

Who and Which Lesions Are the Best Targets for CTO Intervention?

Satoru Otsuji. M.D.



Higashi Takarazuka Satoh Hospital

Hyogo, Japan

Agenda

Who are the best targets for CTO-intervention?

Patient's characteristics

Symptom

Assessing ischemia burden

Demonstrating Viability

Which lesions are the best targets for CTO-intervention ?

Antegrade approach

Understanding lesion morphology

J-CTO score

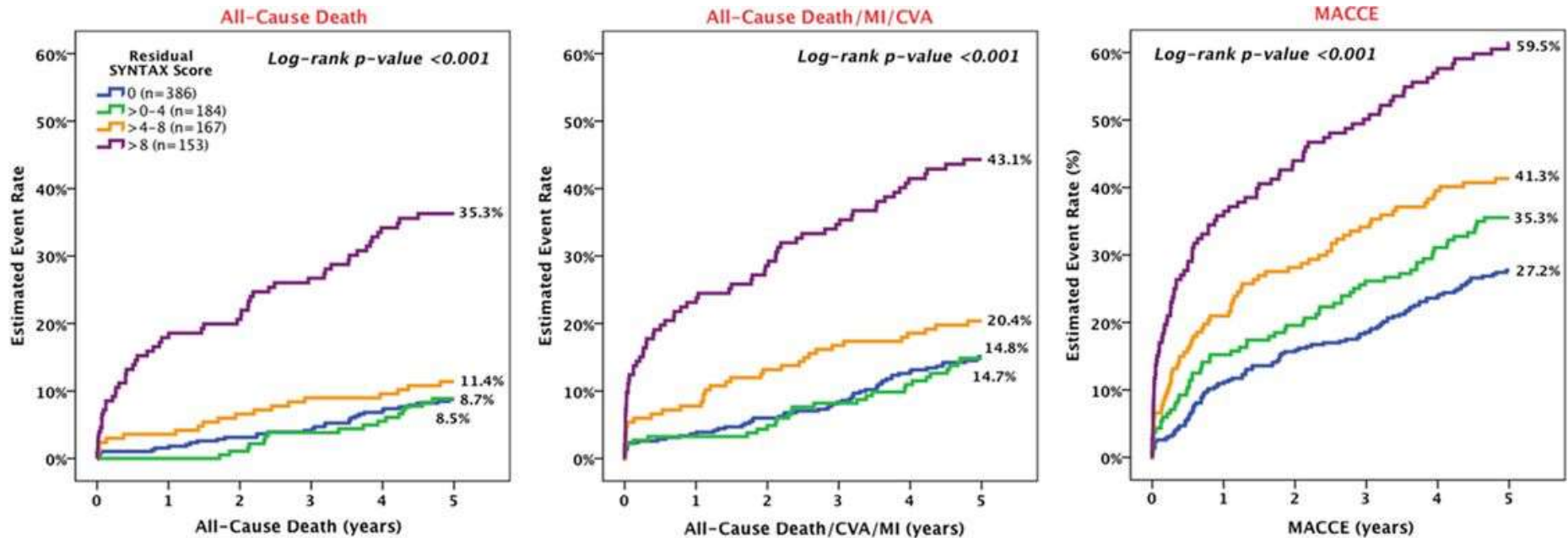
Angio derived J-CTO score versus Coronary CTA derived J-CTO score

Retrograde approach

Interventional collaterals present /absent

Why CTO should be treated ?

Incomplete revascularization predicts adverse outcomes.



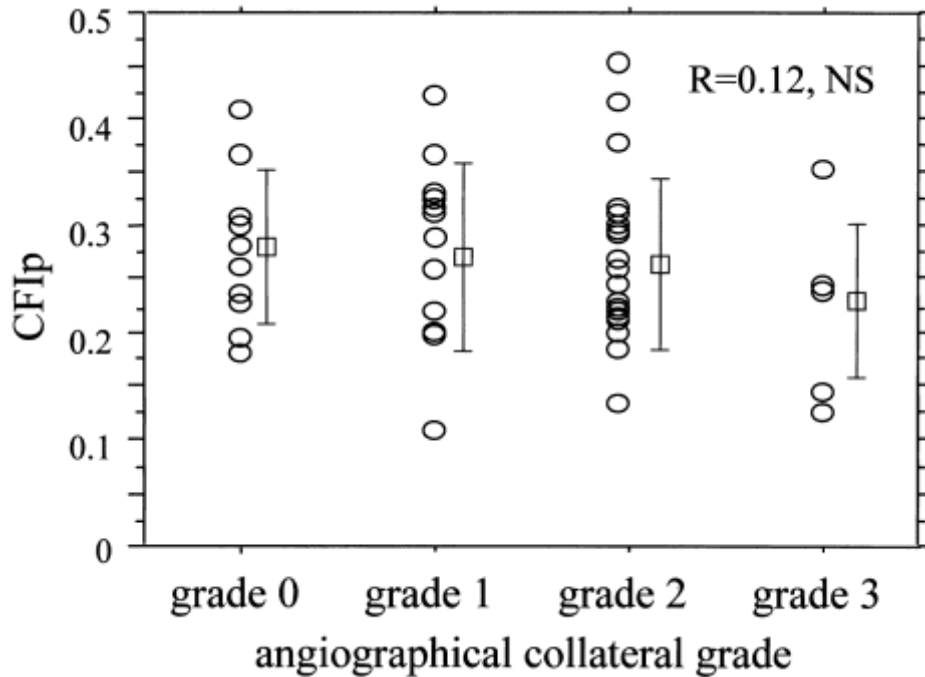
Circulation. 2013;128:141-151

The presence of a CTO was the strongest predictor of incomplete revascularisation

