

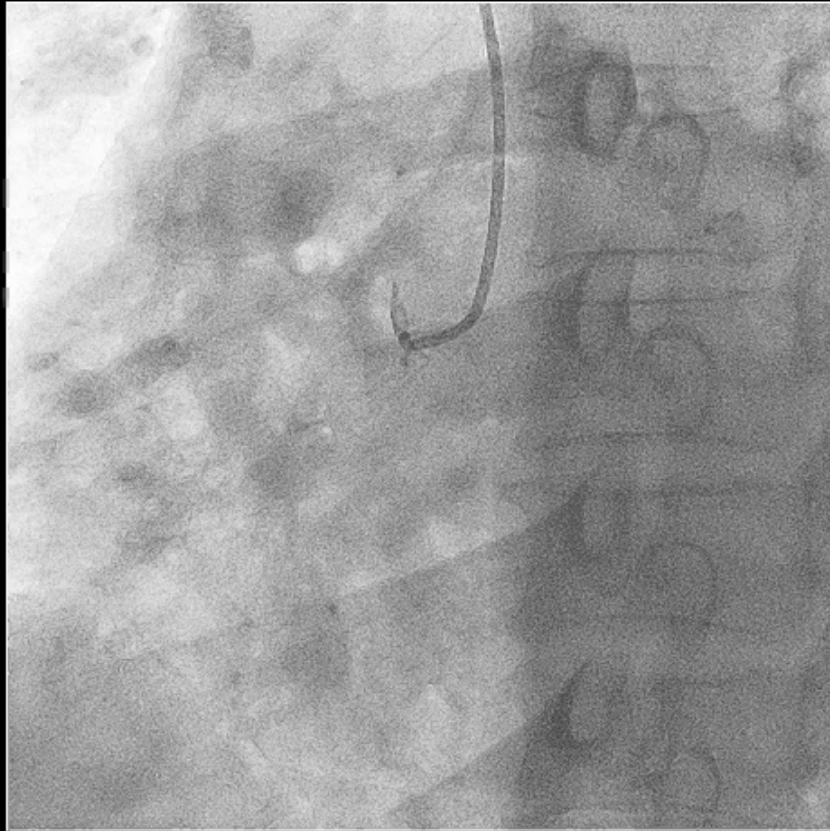
Value of MSCT in CTO PCI

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What's the role of coronary CT before CTO PCI ?



CT tells something more than CAG !

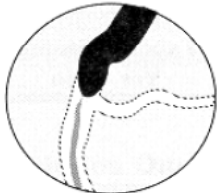
Invasive CAG - predictors of CTO PCI success

Favorable



Tapered stump

Tapered stump



Functional occlusion

Functional (or short) occlusion



Pre or post-branch occl.

Not at branching site

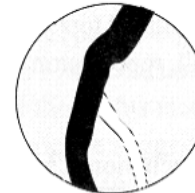


Bridging collaterals absent

No bridging collaterals

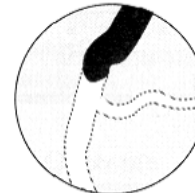
... and, occlusion length

Unfavorable



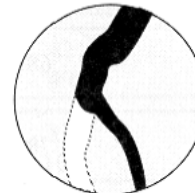
Stump absent

No stump



Total occlusion

Complete and long occlusion



Occlusion at side-branch

At branching site (= no stump, ostial location)



Bridging collaterals present

Bridging collaterals

Tortuous vessel

Severe calcification

Poor distal vessel ...

