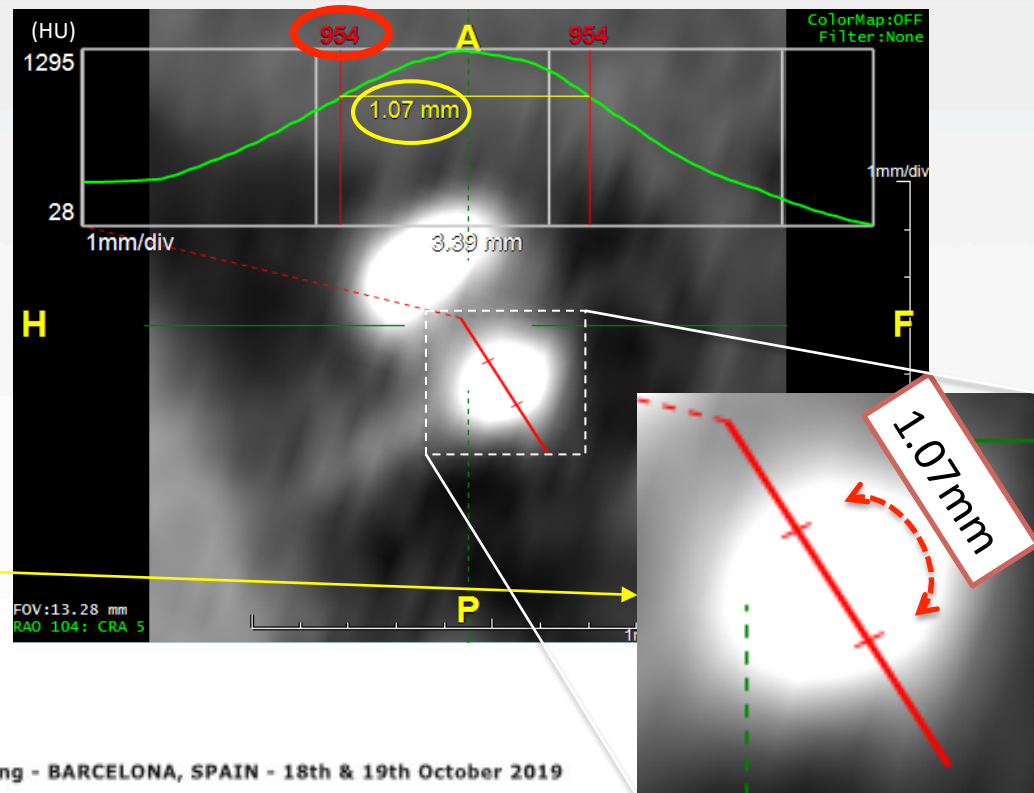
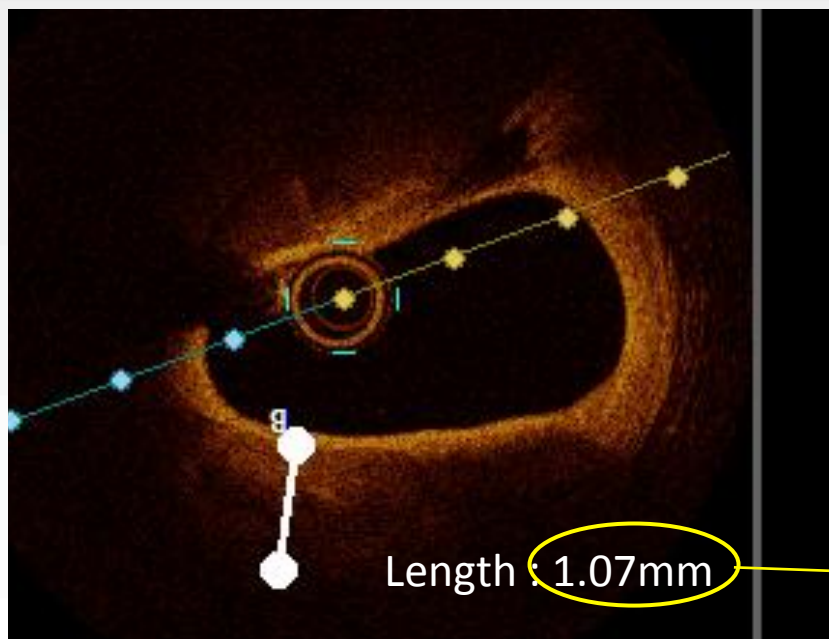
- **SCCT guideline**