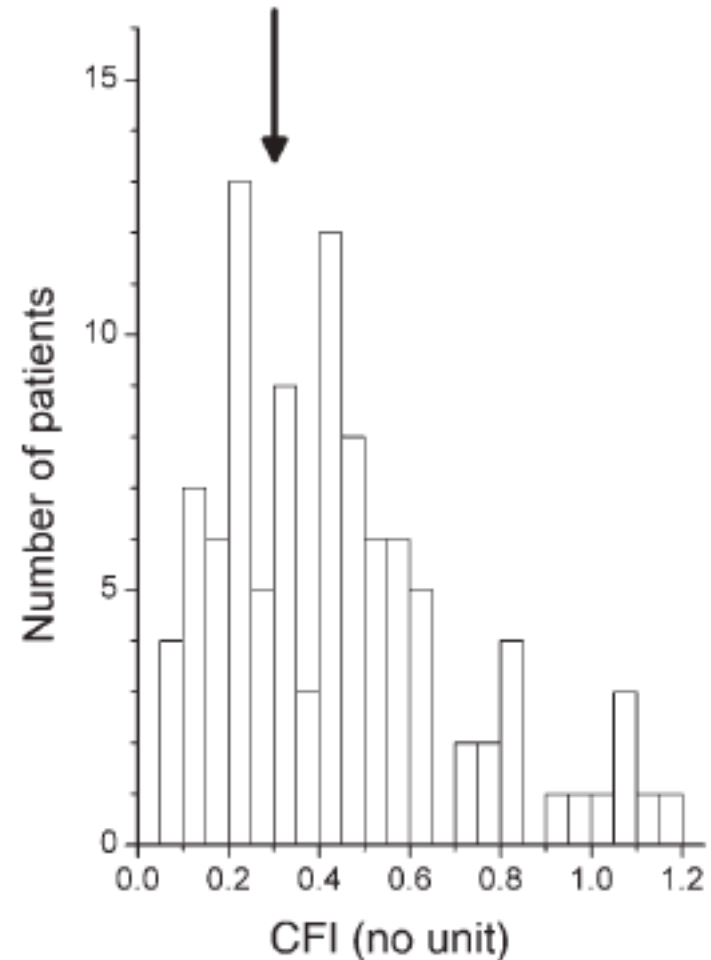
	Residual SYNTAX Score (n=890)				P Value for Linear Trends*
	0 (n=386)	>0-4 (n=184)	>4-8 (n=167)	>8 (n=153)	
Anatomical characteristics					
Left main disease§†	42.5%	34.8%	40.1%	39.2%	0.48
De novo 3VD	57.5%	65.2%	59.9%	60.8%	0.48
Number of lesions	3.5±1.7	4.1±1.6	4.3±1.6	4.5±1.6	<0.0001
Any total occlusions	12.3%	22.3%	28.3%	50.7%	<0.0001
Number of total occlusions					
1 T0	12.0%	22.3%	25.3%	42.8%	<0.0001
2 T0	0.3%	0.0%	3.0%	7.9%	<0.0001
Any bifurcation lesion	57.3%	66.3%	62.9%	70.6%	0.0056
Any trifurcation lesion	7.3%	6.0%	10.2%	6.5%	0.77
Any bifurcation or trifurcation	62.2%	68.5%	70.1%	71.9%	0.015
Diffuse or small vessel disease	18.4%	26.1%	20.4%	28.1%	0.034
Any aorto-ostial lesion	17.3%	13.6%	11.5%	17.1%	0.48
Any angiographically visible thrombus	2.6%	2.2%	2.4%	2.6%	0.97
Any heavy calcification	42.7%	47.3%	53.0%	64.5%	<0.0001
Any severe tortuosity	55.8%	74.5%	74.7%	71.7%	<0.0001
Left arterial dominance	16.8%	19.6%	19.8%	16.3%	0.85

Why CTO should be treated ?