CTO - Information available from coronary CT

Ostial size and location

Lesion length

Anatomy of Vessel

Stump morphology

Intramural or extramural calcification

Anatomy of CTO lesion

Distal vessel morphology

Vessel angulation

Physiology of Myocardium

Calcification at entry

Calcification in CTO

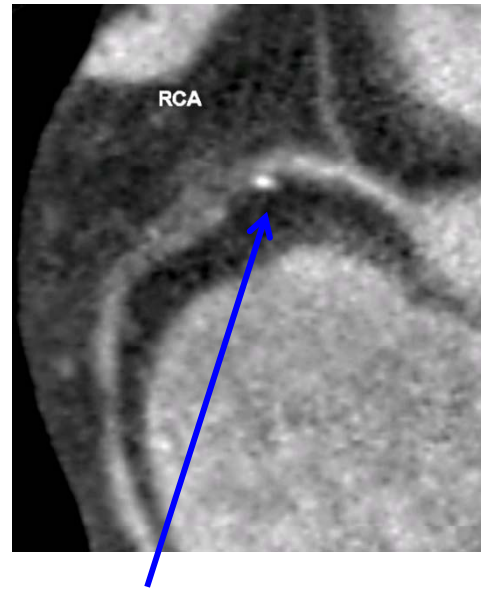
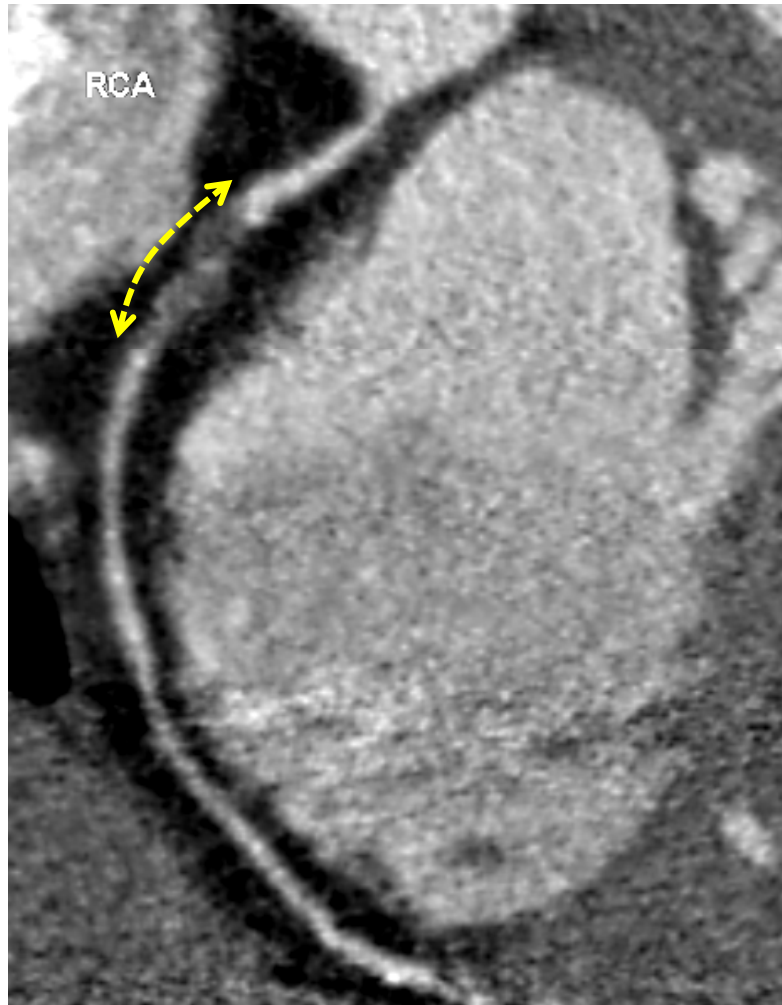
Physiology of Collaterals

Presence of good collateral vessel for retrograde approach

Modified from Feyter, Niemann, EuroPCR 2011

Samsung Medical Center, Sungkyunkwan University School of Medicine

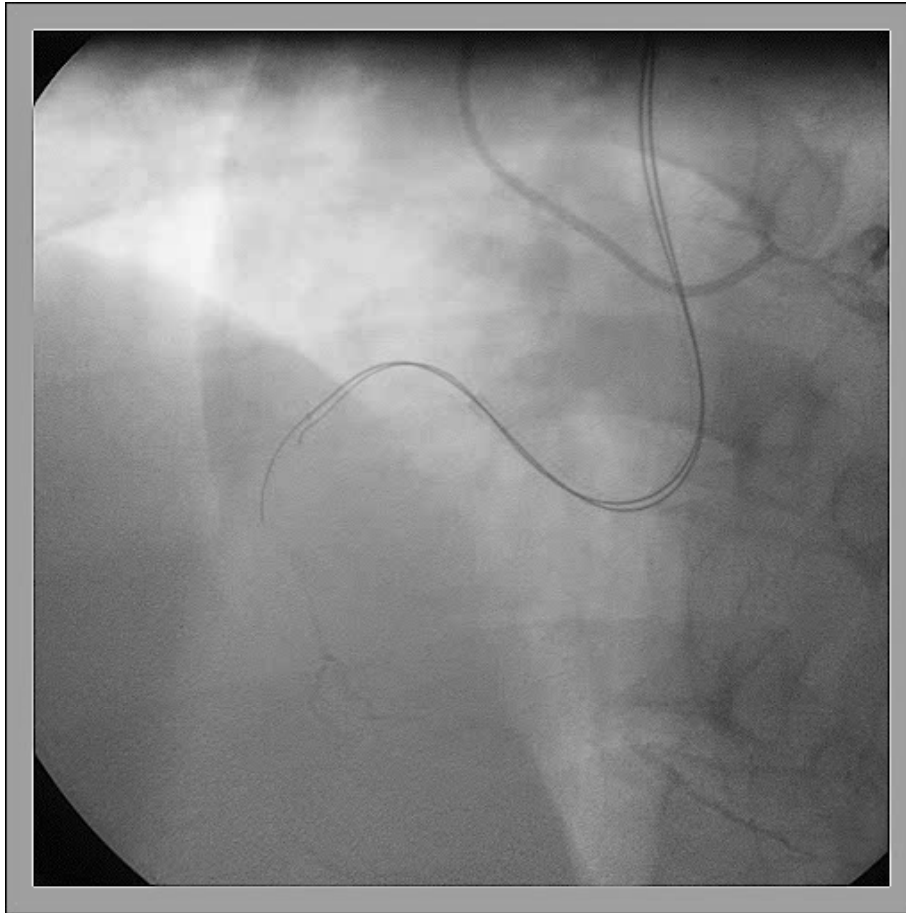
CT



1. Relatively short CTO
2. Focal calcification at myocardial side of CTO entry
3. Ostium is relatively small and upward → **Judkin Rt GC** and **large-bore GC** would be **NOT** adequate