– Analysis of coronary artery anatomy and pathology

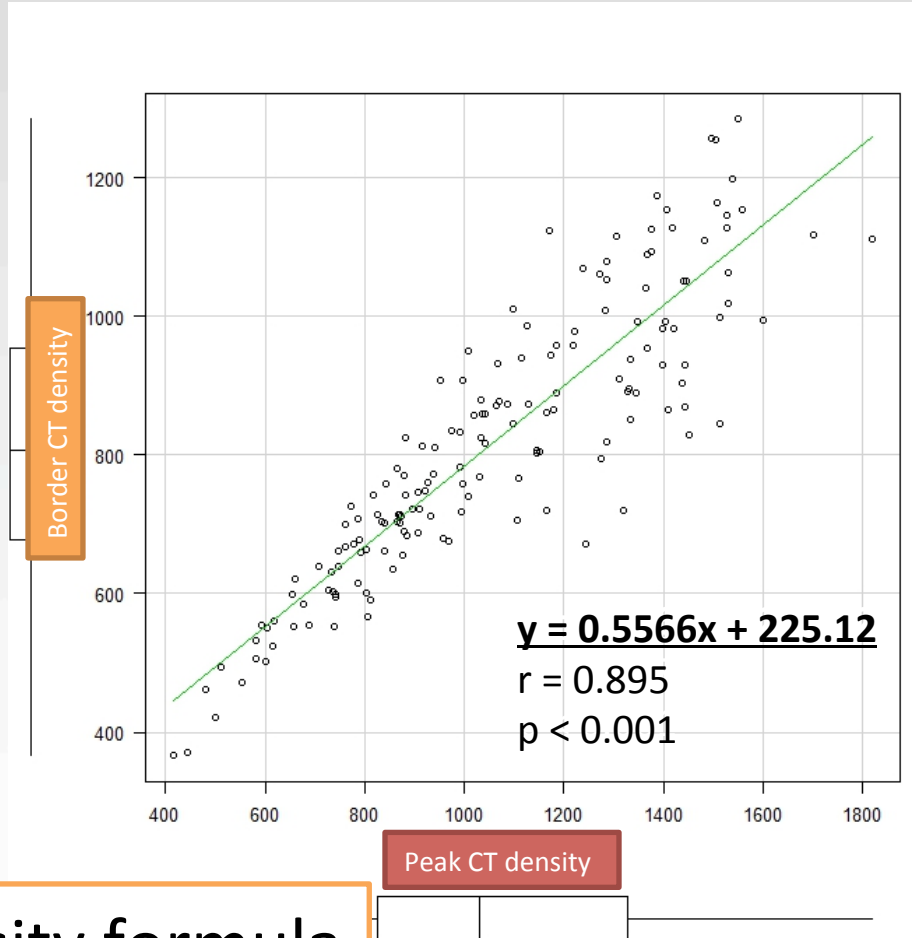
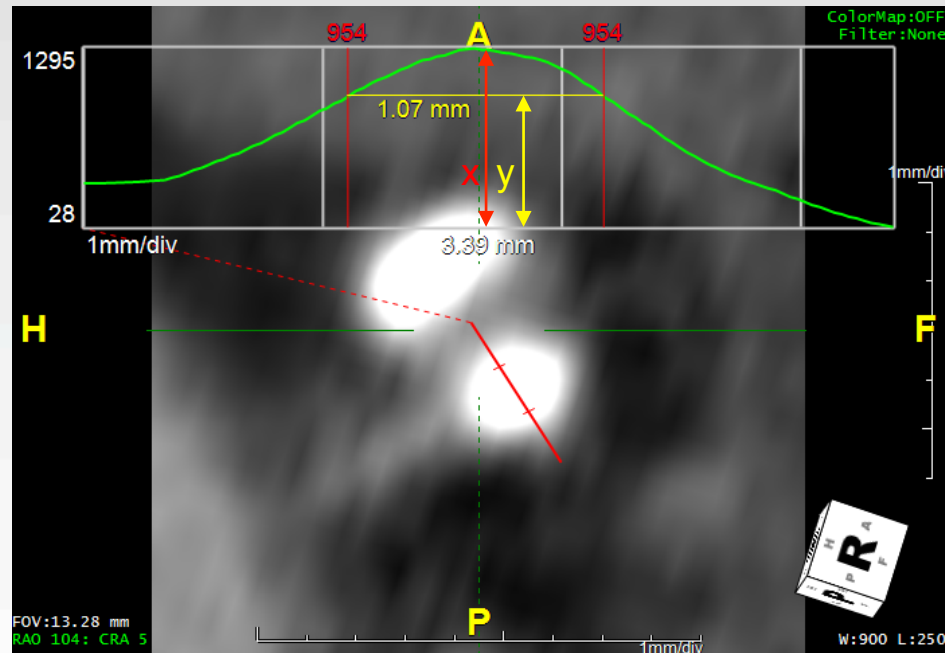
“ . . . differentiate **calcific, noncalcific, and partially noncalcified plaque**, . . . ”