Collaterals are **INSUFFICIENT** to prevent ischemia



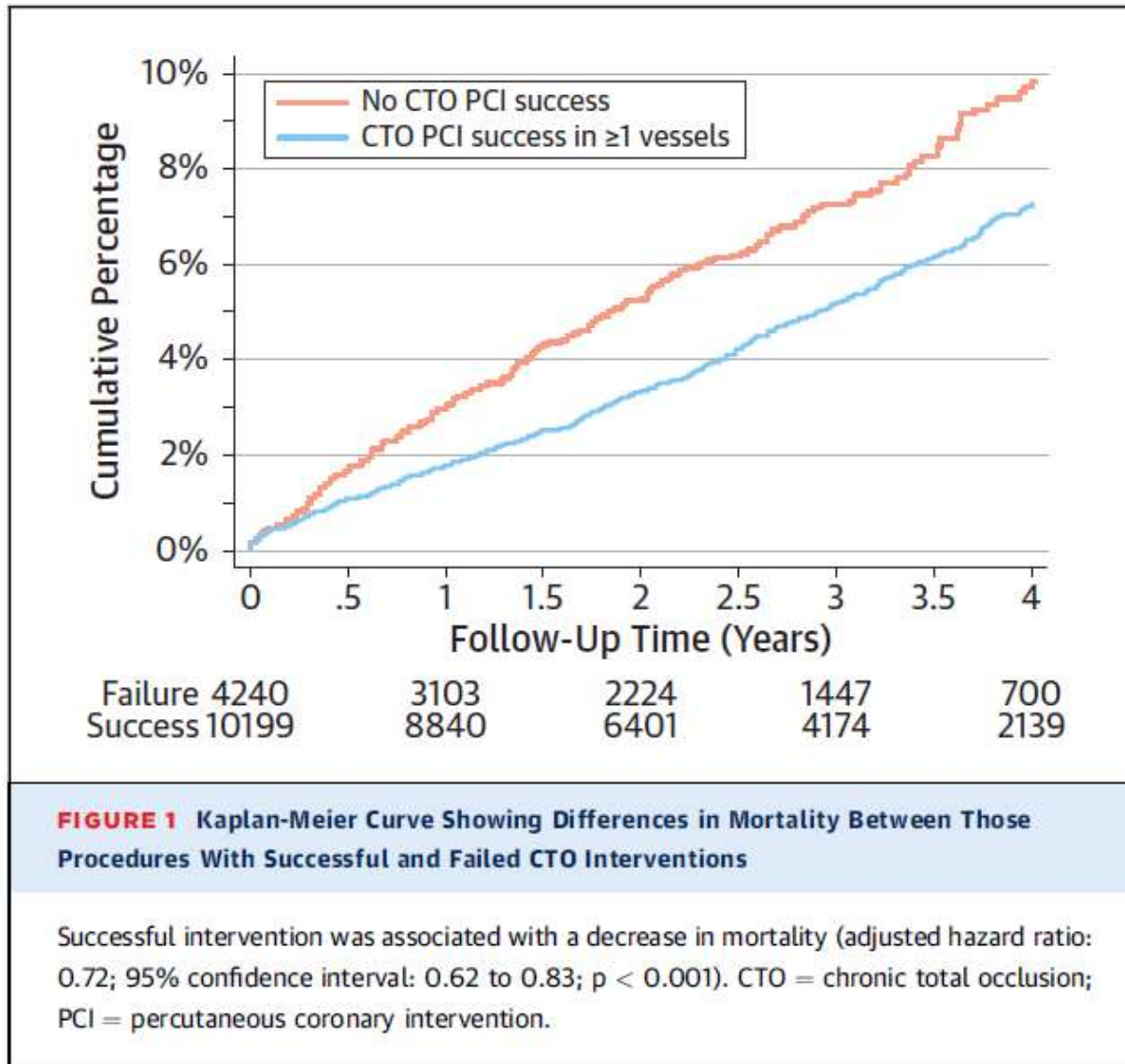
CFI:Collateral Flow Index



K. Yamamoto, et.al. J Am Coll Cardiol. 2001 Nov 1;38(5):1383-9.

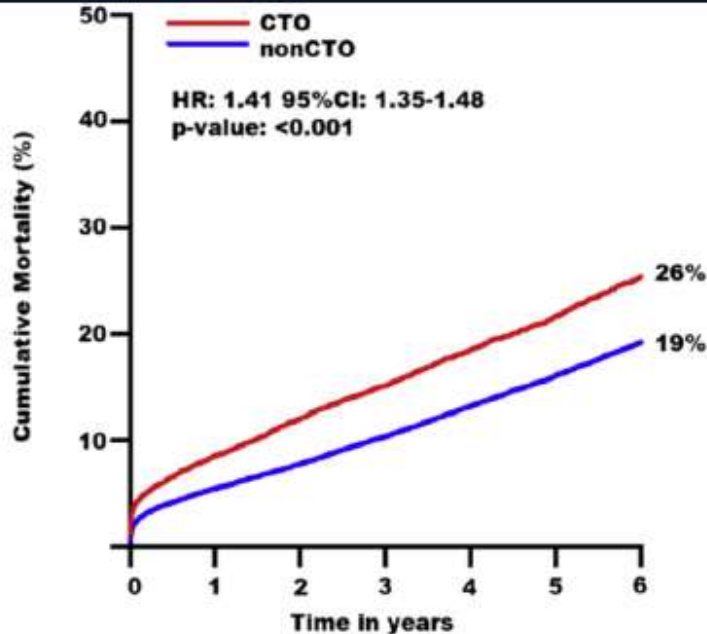
European Heart Journal 2006;27:2406

Long-term follow-up of elective chronic total coronary occlusion angioplasty



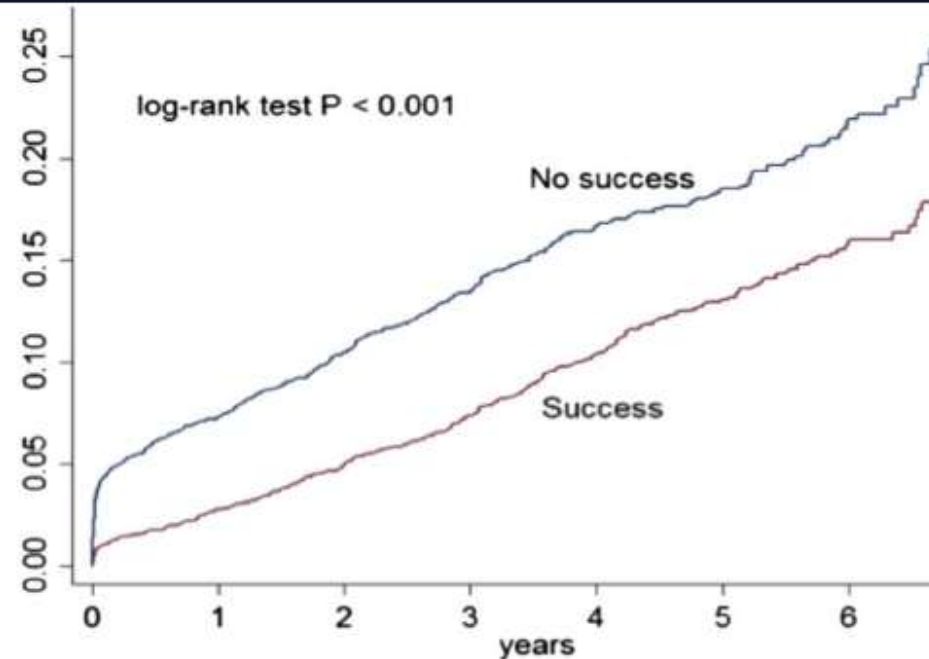
Prognostic impact of CTO

Long-Term Mortality in Patients W/ and W/o CTO



Number at Risk	0	1	2	3	4	5	6
CTO	14,269	11,009	9,015	7,163	5,447	3,797	1,773
non CTO	74,373	58,408	47,639	37,365	28,218	19,270	9,204

Long-Term Mortality in Patients with CTO After Successful vs Failed PCI



Number at risk	0	1	2	3	4	5	6
No success	2937	2363	1904	1517	1088	739	323
Success	3505	2889	2351	1892	1420	991	480

ESC/EACTS Guidelines On Myocardial Revascularization

Recommendation	Class	Level
CTO-PCI should be considered in patients with expected ischemia reduction in a corresponding myocardial territory and/or angina relief	IIa	B
Retrograde CTO-PCI may be considered after a failed antegrade approach or as the primary approach in selected patients	IIb	C

2011 ACCF/AHA/SCAI Guideline for PCI

5.8.1. CTOs: Recommendation

Class IIa

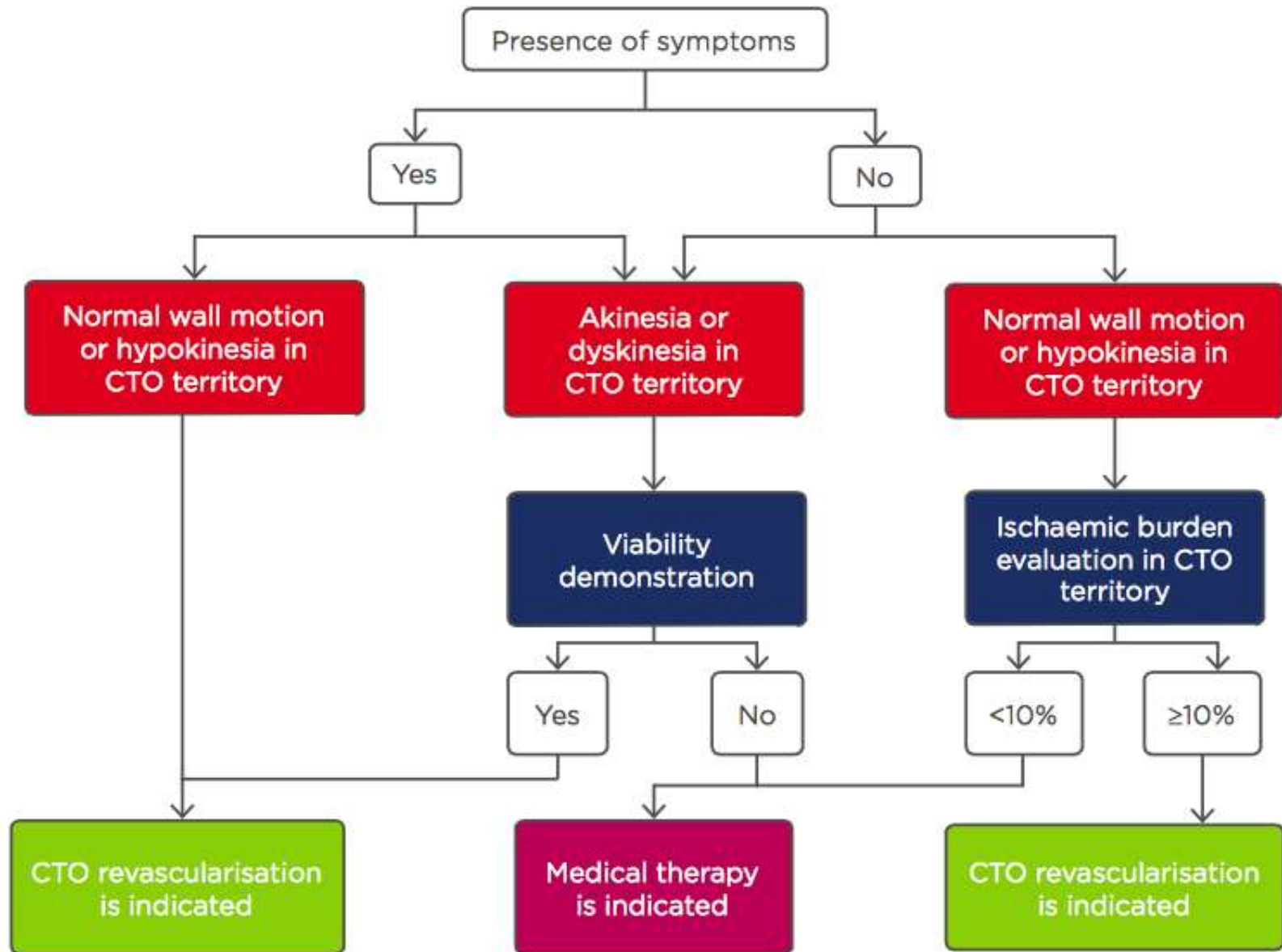
PCI of a CTO in patients with appropriate clinical indications and suitable anatomy is reasonable when performed by operators with appropriate expertise.⁶⁹⁹⁻⁷⁰³ (Level of Evidence: B)