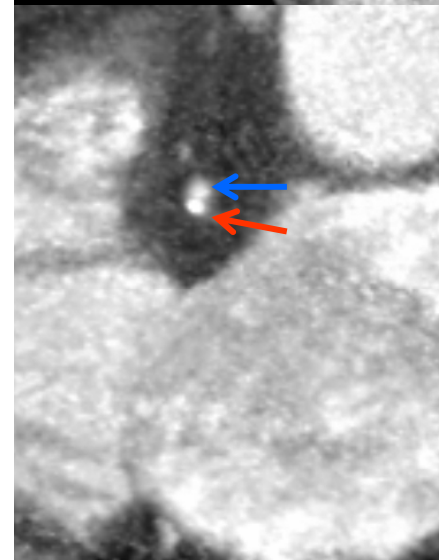
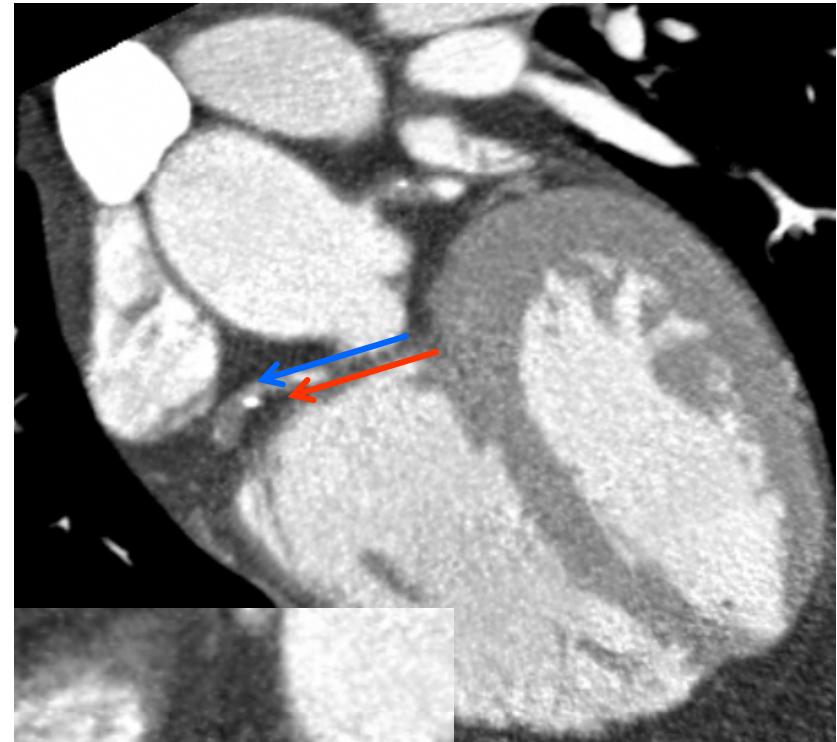
KJH 19444874

PCI



Guiding catheter: XB 2.0 6Fr.