# OCT and CT image of same calcium

Calcium thickness was measured correctly by OCT. Calcium image in CT is thicker than actual calcium.



# Calcium thickness estimation algorithm



Estimated calcium border density formula  
 $= 0.557 \times (\text{Peak CT density}) + 225 \text{ (HU)}$

# Objective

- To investigate the relationship between calcium thickness at LMT bifurcation and LCX ostium deterioration after LMT-LAD crossover single stenting.

# Study population

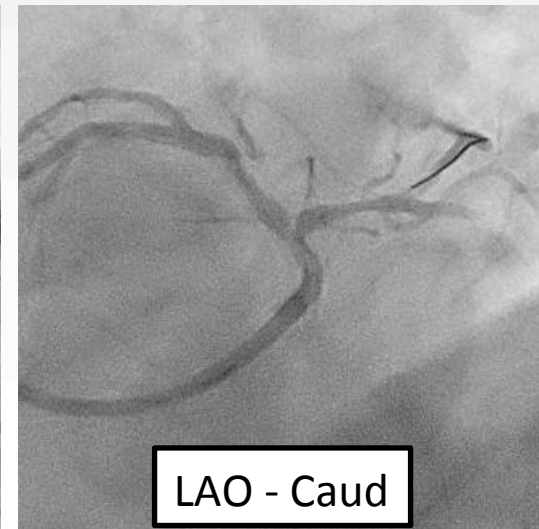
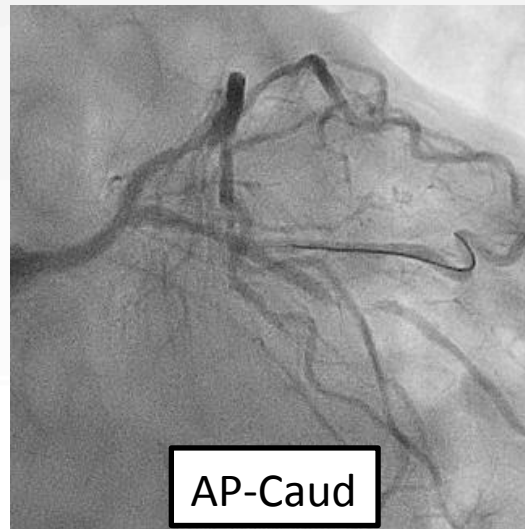
379 patients with PCI for LMT disease from Jan.2017 to Sep.2019

- 311 were excluded
- 243 - No pre-procedural coronary CT
  - 1 - Poor CT image
  - 7 - CT examination other than with 120kV
  - 11 - Non bifurcation stenting
  - 3 - LCX ostium lesion > 50% stenosis
  - 31 - In-stent restenosis
  - 2 - Sub-acute thrombosis
  - 9 - Planned 2 stent procedure
  - 2 - LMT to LCX stenting
  - 2 - DCA without stent

68 patients with coronary CT and LMT bifurcation crossover stenting to LAD were enrolled for analysis.

# Angiogram evaluation

- Jailed LCX ostium stenosis after stent implantation from LMT to LAD was evaluated by angiogram.
- Stenosis deterioration of LCX ostium was defined as more than 50% stenosis post crossover stenting visually.