		Asymptomatic			Symptomatic Class II			Symptomatic Class III-IV		
		Low risk	Interm. risk	High risk	Low risk	Interm. risk	High risk	Low risk	Interm. risk	High risk
Single-vessel disease	CTO	I	U	U	U	U	A	U	A	A
	Non-CTO	I	U	A	U	A	A	A	A	A

				No left main involvement		Left main involvement	
				No LAD Low Syntax score	High Syntax score with LAD involvement	Low Syntax score	High Syntax score
Multi vessel disease	CTO	PCI		A	U	U	I
		CABG		A	A	A	A
	Non-CTO	PCI		A	U	A	I
		CABG		A	A	A	A

Appropriateness of CTO PCI, 2012

CTO – PCI Current Decision – Making Steps

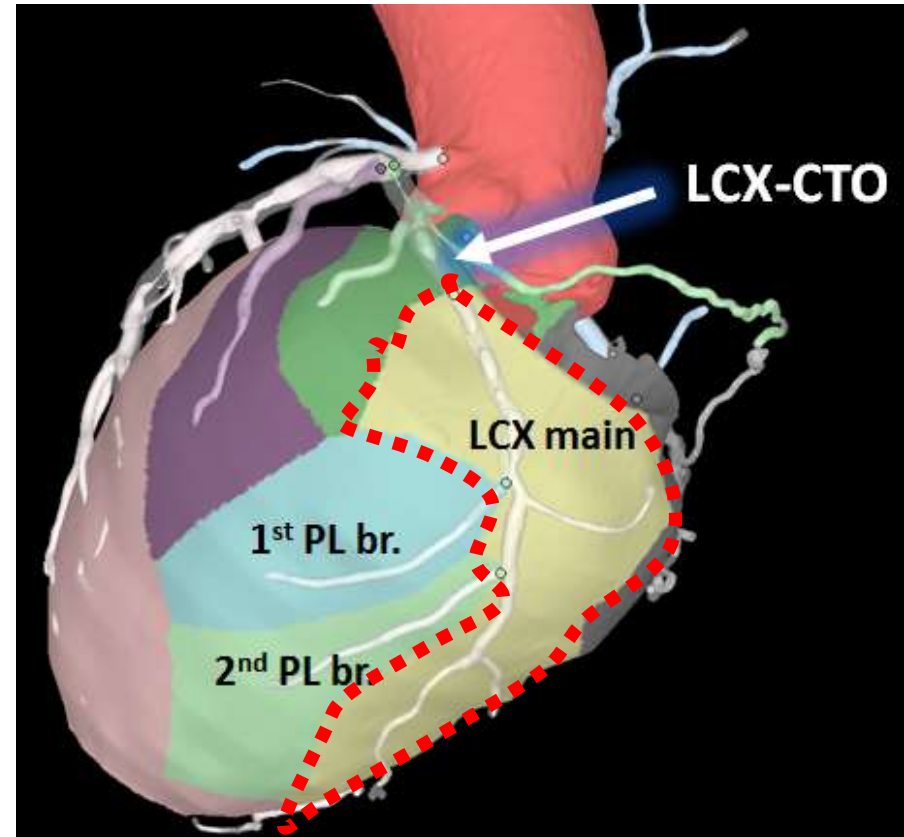
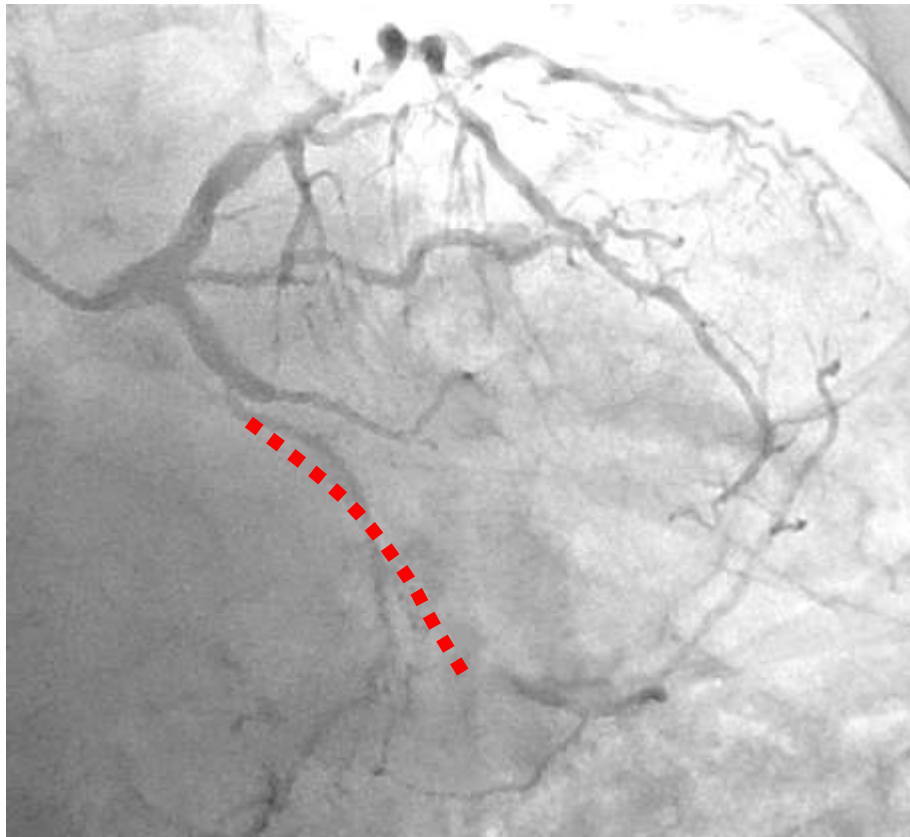


MMAR (Myocardial Mass At Risk)

Case: middle LCx- CTO

According to CT information, the territory of LCX-CTO is 33% of whole LV myocardium mass,

→ *The Best Target !!*



Agenda

Who are the best targets for CTO-intervention?

Characteristics

Symptom (angina.etc)

Assessing ischemia burden

Demonstrating Viability

Which lesions are the best targets for CTO-intervention ?