The guidewire at outer curvature could enter distal true lumen

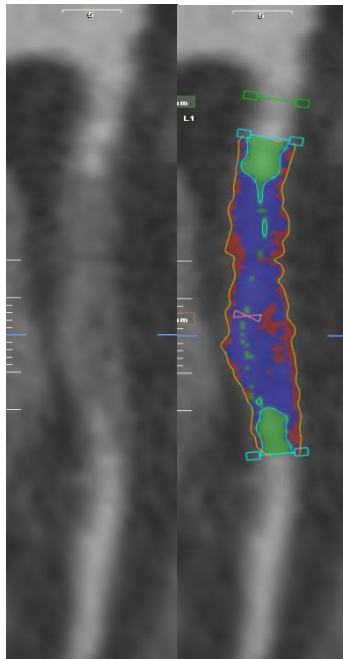


The guidewire course was predictable from CT

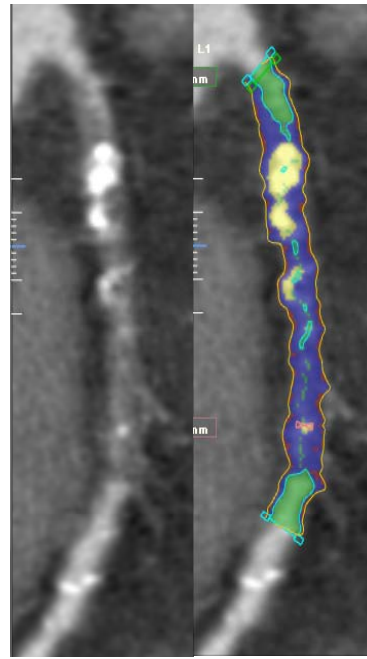
KJH 19444874

Remodeling pattern of CTO plaque

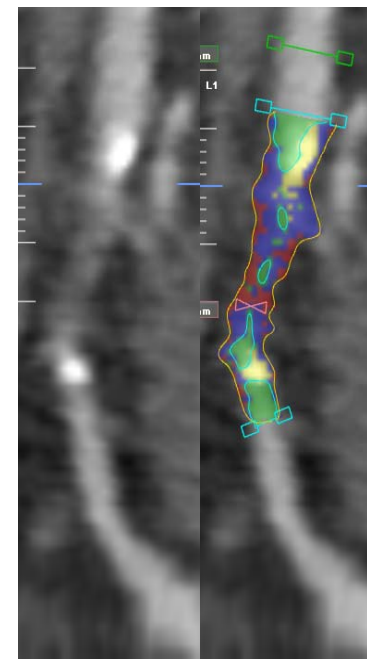
Positive remodeling



Neutral



Negative remodeling



CTO \leq 1 yr

35.4%

7.6%

57.0%

CTO $>$ 1 yr

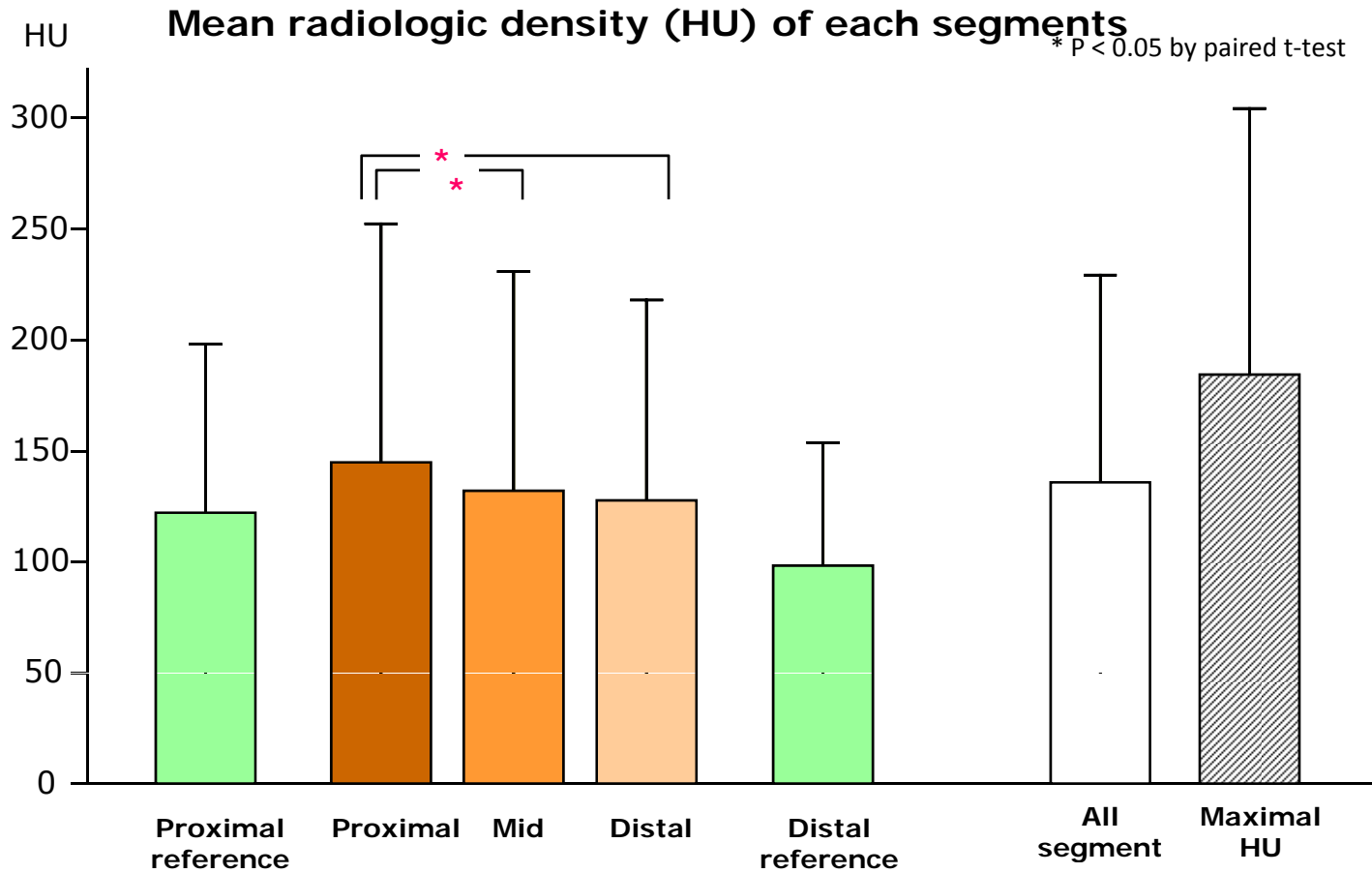
16.5%

5.0%

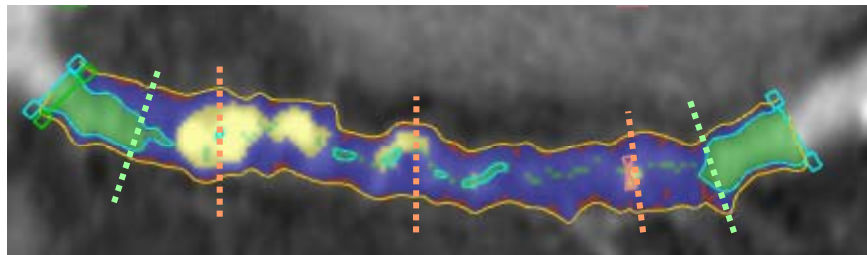