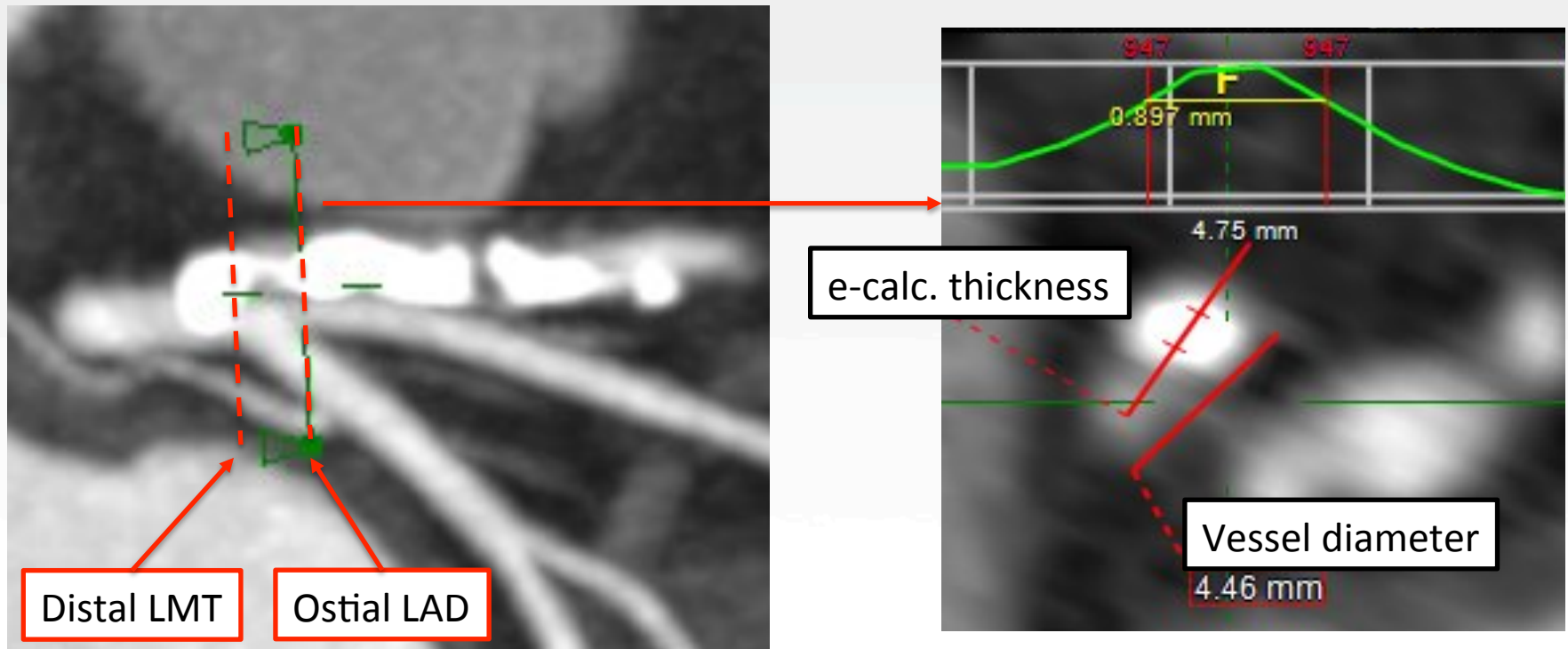


# Calcium measured point

- Estimated calcium thickness by CT was leaded by  

$$\text{Estimated border density} = 0.557 \times (\text{Peak CT density}) + 225$$
- % calcium thickness  

$$= \text{E-calcium thickness} / \text{vessel diameter} \times 100 (\%)$$



# Patient's characteristics

n=68	n (%)
Age – y.o.	72.6±9.4
Gender (male) - no. (%)	54 (79.4)
Hypertension - no. (%)	43 (63.2)
Dyslipidemia or Statin use - no. (%)	56 (82.4)
Diabetes mellitus- no. (%)	25 (36.8)
CKD (eGFR<45) - no. (%)	6 (8.8)
Hemodialysis - no. (%)	2 (2.9)
Prior PCI- no. (%)	4 (5.9)
Prior CABG- no. (%)	0 (0.0)
Prior MI- no. (%)	4 (5.9)
Period between CT and PCI - days	17.6±16.8