Antegrade approach

Understanding lesion morphology

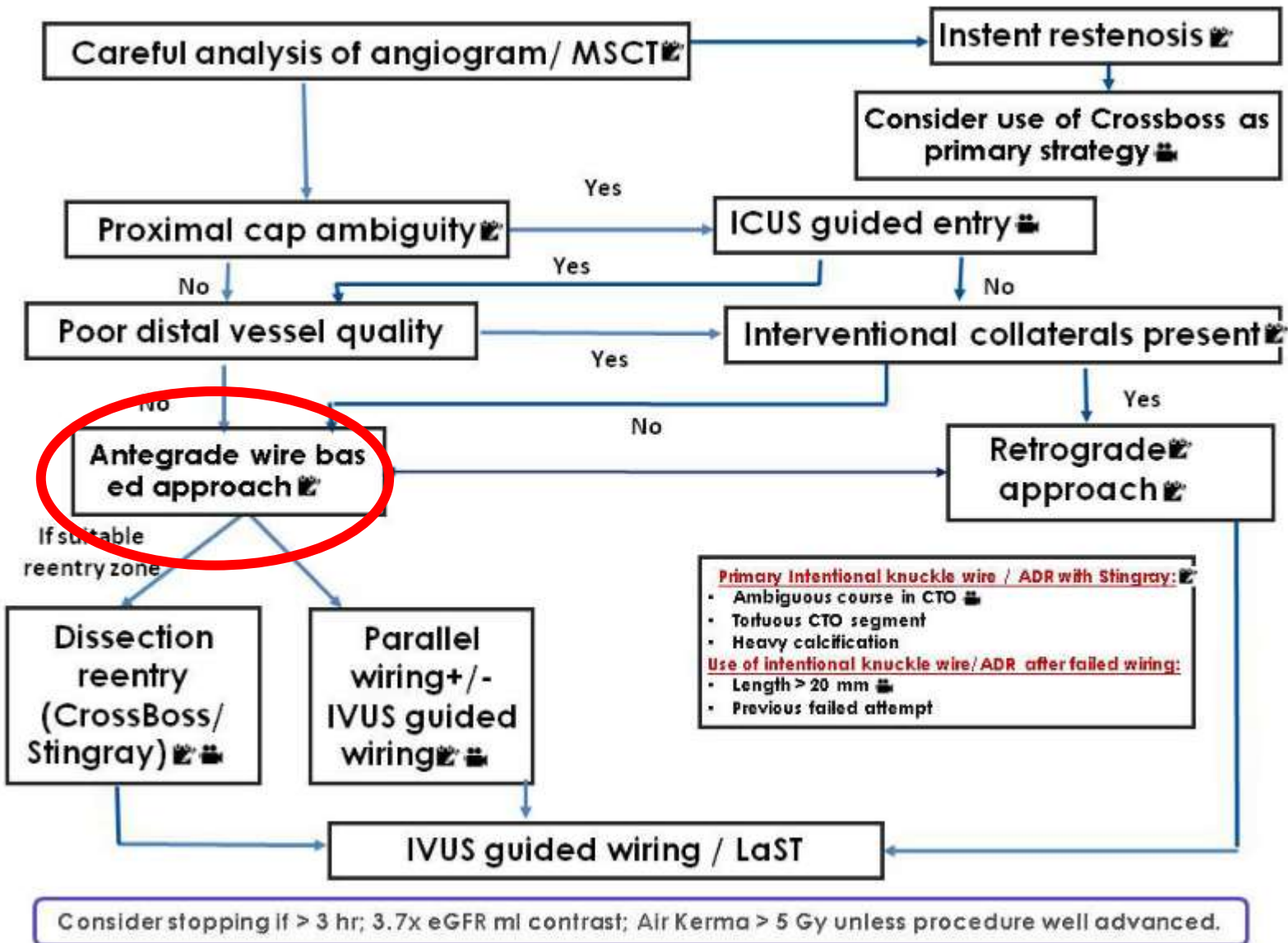
J-CTO score

Angio derived J-CTO score versus Coronary CTA derived J-CTO score

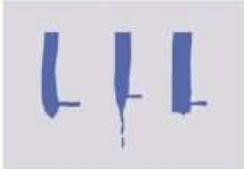


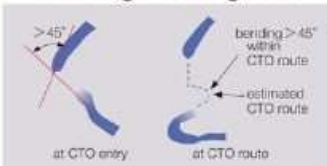
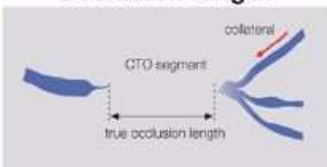
Retrograde approach

interventional collaterals present /absent

Algorithm



J-CTO (Multicenter CTO Registry of Japan) Score

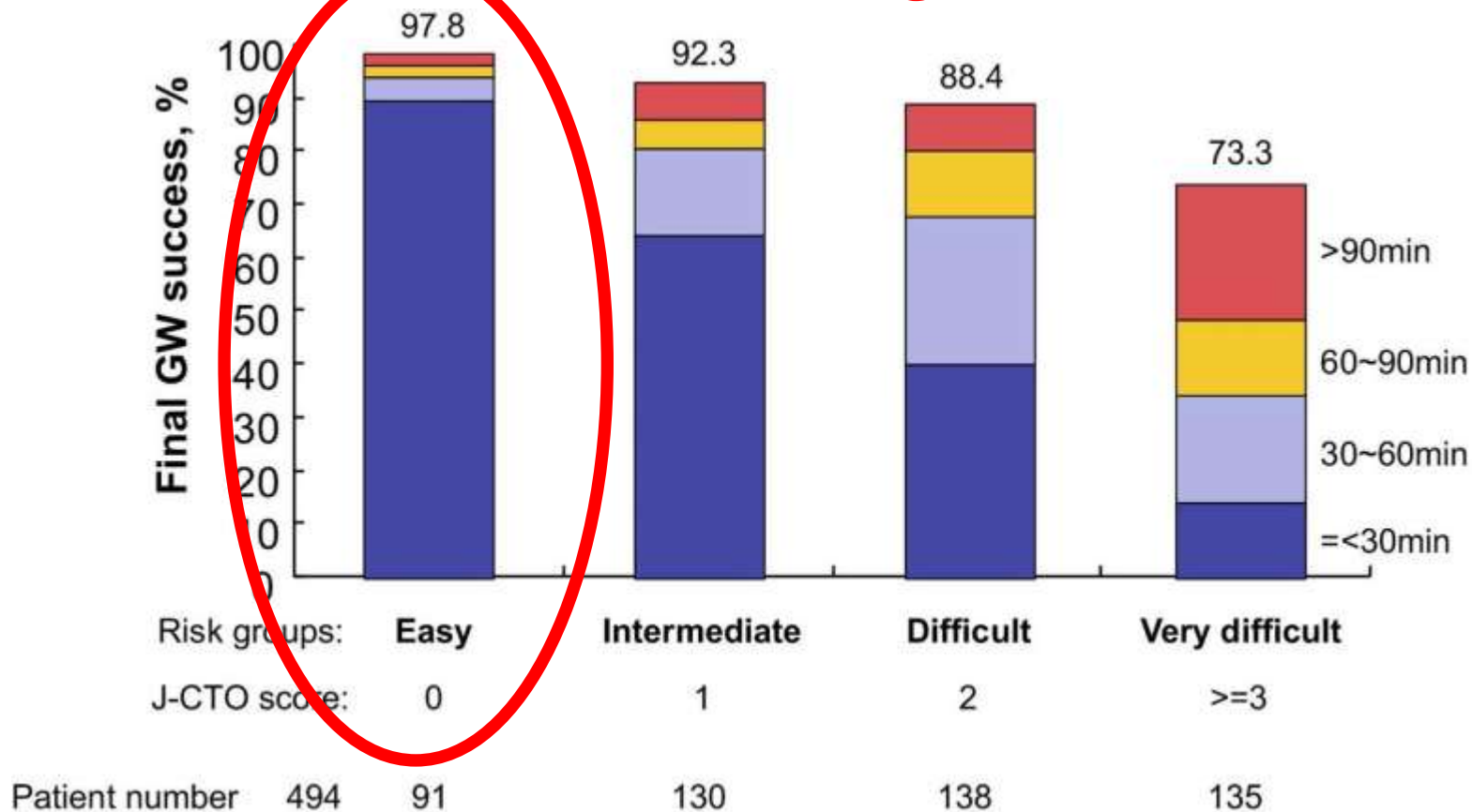
Variables and definitions		
<p>Tapered</p> 	<p>Blunt</p> 	<p>Entry with any tapered tip or dimple indicating direction of true lumen is categorized as "tapered".</p>
<p>Entry shape</p> <p><input type="checkbox"/> Tapered (0)</p> <p><input type="checkbox"/> Blunt (1)</p>		point
<p>Calcification</p> 		<p>Regardless of severity, 1 point is assigned if any evident calcification is detected within the CTO segment.</p>
<p>Calcification</p> <p><input type="checkbox"/> Absence (0)</p> <p><input type="checkbox"/> Presence (1)</p>		point
<p>Bending > 45degrees</p> 		<p>One point is assigned if bending > 45 degrees is detected within the CTO segment. Any tortuosity separated from the CTO segment is excluded from this assessment.</p>
<p>Bending > 45°</p> <p><input type="checkbox"/> Absence (0)</p> <p><input type="checkbox"/> Presence (1)</p>		point
<p>Occlusion length</p> 		<p>Using good collateral images, try to measure "true" distance of occlusion, which tends to be shorter than the first impression.</p>
<p>Occl.Length</p> <p><input type="checkbox"/> <20mm (0)</p> <p><input type="checkbox"/> ≥20mm (1)</p>		point
<p>Re-try lesion</p> <p>Is this Re-try (2nd attempt) lesion ? (previously attempted but failed)</p>		<p>Re-try lesion</p> <p><input type="checkbox"/> No (0)</p> <p><input type="checkbox"/> Yes (1)</p>
		point