78.5%

Choi, Circ J 2011

3D radiologic density analysis of CT



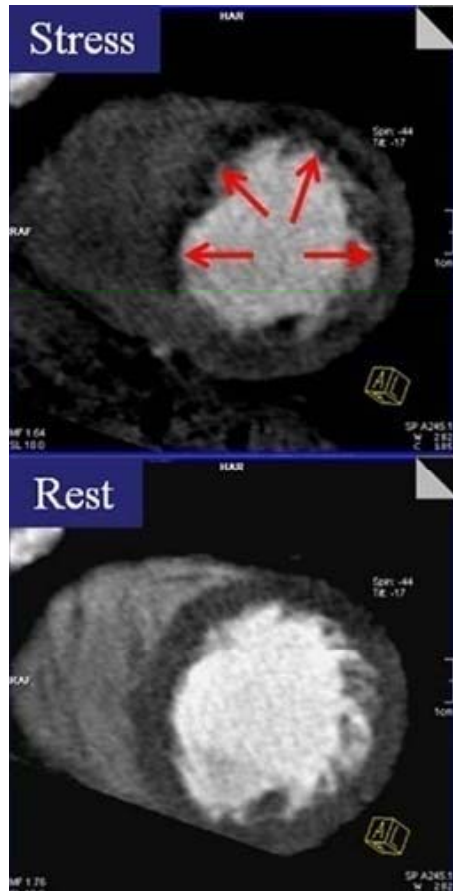
Anterograde approach →



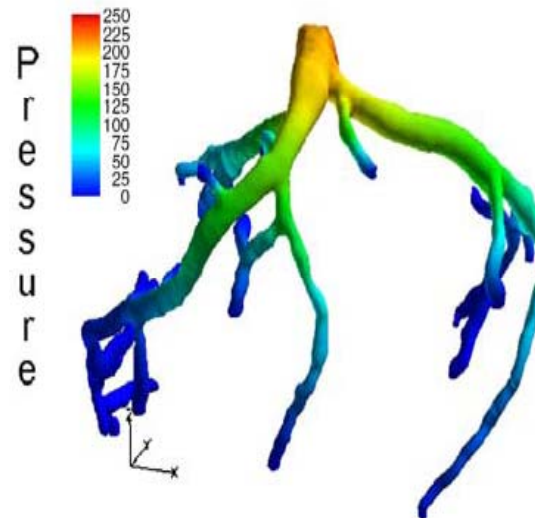
← Retrograde approach

Choi, Circ J 2011

Beyond anatomical stenosis: Evaluation of myocardial ischemia by CT

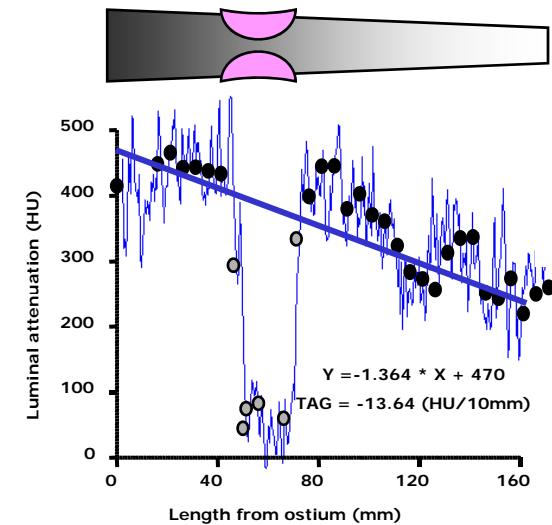


Myocardial perfusion



Koo, JACC 2011

Computational fluid
dynamics



Choi, JACC Img, in press

Chow, JACC 2010