# Lesion characteristics

n=68	no. (%)
Medina classification	
1,1,1,	4 (5.9)
1,1,0	9 (13.2)
1,0,1	2 (2.9)
0,1,1	3 (4.4)
1,0,0	11 (16.2)
0,1,0	31 (45.6)
0,0,1	0 (0.0)
0,0,0	8 (11.7)

n=68	Pre PCI no. (%)	Post PCI no. (%)
Stenosis of LCX ostium		
≤25%	57 (83.8)	30 (44.1)
>25%, ≤50%	11 (16.2)	25 (36.8)
>50%, ≤75%	-	8 (11.8)
>75%	-	5 (7.4)
Stenosis deterioration		13 (19.1)

# Procedural characteristics

n=68		n=68	
Stent	- no. (%)	KBI - no. (%)	42 (61.8)
Xience	25 (36.8)	Balloon size of MB (mm)	3.15±0.64
ResoluteOnyx	35 (51.5)	Balloon size of SB (mm)	2.82±0.50
Synergy	4 (5.9)	POT - no. (%)	66 (97.1)
Ultimaster	2 (2.9)	balloon size (mm)	4.48±0.51
Orsiro	2 (2.9)	Post dilatation procedure	- no. (%)
Stent size	(mm)	POT alone	23 (33.8)
diameter	3.56±0.34	POT+FKI	8 (11.7)
length	29.6±9.4	KBI+F-POT	33 (48.5)
Ablation or debulking device	- no. (%)	SB dilatation+F-POT	2 (2.9)
Rotablator or OAS	10 (14.7)	KBI alone	0 (0.0)
DCA - no. (%)	3 (4.4)	no additional dilation	2 (2.9)
		provisional TAP	1 (1.5)