Category of difficult (total point)

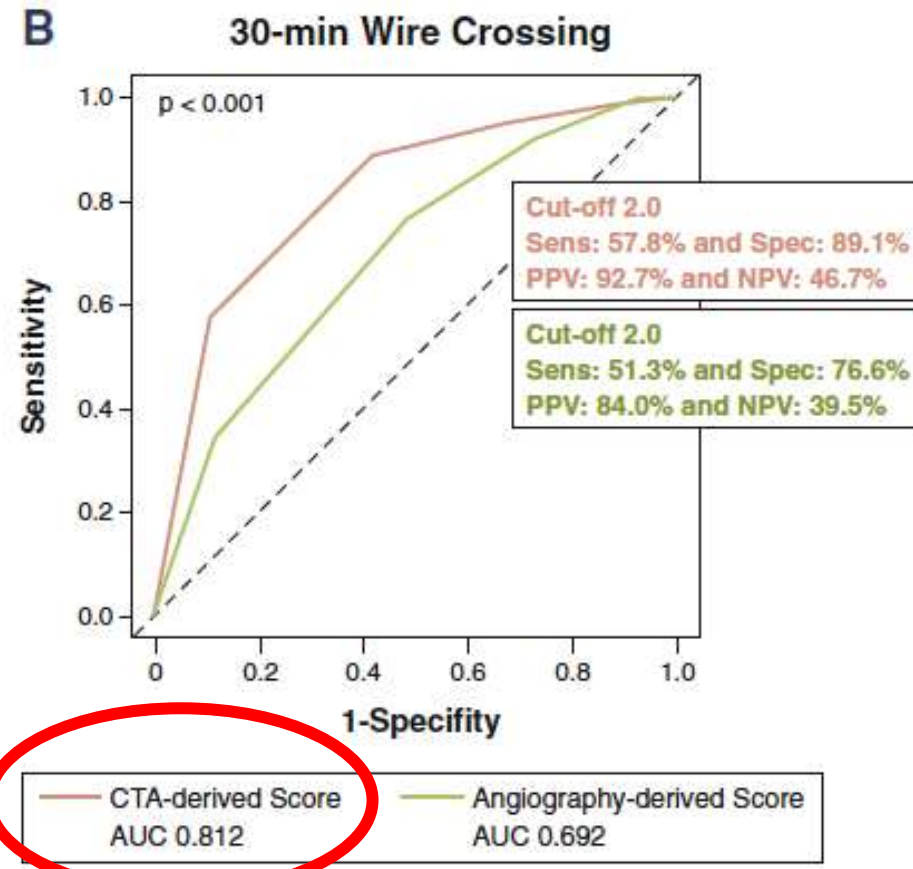
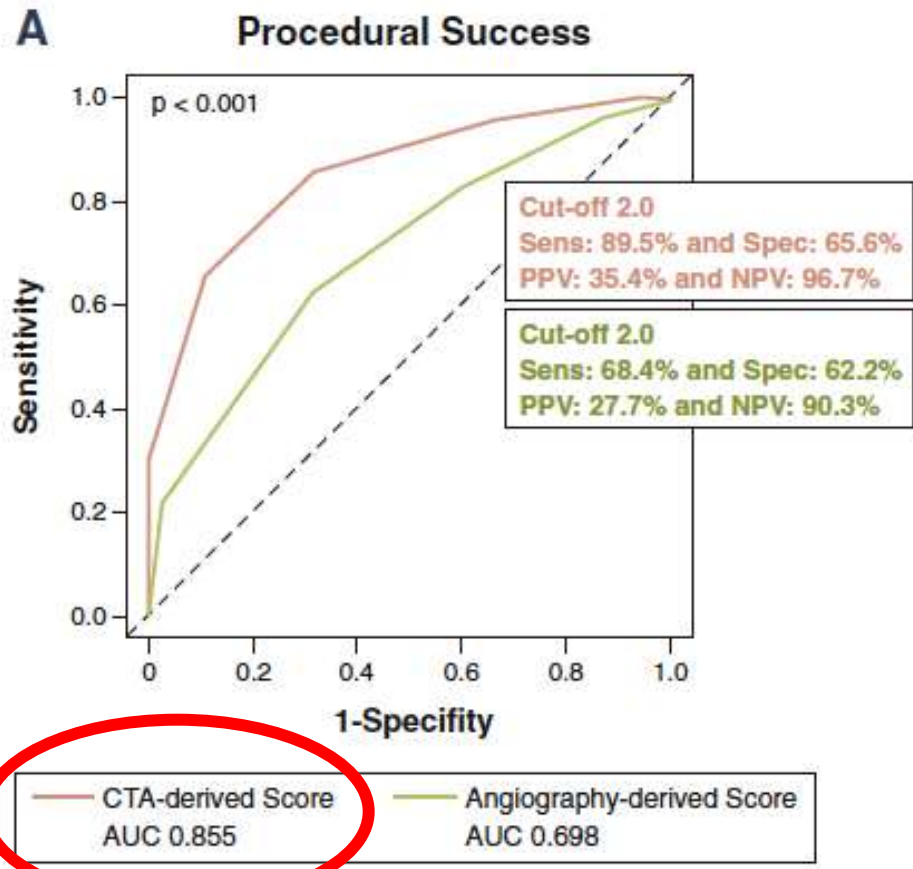
- easy (0)
- intermediate (1)
- difficult (2)
- very difficult (3-5)

J-CTO score was strongly associated with final success and efficiency, supporting its expanded use in CTO interventions.