Steigner, Circ Img 2009

Attenuation gradient

Concept of CT-gradient in CTO

Normal

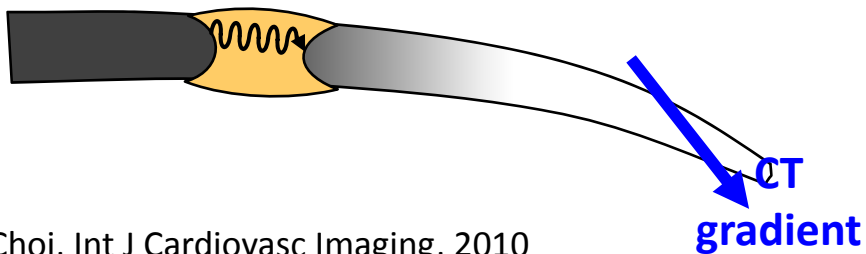
Major epicardial coronary artery



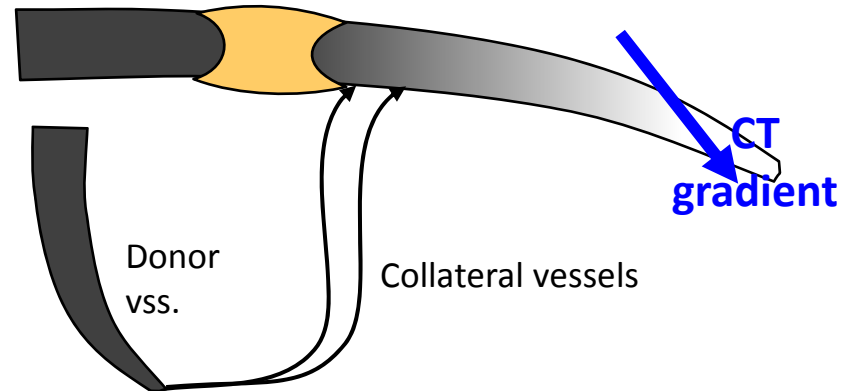
Significant stenosis



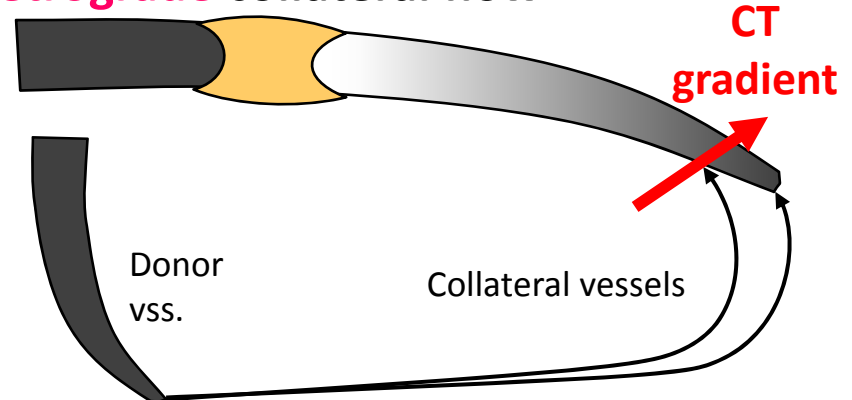
CTO with intra-arterial anterograde collateral flow



CTO with inter-arterial anterograde collateral flow



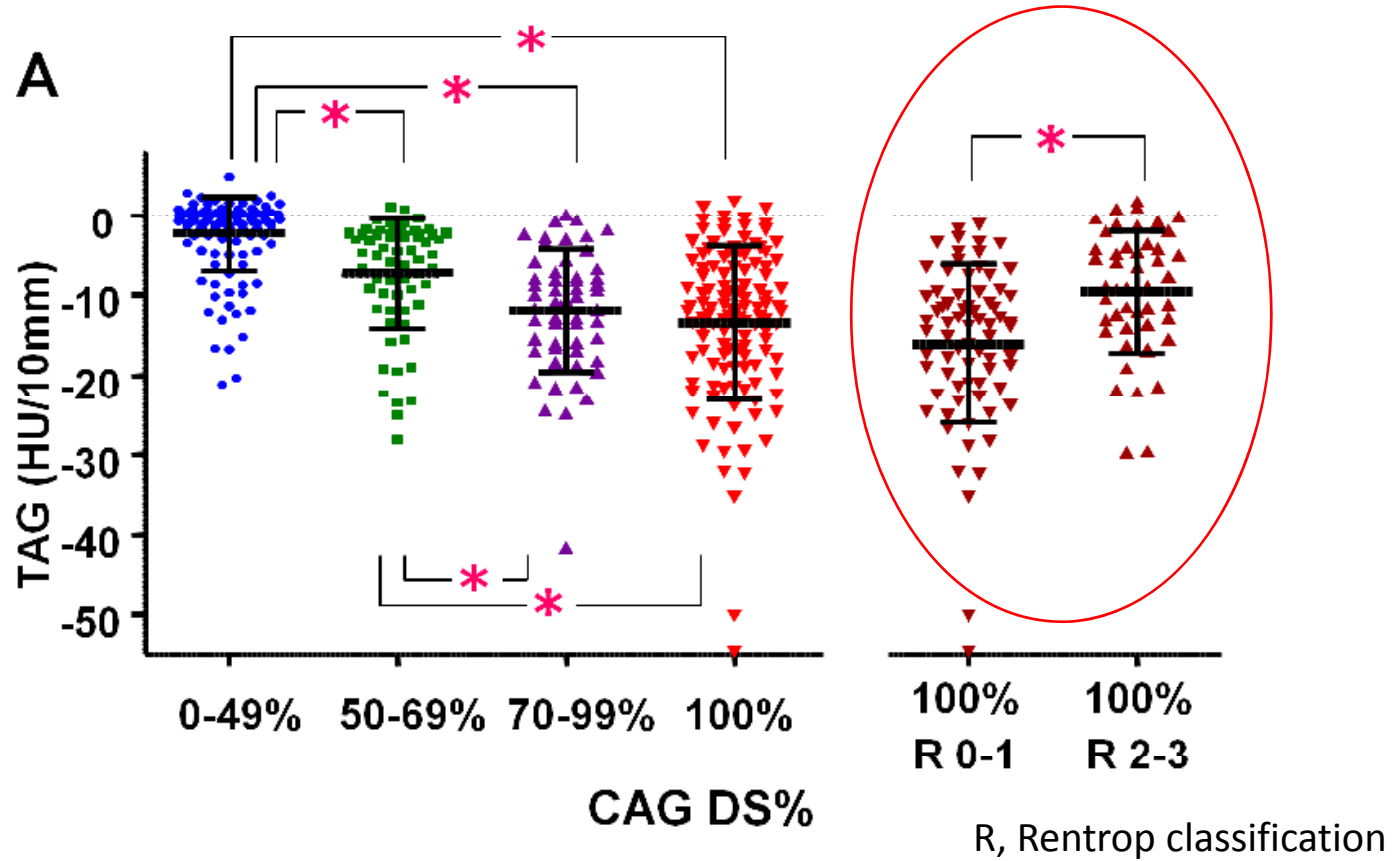
CTO with inter-arterial retrograde collateral flow