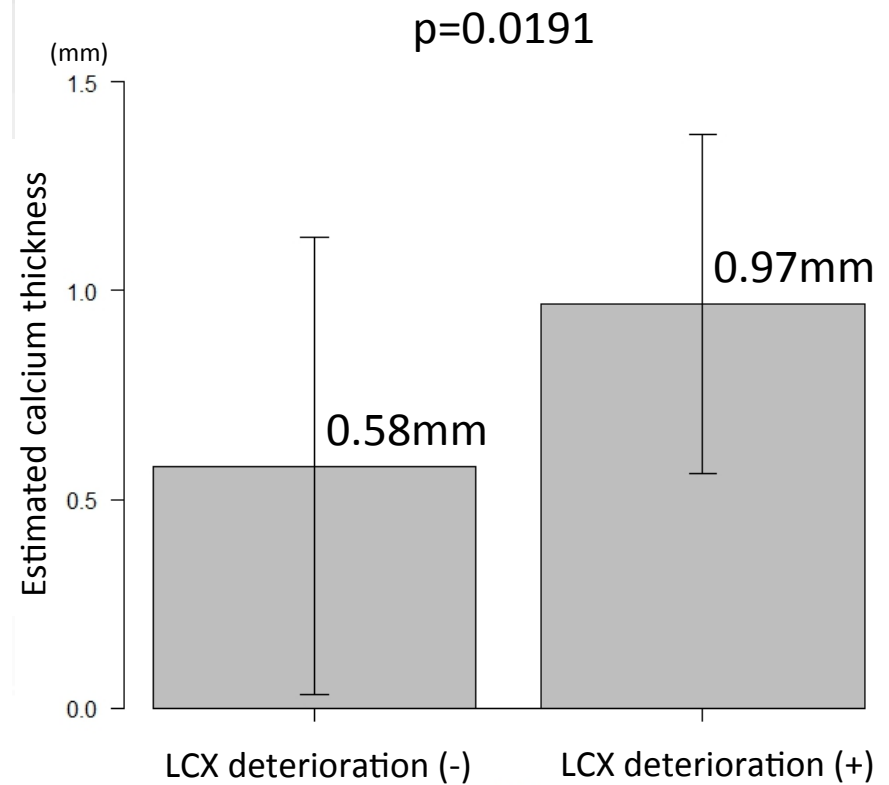
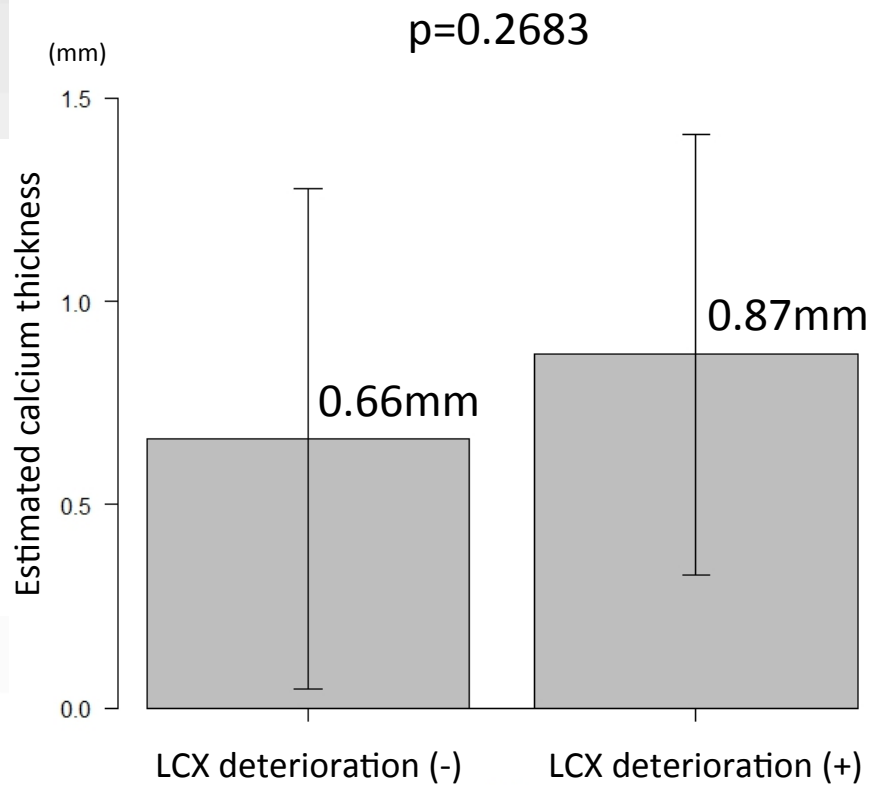
OAS, Coronary orbital atherectomy system