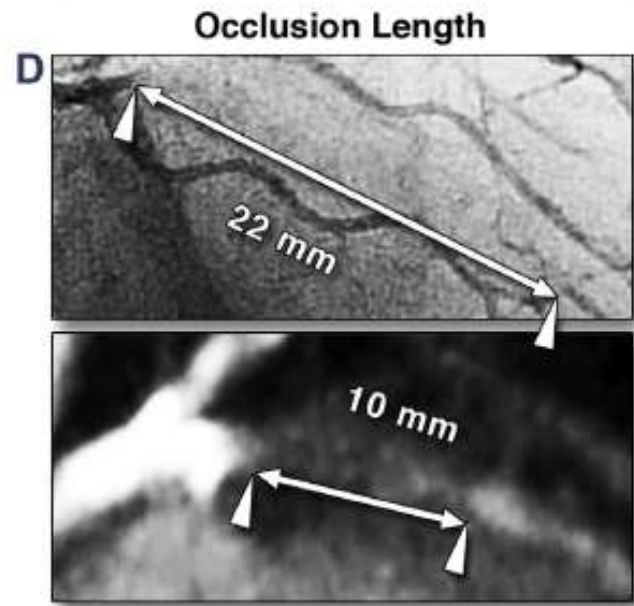
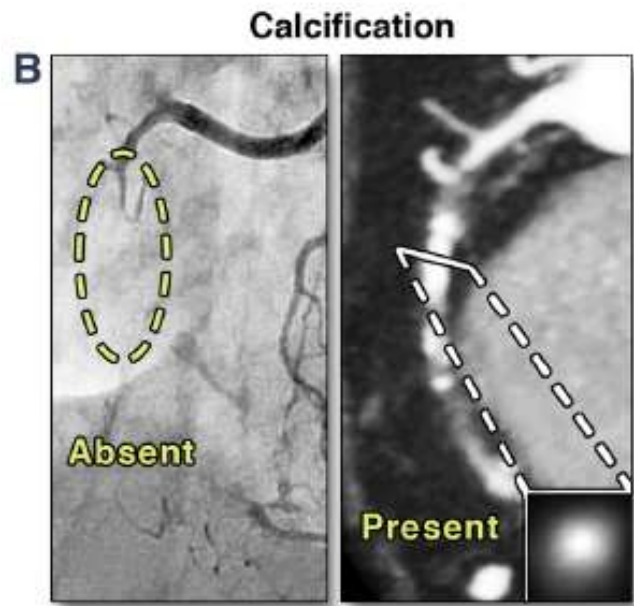
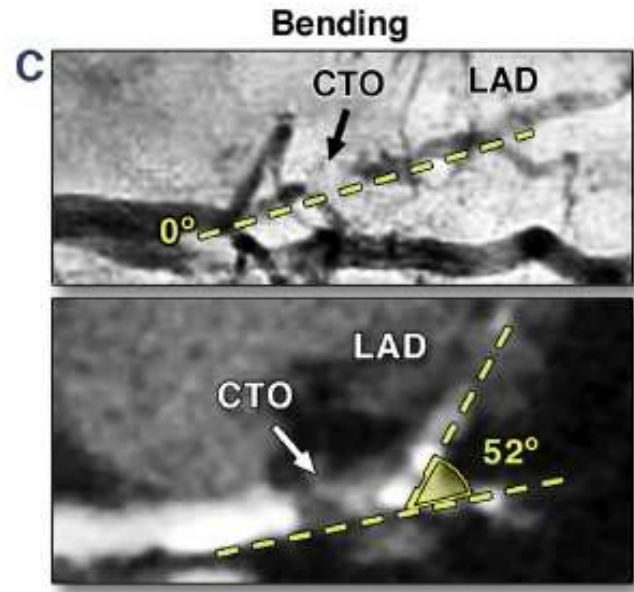
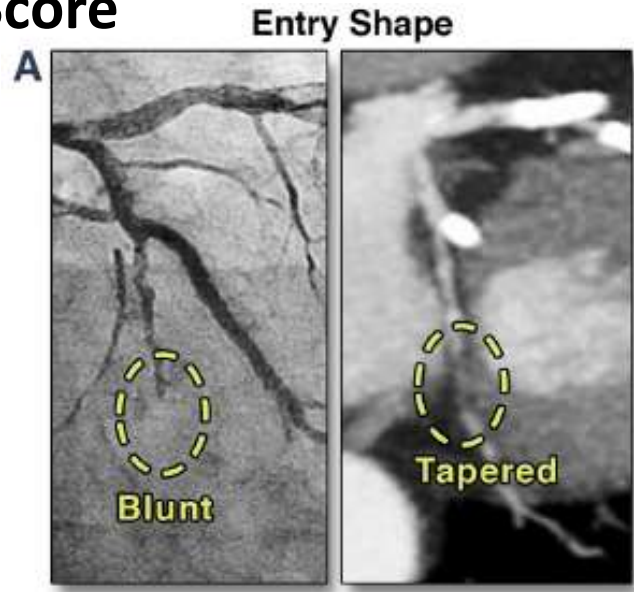
The Best Targets !!



CCTA-derived J-CTO score might be a more useful predictor of successful PCI of CTO than CAG-derived J-CTO score.



Representative Cases Showing Discrepancies Between CTA and Conventional Angiography Regarding 4 Morphologic Characteristics of J-CTO Score