Choi, Int J Cardiovasc Imaging, 2010

Choi, JACC Img in press

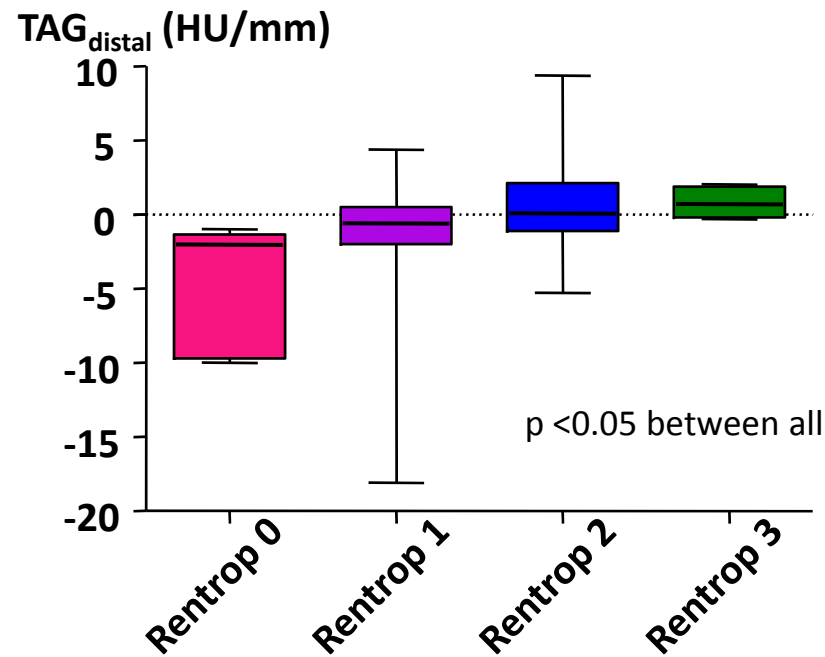
CT-gradient in CTO



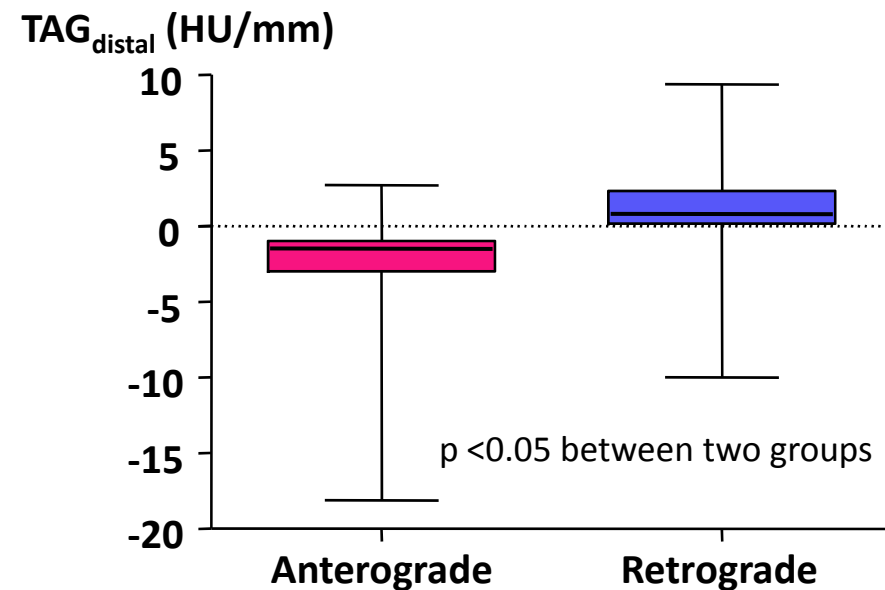
Choi, JACC Img in press

CT-gradient shows the degree and direction of collateral flow

Rentrop collateral flow classification



Anterograde vs. retrograde collateral flow



Choi, in submission

Prediction of CTO PCI success by pre-procedural CT

	N of CTO	Success (%)	CT predictors	Independent predictors
Mollet, Am J Cardiol 2005	45	53%	Calcification > 15 mm Blunt stump	Calcification > 15 mm Blunt stump
Soon, J Interv Cardiol 2007	43	56%	Transluminal calcification > 50% Blunt stump (by CAG)	
Otsuka, Int J Cardiovasc Imaging 2008	26	100%	None (100% success)	
Cho, Int J Cardiol 2009	72	76%	Length Regional calcium scores % Ca area/CSA	% Ca area/CSA
Garcia, Eurointervention 2009 (CTTO registry)	139	63%	CSA > 50% Angulation Calcium at entry > 15 mm	CSA > 50%
Ehara, J Inv Cardiol 2009	110	85%	Bending, Shrinkage, Calcium	
Choi, Circ J 2010	186	77%	Length > 18 mm Density > 139 HU	CTO > 1 year
Araki, EuroPCR 2011	114	82%	Intramural calc	Intramural calc
Jen, Int J Cardiol 2010	82	81%	Calcium length ration > 0.5 Calcium at proximal and distal stump	