DCA, Directional coronary atherectomy

# Estimated calcium thickness

Distal LMT

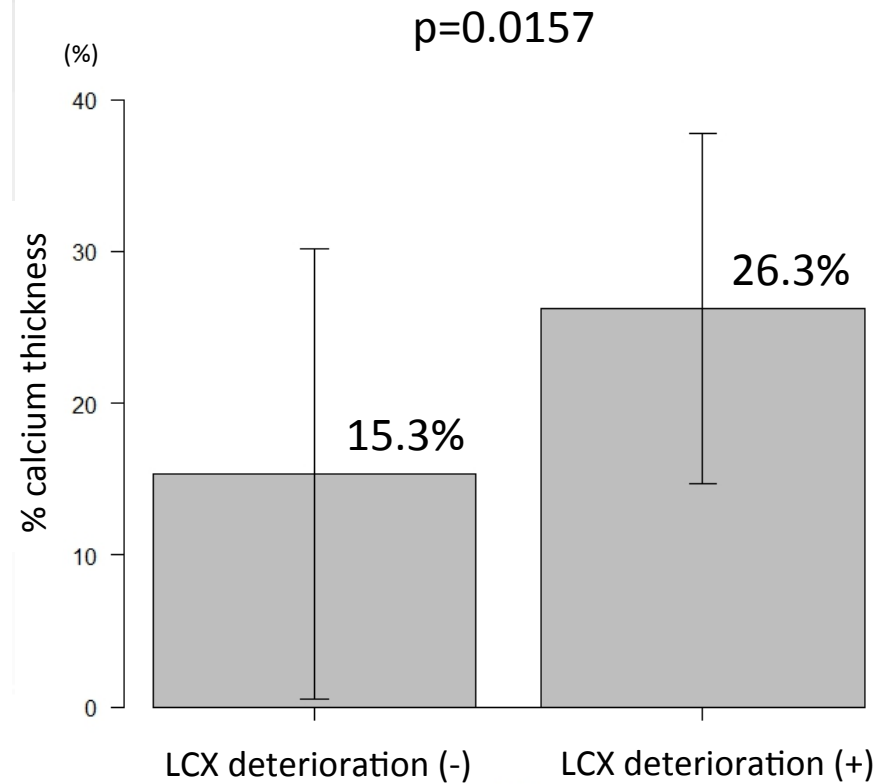
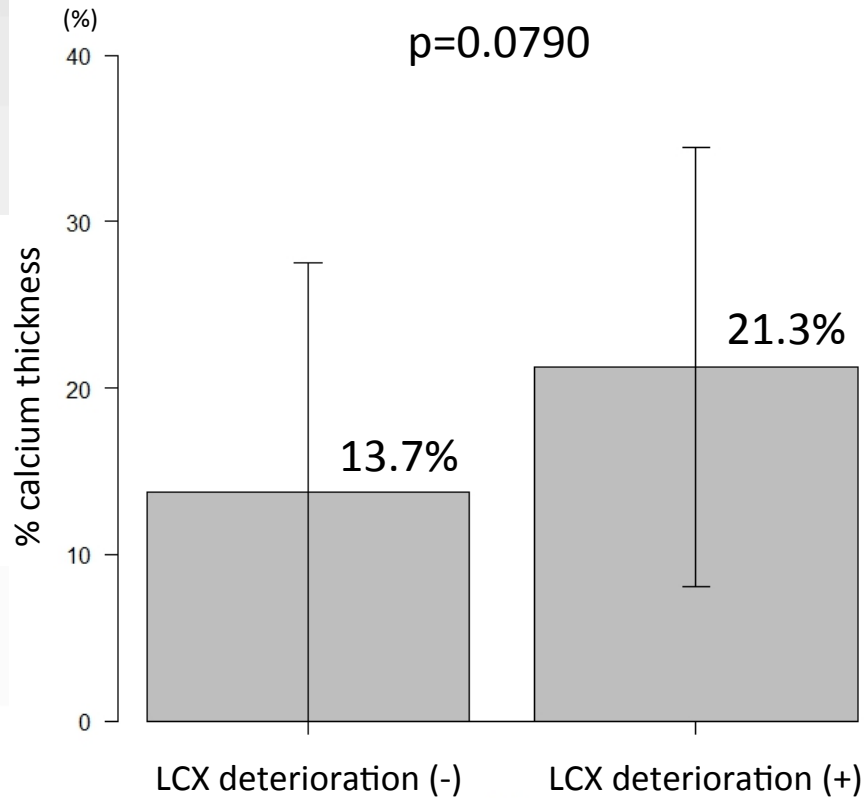
Ostial LAD