CTO – PCI Current Decision – Making Steps

Assessing angiography and
Coronary CT angiography



Choose targets to lead easy
to success, based on previous
report



Antegrade wire based approach

CTO entry shape

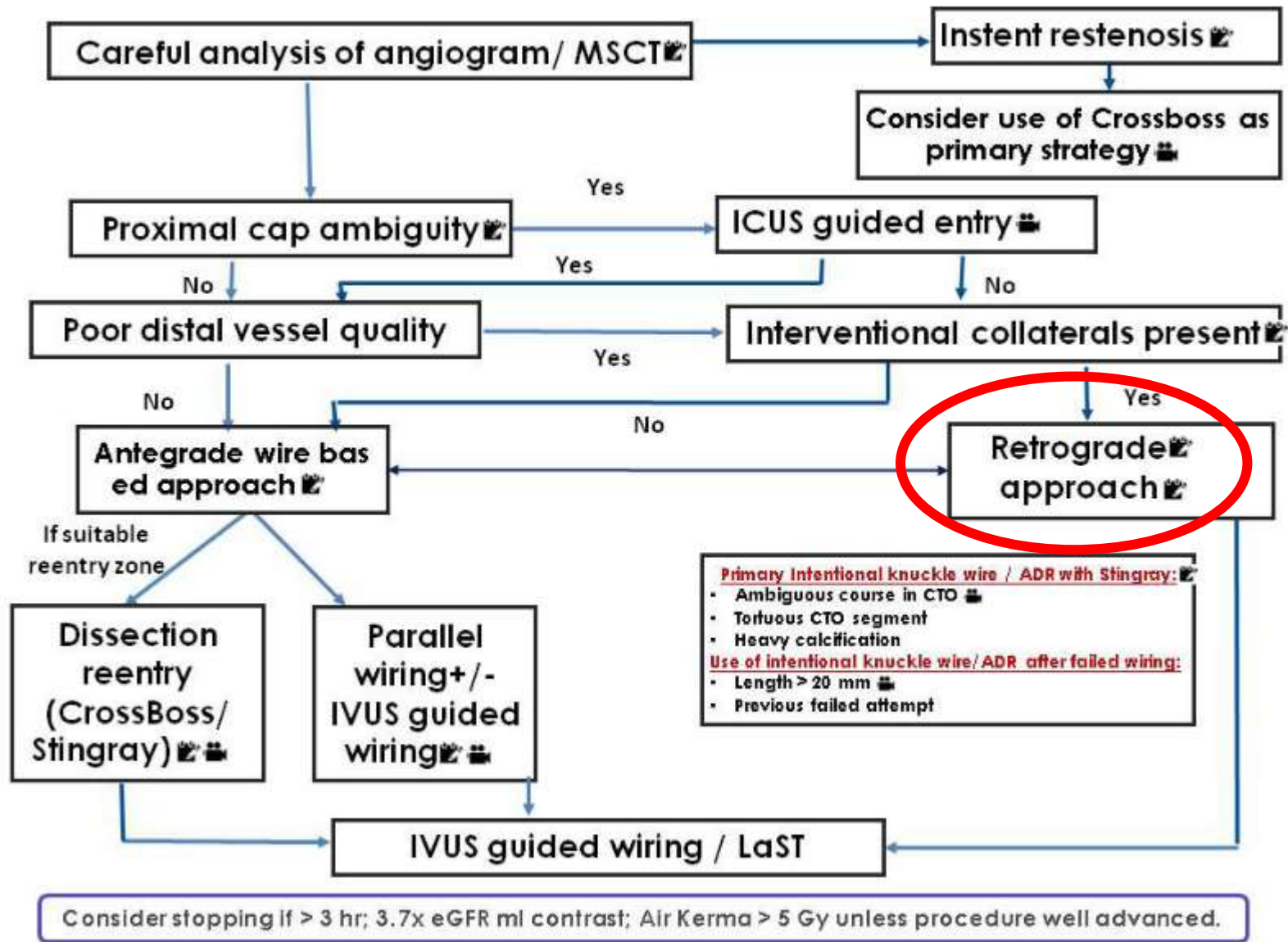
Bending

CTO length

Lesion calcification
within CTO

J-CTO score

According to the Algorithm

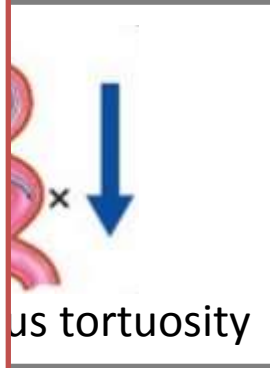
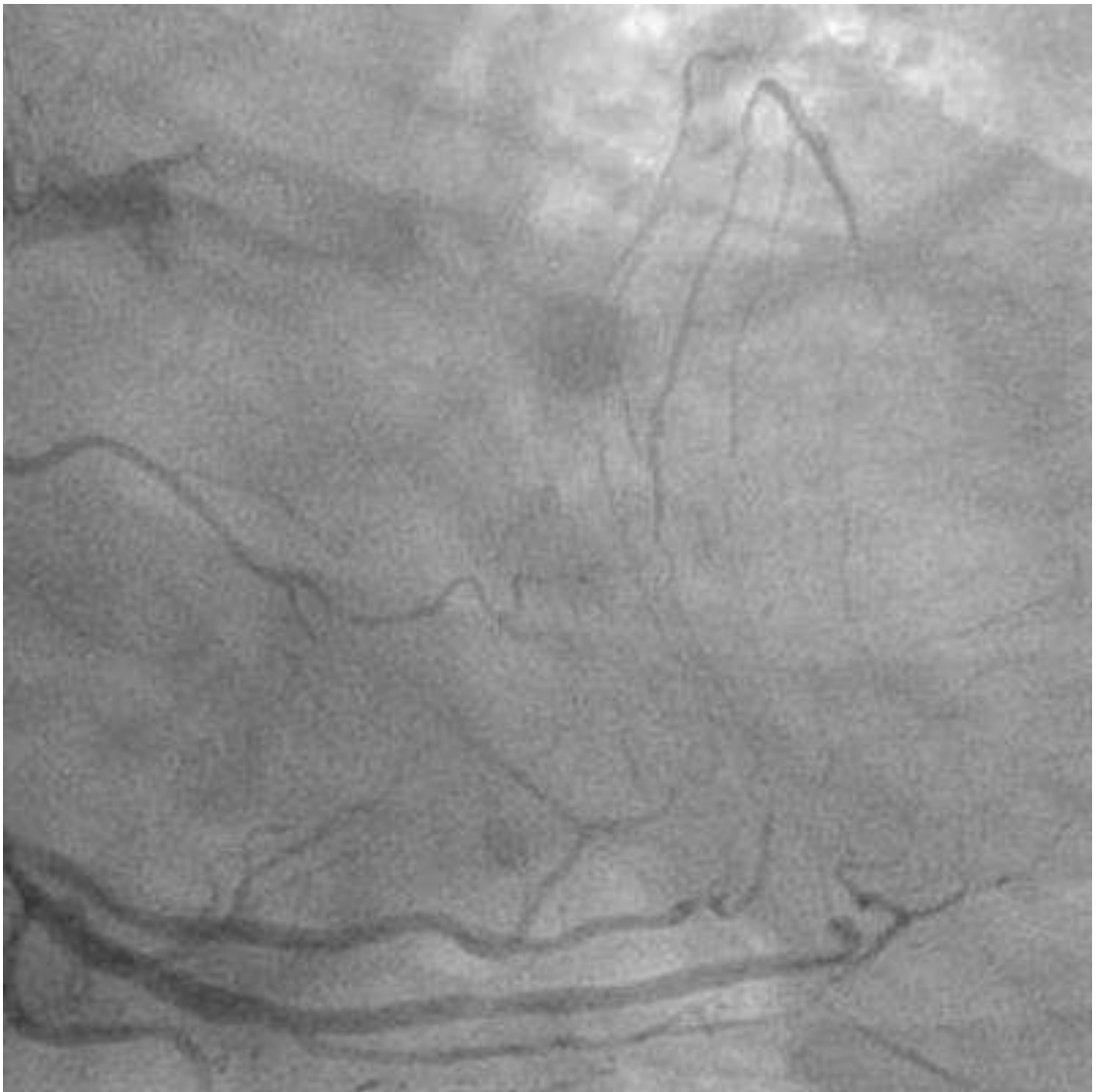
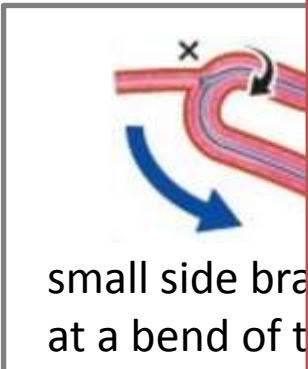


Ir

ent ?

- There a

difficult.



Well developed straight channel
→ *The Best targets !!*

Summary

To get high success rate in CTO intervention, there are many tips and tricks.

J-CTO score was strongly associated with final success and efficiency, supporting its expanded use in CTO interventions.

However, CCTA–derived J-CTO score might be a more useful predictor of successful PCI of CTO than CAG-derived J-CTO score.

So that, it is most important to analyse the angiogram or CTA for understanding the lesion morphology.

We should choose the target with high likelihood of success and low risk for complication.