Most accepted predictors: severity of calcification and lesion length

CTO PCI with or without pre-PCI CT



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Effect of preoperative evaluation by multidetector computed tomography in percutaneous coronary interventions of chronic total occlusions

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	CT (+)	CT (-)	P-value
N	40	60	
Success (%)	77.5%	80.0%	NS
Complication (%)	7.5%	23.3%	0.039
coronary perforation	0%	10%	0.039
AMI	5%	12%	NS

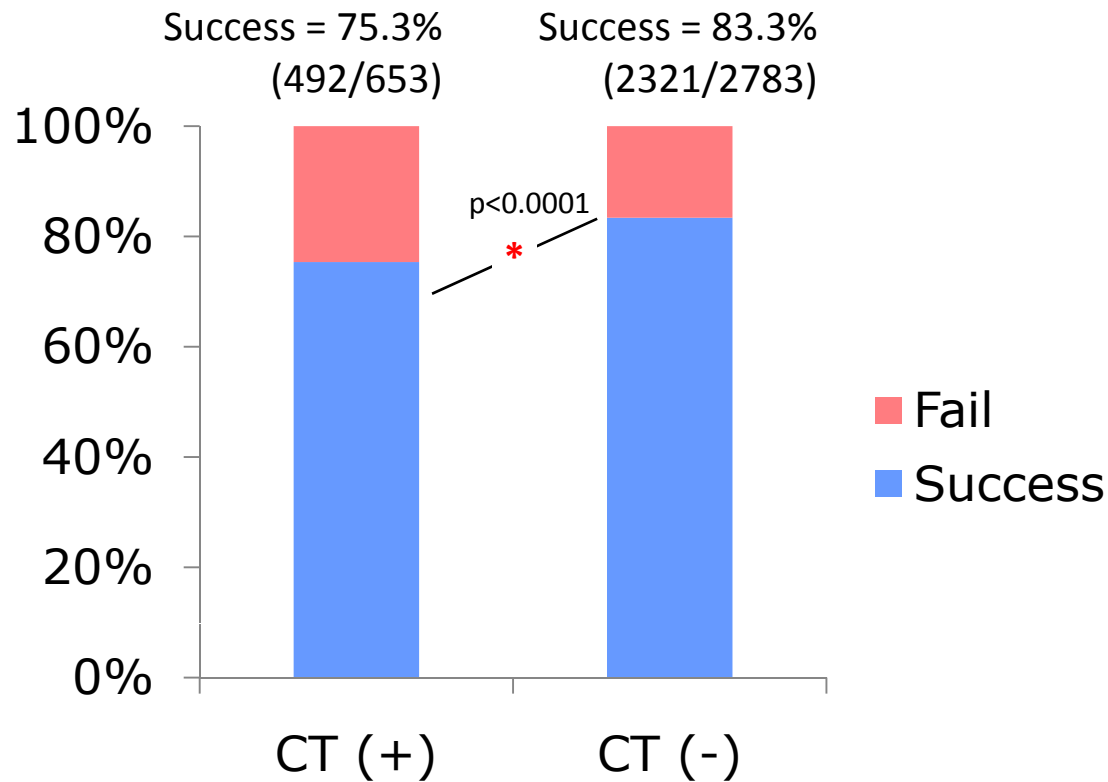
Ueno, Int J Cardiol 2010

Samsung Medical Center, Sungkyunkwan University School of Medicine

CTO PCI with or without pre-PCI CT

e-CTO: Korean multicenter CTO registry

N=3436 (age 63+/-11 year, male 74%), unadjusted data



Choi and e-CTO investigators, abstract submitted to KSC 2011

Summary

- 1. CT can evaluate detailed anatomy of whole vessel, lesion characteristics (especially calcification), and physiological function of collaterals and myocardium.**
- 2. CT can predict procedural success mainly based on the severity of calcification and lesion length.**
- 3. However, these potential values of CT has not been reflected in real-world clinical practice (e.g. CTO PCI success). We need more sophisticated investigation.**