# % calcium thickness

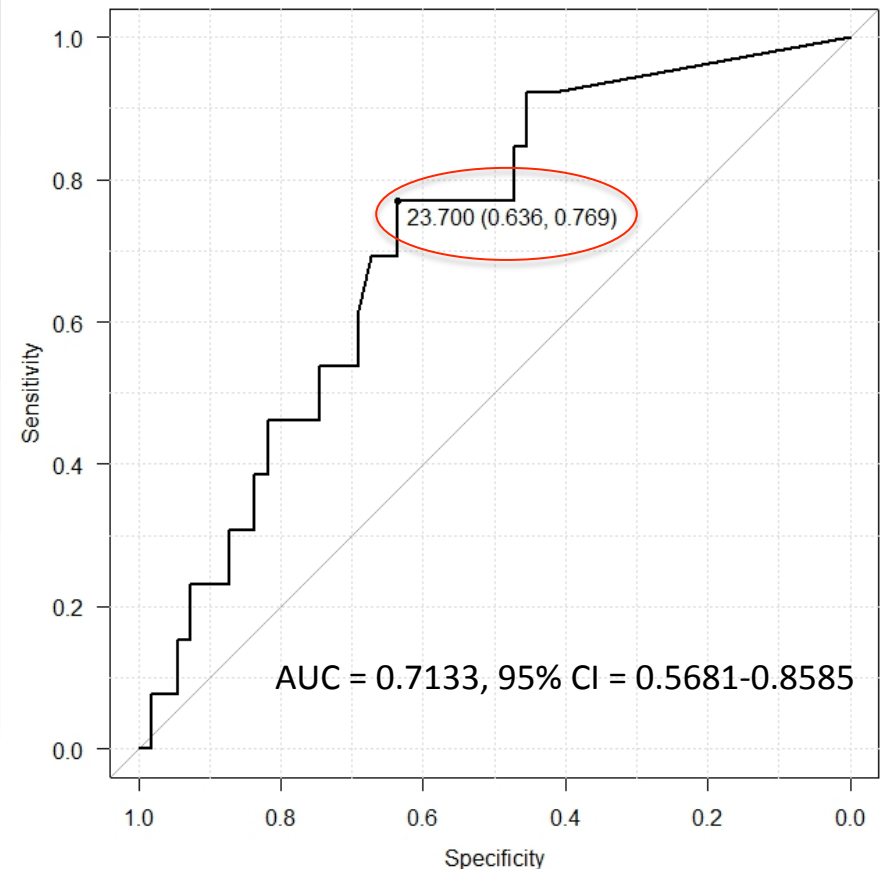
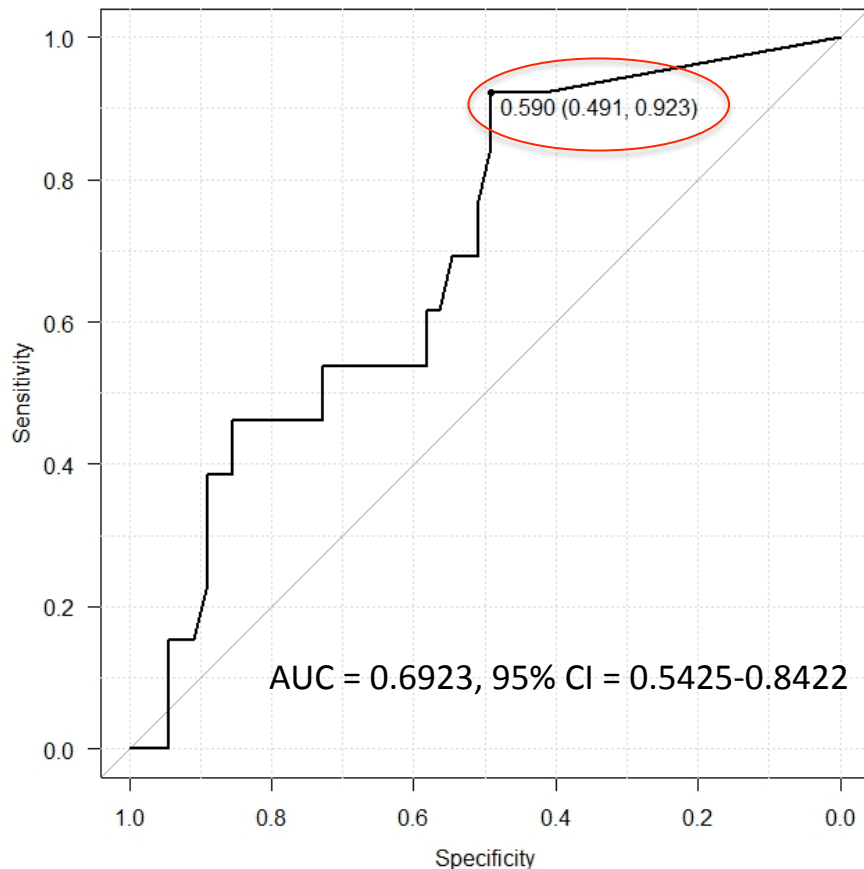
Distal LMT

Ostial LAD



# Predictability tests for LCX ostium deterioration

Estimated calcium thickness of ostial LAD    % calcium thickness of ostial LAD



# Conclusion

- Coronary CT might be able to measure calcium thickness.
- Calcium thickness of ostial LAD might affect LCX ostium stenosis deterioration after crossover stenting from LMT to LAD.